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ABSTRACT BOOK

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CONTENTS

Session 3: Biological and Medical Science

Session 4: AI and Data Science for Health

PLENARY SESSION

Prof. Samir Mitragotri,
Harvard University, USA

Samir Mitragotri is the Hiller Professor of Bioengineering and Hansjorg Wyss Professor of Biologically Inspired Engineering at Harvard University and Wyss Institute. His research is focused on therapeutic and biomaterial development. His research has led to new technologies for treating many diseases. He is an elected member of the US National Academy of Engineering, US National Academy of Medicine and US National Academy of Inventors. He is an author on over 400 publications and an inventor on over 300 patents/patent applications. His research has led to several companies that have advanced technologies developed by him into clinical and commercial products. He is also an elected fellow of AAAS, CRS, BMES, AIMBE, and AAPS. He received BS in Chemical Engineering from the Institute of Chemical Technology, India and PhD in Chemical Engineering from the Massachusetts Institute of Technology.

Abstract

Targeted delivery of drugs offers a potential to maximize their efficacy and minimize toxicity. To achieve this, drugs such as chemotherapeutics, proteins and mRNA are encapsulated in polymer or lipid-based carriers. However, upon injection in the body, these carriers face the challenge of poor blood circulation, limited targeting and the inability to negotiate

many biological barriers. Biology has provided many examples of successful “carriers” in the form of circulatory cells including red blood cells, macrophages, neutrophils and T cells, among others, which routinely overcome the hurdles faced by synthetic carriers. We have developed “cellular hitchhiking and backpacking” approaches which involve combining synthetic carriers with circulatory cells to drastically alter the in vivo fate of the carriers as well as the cells. I will provide an overview of the principles and applications of hitchhiking and backpacking approaches for therapeutic delivery and cell therapy.

Prof. Kam W. Leong,
Columbia University, USA

Dr Leong is the Samuel Y. Sheng Professor of Biomedical Engineering at Columbia University. He is one of the pioneers in developing multifunctional nanocarriers for delivery of drugs, antigens, proteins, siRNA, pDNA, and mRNA. Dr. Leong’s current research encompasses nonviral gene editing in vivo, biomaterials for inflammation modulation, and human-tissue chips for disease modeling and drug development. His publication record includes around 500 manuscripts, an h-index of 144, and over 78,000 citations. He also holds more than 60 issued patents. Dr. Leong's contributions have been recognized by his election to the USA National Academy of Engineering, the National Academy of Inventors, and the National Academy of Medicine. Recent awards include the Society for Biomaterials' Founders Award (2022), the IEEE-EMBS Career Achievement Award (2023), and the IEEE Biomedical Engineering Award (2024). Dr. Leong has been serving as the Editor-in-Chief of *Biomaterials* for the past decade.

Abstract

Therapeutic biomaterials are functional materials designed not only to serve as carriers or structural supports, but also to actively contribute to treatment. Unlike traditional biomaterials, such as drug carriers or scaffolds that only control release kinetics or provide mechanical support, therapeutic biomaterials are engineered to interact with cells, tissues, or the immune system to promote healing or modulate disease progression. These materials can exert therapeutic effects independently

of any encapsulated drugs, through mechanisms including immune modulation, biochemical signaling, and scavenging of pathological molecules such as cell-free DNA, cell-free RNA, or reactive oxygen species. Their activity arises from intrinsic properties such as composition, architecture, and surface chemistry, enabling them to function as both a delivery platform and a therapeutic modality. In this lecture, I will discuss the design and application of therapeutic biomaterials across multiple scales, with an emphasis on inflammation modulation in sepsis, colitis, muscle fibrosis, and regenerative medicine.

KEYNOTE SESSION

Prof. Yadong Wang,
Cornell University, USA

Yadong Wang is the inaugural McAdam Family Foundation Professor in the Meinig School of Biomedical Engineering at Cornell University. He obtained his Ph.D. degree under the guidance of professor T. Daniel P. Stack at Stanford University in 1999, conducted his postdoctoral research under the mentorship of professor Robert Langer at MIT, and joined the Georgia Institute of Technology in 2003 as an assistant professor. He was recruited as an associate professor to the University of Pittsburgh in 2008. He was promoted to full professor in 2023 and then promoted to the Whiteford Professor within 3 months. He was recruited to Cornell University in 2017 to be the first McAdam Family Foundation Professor at Cornell. He has published over 150 peer reviewed articles on topics ranging from Chemistry, Materials Science to Biomedical Engineering.

He has published in high-impact journals at every stage of his career. He is a fellow of American Institute for Medical and Biological Engineering and a fellow of the National Academy of Inventors. His research focuses on the design and application of biomaterials. Several of his inventions are licensed, one of which is commercially available and approved for clinical use. He co-founded three companies: one is marketing advanced medical adhesives, the other two are developing drug delivery technologies and vascular grafts respectively.

Abstract

My lab study soft materials designed to interface living tissues. A common approach is to mimic the design of natural materials. We use this approach in our design of elastomers. On the other hand, one can obtain surprisingly useful materials by intentionally not following every design decision nature made. Such is our approach to protein delivery. On the first topic, we are developing tissue engineered blood vessels using these “biomimetic” elastomers. Here, we learned that an elastomer is indeed more suitable for vascular tissue engineering than stiff polymers. In rat, the fully synthetic, cell-free graft transforms into an autologous host vascular conduit with cellular and tissue organization resembling nature arteries. In sheep, however, we met significant challenges and learned much about the consequences of small variations have on host response. In the second topic, we learned that altering biological features can outperform full biomimicry in making useful drug delivery vehicles. Here our biomolecular condensate only mimics a small subset of features of a mammalian cell. However, our condensate circulates in blood longer than the best liposome. Furthermore, we achieved this without using PEGylated lipid, the secret behind long circulating liposomes and the COVID-19 vaccine.

Prof. Thanh Nguyen,
University of Connecticut, USA

Dr. Nguyen is an associate professor of Mechanical Engineering, joined with the Biomedical Engineering department at the University of Connecticut (UConn). His research is highly interdisciplinary and at the interface of biomedicine, materials and nano/micro technology. Specifically, his research focuses on the science and technology to transform biodegradable and biocompatible materials (e.g surgical-suture polymers and amino acids) into special forms, shapes, or structures with “smart” functions at nano/micro-scales for diverse applications in vaccine/drug delivery, regenerative engineering and electrical implants. He developed a platform technology, so-called SEAL (StampEd Assembly of polymer Layer) to create 3-dimensional microstructures of biodegradable polymers and advanced the SEAL method to create a novel single-administration self-boosting skin microneedle patch. This single-administration microneedle platform can be programmed to repeatedly deliver not only vaccines but also other therapeutics like antibodies and diabetic/pain drugs, thus avoiding all painful and inconvenient injections in the traditional vaccination and drug administration methods. Besides the microneedle technology, his research group at UConn has extensively studied biodegradable piezoelectric materials, derived from safe medical polymers and natural amino acids, to develop novel biodegradable implanted force-sensor and ultrasound transducer for monitoring vital intra-organ pressures and delivering medicines through the blood-brain barrier, respectively. The biodegradable piezoelectric materials were also used as a tissue scaffold which can be remotely activated to produce electrical cues for stimulating tissue regeneration. Dr. Nguyen's works have been published in prestigious journals including Science, Science Translational medicine, Nature Nanotechnology, Nature Communication, Advanced Materials, PNAS, etc. and highlighted in major media such as The New York Times, BBC News, the Guardian, NIH research matter, etc.. He received several awards including the Young Investigator Award from the journal of Biomaterials (2022), ACell Young Investigator Award (2020), MIT top innovator under 35 for Asia Pacific (2019), NIH Trailblazer Award for Young and Early Investigators (2018), SPIE Rising Researcher Award (2019), Young Investigator Award in Biosciences and Bioengineering of Applied Sciences (2019), and the SME Outstanding Young Manufacturing Engineer Award (2018), etc..

Abstract

The ability to transform medical materials such as the resorbable surgical suture polymers and natural amino acids, into desired 3D forms/shapes/structures at nano and micro scales with "smart" functions, while sustaining the materials' excellent biocompatibility and biodegradability, provides significant applications in different biomedical fields, ranging from tissue engineering and controlled drug/vaccine-delivery to medical implants. Here, I will present our recent research works to create 3D microstructures of biodegradable polymers for developing single-administration self-boosting vaccine microneedles, and convert the biopolymers into "smart" piezoelectric nanomaterials, which can generate electricity under deformation and vice versa, offering a variety of exciting applications such as the implanted biodegradable force sensors, biodegradable ultrasound transducers, and the self-stimulated tissue engineering scaffolds.

Prof. Xuliang Deng,
Peking University School of
Stomatology, China

Dr. Deng got his Ph.D. in 1999 from Peking University Hospital of Stomatology. He has 26 years clinical experience in prosthodontics. He is a Member of the Academic Division of the Chinese Academy of Medical Sciences, President of The Peking University School of Stomatology, Director of the National Center for Stomatology, Director of the National Engineering Research Center for Oral Biomaterials and Digital Medical Devices, Deputy Director of the National Clinical Research Center for Oral Diseases.

He serves as the Founding Chair of the Scientific Research Management Branch of the Chinese Stomatological Association. He is a Fellow of the International College of Dentists, a Fellow of the Royal Society of Chemistry, and a Visiting Fellow at the National University of Singapore.

He is a recipient of the National Science Fund for Distinguished Young Scholars, and serves as the Principal Investigator for the National Natural Science Foundation's Innovative Research Group Project and the Chief Scientist of the National Key Research and Development Program. He is editor of several textbooks and reviewer of multiple international journals. His research focuses on advanced prosthodontic techniques, the development and application of innovative dental biomaterials, and the integration of intelligent technologies in stomatology.

He can lecture on:

1. Clinical skills and innovations in prosthodontics.
2. Development and application of advanced dental biomaterials.
3. Intelligent stomatology: AI and digital technologies in oral healthcare.

Abstract

The classical theory postulates that dentine Supersensitivity is caused by rapid fluid-flows within tubules transduce external stimuli to nerve terminals. This theory was proposed in 1900 and ever since then it has been used in dentistry textbooks till today. We found that a unique structure was naturally formed between the dentinal tubule wall and odontoblasts, which had a conical shape, nanopore size, and negative surface potential. This nanoconfined and negatively charged structure had a cationic rectification effect. Stimuli-induced cation transport through dentinal tubules at high speed and achieve rapid sensing. The directed flow of cation generates ionic currents, which efficiently open the pulpal nociceptive voltage-gated ion channels, triggering the nerve impulses causing the dentine hypersensitivity. This theory has well elucidated the signaling process of dental stimuli and has changed the theoretical understanding of dental stimulus transmission for 120 years. Based on this theoretical discovery, a new technique and commercial medical device of dentine hypersensitivity relief based on ion-blocking was invented, which has the characteristics of efficient pain relief and long-lasting maintenance.

Prof. Hala Zreiqat,
University of Sydney,
Australia

Professor Hala Zreiqat AM is a Payne-Scott Professor of Biomedical Engineering at The University of Sydney. A global leader in biomaterials and regenerative medicine, she has pioneered innovative synthetic biomaterials using advanced materials science and 3D-printing technologies. Her achievements have been recognized by numerous awards, including a Fulbright Fellowship, Harvard Radcliffe Fellowship, and the NSW Premier's Woman of the Year. She is an elected Fellow of Australia's National Academies and the American Institute for Medical and Biological Engineering. She also chairs the Australia-Arab Council and founded BIOTech Futures to mentor the next generation of scientists and engineers.

Abstract

The growing clinical demand for synthetic grafts to repair critical large bone defects, particularly in ageing populations with impaired regenerative responses, calls for innovative, cell-free approaches. This presentation will highlight two complementary strategies: 1) the development of patented engineered nanostructured, 3D-printed biomaterials tailored for personalized, load-bearing bone regeneration, including advanced fabrication methods for customizable implant architecture; and 2) insights into the influence of biomaterial curvature on stem cell senescence, offering a novel strategy to counteract age-related declines in tissue repair. Together, these technologies present powerful new avenues for enhancing skeletal and soft tissue regeneration, addressing the specific challenges of ageing and improving outcomes across diverse clinical applications.

Prof. Vladislav V. Yakovlev,
Texas A&M University,
USA

Education:

1990: Ph.D. Faculty of Physics, Moscow State University, USSR

1987: BS/MS Faculty of Physics, Moscow State University, USSR

Experience:

2012 – Present: Professor, Department of Biomedical Engineering, Department of Electrical and Computer Engineering, Department of Physics and Astronomy, Texas A&M University

1998 – 2011: Assistant Professor, Associate Professor, Professor, Department of Physics, University of Wisconsin – Milwaukee

1992 – 1998: Assistant Research Scientist, Department of Chemistry and Biochemistry, University of California, San Diego

1992: Research Engineer, Novatec Laser Systems, Inc., San Diego, California

1990 – 1991: Research Scientist, International Laser Center, Moscow State University, Moscow, USSR

Service:

Member of Editorial Board: Advanced Photonics, PhotoniX-Life, Applied Sciences

Awards:

2025 Light: Science & Applications, Best Reviewer Award

2023 – Present: Stewart & Stevenson Professor I, Texas A&M University

2021 SPIE Harold E. Edgerton Award in High-Speed Optics

2018 – Present: University (Distinguished) Professor, Texas A&M University

2015 William E. Lamb Medal for Laser Physics and Quantum Optics

Fellow of Optica, SPIE, APS and AIMBE

Research interests:

Nanophotonics; biophotonics, including biosensing, bioimaging and therapeutics

Abstract

Antimicrobial resistance (AMR) poses an escalating threat to global health, necessitating innovative strategies beyond conventional antibiotics. Among emerging approaches, antimicrobial photodynamic therapy (aPDT)—which employs light-activated photosensitizers to generate reactive oxygen species (ROS)—has shown promise in enhancing bacterial susceptibility and reducing resistance heterogeneity.

We explored the efficacy of aPDT as an adjuvant to antibiotic treatment, focusing on resistant strains of *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

In one study, *S. aureus* strains resistant to amoxicillin, erythromycin, and gentamicin were treated with five cycles of aPDT using curcumin (10 μM) activated by 450 nm light (10 J/cm^2). Post-treatment analysis revealed significant reductions in minimum inhibitory concentrations (MICs) and decreased heterogeneity among resistant populations, suggesting improved antibiotic effectiveness. In vitro experiments demonstrated that concurrent treatment with aPDT (using methylene blue) and antibiotics (chloramphenicol, tetracycline) significantly enhanced the susceptibility of methicillin-resistant S. aureus strains (USA300, RN4220). This synergy was replicated across additional antibiotic-strain pairings, emphasizing the potential of aPDT to impair bacterial resistance mechanisms non-specifically and restore antibiotic

efficacy. We further assessed the interaction between aPDT (using photodithazine and 660 nm irradiation) and antibiotics—gentamicin, ciprofloxacin, and ceftriaxone—against P. aeruginosa. Results showed the effect of the combined therapy was antibiotic-dependent: gentamicin exhibited consistent synergy, ciprofloxacin showed dose-dependent antagonism, and ceftriaxone's efficacy remained stable across PDT intensities. These findings underscore the importance of optimizing antibiotic–aPDT combinations based on specific pharmacodynamic interactions.

In summary, photodynamic therapy, when strategically combined with antibiotics, offers a promising route to mitigate antimicrobial resistance. It not only reduces bacterial heterogeneity and resistance profiles but also revives the efficacy of existing antibiotics. These findings advocate for the development of optimized combination protocols, marking a critical step toward combating the growing threat of drug-resistant infections.

INVITED SPEAKERS

Assoc. Prof. Vi Khanh Truong,
Khalifa University, UAE

Dr. Vi-Khanh Truong is an Associate Professor and leading NanoBioLab at Khalifa University. With a Ph.D. in Nanobiotechnology from Swinburne University of Technology earned in 2012, Dr. Truong has built a robust career highlighted by prestigious fellowships, including the BASF Industrial Postdoctoral Fellowship, CNRS Fellowship, RMIT VC Fellowship, and Fulbright Fellowship. His academic journey began with a visiting scholar award in Germany, receiving recognition for his impactful dissertation on titanium implant surfaces. Dr. Truong's research is dedicated to designing multifunctional nanomaterials that enhance biomedical device performance and mitigate device-related infections; and improve functional food for health. His innovations span advanced antimicrobial products used in medical settings and sustainable agricultural products with BASF, reflecting his functional integration of nanotechnology across various applications. His findings are published in top-tier journals like Nature Materials, Nature Communications, Advanced Materials, Adv. Func. Mater, ACS Nano, and PNAS, with over 140 publications and more than 12,000 citations, with an H-index of 51. Dr. Truong's industrial engagements have led to real-world solutions, including collaborations with Global Orthopaedics (now part of Corin Group) and ANISOP Holdings. He has secured 4 patents, with recent filings in immune modulation and anti-infection. His leadership roles continue to influence both the field of biomedical engineering and functional food nanotechnology, furthering health-promoting innovations.

Abstract

Gallium-based liquid metals (GaLMs) are catalyzing a paradigm shift in biomedical engineering, surfacing as formidable adversaries against infections with significant implications for tissue regeneration. This presentation will highlight the forefront potential of GaLMs in eradicating microbial resistance and advancing therapeutic outcomes in medical practice. Capitalizing on the distinct characteristics of GaLMs, including minimal toxicity, superior thermal and electrical conductivity, and their fluid state at near room temperatures, these innovative materials are being tailored to challenge and transform conventional infection control methods. Gallium's intrinsic antimicrobial properties disrupt critical metabolic processes of bacteria, particularly those strains that have developed resistance to standard antibiotics, offering a robust alternative in the battle against persistent infections.

This presentation will also navigate through the development processes of GaLMs, focusing on enhancements and breakthroughs that elevate their compatibility and functionality within biological systems. By exploring both the current landscape and future prospects, this presentation will highlight the critical role of GaLM in redefining antimicrobial strategies, setting new benchmarks for safer, more efficacious medical interventions.

Assoc. Prof. Thuy Ngo,
Oregon Health and Science University, USA

Dr. Ngo is an Associate Professor in Molecular and Medical Genetics and Biomedical Engineering at Oregon Health and Science University and a member of the Knight Cancer Institute's Cancer Early Detection Advanced Research Center (CEDAR). She received undergrad training in Engineering Physics at Hanoi University of Technology and Ph.D. in Biophysics and Computational Biology from the University of Illinois at Urbana-Champaign under the advisory of Dr. Taekjip Ha. She completed postdoctoral training in Dr. Stephen Quake's laboratory at Stanford University in 2017. Dr. Ngo is interested in technologies and basic mechanisms for diagnosis, precision selection of therapy, and treatment assessment by maximizing the high information content of cell-free RNA, cell-free DNA, and extracellular vesicles in body fluids. Her research program was awarded the IDEA Award from the Department of Defense and Career Catalyst Award from the Komen Susan Foundation. She has published research articles across disciplines in high-impact journals such as Science, Nature, and Cell. Her work in diagnostic technologies has led to multiple patent applications and licenses, and was selected as Top 10 Breakthrough Technologies 2019 by MIT Technology Review. Her findings have been well-received by the academic community, which has led to a broad audience by multiple media outlets such as NYTimes, CNN, BBC, and TIME Magazine.

Abstract

Liquid biopsy, the analysis of analytes in accessible biofluids such as blood, is an emerging approach for disease detection and monitoring across a wide range of conditions. We and others have demonstrated the efficacy of blood-based cell-free RNA (cfRNA) biomarkers in fields including obstetrics, transplantation, neurodegeneration, chronic diseases, and oncology. In addition to their predictive potential, cfRNA biomarkers offer an opportunity for longitudinal monitoring of high-risk patients and those undergoing treatment through minimally invasive means.

In this talk, I will present two examples from our lab where cfRNA-based methods were developed for cancer detection and treatment selection. The first involves the non-invasive detection of Pancreatic Ductal Adenocarcinoma (PDAC) in both pre-diagnostic high-risk individuals and de novo symptomatic patients. The second example demonstrates the use of cfRNA to identify breast cancer subtypes — a critical factor for guiding treatment. We applied this method to longitudinal blood samples collected during adaptive clinical trials to monitor subtype switching and predict treatment response.

Dr. Minh Le,
National University of Singapore,
Singapore

Dr. Minh Le is an Assistant Professor and Graduate Program Director at the Department of Pharmacology, Yong Loo Lin School of Medicine, National University of Singapore. She received a Ph.D. degree in Computational and Systems Biology from the Singapore-MIT Alliance and further trained as a postdoctoral fellow at Boston Children's Hospital. Dr. Le is a recipient of the L'Oreal Singapore for Women in Science Fellowship, the Graduate Mentor of the Year Award, the Promising Researcher Award as well as multiple national grants. Besides, she is also a cofounder of Carmine Therapeutics, and the director of the EVANTICA industry alignment program in Singapore.

Abstract

While immunotherapy has transformed oncology, its success is currently limited to 20-40% of patients, with 50-70% experiencing severe immune-related toxicities. There is a critical need for a targeted immunotherapy approach that enhances efficacy while mitigating these risks. We have developed an innovative extracellular vesicle (EV) platform tailored for cancer immunotherapy. By utilizing engineered natural EVs functionalized with immunomodulatory ligands, our approach amplifies treatment effectiveness while significantly reducing toxicity. These precision-targeted EVs improve biodistribution and

enhance the immune response against tumors. Furthermore, we generated a potent bispecific EVs (BEVs) platform using EVs functionalized with antibodies specific for CD3 and for tumour. BEVs elicit a greater stimulatory effect on T cells than free antibodies, reaching therapeutic efficacy at a lower dosage, hence reducing toxicities. Importantly, BEVs recruit activated T cells to the tumour sites, lower tumour burden, and prolong the survival of mice with lung cancer without causing observable side effects.

Prof. Sung-Min Lee,
Department of Electrical Engineering,
Hanyang University,
South Korea

Sung-Min Lee received a B.S. degree from Seoul National University, South Korea in 2006, and M.S./Ph.D. degrees from Korea Advanced Institute of Science and Technology, South Korea in 2008/2012, respectively, all in electrical engineering. Prior to joining Hanyang University, he was a Postdoctoral Research Associate at the University of Southern California in the United States from 2013 to 2015, a Research Staff Member at Samsung Advanced Institute of Technology in South Korea from 2015 to 2016, and an Assistant/Associate Professor at Kookmin University from 2016 to 2023. He also served as a Visiting Assistant Professor at Terasaki Institute for Biomedical Innovation in the United States in 2022.

His research interests have been on emerging optoelectronic devices and systems with unusual functions and enhanced performance. He has been studying (i) free-form displays and lightings, (ii) flexible/wearable/transparent semiconductor photovoltaics, (iii) optical sensor systems, and (iv) biocompatible electronics. He has given several invited talks and lectures at conferences and seminars, and authored over 50 peer-reviewed journal articles (H-index = 22). Since 2021, he has served as an Asian Program Committee Member of the Society for Information Display (SID) and Technical Program Committee Session Chair of the Global Photovoltaic Conference (GPVC). Also, he has been working as an associate editor of the IEEE Transactions on Electron Devices since 2023.

Abstract

Medical electronic devices have emerged as a crucial area of research, driven by increasing demand for health monitoring and therapeutic applications. In particular, the development of both non-invasive and invasive devices for continuous biosignal monitoring and photonic stimulation therapy has been actively pursued. Each approach, however, has inherent limitations. Non-invasive devices offer safety and user convenience but often suffer from limited signal accuracy. Conversely, invasive devices enable high-precision diagnostics but pose risks of inflammation and infection during implantation. In this study, we propose a biocompatible organic light-emitting diode (OLED) tailored for implantable light-emitting applications, with the goal of minimizing immune and inflammatory responses during implantation while maximizing compatibility with human tissue. The key objective is to implement transient characteristics in OLEDs by enabling controlled degradation or excretion within the body, thereby eliminating the need for surgical retrieval. To achieve this, we selected a range of biocompatible material candidates and integrated them into OLED thin films using a vacuum deposition process. The fabricated OLED devices included fully biocompatible components—substrate, anode, cathode, hole transport layer, and emitting layer. This work highlights the potential for commercializing OLED devices that fulfill both biocompatibility and biodegradability requirements. It also underscores the promise of innovative materials design capable of balancing biocompatibility with electrical performance. Such devices may play a pivotal role in the next generation of implantable light-emitting devices, contributing meaningfully to the advancement of biocompatible electronic technologies.

Session 1

Bio-Sensing Technology and Medical Devices

INVITED SPEAKERS

Dr. Vinh Truong,
Institute of Sustainability for Chemical, Energy and Environment,
A*STAR, Singapore

Dr Vinh Truong is currently a principal scientist and team leader at Institute of Sustainability for Chemical, Energy and Environment, A*STAR, Singapore. He holds an adjunct assistant professor at the Department of Pharmacology, NUS. His research focuses on the applications of photochemical reaction systems in biomaterials engineering and sustainability.

Dr Truong has published 80 papers in leading interdisciplinary journals including *Nat. Sus.*, *Nat. Comm.*, *JACS*, *Angew. Chem. Int. Ed*, and *Adv. Mat*. Dr Truong is among the top 2% most-cited scientists 2023-2025, listed by Stanford University. He also engages widely with industry partners, leading a number of industry research collaboration projects with a total funding of $SGD 24 mil.

Abstract

Photochemistry has become an indispensable tool for numerous spatially addressable applications in materials science and biology.[1, 2] Indeed, photochemistry has seen an immense resurgence and development in the last 20 years. In biomaterials applications, light-induced bond formation or cleavage provides a high degree of

versatility in tuning specific material properties including stiffness and degradability.

The critical advantage of light responsive biomaterials is the on-demand spatial and temporal control that is valuable for applications in biological environment. We have thus employed red-shifted photochemical reactions for wavelength-selective crosslinking of polymer networks, subsequently tuning the materials stiffness by using different colours of visible light.[3-5] We have also incorporated various photocleavable groups within polymer structures, enabling on-demand photodegradation- and softening-of the materials by different wavelengths.[6-8] We further demonstrated the utility of such materials in cell cultures and investigation of cell-materials interaction.

References

[1] Irshadeen, I.; Walden, S.; Truong, V. X.; Frisch, H.; Blinco, J.; Barner-Kowollik, C., *J. Am. Chem. Soc* **2021**, *143*, 50, 21113.

[2] Truong, V. X.; Barner-Kowollik, C., *Trends Chem.*, **2022**, *58*, 6397.

[3] Kalayci, K.; Frisch H.; Barner-Kowollik, C.; Truong, V. X., *Adv. Func. Mat.*, **2020**, *30*, 1908171.

[4] Kalayci, K.; Frisch H.; Truong, V. X.; C. Barner-Kowollik, *Nat. Comm.*, **2020**, 4193.

[5] Truong, V. X.; Bachman, J.; Blinco, J.; Barner-Kowollik, C. *Angewandte Chemie Int. Ed.*, **2022**, 61, e202113076.

[6] Truong, V. X.; Li F.; Forsythe, J. S. *ACS Appl. Mater. Interfaces*, **2017**, *9*, 32445.

[7] Pelloth, J. L.; Tran, P.; Frisch, H.; Walther, A.; Goldmann, A. S.; Truong V. X.; Barner-Kowollik, C, *Adv. Mat.*, **2021**, 202102184.

[8] Gernhardt, M.; Truong, V. X.; Barner-Kowollik, C., *Adv. Mat.* 2022, 2203474.

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Dr Dang Thuy Tram is Assistant Professor at the School of Chemistry, Chemical Engineering and Biotechnology and a Fellow of the Ageing Research Institute for Society and Education (ARISE) at Nanyang Technological University (NTU), Singapore. Dr Dang received her B.Sc degree from the University of Illinois, Urbana-Champaign (USA) and Ph.D. degree from Massachusetts Institute of Technology (USA), both in Chemical Engineering. She also conducted her postdoctoral training as a Controlled Release Society fellow at Brigham and Women's Hospital, Harvard Medical School (USA). She was the recipient of the A*STAR Singapore National Science Fellowship, MIT Edward Clark Presidential Fellowship and the Controlled Release Society Sung Wan Kim postdoctoral fellowship. Dr Dang's research leverages fundamental understanding of the interaction between biomaterials and the immune systems to design novel immuno-modulatory biomaterials and therapeutic delivery systems for the treatment of diabetes and chronic inflammatory diseases.

Abstract

Patients with chronic inflammatory diseases such as chronic inflammation-associated diseases and psoriasis require are treated with anti-inflammatory drugs to manage inflammatory symptoms and pain,

especially during flare-ups. However, it is challenging to administer an effective dose of the therapeutic drugs. High doses cause adverse side effects while low doses may not be as effective. To address these challenges, we have developed a patent-pending hydrogel drug delivery systems which can be activated by inflammation to release a tailored drug dosage that matches the specific condition of a chronic disease site. The drug delivery system is a modular hybrid hydrogel carrier which is triggered to releases an anti-inflammatory drug upon exposure in response to an increased enzymatic activity which is typically associated with increased greater disease severity. We demonstrated quantitatively robust inflammation-responsive drug release with therapeutic efficacy in immuno-competent mice of chemically induced subcutaneous inflammation and wound healing. The clinical relevance of our approach was also demonstrated by a positive correlation between drug delivery kinetics from the wound dressing with the presence of protease biomarkers in human wound fluids. Overall, this drug delivery platform lays foundation of a promising avenue for management of chronic inflammation with the goal of enhancing treatment efficacy and minimizing adverse side effects.

(0047) EEG-based Epilepsy Detection using Liquid State Machine

Thanh V. Vu and Hanh Thi Minh Tran (The University of Danang – University of Science and Technology, Danang, Vietnam)

Abstract

Introduction: Epilepsy affects millions of people worldwide, making it one of the most common neurological disorders. The automatic detection of epileptic seizures from electroencephalogram (EEG) signals has become a key area of research because of its potential in ensuring rapid and efficient clinical decision-making. Neural network-based models have emerged as leading solutions due to their high classification accuracy and capacity for end-to-end learning. However, many of these models treat EEG data as image-like inputs, resulting in increased computational and memory demands. In the biomedical domain, particularly in epilepsy diagnosis, there is a growing need for devices that not only achieve accurate seizure detection but are also energy-efficient, real-time, and wearable.

Methodology: This study proposes and systematically evaluates a range of Liquid State Machine (LSM) models integrated with feedforward (FF) spiking neural networks for the task of seizure detection using EEG signals. The EEG signals are first encoded into spike trains and then input into various LSM-FF architectures. The models are evaluated in terms of precision, recall, F1-score, and inference time.

Results: Evaluated on a publicly available dataset, the proposed LSM-FF models demonstrate robust seizure detection capabilities while reducing computational complexity. The results confirm the potential of these models for deployment in embedded, resource-constrained environments.

Conclusion and Discussion: This paper presents and evaluates LSM based architectures combined with a feedforward spiking neural

network to address the problem of epilepsy detection. The proposed method balances seizure detection performance with computational efficiency, making it suitable for hardware deployment. Future work will focus on contructing neural units and implementing the optimal LSM-FF model on hardware platforms such as FPGAs.

(0160) Correlation between surface temperature at neck acupoints and cervical spine range-of-motion: A study using novel ROMIX system

Huu Duc Minh Nguyen, Phan The Vinh Le, Kha Le Tan, Chi Loc Ha (University of Medicine and Pharmacy at Ho Chi Minh City, Vietnam), Huu Khanh Nguyen (Hospital For Rehabilitation – Occupational Diseases, Ho Chi Minh City, Vietnam), Le Giang Tran (International University, Ho Chi Minh City, Vietnam), Quang Cong Che (Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam) and Chan Viet Duong (FPT Software Ho Chi Minh City, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Previous research indicates that prolonged exposure to cold can lead to decreased skin temperature and restricted cervical spine range-of-motion (CROM) due to vasoconstriction and muscular stiffness.

Objective: To investigate the correlation between CROM and skin temperature at key neck acupuncture points, namely Fengchi (GB20) and Fengfu (GV16).

Methods: A cross-sectional study was conducted on 60 participants divided into the cold-exposed and normal group. Their skin temperatures at GB20 and GV16 were measured with a FLIR C5 thermal camera, whilst CROM was evaluated in six directions (flexion, extension, left/right bending, and left/right rotation) using the ROMIX photogrammetry system after two sessions of active neck movements.

Results: Significant differences in acupoint temperatures were observed between groups, with lower temperatures in cold-exposed participants

(Cohen's d between 1.27 and 3.44). Similarly, the cold-exposed group demonstrated significantly lower CROM in all directions ($p < 0.05$ with Cohen's d in range of 0.76 — 2.56). Strong positive correlations (Spearman r = 0.59 — 0.73) were observed between skin temperatures at GB20 and contralateral cervical rotation and bending, while the temperature at GV16 followed a similar pattern with cervical flexion and extension.

Conclusion: Cold exposure leads to reduced acupoint temperatures, which significantly correlate with decreased cervical mobility. This highlights the clinical relevance of thermal assessments at specific acupoints as objective indicators of cervical functional status.

(0822) Non-contact Breathing Rate Monitoring Using an RGB Camera

Duong Ngo Thuy, Linh Tran Mai and Hung Pham Manh (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Monitoring breathing rate (BR) to detect sudden unexplained apnea is an important measurement that can contribute significantly to diagnosing diseases, then providing appropriate treatment to increase patient life expectancy. This study presents a low-cost, non-contact breathing rate monitoring using an RGB camera to record chest movements caused by respiratory activity, which adopts anatomy-based selection of the chest region of interest (ROI) and signal processing to address motion sensitivity. The system includes: (i) detection and tracking of the chest region exhibiting the most prominent respiratory motion, (ii) extraction of the breathing signal from image sequences based on pixel intensity change, (iii) elimination of breathing-unrelated events from the signal, and (iv) estimation of the BR value (fR) every second. The performance of the system was evaluated in 7 healthy volunteers wearing casual clothing, considering

ROI selection for chest movements as an influencing factor. Reference data were obtained by an ADInstruments BR measurement device using an abdominal belt respiration sensor. The results show that the system achieved higher precision when ROI was restricted to the central upper chest, giving a mean absolute percentage error of 5.38%. In the range of 6 to 100 breaths per minute (bpm), the mean difference between the proposed system and the reference device was –0.63 ± 4.48 bpm, with subjects at 50 cm from the camera.

(1212) Bounding Circle Representation for Blood Cell Detection and Counting

Viet Dung Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Accurate detection and counting of blood cells are crucial for hematological analysis. Traditional microscopic examination is time-consuming and prone to variability. Deep learning, particularly YOLO-based models, has significantly improved real-time object detection. This study improves YOLOv11 for blood cell detection by introducing bounding circles instead of conventional rectangular or square bounding boxes. Bounding circles align better with the natural morphology of blood cells, reducing background noise, and improving localization accuracy. The proposed method is evaluated on publicly available blood cell datasets and compared with the standard YOLOv11 model using square bounding boxes. The experimental results show detection accuracies of 100% for red blood cells (RBC), 95.08% for white blood cells (WBC), and 96.36% for platelets. The mask detection ratio (MDT) analysis further confirms the effectiveness of the method, achieving an average MDT of 87.93%, compared to 76% for

conventional bounding boxes. The advantages of using bounding circles for deep learning-based blood cell detection are demonstrated, offering a more morphology-aware alternative for improved accuracy.

(1551) Automated Page-Turning System with AI for Printed Book

Truong Minh Duc (University of Economics –Technology for Industries, Hanoi, Vietnam), Nguyen Dinh Dung, Nguyen Anh Tu, Dong Quang Huy, Nguyen Chi Huong, Hoang Trong Linh and Vu Thang (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

This paper presents the design and development of an intelligent device to assist reading printed books for individuals with limited hand mobility. The device uses a smart mechanical mechanism and an automatic page turning system. It supports both eye gesture control through image processing and voice commands, allowing users to flip pages, pause, resume, or adjust settings using simple eye gestures or speech. Moreover, the system integrates an AI language model enabling users to interact with the content by asking questions, retrieving information, or requesting text to speech reading. Experimental results show that the device can turn pages in approximately 2.7 seconds with 91% accuracy. These findings demonstrate the device's potential to enhance reading accessibility and independence for people with physical impairments and suggest broader applications in assistive technology.

(1717) Design and Development of a Low-Cost Velostat-Based Pressure Sensor for Flatfoot Detection

Anh Dao Tuan, Trung Nguyen Thanh, Hop Nguyen Hoa, Dung Duong Quoc, Tien Nguyen Manh Hoang (Hanoi University of Science and Technology, Hanoi, Vietnam) and Tam Bui Ngoc (Shibaura Institute of Technology, Tokyo, Japan)

Abstract

Identifying flatfoot is crucial for timely diagnosis and treatment intervention; however, methods such as X-rays, CT scans, ultrasound, and MRI can diagnose flatfoot accurately but are often expensive and require specialized equipment. To provide a more cost-effective alternative, this study aims to develop a low-cost pressure sensing mat using Velostat to detect flatfoot based on plantar pressure analysis. The mat consists of a flexible Velostat piezoresistive sensor array capable of capturing spatial pressure distribution under the foot. A computational algorithm was implemented to calculate the arch index, a clinically relevant indicator for flatfoot detection. Experimental evaluations showed that the system achieved the desired accuracy, with the computed index aligning well with expected clinical patterns. These findings suggest that Velostat-based mats can serve as accessible alternatives to other high-cost flatfoot detection methods.

(2813) Baseline Wander Removal in Biomedical Signal Acquisition System for Heart Rate Monitoring

Anh Truong, Thuong Hoang and Loan Pham (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Early detection and monitoring of cardiovascular diseases are difficult in remote areas due to limited access to medical facilities. Electronic stethoscopes provide a practical solution by enabling real-time assessment. This study proposes a system that wirelessly transmits and uses low power to acquire PCG, ECG, and PPG signals simultaneously. Digital signal processing methods are used to remove noise and baseline wandering to maintain critical cardiac features. Besides, computational algorithms are employed to analyze heart activity and identify abnormalities. Experimental results demonstrate the reliability and effectiveness of the system in detecting multimodal cardiac signals, with a SNR after processing is 46 dB, compared to 35.4 dB for the raw signal.

(3009) Evaluation of EEG channels related to Cognitive tasks: Concentration and Relaxation using Complex Morlet CWT and Pearson correlation

Ngoc Pham Phuc, Diem Anh Nguyen Thi and Quy Vu Hoang, Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

In modern society, human life is influenced by numerous factors that affect brain concentration, such as the Internet and social media, which can lead to distraction and reduce work efficiency. Assessing concentration levels can provide insight into brain mechanisms, helping scientists achieve a milestone in improving the effectiveness of cognitive activities. Electroencephalograph (EEG) is a non-invasive method capable of tracking temporal variations and brain wave patterns, which can reflex human cognitive paradigms. This research aims to study the dynamic characteristics of concentration brain waves and proposes a method using Pearson correlation to identify the most

relevant EEG channels during concentration tasks, which can suggest optimized montage. The study validates the use of Complex Morlet Continuous Wavelet Transform (CWT) for qualitatively assessing the observed signal in the time-frequency domain. Then, Pearson correlation is applied to Power Spectrum Density (PSD) of all channels in both relaxation and concentration state to evaluate the effect of the channels. The results implied that Complex Morlet CWT could analyze and visualize the change between concentration and relaxation states. During the concentration stage, there is a decrease in the theta band and an increase in the beta band. Pearson correlation indicated that frontal channel groups show differences between the two states (0.4 - 0.6), while the posterior channel groups do not show significant differences (0.7 - 0.8). Consequently, this research is possibly to serve as a foundation for analyzing the concentration states and suggesting the measurement channels suitable for EEG concentration experiments.

(3196) An Improvement on Class-imbalanced Cardiovascular Disease Classification using Spectrogram-based 12-lead ECG.

Phuong Linh Nguyen, Hoang Bach Vu, Minh Khang Trinh and Viet Dung Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Cardiovascular diseases (CVDs) are the leading cause of mortality worldwide, with significant difficulties in precise diagnosis and effective treatment. The electrocardiogram (ECG) is a non-invasive diagnostic tool that plays a crucial clinical role in evaluating the severity of these conditions. Conventional ECG evaluation methods require specialized expertise and pose challenges for inexperienced cardiologists. Deep learning offers a promising solution for analyzing resting ECG signal to detect structural cardiac pathologies and predict long-term cardiovascular risk. This paper proposes a transfer learning approach for CVDs classification using two 12-lead ECG datasets (CPSC2018 and Chapman). ECG signals are upsampled and transformed into spectrograms to gain deeper insights into cardiac rhythms, which are then pretrained on CPSC2018 with optimized Focal loss to address class imbalance and enhance CVDs classification. The deep learning model is fine-tuned and tested on the Chapman dataset. Experimental results demonstrate that our method outperforms recent studies by up to 4% in merged-class evaluation while achieving robust performance (>92% average accuracy across all classes) in handling class imbalance, thanks to upsampling and the optimized loss function.

(3884) Characterizing Obstructive Sleep Apnea Endotypes using Wearable EEG Spectral Analysis

Trung Le (University of South Florida, Florida, USA)

Abstract

Background: Obstructive sleep apnea (OSA) rarely occurs in isolation. Its chronic cycles of intermittent hypoxemia, sympathetic surges, and sleep fragmentation accelerate cardiovascular remodeling, exacerbate neuro-inflammatory cascades after traumatic brain injury (TBI), and may amplify tumor-associated hypoxia in head-and-neck cancer. Continuous, home-based monitoring with wearable sensors-paired with artificial-intelligence (AI) analytics-offers a scalable path to disentangle these intertwined disease mechanisms and deliver comorbidity-aware precision care.

Objective: We present an integrative framework that combines multi-modal wearable signals and machine-learning pipelines to (i) quantify the comorbidity burden of OSA across cardiovascular, neuro-degenerative (TBI), and oncologic cohorts, and (ii) extract digital

biomarkers that link sleep-disordered breathing to downstream pathology.

Methods: The platform ingests synchronized nocturnal data streams-including headband EEG, photoplethysmography, respiratory inductance plethysmography, and accelerometry-together with electronic-health-record phenotypes. Signal pre-processing employs artifact-robust adaptive filtering followed by spectral and cardiopulmonary feature extraction. Gradient-boosted classifiers and graph neural networks map feature dynamics onto comorbidity labels, while Shapley values provide physiological interpretability. A pilot analysis was conducted on polysomnography recordings from 30 adults with moderate-to-severe TBI (age 33 ± 11 yr), 25 % of whom carried a concurrent OSA diagnosis.

Results: Spectral EEG analysis revealed that OSA epochs in the TBI cohort displayed markedly lower delta (0.5 – 4 Hz), theta (4 – 8 Hz), and alpha (8 – 12 Hz) power, alongside a pronounced increase in gamma (30 – 45 Hz) activity, relative to non-OSA sleep. These frequency-specific shifts, coupled with oxygen-desaturation indices derived from wearable oximetry, formed a parsimonious feature set that separated OSA from non-OSA segments with promising discrimination (cross-validated AUC > 0.80). Preliminary cardiovascular and oncologic subsamples show similar autonomic and hypoxic signatures, underscoring shared pathophysiological threads.

Conclusions: Early evidence supports the utility of lightweight wearable devices and AI-enabled analytics for capturing comorbidity-relevant sleep physiology outside the laboratory. By fusing brain, cardiorespiratory, and oncologic markers into a unified digital phenotype, the proposed approach lays the groundwork for longitudinal risk stratification, therapy titration, and mechanistic trials that span OSA, cardiovascular disease, neuro-trauma, and cancer. Ongoing studies will expand the multimorbidity cohorts, refine graph-based models for causal inference, and validate real-time clinical decision support in home and inpatient settings.

(4137) Skin temperature at acupuncture points in the head and neck region across different age groups: A study using ATHERM infrared thermometer device

Huu Duc Minh Nguyen, Thi Anh Dao Nguyen, Trong Tuan Vo (University of Medicine and Pharmacy at Ho Chi Minh City, Vietnam), Thi Thu Hien Pham, Le Y Nguyen (International University, Ho Chi Minh City, Vietnam), Quang Cong Che (Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam), Minh Tri Than, Huy Hung Pham (Faculty of Medicine, Hong Bang International University, Ho Chi Minh City, Vietnam) and Minh Hoai Nguyen (Hospital For Rehabilitation – Occupational Diseases, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Skin temperature at acupuncture points serves as a physiological indicator that may reflect microcirculation and thermoregulation. However, standardized reference values at specific head and neck acupoints are still limited.

Objective: To determine the mean, standard deviation, maximum, and minimum skin temperatures at five acupuncture points (left/right GB20, GV16, left/right Ex-HN5) across different age groups and genders using the ATHERM infrared thermometer.

Methods: A descriptive cross-sectional study involved 360 healthy participants divided into six age groups (18 – 29, 30s, 40s, 50s, 60s, and 70s). Skin temperatures were measured at GB20, GV16, and Ex-HN5 using the ATHERM device.

Results: The youngest participants (18 – 29 years old) exhibited the highest average temperatures at GV16 (36.43 ± 0.57°C), with temperatures decreasing with age, reaching the lowest values in participants over 70 (GV16: 35.28 ± 0.59°C, GB20: 35.2 ± 0.6°C). Temperatures at Ex-HN5 displayed the highest variability among individuals, while GV16 temperatures were consistently the lowest and most stable. Additionally, female participants had slightly higher skin temperatures than males at most acupoints, although the differences were minimal and not statistically significant.

Conclusion: Skin temperature at head and neck acupuncture points decreases with age and shows slight gender variations. These normative data provide valuable references for clinical and traditional medicine applications using infrared thermography.

(4219) Development of a Dynamic Lung Phantom for Real-Time Evaluation of Electrical Impedance Tomography Systems

Kiet Ngac Anh, Duc Anh Tran, Tuan Vu Quoc, Loc Do Quang, Tung Bui Thanh and Trinh Chu Duc (VNU University of Engineering and Technology, Hanoi, Vietnam)

Abstract

In recent years, advancements in medical technology have played a vital role in enhancing healthcare quality and improving disease diagnosis. Among these technologies, Electrical Impedance Tomography (EIT) is one of the methods that has emerged as a promising non-invasive imaging method, particularly for monitoring lung function. However, during high-demand scenarios such as the COVID-19 pandemic, when patient numbers increase exponentially, existing EIT systems are often insufficient, leading to delays in diagnosis and treatment, ultimately

worsening patient outcomes. To address this urgent demand, ongoing efforts aim to develop low-cost, portable EIT devices tailored for pulmonary application.

Despite the ability of EIT systems to reconstruct lung images during respiration, accurately evaluating these reconstructions remains a significant challenge, especially under dynamic breathing conditions. Existing lung phantoms used for system testing primarily reflect static conditions and lack of the ability to simulate real-time physiological changes, limiting their effectiveness in validating EIT performance.

To address this gap, we present a novel 3D lung phantom integrated with an air-pumping mechanism to simulate human-like the breathing activity. This dynamic setup enables real-time evaluation of the EIT system by allowing controlled variation of air volume without interference from conductive media. The system's imaging accuracy can be assessed by comparing EIT reconstruction results with synchronized video recordings of the phantom's motion. This approach provides a practical and repeatable method for optimizing both hardware and reconstruction algorithms of EIT systems, ultimately contributing to improved diagnostic capabilities in clinical and emergency settings.

(4266) Development of IMU in Post-Stroke Rehabilitation Assessment

Chien Phan Quoc, Trung Nguyen Thanh, Truong Hoang Quoc, Thanh Nguyen Nam, Doanh Dao Duc, Truong Nguyen Dinh, Quang Chu Dac Vinh and Tuan Dao Minh (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Stroke is not only one of the leading causes of fatality and disability but also poses significant health issues due to the risk of recurrence.

Rehabilitation plays a critical role in improving motor function and quality of life for people suffering from stroke, and gait assessment is a major component in evaluating post-stroke recovery, as lower-limb damages often lead to reduced mobility. However, traditional motion capture systems are far more expensive and require specialized laboratory setups. This study proposes a cost-effective, portable system to assist gait recovery in stroke patients. The proposed system includes Inertial Measurement Unit (IMU) sensors to capture lower-limb motion. The collected data is then analyzed for assessing motor recovery in stroke patients. Pre-existing patient data is also incorporated along with the measured figures to enhance the accuracy of the system. Experimental validation demonstrated a high level of synchronization with the data that can be retrieved by the VICON motion capture system, a gold standard in motion analysis, showing strong equivalence in joint angle measurement and gait parameters. These findings indicate that the proposed setup can reliably estimate recovery progress in stroke patients with a much lower cost and higher portability. The study confirms that a combination of IMU can serve as a practical tool for evaluating lower-limb functional recovery in post-stroke patients. The system's affordability, ease of use, and portability make it suitable for both clinical and home-based rehabilitation. Future work may focus on integrating machine learning for automated recovery prediction and expanding the system to assess upper-limb function.

(4566) Development of a Upgraded Sarrus-Driven Mobile Robot for Height Adaptability and Environmental Functionality

Phuong Thao Thai and Le Quan Hoang (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: Mobile robots require adaptability to environments with varying heights. This study introduces a 15 x 15 cm robot equipped

with a Sarus mechanism. It enables the platform to rise 9 cm from its lowest position while supporting sensors for environmental monitoring and actuators for interaction.

Methodology: The robot model features a two-wheel chassis, powered by motors with adjustable speed, and a caster wheel for stability. It tracks pre-programmed trajectories, including linear, circular, and wave-like paths. A four-leg Sarus mechanism, with a folding range of 17° to 89°, adjusts the platform height to match predefined profiles (linear or wave-like). PID controllers regulate trajectory tracking with errors below 1 cm, height accuracy within 0.5 cm, and response times under 0.5 seconds. The design is validated through simulations using MATLAB Simscape.

Results: Simulation results in MATLAB demonstrated that the robot followed a pre-programmed trajectory with an average error of 10^{-2} cm. The Sarus mechanism successfully lifted the platform 9 cm, with a height error of 10^{-2} cm and a response time of 0.45 seconds. Separate modules on the platform, including sensors and actuators, operated smoothly without affecting the robot's motion. These results indicate robust performance compared to typical mobile robots with fixed-height platforms.

Conclusion and Discussion: The results confirm the robot's high accuracy (0.01 cm) and fast response (0.45 seconds), demonstrating the Sarus mechanism's flexibility in integrating modules for data collection and environmental interaction. These include applications such as irrigating uneven surfaces, retrieving items at varying heights, painting, and grasping objects. This work establishes a foundation for versatile mobile robots, with future efforts focusing on real-world testing and enhancements to intelligent modules.

(5261) Vision Guided Robot Arm for Intelligent Shoe Sole Gluing Process

Based on Yolov7

Thi-Thoa Mac, Minh-Huy Nguyen, Giang-Nguyen Thi Tra, Hoang-Hai Hoang, Xuan-Thuan Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam) and Duc-Nguyen Tien (School of Mechanical Engineering, Nam Dinh University of Technical Education, NinhBinh, Vietnam)

Abstract

This research addresses the need to provide research to quickly and improve the performance of footwear products to meet a variety of products and materials. The system includes a UR5 robot, a 3D camera and a shoe sole applicator. The solution approach offers a unified 3D and YOLOv7 image processing method to process substrates of different shapes, sizes, and materials. For training, we use a dataset consisting of 250 labeled actionable shoe images, while the validation data contains 50 images. study used initial learning rate of 0.01 and the number of integers was set to 500 and latch size was set to 4. Ablation experiments conducted to improve YOLOv7, using the model.

Pre-training to save time and costs. Object detection using the Yolov7 model on the shoe dataset achieved high accuracy (97.4). The research helps enhance the digitalization of the shoe sole automatic glue application system, helping to optimize glue application, significantly improving productivity, product quality and safety in the footwear production process.

(5430) OwlSight: An Effective Bird Deterrent Solution

Xuan-Thuan Nguyen, Van-Sinh Tong, Thi-Thoa Mac and Trieu-Duong Vu (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Bird-induced damage poses significant risks to critical infrastructures such as high-tech agricultural zones, airports, and solar farms, necessitating the development of automated, effective, and environmentally safe deterrent systems. Existing solutions, including acoustic and conventional laser-based methods, often lack target specificity, adaptability to dynamic environments, and a high degree of automation. This paper presents OwlSight, an autonomous robotic bird deterrent system that combines computer vision and a laser-based repellent mechanism. The key innovation of OwlSight lies in its fully automated operation, requiring no human oversight while minimizing interference with non-target species. The system serves as an initial step toward developing automated, humane bird deterrent solutions, with potential applicability in areas such as agriculture, aviation, and renewable energy infrastructure.

(5435) Evaluation and improvement of the design of mastectomy bra for breast cancer patients applying virtual try-on simulation

Thi Thuy Ngoc Nguyen, Thuy Chinh Tran and Tien Dung Vu (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Mastectomy bras are essential for women with breast cancer after surgery. Mastectomy bras need to ensure good fit and comfort for each body. This paper presents the results of the research that continues the previous research on the shape design of breast inserts for mastectomy

bras. In this new study, the design of the mastectomy bra with a breast insert was improved to ensure better elasticity and comfort. CLO3D virtual fitting software was applied to simulate the fitting of the bra and insert on a three-dimensional model of the female body after surgery. The human body model for virtual fitting simulation was obtained from this real human body scan data. The bra and insert meet the requirements of pressure and stretch according to the evaluation results from this software. The bra strap was improved with larger width to reduce the pressure on the body's shoulders. The bra design is adjusted to ensure the best fit in the lower and upper breast areas. The fitting simulation method allows for a preliminary assessment of the external shape and fit. The results of the study showed that the virtual try-on simulation on the chest area of a naked body model was successful. This is the basis for applying this method of designing the personalized bras.

(5980) Development of a Circuit to Detect Drowsiness for Drivers by Measuring the EOG Signal

Le Hoang Vu, Quang Minh Tong, Thi Ha Phuong Le, Thi Thu Trang Van and Viet Hung Dao (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Driver drowsiness is a significant contributor to traffic accidents worldwide, emphasizing the urgent need for reliable, real-time monitoring systems that are non-intrusive and suitable for everyday use. While current solutions include EEG-based and camera-based methods, they often face limitations related to wearability, environmental sensitivity, and user comfort. Electrooculography (EOG) has emerged as a promising alternative, yet the development of compact, low-power, and wearable EOG acquisition systems remains limited. In this study, we

propose a miniaturized EOG detection circuit integrated into a pair of smart glasses, designed to capture vertical eye movement and identify signs of drowsiness through blink pattern analysis. The hardware comprises an instrumentation amplifier, analog filters, a DC level shifter, and an ESP32 microcontroller kit for signal conditioning and processing. The system effectively distinguishes between normal blinking and prolonged eyelid closures, the key indicators of fatigue. This work provides a practical foundation for wearable drowsiness detection systems, with potential applications in road safety, clinical diagnostics, and human–machine interaction. Future developments will focus on improving signal fidelity and integrating advanced detection algorithms for enhanced robustness in real-world conditions.

(6274) Improving balance in stroke rehabilitation patients using Kinect camera combined with GCN model

Truong Minh Duc (University of Economics – Technology for Industries, Hanoi, Vietnam), Nguyen Anh Tu, Ngo Han Quang Vu, Do Manh Dung, Dong Quang Huy and Vu Toan Thang (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Stroke rehabilitation plays a crucial role in helping patients regain lost skills. However, existing rehabilitation methods often suffer from limitations in accuracy, processing time, analysis, and personalization, hindering optimal recovery. Current posture analysis systems are often expensive and complex, and previous models lack effective personalized treatment plans. This study addresses these shortcomings by proposing a novel approach for stroke rehabilitation. In this research, we present a system utilizing the Kinect V2 camera in conjunction with a Graph Convolutional Network (GCN) model integrated with reinforcement learning (RL). This hybrid approach is designed to recognize, analyze, and evaluate patient posture in real-time during rehabilitation exercises. To enhance personalization and data sharing while maintaining privacy, we incorporated Meta-RL, Federated RL, and Multimodal Reward mechanisms. The developed model attained a high degree of accuracy (99.23%) in postural recognition and analysis. The system exhibited efficient operational characteristics, achieving task completion in a mean duration of 45 seconds with a 99% success rate and a performance metric score of 97%. The model training and optimization phase required 580 seconds, with a mean training time of 0.27 seconds per model instance. These outcomes underscore the efficacy of the model in delivering granular assessments of patients' motor coordination and postural balance. The integration of personalized treatments, facilitated by the advanced RL techniques, also contributes to minimizing patient rehabilitation time. This study highlights the potential of combining affordable motion capture technology with advanced deep learning techniques for improving stroke rehabilitation outcomes.

(6359) Research and fabrication of an electrochemical immunosensor based on gold-sputtered glass for protein detection

Viet Nguyen Canh (VNU – University of Science, Hanoi, Vietnam), Tung Bui Thanh, Loc Do Quang, Trinh Chu Duc, Chi Tran Nhu (VNU – University of Engineering and Technology, Hanoi, Vietnam) and Chun-Ping Jen (National Chung Cheng University, Chiayi County, Taiwan)

Abstract

Protein plays a vital role in the human body and serves as a key biomarker in cancer diagnostics. Due to their high sensitivity and low detection limits, electrochemical immunosensors have gained widespread application in protein detection. In this study, an electrochemical immunosensor was designed and fabricated on a gold-sputtered glass substrate for the detection of target proteins. The proposed sensor was designed with a three-electrode configuration, including working, counter, and reference electrodes, fabricated using the photolithography technique. The working electrode, where target binding occurs, was circular with a radius of 1.2 mm. The reference electrode was formed by selectively electrolyzing the gold surface in $AgNO_3$ and KCl solutions to produce Ag/AgCl layers, while other areas were covered with a thin layer of photoresist. After fabrication, the working electrode was modified to immobilize antibodies on its surface and create the electrochemical immunosensor. Experiments using bovine serum albumin–fluorescein isothiocyanate conjugate (BSA-FITC) and neuron-specific enolase (NSE) demonstrated effective protein retention and specific antibody binding. These interactions were validated by fluorescence imaging and electrochemical methods, including cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). The appearance of green fluorescence on the electrode surface demonstrated the success of the functionalization process, the protein had specifically bound to the antibody and was retained. Besides, a pronounced reduction in the CV oxidation peak and a significant increase in EIS impedance confirmed the sensor's detection performance. These findings highlight the sensor’s potential for future development into commercial immunosensors and point-of-care diagnostic applications.

(6575) Developing a Lipidomic Tool for Hypertension Screening and Risk Stratification in the Vietnamese Population

Nhat Linh Nguyen, Luong Thang Pham, Dang Minh Pham, My Linh Nguyen, Thi Phuong Anh Pham, Huong-Ngan Vuong Thi and Van Khanh Do (Phenikaa University, Hanoi, Vietnam)

Abstract

Introduction: Hypertension is a major public health concern in Vietnam, affecting 20.7% to 24.3% of adults. As a leading risk factor for cardiovascular diseases, it is associated with alterations in lipid metabolism that contribute to disease progression. Lipidomics, an emerging field, enables the comprehensive profiling of lipid metabolites in plasma, providing insights into the pathophysiological mechanisms of hypertension. This study aims to characterize plasma lipidomic profiles in hypertensive individuals using high-sensitivity triple quadrupole LC-MS/MS, identifying potential biomarkers and metabolic disruptions linked to hypertension.

Methodology: Plasma lipidomics profiling was performed on 150 hypertensive individuals and 150 age- and gender-matched normotensive controls using LC-MS/MS on an Agilent 6495D Triple Quadrupole system. Plasma samples were collected, processed, and stored at -80°C before analysis. Lipids were extracted using a modified Bligh and Dyer method, with deuterated-labeled compounds as internal standards for precise quantification. Retention times and mobile phase compositions were optimized for improved lipid separation and detection. NIST 1950 was used as a commercial reference standard for quality control. Lipid species were identified and quantified using multiple reaction monitoring (MRM) mode and compared against a comprehensive lipid database. Statistical analyses, including principal component analysis (PCA) and partial least squares discriminant analysis (PLS-DA), were conducted to evaluate lipidomic differences between groups.

Results: The extraction protocol was optimized, establishing a comprehensive lipidome library for 300 plasma samples. Significant differences were observed in phosphatidylcholines (PCs), phosphatidylethanolamines (PEs), and lyso-phosphatidylcholines (LPCs), indicating metabolic disruptions in hypertension. These lipidomic variations highlight potential biomarkers for disease progression and risk assessment.

Conclusion and Discussion: This study highlights the importance of lipid metabolism in hypertension, identifying lipidomic alterations that may serve as biomarkers for early detection and risk assessment. These findings provide new insights into hypertension pathophysiology and lay the foundation for future lipid-targeted therapeutic strategies.

(6805) Application of Simulation Modeling Methods in the Calculation and Design of Lower Limb Rehabilitation Equipment for Stroke Patients

Trung Nguyen Thanh, Huy Le Ba Quang, Duc Tran Quang, Phuoc Tran Cao, Hung Nguyen Tuan, Hung Nguyen Duc (Hanoi University of Science and Technology, Hanoi, Vietnam) and Tam Bui Ngoc (Shibaura Institute of Technology, Tokyo, Japan)

Abstract

This paper presents a kinematic model for a 3-DOF parallel robot used for lower limb rehabilitation for patients after a stroke. The device is designed to include the following movements: hip flexion, knee flexion, and foot flexion and extension. In this study, to support the calculation and model design, 3 software Solidworks, Matlab, and Simscape were applied. This method allows for the simulation of the workspace of the links and joints, thereby accurately evaluating the Robot's efficiency before manufacturing. In addition, Simscape is applied in the dynamics problem to determine the necessary moment at each joint, serving the

problem of selecting the device's motor. To describe this process, the model from Solidworks in the Assembly environment will be taken as input for the model in Simscape and give results on the moments of the joints during movement. The simulation results demonstrate the effectiveness of simulation modeling in design and provide important parameters for evaluating and improving the device. The study also found the influence of two sitting and reclining states on the working space of the device. The application of numerical simulations shows that the model can meet the rehabilitation exercises for patients.

(7798) Computational Design and Simulation of a High-Sensitivity Surface-Enhanced Raman Spectroscopy (SERS) Optical Sensor for Picomolar Detection of Cancer Biomarkers

Hoang Chu Duc (The VNU University of Engineering and Technology, Hanoi, Vietnam) and Nguyen Thanh Tung (VNU International School, Hanoi, Vietnam)

Abstract

Introduction: Early cancer detection remains a critical challenge in oncology. This study presents the computational design and simulation of a Surface-Enhanced Raman Spectroscopy (SERS) optical sensor for ultra-sensitive detection of cancer biomarkers, addressing the urgent need for advanced molecular diagnostic tools in clinical oncology.

Methodology: We employed finite-element simulations to optimize plasmonic nanostructures for SERS enhancement. The study investigated light-matter interactions between 785 nm laser excitation, gold nanostructures with various geometries (spheres, rods, and stars), and model cancer biomarkers. Nanostructure designs were systematically evaluated to maximize Raman signal enhancement factors.

Results: Simulations revealed that optimized gold nanostars (60 nm diameter, 10 nm tip radius) produced the highest SERS enhancement,

with calculated enhancement factors exceeding 10^8. The sensor demonstrated theoretical detection limits in the picomolar range (10^{-12} M) for model cancer biomarkers. Selectivity was achieved through in silico modeling of specific aptamer probes conjugated to the nanostructures.

Conclusion and Discussion: The proposed SERS-based optical sensor shows significant potential for highly sensitive cancer biomarker detection. Simulations suggest a 100-fold improvement in sensitivity compared to conventional Raman spectroscopy. This approach could enable early cancer diagnosis and treatment monitoring, potentially improving patient outcomes. Future work will focus on experimental validation, sensor stability optimization, and integration into practical analytical systems for clinical applications.

(8011) A Study on Developing an Affordable 2-DoF Upper-Limb Rehabilitation Robot

Hoang-Hiep Ly, Quang-Minh Dao, Thi-Thoa Mac, Xuan-Thuan Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam) and Thi-Khanh-Huyen Nguyen (University of Economics – Technology Industries, Hanoi, Vietnam)

Abstract

In modern society, stroke is a leading cause of longterm disability, particularly in developing countries with limited access to physical therapy resources. A common consequence of stroke is impaired motor function, especially in the upper limbs. Rehabilitation robots can help accelerate patient recovery, reduce the burden on healthcare facilities, and the workload of medical staff. This study aims to develop a cost-effective, two-degree-of-freedom (2-DOF) upper-limb rehabilitation robot to support patients' shoulder and elbow joint movements. The device is integrated into a training chair and supports six typical therapeutic exercises without direct attachment to the user's arm. The

mechanical structure includes adjustable segments to accommodate diverse patient anatomies. Finite element simulations investigate mechanical integrity, with maximum deformations under 3 mm and equivalent stress values below 133 MPa-well within the safety limits of C45 steel. A PID-based velocity control system is implemented for each joint motor. Tuning via the Ziegler–Nichols method and a developed tuning app yields stable responses: for motor 1, a rise time of 0.9 s with overshoot under 18 rpm at a 48 rpm target speed; for motor 2, a settling time of 0.72 s and improved stability at speeds above 24 rpm. The prototype performs reliably across all six exercises and is estimated to cost approximately $1,000 significantly lower than comparable imported systems. Initial trials with healthy users indicate positive feedback on usability and comfort. This work offers a feasible rehabilitation solution for low-resource settings.

(9622) Emotion Recognition from Vietnamese Text Using PhoBERT and BiLSTM

Van Hiep Phung, Tuan Truong Cong, Manh Tuyen Dao and Thi Thoa Mac (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

In recent years, emotion recognition from text has become increasingly popular for processing social media data from platforms such as Twitter, YouTube, and Facebook for various purposes. Previous studies show that emotion classification into 2 or 3 categories – positive and negative, or positive, negative, and neutral – consistently achieves higher accuracy than classifying emotions into a broader range (from 5 to 7 emotions). Globally, Vietnamese is a low-resource language in natural language processing (NLP), making emotion recognition in Vietnamese text more challenging than in more commonly used

languages like English. The dataset used in this research is sourced from the UIT-VSMEC corpus, consisting of 6927 human-annotated sentences with 7 common emotion labels: anger, disgust, enjoyment, fear, other, sadness, and surprise. In this study, we use the PhoBERT model combined with neural network BiLSTM to classify Vietnamese text into 7 emotion labels, achieving an accuracy of 64.57% during evaluation, the model achieved the highest performance with the weighted F1-score of 0.6460.

(9698) Integrating Dimensionality Reduction and Quantum Support Vector Machine (QSVM) for Cancer Diagnosis

My Nguyen and Hang Dang (Le Quy Don Technical University, Hanoi, Vietnam)

Abstract

The analysis of data and the development of Quantum Support Vector Machine (QSVM) models for disease classification have rapidly become crucial, commanding significant attention from the research community. Principal Component Analysis (PCA) is a powerful dimensionality reduction technique that effectively eliminates noise and optimizes processing in machine learning applications. When integrated with QSVM, PCA plays an essential role in reducing the number of qubits required and significantly enhancing model performance. In this study, we present a robust breast cancer diagnosis model that seamlessly incorporates PCA into QSVM, clearly demonstrating its effectiveness in improving classification performance on biomedical data compared to traditional methods. Our experimental results decisively show that PCA not only optimizes computational resources but also substantially increases model accuracy, affirming its transformative potential for quantum applications in large-scale data analysis. Our proposed model achieves an exceptional classification accuracy of 98%, unequivocally highlighting the impact of PCA in strengthening QSVM performance for biomedical applications.

0845) Multifunctional Smart Chair with Non-contact Physiological Sensing for Comprehensive Healthcare Monitoring

Truong Tien Vo, Quy Phuong Le, Jaeyeop Choi, Byeongil Lee, Jae Sung Ahn and Junghwan Oh (Pukyong National University, Busan, Korea)

Abstract

Proactive healthcare, remote patient management, and early health anomaly identification require continuous, nonintrusive health monitoring. Traditional physiological monitoring methods involve direct skin contact, which is painful and unsuitable for long-term usage. This study introduces a Multifunctional Smart Chair with non-contact sensors to monitor comprehensive vital signs and improve accessibility and comfort. The system includes BCG sensors for heart rate and respiration rate estimates, PPG sensors for blood pressure and SpO_2 monitoring, and IR thermal sensors for body temperature detection. AI-driven signal processing, including deep learning models, improved data accuracy, noise filtering, and real-time health evaluation for non-contact physiological signals due to motion artifacts and ambient noise. In a controlled environment, twelve volunteers matched the smart chair's sensor outputs with medical-grade monitoring equipment. With heart rate and respiration rate accuracy reaching 95% and blood pressure estimation within clinical error limits, AI-enhanced BCG and PPG data linked well with known reference devices. The findings

highlight the integration of non-contact and AI-IoT into smart chairs might offer real-time health monitoring for telemedicine, senior care, and workplace wellness. Future study will focus on enhancing the system’s capabilities, incorporating multi-user adaptability, and optimizing AI algorithms for personalized health insights.

(3511) An Active Cooling system for synergic robot hand

Quan Vo Anh, Hung Nguyen Van, Cuc Nguyen Thi Kim (Hanoi University of Science and Technology, Hanoi, Vietnam) and Hoang Le Minh (Osaka University, Osaka, Japan),

Abstract
Shape memory alloys (SMAs) has been increasingly adopted in the field of robotics for its robustness, speed, and lightweight properties. However, their application as actuators in dexterous robotic hands remains underexplored, primarily due to SMA’s inherent hysteresis, which causes nonlinear heating/cooling behavior and limits response predictability. A compact SMA coil actuator integrated into the Synergy Robotic Hand's actuation system was conducted. This study proposes a two-fold solution: an active cooling subsystem to accelerate phase transformation, and a cable-driven mechanism with adaptive current modulation for accurate finger control. This effort intends to address the hysteresis difficulties of SMA by co-designing temperature management and electromechanical actuation while retaining the hand's anthropomorphic dexterity. The incorporation of this technique with anthropomorphic robotic manipulators resulted in considerable gains in dexterity and grip force modulation. These findings demonstrate that enhanced cooling and processing systems lower

finger response time, improving Synergy Robotic Hand task completion capability.

(4590) 3D Printing for Precision Drug Delivery and Bioelectronic Innovation

Phong Quoc Truong and Hieu Trung Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: In pharmaceuticals and biomedical electronics, 3D printing has ushered in a new era of precision, customized solutions. In pharmaceutical production, it facilitates the creation of customized dosage forms with controlled release characteristics overcoming hurdles in personalized medicine. In biomedical applications, it enables the manufacture of patient-tailored implants, wearables, and biosensors, improving diagnosis and therapy. 3D printing has emerged as a powerful tool in shaping the future of healthcare through the structural and functional customization of a wide range of healthcare-related applications.

Methodology: The study is a meticulous synthesis of data available from literature on extrusion-based methods (e.g., fused deposition modeling), stereolithography (SLA), and selective laser sintering (SLS) for pharmaceuticals and electronics. To this end, we highlight promising case studies ranging from 3D-printed polypills, to drug-loaded shells for controlled release, and bioelectronic devices.

Results: In the field of drug delivery systems, 3D printing manufacture has been adapted for high precision and controlled release. Such multi-drug formulations have the advantage of more flexible dosing and matching of drug properties. Furthermore, their additive manufacturing methods have contributed impressive cost and time-saving compared to other traditional techniques.

Integrating 3D printing into the biomedical electronics field has resulted in enhanced functional performance and anatomical accuracy

of 3D-printed devices, including biosensors and patient-specific implants. The biocompatible stretchable electronics of wearable technologies have opened up exciting avenues for continuous and real-time health monitoring.

Conclusion and Discussion: While 3D printing holds the potential to address gaps in personalized medicine and smart healthcare models, suitable polymers and bio-ink limitations, along with regulatory and compliance challenges, remain barriers to clinical adoption. Moving forward, it is envisaged that integrating AI into design optimization, improving biocompatible and scalable materials will open up the possibilities of on-demand drugs and implantable electronics. At the same time, to advance and support decentralized manufacturing regulatory frameworks must adapt to decentralized manufacturing technologies to secure quality and safety.

(4864) On the Design of Skin Hydration Sensor Integrated into Portable Skincare Devices

David Botequim, Thanh Vu, Tuan Vu, Flora Bui and Phan Son (WEIRD&WOW INC)

Abstract

Introduction: Skin hydration is a key biomarker in dermatology and skincare, playing a vital role in assessing overall skin health. Accurate monitoring and tracking of skin hydration are essential for effective diagnosis and treatment. In this paper, we introduce a non-invasive, real-time, and high-precision biosensor for skin hydration measurement. By analyzing the bio-electrical spectra of the skin, our design not only measures hydration levels but also has promise to assess skin oiliness, elasticity, and even detect early signs of skin cancer. The study covers its mechanical and electrical design, along with algorithms in software.

Methodology: Bioimpedance sensors work by exciting a weak electrical current through tissue and calculating the impedance as a correlation to tissue pathology.

As such, our biosensor consists of gold-plated electrodes with appropriate housing, an op-amp amplifier circuit, and advanced signal processing techniques. The device captures bio-impedance spectra across a wide range of frequencies, allowing detailed hydration profiling. The entire sensor is integrated into our portable skincare device.

Moreover, we developed a mobile app to collect and store historical data for further analysis.

Results: We conducted over one thousand measurements across multiple human subjects. The results demonstrate high sensitivity, as hydration levels vary across different skin regions and distinguish between individuals. Additionally, the sensor exhibits strong repeatability, with the hydration score's standard deviation remaining below 3%.

Conclusion and Discussion: The proposed biosensor provides highly reliable and user-friendly skin hydration monitoring. Integrated into a skincare device, it enables continuous data collection through daily use. Future research will focus on developing AI models for personalized hydration prediction and expanding its capabilities to measure skin oiliness, elasticity levels, and detect early-stage skin diseases.

(4978) Design and development of radial artery pulse generation device

Truong Duc Phuc (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

The development of a device that simulates the radial artery pulse plays a crucial role in improving wearable medical devices and optimizing pulse diagnosis methods widely applied in Eastern medicine. This device can be used to calibrate sensors in wearable devices as well as support the training of medical personnel in pulse diagnosis. In this study, a pulse simulation system was developed with a simple, cost-effective yet

efficient design capable of generating various types of blood pressure waveforms. The system comprises two precision solenoid valves, an air chamber, a Half-CAM mechanism, a pneumatic sensor, and an electronic control system. Pulse waves are generated by controlling air pressure through the regulated opening and closing of the solenoid valves. To evaluate performance, the simulation system was used to reproduce pulse waveforms corresponding to different age groups. Pulse patterns were generated for four representative age groups (10, 50, 60, and 90 years old) and compared with real-world data collected from actual individuals. Experimental results show that the root mean square error (RMSE) between the simulated signals and the real data remains below 10% across all age groups. This indicates that the solenoid valve-based pneumatic control system is capable of producing sophisticated pulse waveforms, confirming the feasibility of the device in replicating a wide range of pulse types.

(6277) Photolithography-Based Electrochemical Sensing Platform Using an ITO Microchip with On-Chip Ag/AgCl Reference for Protein Detection

Linh Huynh Thi Thuy (Hue University, School of Engineering and Technology, Hue, Vietnam)

Abstract

Introduction: Photolithography is a key technique in microfabrication, offering high patterning precision using light-sensitive photoresists and UV exposure. In this study, we present the rapid fabrication of an indium tin oxide (ITO) microchip integrating three electrodes-working, counter, and Ag/AgCl reference-using photolithography. The working electrode was functionalized to immobilize specific biomarkers for protein detection. The electrochemical performance of the fabricated microchip was evaluated using cyclic voltammetry (CV), square wave voltammetry (SWV), and optical confirmation.

Methodology: The ITO microchip with three electrodes was fabricated using a five-step photolithography process, followed by Ag/AgCl electroplating to create a stable on-chip reference electrode. The working electrode was modified for biomarker immobilization to enable protein detection. Target protein detection was carried out using electrochemical measurements with cyclic voltammetry (CV) and square wave voltammetry (SWV) in a ferri/ferrocyanide redox solution, validated by optical signal analysis.

Results: Microscopic imaging confirmed the successful fabrication of the ITO microchip with a well-defined three-electrode structure and uniform Ag/AgCl deposition on the reference electrode. Electrochemical measurements using CV and SWV exhibited distinct and progressive changes in peak current after each surface modification step. These electrochemical results, combined with the fluorescence signal from FITC-labeled protein observed on the electrode surface, confirm the successful stepwise functionalization and target protein binding on the working electrode.

Conclusion and Discussion: The proposed photolithography-based fabrication and surface modification strategy effectively enabled protein detection with high signal responsiveness. Electrochemical results were consistent with optical fluorescence confirmation, demonstrating reliable binding of the target protein. This platform holds strong potential for further development toward selective protein detection in real sample analysis, with ongoing efforts focused on enhancing sensitivity and broadening practical applicability.

(6416) Comparison of Photocatalytic and Antibacterial Activities of ZnO, Ag-ZnO, and Cu-ZnO Coated Cotton Fabrics after Washing Cycles

Phuong Linh Nguyen (Hanoi Industrial Textile Garment University, Hanoi, Vietnam) and Duy Nam Phan (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

In this study, zinc oxide (ZnO), silver-doped ZnO (Ag-ZnO), and copper-doped ZnO (Cu-ZnO) nanoparticles were synthesized via the co-precipitation method. The nanoparticles were subsequently applied onto cotton fabrics using a sol-gel coating technique to impart enhanced photocatalytic and antibacterial properties. The structural and morphological characteristics of the nanoparticles were analyzed using X-ray powder diffraction (XRD), scanning electron microscopy (SEM), UV–visible spectroscopy, diffuse reflectance spectroscopy (DRS), and Fourier-transform infrared spectroscopy (FTIR). The photocatalytic activity was evaluated based on the degradation of methylene blue under xenon, UV, and visible light irradiation. Antibacterial efficacy was assessed by the Kirby–Bauer disc diffusion method against Staphylococcus aureus (Gram-positive) and Escherichia coli (Gram-negative). The durability of the coatings after repeated washing cycles was examined following the AATCC 61-2013 (2A) standard. Adhesion and retention of the nanocoatings were further investigated using SEM, energy-dispersive X-ray spectroscopy (EDS), FTIR, and UV–visible spectroscopy. The photocatalytic and antibacterial performance after washing was compared according to the ASTM E2149 standard.

(9810) BalGym: Muscle Balance Assessment EMG-Based System with

Mamba for Smart Gym

Huu Sang Nguyen, Truong Tien Vo, Jaeyeop Choi and Junghwan Oh (Pukyong National University, Busan, Korea)

Abstract

Maintaining balanced muscular activation (BMA) between both sides of the body is critical for injury prevention and performance optimization in strength training. However, conventional training environments rarely provide real-time feedback on muscular asymmetries. In this study, we propose a novel approach for BMA using surface electromyography (sEMG) and Mamba, a state-of-the-art structured state space deep learning model design for long-range time-series signal processing. Our custom-designed datalogger, equipped with Internet of Things (IoT) capabilities, integrates two skin-mounted sEMG sensors placed on both pectoralis major (chest) to continuously record muscle activation during exercise. An initial dataset was collected from 10 healthy participants (8 males, 2 females) performing the chest press exercise on chest press machine, with the pectoralis major (chest) annotated as the target muscle group. The Mamba-based model processes multichannel sEMG sequences to identify and quantify bilateral imbalance levels — from minor to severe — with high precision. Our proposed system delivers real-time personalized biofeedback through a mobile application. The results demonstrate high performance of AI-driven BMA biofeedback in smart gym environments, offering an innovative solution to self-coaching. This system supports athletes, physical therapists, and fitness users in optimizing training symmetry, preventing overuse injuries, and tailoring corrective routines.

(1425) Preliminary 3D printing application in upper extremity osteotomy at

Military Hospital 175

Khoi Luan Tran, Quoc Hung Vu, Quoc Doanh Tran, Van Binh Nguyen, Van Phuc Bui, Sy Trung Nguyen Vo, Manh Linh Hoang, Thanh Nhon Vo, Quang Sung Nguyen, Don Luong Le, Chanh Trung Pham, Hai Nam Do, Huu Minh Pham, Thuong Huynh (Military 175 Hospital, Ho Chi Minh City, Vietnam) and Anh Sang Nguyen (Vietnam Military Medical University, Hanoi, Vietnam; Military Hospital 175, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Osteotomy in treating malunion is a method that brings many challenges to orthopedic traumatologists. However, with 3D printing technology, surgeons can plan each surgery case and develop many options to help make osteotomy more convenient. Our goal in conducting this study is to evaluate the preliminary results of upper extremity osteotomy combined with the application of three-dimensional printing technology at Military Hospital 175.

Methodology: A prospective study describing a series of cases at the Upper Limb Department, Military Hospital 175, from March 2024 to July 2024, including four patients with malunion in the upper limb bones who underwent osteotomy method using three-dimensional printing technology.

Results: This approach reduces the need for subjective decision-making and decreases reliance on intraoperative fluoroscopy. The postoperative radiographs have demonstrated satisfactory accuracy in alignment and rotational correction. However, additional follow-up assessments will be needed to evaluate the potential improvement of the patient's functional outcomes.

Discussion and Conclusion: Three-dimensional printing technology facilitates when applied in upper extremity osteotomy and initially provides good anatomical results.

(3353) Successful hair regrowth in a 21-year-old female with advanced androgenetic alopecia and scalp fibrosis using combined autologous stem cells, exosomes, and red light therapy: A case report

Tra My Nguyen Thi (DNA International Hospital, Ho Chi Minh City, Vietnam), Anh Sang Nguyen (Military Hospital 175, Ho Chi Minh City, Vietnam; Vietnam Military Medical University, Hanoi, Vietnam) and Quoc Doanh Tran (Military Hospital 175, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Androgenetic alopecia (AGA) is the progressive miniaturization of hair follicles linked to genetic and hormonal factors commonly seen in middle-aged women. Current treatment options, such as minoxidil, finasteride, and hormonal therapy, offer limited efficacy, particularly in advanced cases. Recently, stem cells, exosomes, and red light therapy have emerged as innovative therapeutic approaches due to their capacity to activate follicular stem cells and improve microcirculation. This study examines the effectiveness of combining these three biological therapies in a specific clinical case.

Methodology: A 21-year-old female (born in 2004) presented with significant hair loss and nearly complete baldness. She had previously undergone unsuccessful aesthetic treatments elsewhere, leading to widespread scalp sclerosis. During her first visit, a 34G needle could not penetrate the scalp and was replaced with a 29G needle due to dermal hardness. She followed a standardized six-step protocol in each session: (1) scalp cleansing shampoo, (2) oxygen spray via the Hairzone device, (3) plasma comb massage, (4) topical anesthetic spray, (5) injection (either autologous stem cells or exosomes), and (6) red light therapy (630 – 660 nm) for 20 minutes. The patient received three sessions of autologous stem cell injections and five sessions of exosome injections.

Results: Hair regrowth was evident after three months and improved significantly by the fifth month. Clinical photographs showed increased hair density, scalp softening, and reduced bald areas. No adverse effects were reported.

Discussion and Conclusion: This case underscores the potential of multimodal regenerative therapy to reverse advanced AGA with scalp fibrosis in young women. The combination of stem cells, exosomes, and red light therapy demonstrated effectiveness and was well-tolerated.

(3560) Effectiveness of locking plate fixation for proximal humerus fractures in elderly patients aged over 60 years

Hoang Anh Dang (Vietnam Military Medical University, Hanoi, Vietnam), Anh Sang Nguyen (Military Hospital 175, Ho Chi Minh City, Vietnam; Vietnam Military Medical University, Hanoi, Vietnam) and Quoc Doanh Tran (Military Hospital 175, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Proximal humerus fractures (PHF) are common injuries among the elderly, particularly in individuals over 60 years old. These fractures can lead to significant morbidity due to impaired healing and delayed functional recovery. Locking plate fixation has emerged as a promising solution because it provides stable fixation in osteoporotic bone. This study aims to evaluate the clinical outcomes of locking plate fixation in older patients and compare them to younger adults.

Methodology: We conducted a retrospective cross-sectional study involving 42 patients with closed PHF treated with locking plate fixation at Military Hospital 175 from January 2022 to December 2023. Data were collected during the 6-month postoperative follow-up. Variables included Constant-Murley scores, radiographic union status, complications, and scar evaluation. Patients were categorized into two groups: those under 60 and those 60 or older.

Results: All patients achieved radiographic union by 6 months. The ≥ 60 groups exhibited a lower Constant score (60.58 ± 6.86) compared to the <60 groups (68.93 ± 8.82), and this difference was statistically significant ($p < 0.01$); shoulder stiffness was more frequently observed

in the ≥ 60 groups. Scar stretching was noted in 14.29% of elderly patients. No cases of implant failure, non-union, or osteomyelitis were reported.

Discussion and Conclusion: Fixation with a locking plate is a reliable and effective treatment for PHF in patients aged 60 and older. Although the shoulder function score based on Constant's criteria was lower in the elderly group than in the younger group, the overall bone healing rate and complication profile remained favorable. There should be an emphasis on postoperative rehabilitation to optimize recovery for older patients.

(4515) Effects of Anodal tDCS and Alpha tACS on Tactile Discrimination: Investigating Individual Differences in Neuromodulation Efficacy

Tran Quan and Ben Godde (Constructor University, Bremen, Germany)

Abstract

Tactile functions are often impaired following a stroke or neurological injury, making it crucial to explore rehabilitation methods that enhance recovery. Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique known to promote brain plasticity and modulate sensory, motor, and cognitive functions, particularly in stroke rehabilitation. Anodal tDCS can increase spontaneous neural activity and facilitate action potential generation in targeted areas; however, its effects on tactile perception and discrimination remain underexplored. This study aims to investigate the effects of anodal tDCS and alpha transcranial alternating current stimulation (tACS) at the primary somatosensory cortex (S1), while examining individual differences in responsiveness to neuromodulation. Sixteen right-handed students from Constructor University participated in a crossover study with two sessions (tDCS and tACS) conducted one week apart. Each session included a pre-test, stimulation during training, and a post-test

on the Grating Orientation Discrimination Task (GOT), with EEG recorded before and after stimulation. The GOT assessed tactile spatial discrimination using hemispherical domes of varying groove widths, with participants identifying orientation while blindfolded. Participants are expected to show improvement in tactile discrimination performance after anodal tDCS and alpha tACS. Individual differences in response to tDCS and alpha tACS were observed, with greater improvements observed in participants with lower baseline cortical excitability. Additionally, individuals with lower alpha oscillations are projected to be more affected by alpha tACS. The findings suggest that anodal tDCS enhances tactile discrimination by modulating sensory processing in the S1 region, while alpha tACS shows a significant effect on individuals with low baseline alpha activity. Individual differences in response highlight the importance of personalized approaches in neurostimulation-based rehabilitation. These results contribute to the understanding of non-invasive brain stimulation in sensory enhancement and may inform future interventions for patients with impaired tactile function.

Session 2
Biomaterials and Drug Delivery

INVITED SPEAKERS

Assoc. Prof. Kevin Lo,
University of Connecticut, USA

Dr. Kevin Lo is an Associate Professor at the University of Connecticut (UConn) Health Center. He has held editorial positions on several prestigious international peer-reviewed journals including PLoS ONE, Scientific Reports, Regenerative Engineering and Translational Medicine, and Frontiers in Bioengineering and Biotechnology. His broad research interests are regenerative engineering, drug delivery, biochemistry and cellular molecular biology.

Abstract

Bone scientists are actively investigating a range of methods to promote skeletal and dental tissue regeneration. Regenerative engineering stands at the forefront of biomedical innovation, combining principles from various scientific disciplines to develop advanced therapeutic strategies. This presentation showcases our recent strategies in bone regenerative engineering, emphasizing the convergence of small molecule therapeutics, bone-targeted drug delivery systems, and piezoelectric biomaterials. Small molecules offer a cost-effective alternative to traditional bone morphogenetic proteins but face challenges such as off-target effects. Targeted delivery systems enhance their efficacy while minimizing side effects. Additionally, piezoelectric biomaterials generate electrical stimuli that further promote osteogenesis. These approaches represent a promising path forward in the field, with the potential to revolutionize treatments for bone and dental tissue regeneration.

Dr. Liu Yang,
Peking University School of Stomatology, China

Dr. Liu is currently an assistant professor in School and Hospital of Stomatology and a Boya Young Fellow at Peking University. He received his bachelor's degree from Harbin Engineering University (2013) and Ph.D. from Peking University (2019). He did his postdoc with Prof. Thanh D. Nguyen at the University of Connecticut. His research focuses on biodegradable materials used for regenerative engineering. He has published 40 papers in Science Translational Medicine, Nature Reviews Electrical Engineering, Advanced Functional Materials, Biomaterials, etc. He was awarded Trainee Award by Chinese Association for Biomaterials (CAB, 2022) and selected as the finalist of MIT TR35 Asian Pacific (2022). His work has been widely recognized by top researchers in Science, Cell, Nature Reviews Materials, Nature Reviews Rheumatology, and reported by more than 30 authorities and media.

Abstract

Biodegradable piezoelectric materials receive great attention as self-powered battery-less stimulators for the regeneration of cartilage. Here, we have demonstrated that a biodegradable piezoelectric poly(l-lactic acid) (PLLA) nanofiber scaffold under knee joint load could act as a battery-less electrical stimulator to promote chondrogenesis and cartilage regeneration. We further demonstrate the ability of biodegradable piezoelectric scaffold to regenerate fibrous cartilage in a temporomandibular joint osteoarthritis model, in addition to regenerating hyaline cartilage in knee. The approach of combining biodegradable piezoelectric tissue scaffolds with controlled mechanical activation (via physical exercise) may therefore be useful for the treatment of osteoarthritis and is potentially applicable to regenerating other injured tissues.

(0350) Influence of acid etching on the surface characteristics and cell attachment of titanium implants

Hong Trang Pham, Duc Hung Nguyen, Van Vuong Hoang, Quoc Phong Truong, Phuc Duong Nguyen, Hoang Viet Nguyen and Hung-Vuong Pham (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Cell-surface interactions play an important role in osseointegration, implant lifetime, and immune response, thereby influencing the application of titanium (Ti) implants. This study focuses on acid etching with controlled concentrations and processing times to modify the micro-surface roughness, enhance hydrophilic properties, and control cell attachment to Ti implants. The surface morphology of Ti was characterized using scanning electron microscopy, and surface roughness was evaluated using optical microscopy. The hydrophilic properties of Ti were examined through contact angle measurements. The results showed that the micro-surface roughness of Ti increased from approximately 1 to 10 µm with high uniformity, and the hydrophilic properties of Ti were also enhanced. XRD and EDS data confirmed the purity of the Ti surface, indicating the absence of contaminants after surface modification. In vitro cell tests revealed that surfaces with high uniformity in roughness promoted better cell attachment compared to surfaces with random roughness. These results suggest that the current acid etching process is suitable for surface modification of Ti applications in biomedical implants.

(1938) Multifunctional 2D MXene Nanosheets for Biomedical Applications

Thi Xuan Nguyen, Thi Nhat Linh Phan, Thi Thuy Truong, Thi Kim Ngan Duong, Vu Hoang Minh Doan, Jaeyeop Choi, Junghwan Oh and Sudip Mondal (Pukyong National University, Busan, Korea) and Umapada Pal (Institute of Physics, Autonomous University of Puebla, Puebla, Mexico)

Abstract

MXenes, a family of two-dimensional (2D) transition metal carbides and nitrides, have emerged as promising materials for biomedical applications owing to their exceptional electrical conductivity, large surface area, and versatile surface functional groups. In this study, MXene was prepared via selective etching of Ti3AlC2 (MAX phase) followed by exfoliation, and its physicochemical properties were systematically analyzed using UV-Vis optical absorption spectroscopy, X-ray diffraction (XRD), Raman spectroscopy, X-Ray photoelectron spectroscopy (XPS), Scanning electron microscope (SEM), and Transmission electron microscopy (TEM). In vitro cytotoxicity assays confirmed that MXene had minimal toxicity to both normal and cancer cells at a concentration of 150 µg/mL. The synthesized nanosheets displayed remarkable photothermal conversion efficiency of 24.3%, making them suitable for photothermal therapy (PTT). These properties make MXene a promising candidate for future applications in cancer treatment, bioimaging, tissue engineering and other applications (sensors, energy storage, etc.).

(2613) Study on synthesis of metal-organic framework MIL-53(Al)-NH_2 and its ability of organic dyes removal in aqueous environment

Dang Thi Minh Hue, Bui Phuong Linh, Dao Van Thanh, Nguyen Thi Tuyet Mai, Nguyen Kim Nga, Tran Thi Thu Huyen, Nguyen Thi Lan, Nguyen Thi Hong Phuong, Huynh Dang Chinh (Hanoi University of Science and Technology, Hanoi, Vietnam).

Abstract

The MIL-53(Al)-NH_2 material was successfully synthesized via a solvothermal method. Its structural, morphological, and compositional characteristics were systematically analyzed using advanced techniques, including X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FT-IR), and UV–visible spectrophotometry. The material's adsorption performance toward Congo Red (CR) and Methylene Blue (MB) dyes was evaluated, along with the corresponding adsorption kinetics. The XRD and FT-IR analyses confirmed the successful formation of the MIL- 53(Al)-NH_2 framework. The adsorption equilibrium for both dyes was achieved within 15 minutes, indicating rapid adsorption kinetics. The removal efficiencies were 93.77% for CR and 98.98% for MB. Furthermore, the adsorption data for both dyes were well-fitted to the Langmuir isotherm model, with maximum adsorption capacities of 75.19 $mg \cdot g^{-1}$ for CR and 70.92 $mg \cdot g^{-1}$ for MB, respectively.

(3745) Construction of conductive hydrogels to promote cells migration through electrical stimulation for rapid wound healing

Thi Kim Ngan Duong, Thi Thuy Truong, Thi Nhat Linh Phan, Thi Xuan Nguyen, Vu Hoang Minh Doan, Jaeyeop Choi, Junghwan Oh, Sudip Mondal and Nguyen Minh Hung Vu (Pukyong National University, Busan, Korea)

Abstract

Flexible sensors based on ion-conductive hydrogels offer significant potential for healthcare management systems and wound monitoring. Electrical stimulation (ES) has emerged as a promising strategy in regenerative medicine to promote tissue repair but is often constrained by the requirement for tissue-penetrating wiring and external power sources. Therefore, developing hydrogels with high electrical conductivity, combined with ES, to effectively facilitate and monitor wound healing remains a considerable challenge. In this study, a conductive hydrogel dressing was successfully developed via one-pot polymerization to enhance cell migration in combination with ES therapy. The resulting conductive hydrogel exhibited improved ionic conductivity, enabling efficient ion transport along the polymer backbone and contributing to LED illumination in circuit tests. The conductive hydrogel promoted L929 fibroblast migration under ES treatment while demonstrating excellent biocompatibility and non-toxicity. This improved ionically conductive hydrogel serves as an ideal wound dressing for accelerating the healing process. By integrating conductivity with ES therapy, the hydrogel represents a promising therapeutic strategy for future applications in wound management and regenerative medicine.

(4125) Engineering Gallium-Silk Fibroin-Gelatin Porous Scaffolds for Tissue Regeneration

Eman Abdulla, Aya Al-Aani, Amaal Abdulraqeb Ali (Khalifa University, Abu Dhabi, UAE) and Vi Khanh Truong (Khalifa University, Abu Dhabi, UAE; The University of Danang, Danang, Vietnam)

Abstract

Introduction: Effective scaffolds for tissue engineering must integrate mechanical strength, bioactivity, and porosity — features often lacking in current designs, especially for neural, bone, and chronic wound applications. Gallium (Ga), known for its antimicrobial, anti-inflammatory, and regenerative properties, presents a multifunctional solution. Here, we introduce a novel scaffold composed of gallium, silk fibroin, and gelatin, fabricated via freeze-drying to produce an interconnected porous architecture. Gallium centrally enhances ionic conductivity, immune modulation, and tissue integration.

Methodology: Scaffolds were fabricated by incorporating varying gallium concentrations into a gelatin-fibroin matrix, followed by controlled freeze-drying. Optimization focused on preventing gallium crystallization, improving component miscibility, and achieving structural uniformity. Key parameters-such as polymer ratios, solution viscosity, and freezing kinetics-were adjusted to enhance scaffold cohesion and reproducibility. Morphological and structural assessments were conducted post-fabrication.

Results: Optimized scaffolds displayed uniform gallium distribution, stable porous microarchitecture, and improved mechanical integrity. Freeze-drying produced well-connected pores, while tailored formulations ensured compatibility between gallium and biopolymers. Current analyses include SEM imaging, porosity quantification, and

conductivity testing. Preliminary cell assays show strong adhesion and viability, indicating good biocompatibility.

Conclusion: Gallium-integrated gelatin–fibroin scaffolds fabricated by freeze-drying offer a promising platform for regenerative medicine, combining structural robustness with antimicrobial and conductive functionality. This multifunctional design is suited for next-generation applications in neural repair, musculoskeletal regeneration, and chronic wound care. Ongoing studies will further evaluate in vivo performance and clinical translation potential.

(4633) A Novel Drug Delivery Approach Using Magnetically Actuated Capsule Endoscope with Jet Injection for Precise Gastrointestinal Treatment

Manh Cuong Hoang, Thi Lan Huong Nguyen and Si Hong Hoang (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: Capsule endoscopy has revolutionized gastrointestinal (GI) diagnostics, yet effective targeted drug delivery remains a challenge. Traditional drug administration methods lack precise localization, and needle-based injections pose risks of tissue damage and discomfort. To address these limitations, this study introduces a novel magnetically controlled capsule endoscope that integrates active locomotion with a needle-free jet injection mechanism for precise GI drug delivery.

Methodology: The capsule's locomotion is actuated by an external Electromagnetic Actuation (EMA) system, which interacts with embedded permanent magnets to achieve controlled navigation. The jet injection module utilizes a magnetically triggered chemical reaction to generate high-pressure gas for drug propulsion without using physical

needles. A membrane-sealed nozzle facilitates submucosal drug injection while eliminating onboard battery consumption. The entire activation process is remotely controlled via the EMA system, ensuring precise drug release at the target site.

Results: A prototype of the proposed drug delivery capsule endoscope is fabricated using rapid prototyping method. The proposed system was validated through simulations and ex-vivo experiments in a porcine stomach. The results demonstrated accurate actuation and effective drug penetration using a mockup liquid. The jet injection mechanism achieved controlled drug delivery without mechanical needles, reducing potential tissue damage and improving safety.

Conclusion and Discussion: The developed capsule endoscope successfully combines precise magnetic navigation with a minimally invasive jet injection system, demonstrating its feasibility for targeted GI drug delivery. This technique can also be adapted for applications such as tissue marking by delivering liquid formulations into deep tissue layers. Future research will focus on optimizing the system's efficiency, enhancing real-time control, and exploring in-vivo applications.

(4950) Influence of support layer parameters on thinning behavior in multilayer hydroforming processes

Thu Nguyen Thi, Hong Quang Nguyen and Hong Hai Hoang (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Sheet hydroforming has been increasingly applied in the automotive and aerospace industries, particularly for multilayer metal components (bi-layer, tri-layer) designed to meet specific operational requirements.

Additionally, the auxiliary metal layer plays a supporting role, enhancing the formability of the primary metal layer. In this study, a combined numerical simulation and experimental approach was employed to evaluate the influence of the auxiliary metal layer on the formability of the primary metal layer, analyzed through localized thickness reduction of the formed product. Low carbon steel (DC04) and aluminum were selected as auxiliary materials for the primary copper (Cu) layer.

(5248) Facile Synthesis of Reduced Graphene Oxide Using L-Ascorbic Acid for Biomedical Applications

Thi Nhat Linh Phan, Thi Xuan Nguyen, Thi Thuy Truong, Thi Kim Ngan Duong, Vu Hoang Minh Doan, Jaeyeop Choi, Jae Sung Ahn, Junghwan Oh and Sudip Mondal (Pukyong National University, Busan, Korea)

Abstract

Graphene-based nanomaterials, including graphene oxide (GO) and reduced graphene oxide (rGO), hold significant promise for biomedical applications due to their exceptional physicochemical properties. In this study, GO was synthesized via the Modified Hummer's Method and subsequently reduced using L-ascorbic acid, a biocompatible, eco-friendly alternative to conventional toxic reducing agents like hydrazine. Comprehensive characterization using XRD, Raman, FTIR, XPS, and SEM confirmed effective oxidation and reduction, highlighting the restoration of the sp^2 carbon structure and enhanced electrical conductivity. A Prussian blue–rGO (PB–rGO) nanocomposite was then fabricated through electrostatic and π–π interactions between rGO and Prussian blue (PB). The composite exhibited excellent aqueous dispersibility and structural stability. Its photodynamic therapeutic

(PDT) potential was evaluated on MDA-MB-231 breast cancer cells under red LED irradiation. Cytotoxicity and cell viability assays demonstrated significant cancer cell destruction upon light exposure, confirming the synergistic effect of PB and rGO in enhancing photochemical reactivity. The results underscore the scalability and safety of L-ascorbic acid-based reduction and validate PB–rGO as a promising nanoplatform for cancer-targeted PDT applications.

(7038) Development of novel metal-thiosemicarbazone complexes targeting HT-116 cell line using QSPR-based in silico modeling

Nguyen Minh Quang (Industrial University of Ho Chi Minh City, Vietnam) and Pham Van Tat (Binh Duong University, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Thiosemicarbazone (TSC) compounds and their metal-TSC complexes have numerous practical applications. In particular, the anticancer ability of the complexes is of interest in this study. Besides, artificial intelligence technology is now widely available across various industries and is an excellent tool for human assistance. The pharmaceutical sector, especially in drug production and development, is utilising this opportunity effectively by employing in silico models to discover new medications. This study aimed to develop a series of novel TIO ligands and their complexes that could potentially act as inhibitors against colon cancer (HT-116 cell line).

Methodology: The quantitative structure and property relationship (QSPR) models develop the new TIO and metal-TSC complexes. The models were constructed by using multivariate linear regression (MLR) and artificial neural networks (ANN) via the stability constants (logβ11) of metal ions [M] and thiosemicarbazone [L] and the 0-3D,

physicochemical and quantum descriptors of complexes. These complexes were screened using the Applicability Domains (AD) and Outliers technique. Besides, the derivatives passed drug-likeness analysis using the ADME approach. Docking simulation also applies molecular docking into the HT-116 cell line to discover good meal-thiosemicarbazone complexes.

Results: The best linear model QSPRMLR (k of 5) involves descriptors MW, 3N, Hmax, Total Energy, and SssCH2. The quality of model QSPRMLR was pointed out with the statistical values: R2train = 0.888, R2adj = 0.875, Q2LOO = 0.850, and SE = 1.126. Two QSPRANN models were constructed with architectures I(5)-HL(9)-O(1) and I(5)-HL(4)-O(1), both showing impressive regression parameters. As a result, fifteen new complexes were selected because they were within the predictive AD. Next, nine of fifteen new complexes overcame drug-likeness analysis of Lipinski and Ghose rules. Finally, nine typical complexes simulated the docking on a protein for anti-colon cancer (code: 1M17-PDB). The results screened out four novel complexes considered potential inhibitors in supporting colon cancer treatment.

Conclusion and Discussion: The study successfully developed QSPR models. A series of novel ligands and their complexes were newly designed and developed using these models. Further, experimental investigations are needed to assess the ability of these complexes to inhibit the HT-116 cell line in the treatment of colon cancer.

(7326) Enhancing iron death in breast cancer by ultrasound and magnetic resonance guided low-intensity focused ultrasound based on artemisinin-containing folate-modified biomimetic nanoprobes

Xing-Yue Wang (Xiangyang Central Hospital, Affiliated Hospital of Hubei University of Arts and Science, Hubei, China) and Viet Bui Quoc (Advanced

Institute of Science and Technology, the University of Danang, Danang, Vietnam)

Abstract

Introduction: The clinical application of artemisinin (ART) in cancer therapy is limited due to its poor water solubility and low bioavailability. This study aims to enhance ferroptosis-based therapy in breast cancer through the development of dual-modality imaging-guided, low-intensity focused ultrasound (LIFU) combined with ART-loaded, folate-modified biomimetic nanoprobes.

Methodology: We fabricated folate (FA)-modified erythrocyte membrane-camouflaged PLGA nanoparticles (PFH/ART@PLGA/Fe_3O_4-eFA), incorporating perfluorohexane (PFH), Fe_3O_4, and ART. In vitro and in vivo biocompatibility was evaluated using histological, hematological, and CCK8 assays. Uptake by 4T1 cells and macrophages was assessed via flow cytometry and confocal microscopy. Dual-mode imaging (photoacoustic, ultrasound, MRI) verified tumor accumulation. BALB/c nude mice bearing 4T1 xenografts were assigned to seven groups with or without LIFU (3 W/cm^2, 5 min) to assess antitumor efficacy.

Results: The nanoparticles showed an average diameter of 319.3 ± 14.0 nm and a Zeta potential of −5.3 ± 2.6 mV. LIFU triggered PFH phase transition and nanoparticle collapse, enhancing ART and Fe_3O_4 release. This promoted intracellular Fe^{2+} accumulation, ROS generation, and significant 4T1 cell death. Tumor volume reduction and increased TUNEL-positive cells confirmed superior therapeutic efficacy in the PFH/ART@PLGA/Fe_3O_4-eFA+U group compared to controls.

Conclusion and Discussion: FA-modified nanoprobes demonstrated enhanced tumor targeting and drug release upon LIFU irradiation, significantly improving ferroptosis induction in breast cancer. This synergistic platform holds promise for improving the delivery and efficacy of poorly soluble anticancer agents in clinical applications.

(8744) Development of Ultrathin and Nanoporous π-Conjugated Polymer Films for Organic Field-Effect Transistor-Based Sensors in High-Performance Ammonia Detection at Human Breath Levels

Nu Truong, Viet Bui, Vinh Tran (Advanced Institute of Science and Technology, The University of Danang, Danang, Vietnam) and Mincheol Chang (Department of Polymer Engineering, Chonnam National University, Gwangju, Korea)

Abstract

Ammonia (NH_3) is a promising disease-specific biomarker for non-invasive early diagnosis and continuous health monitoring. The development of electronic sensors capable of detecting NH_3 at parts-per-billion (ppb) levels has emerged as a highly attractive and actively explored avenue within the Health Science and Technology community. In this work, we report the detection of ultra-low concentrations of NH_3 using an organic field-effect transistor (OFET) sensor, highlighting its potential for breath-based ammonia sensing. This highly sensitive OFET sensor is fabricated using a facile strategy that modulates the morphological and charge-transport properties of nanoporous poly(3-hexylthiophene) (P3HT) films. The fabrication method involves shearing-assisted phase separation of polymer blends, followed by selective etching to generate a well-defined nanoporous architecture. The resulting films feature nanoscale dimensions, with pore sizes and thicknesses of approximately 90 nm and 7 nm, respectively — both of which can be precisely tuned by adjusting the shear rate. The sensor's performance was evaluated across a range of NH_3 concentrations, achieving a limit of detection as low as 500 ppb and demonstrating good selectivity for NH_3 over various organic solvent vapors. Comprehensive analysis of the morphology and electrical properties of the CP films reveals those morphological features — such as film

thickness and surface area — have a more pronounced influence on sensing performance than intrinsic charge-transport characteristics. The porosity of the P3HT films enables more effective interaction with analyte molecules, while reduced film thickness shortens diffusion paths, thereby enhancing both response time and sensitivity. Importantly, this highly efficient room-temperature sensor, capable of detecting NH_3 at very low concentrations, shows significant promise for applications in early detection of kidney-related diseases and environmental monitoring.

(8907) Composite Biomaterial for Laser-Assisted Tissue Adhesive Wound Healing

Thi Thuy Truong, Thi Xuan Nguyen, Thi Nhat Linh Phan, Thi Kim Ngan Duong, Vu Hoang Minh Doan, Jaeyeop Choi, Junghwan Oh, Sudip Mondal, Van Bang Nguyen and Byeongil Lee (Pukyong National University, Busan, Korea)

Abstract

Introduction: Modern surgical practices increasingly favor adhesive-based wound closure over traditional sutures due to reduced tissue trauma and improved sealing capabilities. While current adhesives address basic wound healing needs, there remains a significant opportunity to enhance functionality through integrated therapeutic effects. This study develops a multifunctional composite adhesive combining chitosan (CS), bovine serum albumin (BSA), and iron oxide nanoparticles (IONP) designed to provide both mechanical wound closure and photothermal therapeutic capabilities.

Methodology: The research developed a novel laser-activated adhesive system by crosslinking the bioactive properties of chitosan with those of BSA and IONPs. Stable iron oxide (IO) nanoparticles were synthesized using the solvothermal method, followed by the composite formulation of CS, IO, and BSA. A comprehensive evaluation was

conducted, which included photothermal curing, biological assessments, and cytocompatibility tests.

Results: The developed adhesive exhibited strong tissue adhesion in agar phantom, with the added benefit of rapid light-activated curing. Photothermal testing demonstrates efficient temperature elevation capable of Chitosan BSA crosslinking adhesive bond formation. In biological evaluations, the material showed excellent biocompatibility with L929 fibroblast cells. The quick response laser induced sealing behavior could be a promising approach for non-suture laser assisted wound healing.

Conclusion and Discussion: This work successfully developed a novel laser-activated adhesive system that combines chitosan, bovine serum albumin, and iron oxide nanoparticles, providing both mechanical wound closure and photothermal therapeutic effects. The adhesive showed strong tissue adhesion, fast light-activated curing, and effective photothermal properties for bond formation. It also demonstrated excellent biocompatibility, making it a promising option for non-suture laser-assisted wound healing. These results suggest the adhesive could improve surgical practices and promote faster wound healing.

(1149) Magnesium-doped baghdadite bioceramics with multi-target antibacterial activity and osteogenic potential for orthopedic implants

Ngoc Huu Nguyen, Zufu Lu, Hala Zreiqat (The University of Sydney, Sydney, Australia) and Vi Khanh Truong (Biomedical Engineering and Biotechnology, Khalifa University, Abu Dhabi, UAE)

Abstract

Introduction: Periprosthetic infection remains a leading cause of orthopedic implant failure, often necessitating revision surgeries and prolonged antimicrobial therapy. The rise of antibiotic-resistant

pathogens further complicates clinical management, highlighting the urgent need for biomaterials that offer intrinsic antimicrobial properties. In this study, we developed magnesium-doped baghdadite (Mg-BAG), a bioactive ceramic engineered to combat infection while maintaining biocompatibility and structural integrity. By incorporating magnesium into the baghdadite crystal lattice, we aimed to enhance antibacterial activity through ionic release, oxidative stress induction, and disruption of microbial membranes. This multifunctional design presents a promising strategy to improve implant longevity and reduce infection-related complications in orthopedic applications.

Methodology: Mg-BAG was fabricated via solid-state synthesis and characterized using SEM, EDS, XPS, and XRD analyses. Antibacterial activity was tested against Gram-positive Staphylococcus aureus and Gram-negative Pseudomonas aeruginosa. Live/dead staining, membrane potential assays, reactive oxygen species (ROS) quantification, and synchrotron ATR-FTIR microspectroscopy were employed to investigate antibacterial mechanisms and biomolecular alterations induced by Mg-BAG.

Results: Mg-BAG exhibited antibacterial activity, significantly reducing bacterial viability (≈ 75% cell death) compared to control undoped baghdadite (BAG). We demonstrated that Mg-BAG enhances antibacterial activity through multi-target mechanisms involving ion-mediated membrane depolarisation, intracellular ROS generation, and biochemical disruption of cellular macromolecules. The synchrotron macro attenuated total reflection-Fourier transform infrared (ATR-FTIR) microspectroscopy illustrated significant alterations in lipids, proteins, and nucleic acids of bacterial cells adhered to Mg-BAG. Principal component analysis (PCA) of the hyperspectral data revealed distinct clustering of treated bacteria, with Mg-BAG inducing substantial shifts in lipid (~2925, 2852 cm^{-1}), protein (~1650, 1540 cm^{-1}), and nucleic acid (~1080, 1045 cm^{-1}) bands. These changes indicated membrane destabilisation, protein denaturation, and genetic material disruption.

Notably, Mg-BAG preserved high biocompatibility and bioactivity while significantly reducing bacterial viability and inhibiting cell attachment regardless of surface roughness.

Conclusion and Discussion: Mg-BAG is potentially a multifunctional biomaterial for orthopedic implants, offering non-antibiotic antibacterial activity and enhancing bone cells. This dual functionality effectively addresses the critical clinical challenges of implant-related infections and bone regeneration, positioning Mg-BAG as promising next-generation bioceramics in orthopedic applications.

(6406) Biophysical-inspired Engineered Collagen-Based Scaffolds for Artificial Lymph Node and Spleen Regeneration

Bangheng Liu and Dong-An Wang (Chinese University of Hongkong, Hongkong, China)

Abstract

Introduction: Complications from lymph node damage and spleen injury following surgeries for malignant tumors significantly impact patient outcomes and quality of life. The lymphatic system plays a critical role in immune responses, while the spleen is vital for filtering blood and regulating immune function. This research aims to develop innovative engineering solutions to recreate lymph nodes and promote spleen regeneration, addressing these crucial medical challenges.

Methodology: This study utilized a Type II collagen (Col-II) scaffold coated with B cell membranes to engineer artificial lymph nodes, facilitating T cell attraction and mimicking thymus-dependent and independent areas in vitro. For spleen regeneration, this study designed an inducible scaffold with an interpenetrating network structure of fibrous (Col-II)) and reticular collagen (Col-IV), loaded with vascular endothelial cell membranes to promote in situ regeneration. In vivo

assays were conducted in C57BL6 mice to evaluate biocompatibility and functional integration.

Results: The lymph node scaffolds achieved an 11.6-fold expansion of T cells within 14 days, maintaining their activity and differentiation capacity. The artificial lymph nodes demonstrated excellent biocompatibility, adhered to omental tissues, and induced vascular and lymphatic invasion, enhancing T cell migration. For spleen regeneration, the scaffold reduced oxidative stress, promoted tissue integration, and successfully regenerated red and white pulp structures. Proteomics and RNA sequencing revealed the activation of critical pathways, including the Wnt signaling pathway, Statin pathway, and neural crest cell differentiation pathway. These activations enhanced splenic cell metabolism and function, promoting the regeneration of splenic blood vessels.

Conclusion and Discussion: This findings demonstrate the potential of engineered scaffolds in regenerating immune organs, with applications in treating lymph node damage and enhancing spleen regeneration. The observed activation of critical metabolic pathways suggests avenues for further research into tissue engineering. These approaches could lead to advanced therapies for patients with compromised immune functions due to surgical interventions.

(1436) Gallium-silver liquid metal nanoparticles for the next generation of antibacterial hydroxyapatite implant coatings

Ngoc Huu Nguyen (The University of Sydney, Sydney, Australia), Krasimir Vasilev (Flinders University, Adelaide, Australia) and Vi Khanh Truong (Khalifa University, Abu Dhabi, UAE; Flinders University, Adelaide, Australia; The University of Danang, Dannang, Vietnam)

Abstract

Introduction: Implant-associated infections and delayed bone healing remain major challenges in orthopaedic surgery. Here, we report a multifunctional hydroxyapatite (HAp) coating with gallium–silver liquid metal nanoparticles (Ag-GaNPs) designed to prevent infection and promote bone regeneration.

Methodology: Gallium-silver liquid metal nanoparticles (Ag-GaNPs) were synthesised and uniformly deposited onto hydroxyapatite discs through a controlled dip-coating technique. Coatings were characterized via SEM, TEM, EDS mapping, XRD, and XPS to confirm structural integrity and homogeneous nanoparticle distribution. Antibacterial activity and mechanisms were assessed using Live/Dead assays, SEM, ROS production, ATP level analysis, synchrotron macro ATR-FTIR microspectroscopy and proteomic profiling against various bacterial strains. Osteogenic properties were evaluated using bone marrow stem cells (BMSCs), examining cell proliferation, mineral deposition, and expression of osteogenic genes. In vivo efficacy was tested in a rat cranial defect model inoculated with MRSA, evaluating bacterial colonisation, inflammation, and bone regeneration.

Results: The coating achieved over 90% antibacterial efficacy against both Gram-positive and Gram-negative bacteria, including clinically problematic methicillin-resistant strains (MRSA) and small colony variants (SCVs) known for persistence. Antibacterial mechanisms studies using synchrotron ATR-FTIR microspectroscopy and proteomic profiling revealed a multi-target antibacterial action, including membrane disruption, protein denaturation, DNA/RNA interference, and oxidative stress generation. The HAp–Ag-GaNPs coatings also demonstrated excellent biocompatibility with BMSCs, enhancing proliferation, osteogenic differentiation, and mineral deposition. In addition, cytokine profiling revealed an anti-inflammatory immune response, with increased IL-10 and reduced TNF-α and IL-6, suggesting an immunoregulatory role favourable to tissue repair. In a rat cranial defect model, the coating significantly reduced bacterial colonisation,

suppressed local inflammation, and accelerated bone regeneration and neovascularisation without systemic toxicity.

Conclusion and discussion: HAp-Ag-GaNPs enhanced osteogenic differentiation due to synergistic effects of Ga^{3+} promoting bone formation and Ag^{+} ensuring robust antibacterial activity. Gallium–silver liquid metal nanoparticles coating offers a clinically relevant solution to overcome infection-related implant failure and support bone healing.

(4754) Development of a Natural Facial Cleanser from Houttuynia Cordata Extract and Coconut Oil: Formulation, Antimicrobial Evaluation, and Stability Assessment

Tra My Doan Ngoc and Ly Thuy Tram Le (Danang University of Technology, Danang, Vietnam)

Abstract

Cleansing is an essential step in skincare routines to maintain healthy skin by removing impurities, excess oil, and bacteria. However, many commercial facial cleansers contain synthetic surfactants that can cause skin irritation and dryness, particularly for individuals with sensitive skin. This study focuses on developing a natural facial cleanser using locally sourced ingredients in Vietnam, specifically Houttuynia Cordata extract and coconut oil. Houttuynia Cordata is rich in flavonoids and polyphenols, known for their antimicrobial, anti-inflammatory, and acne-reducing properties, while coconut oil, abundant in saturated fatty acids, helps moisturize the skin and reinforce the skin barrier.

The research investigated the optimal extraction conditions for Houttuynia Cordata, including solvent concentration and extraction time, to maximize its bioactive compound content. The obtained extract exhibited significant antimicrobial activity against Staphylococcus aureus, with an inhibition zone of 21 mm, highlighting its potential for acne prevention. A facial cleanser formulation incorporating Houttuynia

Cordata extract and coconut oil was developed, with an emphasis on optimizing the concentration of Carbomer 940 as a thickening agent to achieve desirable texture and consistency.

The final formulation was evaluated for pH stability, structural integrity, and antimicrobial efficacy over a 21-day period. Results demonstrated that the cleanser maintained stable pH levels, effective cleansing properties, and significant antimicrobial activity, making it a promising alternative to conventional facial cleansers.

This study underscores the potential of utilizing natural, locally sourced raw materials for cosmetic formulation, contributing to the growth of Vietnam's natural skincare industry while offering a gentle and effective skincare solution.

(4913) Green synthesis silver nanoparticles using extract of clitoria ternatea flowers and peristrophe roxburghiana leaves for photocatalytic removal of congo red

Mai Nguyen, Chi Nguyen, Hue Dang, Lan Nguyen, Nga Nguyen, Huyen Tran, Dung Ta, Phuong Nguyen, Chinh Huynh (Hanoi University of Science and Technology, Hanoi, Vietnam) and Hong Luu (Institute for Building Materials, Hanoi, Vietnam)

Abstract

Temperature on the AgNP formation was studied. In all studied VCTF: VPRL ratios with reaction temperature in the range of 55 to 90 ℃, the formation of AgNPs was well observed. The Fourier transforms infrared analysis confirmed the participation of the functional groups of the extract in the AgNP formation. The optimal conditions for AgNP preparation were chosen to be VCTF: VPRL of 8 mL:8 mL, retention time of 20 days, and a reaction temperature of 55 ℃. At optimal conditions, AgNPs had spherical morphology with an average diameter of 20.2 ± 4.0 nm. The obtained AgNPs showed high photocatalytic

activity with both Congo red, Methylene blue, and Rhodamine B dyes with the degradation efficiency of 100, 61.62, and 44.59% just after 60 min under visible light irradiation. The photodegradation process was well described by the Langmuir-Hinshelwood kinetic model with the crucial role of photogenerated electrons. These results imply that green synthesized AgNPs are a promising material for visible-light-driven applications.

(6592) Improving vase life of cut flowers by silver nanoparticles synthesized via biosynthetic method

Mai Nguyen, Phuc Hoang, Nga Nguyen, Dung Ta, Anh Trinh, Lan Nguyen and Chinh Huynh (School of Chemistry and Life Science, Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

This study illustrates biosynthesis of a silver nanoparticle using one of Vietnam's natural plant extracts, namely Clitoria ternatea flowers and gardenia seeds which was used as a stabilizer and reducing agent to reduce Ag+ ion to metallic silver (Ag). The analyses by UV-vis spectra showed that the Ag nanoparticles were uniform and near spherical particles with an average diameter of 30 nm. The X-ray diffraction pattern conformed Ag cubic nanostructures, respectively. Transmission electron microscope (TEM) and zeta potential techniques were employed to characterize the synthesis of nanoparticles. The size of particles ranged from 20 nm to 30 nm and the zeta potential had one peak at 19.8 mean (mV) at area 100% for green synthesized AgNPs. Furthermore, the research results on the effects of silver nanoparticles on the longevity of cut chrysanthemum flowers show the applicability of silver nanoparticles in post-harvest applications of fresh flowers.

(7436) Applying new textile materials and technology to panties and sanitary pads to ensure women's menstrual health according to sustainable development

Ngoc Nguyen Thi Thuy, Trang Ngo Thi, Huong Chu Dieu (Hanoi University of Science and Technology, Hanoi, Vietnam) and Hai Vu Phi (108 Military Central Hospital, Hanoi, Vietnam)

Abstract

Menstrual panties, sanitary pads, menstrual cups and tampons are essential products to protect women's health during menstruation. Menstrual panties and cloth sanitary pads are currently highly appreciated because they ensure health and hygiene for women's bodies, can be reused, helping to limit waste to the environment. This article presents the research on the application of new textile materials and technology to panties and sanitary pads to ensure women's menstrual health according to sustainable development. A terry cotton knitted fabric with a spatial structure was used as an absorbent and menstrual fluid storage layer. A polyester textured knitted fabric with good absorbency and capillary properties, quick drying was the inner layer in directly contact with the wearer's body. A waterproof knitted fabric was the two outer layers to prevent fluid from moving out. The adhesive method and seam tape were applied to connect the textile layers ensuring the seams were also waterproof. Four samples of menstrual panties and cloth sanitary pads with different thicknesses of fluid storage layer were created, tested and evaluated. The evaluation results show that the panties and pads samples can absorb and contain up to 50 ml of liquid without leakage to the outer surface. The results also show that the product samples can be easily cleaned and dried quickly. These research results are the basis of the commercial development of menstrual panties and cloth sanitary pads products in sustainable trend.

(9119) Polydimethylsiloxane Film with Nanostructured Surface for Enhanced Adhesion of Dry Adhesives

Minh Canh Vu and Quoc Viet Bui (Advanced Institute of Science and Technology – The University of Danang, Danang, Vietnam)

Abstract

This study explores a simple method to enhance the performance of dry adhesives by replicating the shapes of micro- and nanoparticles onto polydimethylsiloxane (PDMS) films. Copper nanoparticles (20 – 70 nm) and PMMA beads (5 µm) were used as templates to modify the PDMS surface. The effects of particle type and size on adhesion strength, mechanical properties, transparency, surface structure, and water contact angle were examined. PDMS patterned with 20 nm Cu nanoparticles showed over a threefold increase in adhesion strength. The improved adhesion is attributed to the increased surface area, offering potential for applications such as medical adhesive patches.

Session 3

Biological and Medical Science

INVITED SPEAKERS

Dr. Le Thi Hue,
Kobe University, Japan

Dr. Le is currently a Project Assistant Professor working with Prof. Ooya in the Department of Medical Device Engineering, Graduate School of Medicine, Kobe University. Dr. Le obtained a General Medical Doctor degree from Hanoi Medical University (Vietnam) and a Ph.D. degree in Biomedical Science from Wakayama Medical University (Japan) under the guidance of Prof. Nakata and Prof. Sato. She then completed a postdoctoral fellowship in Biomedical Engineering at the National Cerebral and Cardiovascular Center (Japan), mentored by Prof. Yamaoka and Prof. Mahara. Dr. Le focuses on developing soft biomaterials for clinical applications, including smart injectable hydrogels for endoscopic procedures and cardiac repair, as well as artificial vascular grafts. Her work aims to create biomaterials-based medical devices that improve surgical outcomes and promote tissue regeneration.

Abstract

Injectable hydrogel material has emerged as a promising therapy for treating cardiovascular diseases. Our group fabricated a synthetic hydrogel based on boronic acid-grafted polymer and polyvinyl alcohol, whose gelation depends on the pre-added sorbitol concentration. Introducing a high sorbitol concentration inhibits crosslinking between

the boronic acid group and the diol group of poly(vinyl alcohol), maintaining the hydrogel components in a low-viscosity solution. Upon contact with the heart tissue, the pre-added sorbitol spontaneously diffused from the sol, forming the hydrogel. In-vivo assays have demonstrated that the solution gelated and retained for longer than a boronic acid-grafting polymer solution while exhibiting broader distribution within heart tissue than a high-viscosity alginate solution. This presentation will focus on hydrogel therapy in preventing adverse remodeling and enhancing angiogenesis following myocardial infarction in rat models, and in delivering biomolecules for preventing vascular graft stenosis in a pig model. Additionally, the dual functions of sorbitol in fabricating a “smart” injectable hydrogel will be discussed.

(0011) A pilot study on the efficacy of Zingiber officinale and Houttuynia cordata in balancing Yang Deficiency and Damp-Heat constitutions among medical university students

Huu Duc Minh Nguyen, Nguyen Minh Nhat Tran, Tuan Hai Tran, Thi Nhu Quynh Nguyen, Thi Ngoc Lan Duong, Chi Thanh Vuong, Ngoc Nhu Thao Nguyen (University of Medicine and Pharmacy at Ho Chi Minh City, Vietnam), Quang Cong Che (Ho Chi Minh City University of Technology, Ho Chi Minh City, Vietnam) and Huu Khanh Nguyen (Hospital For Rehabilitation – Occupational Diseases, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Traditional Chinese Medicine (TCM) emphasizes the principle of "treating heat with cold and cold with heat" aligned with the philosophy of "medicine and food sharing the same origin". Individuals with Damp-Heat constitution often require cooling herbs such as fish mint (Houttuynia cordata), whereas those with Yang Deficiency benefit from warming ones like ginger (Zingiber officinale). Despite widespread usage, scientific validation of their efficacy remains limited.

Objective: To evaluate the efficacy of ginger and fish mint in relieving symptoms specific to Damp-Heat and Yang Deficiency constitutions among medical university students.

Methods: A non-controlled, non-blinded pilot study was conducted from February to April 2025 involving 63 students from Ho Chi Minh City University of Medicine and Pharmacy. Participants with Damp-Heat or Yang Deficiency constitutions, identified through a web-based constitution questionnaire according to TCM. Participants consumed either 40 g/day of fresh fish mint for Damp-Heat or 2 g/day of fresh ginger for Yang Deficiency over 14 days. Symptom severity was evaluated using a 101-point Numerical Rating Scale at baseline, day 7, and day 14, and adverse effects were monitored.

Results: Significant symptom reductions were observed in both groups. Participants with Yang Deficiency reported notable improvements in aversion to cold, cold extremities, and sensitivity to cold. Similarly, participants with Damp-Heat constitution exhibited significant alleviation of mouth stickiness, bitter taste, fatigue, and related symptoms. These improvements were statistically significant ($p < 0.05$) at both day 7 and day 14 of intervention, along good safety profiles with no serious adverse events.

Conclusion: Ginger and fish mint effectively alleviated constitution-specific symptoms among medical university students, which can support their potential role in dietary interventions aligned with TCM principles.

(1443) Evaluating the Impact of Skip Connections in Efficient Multi-Stage Feedback Attention Networks for Colorectal Polyp Segmentation

Ly Trinh Khanh, Huyen Trang Ong Thi, Chuyen Mai Tat, and Dung Nguyen Viet (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Accurate colorectal polyp segmentation is critical for early cancer detection and effective treatment. In this paper, we investigate the impact of skip connections in the Efficient Multi-Stage Feedback Attention (EMFA) Network by systematically removing individual skip pathways. Through a detailed ablation study, we assess the contribution of each skip connection to the overall performance of the model. Results show that the effect of removing skip connections varies across network layers and datasets. In the Kvasir-SEG dataset, removing the skip connection at stage 4 leads to improved performance over the baseline, achieving an IoU of 81.65%, Dice of 88.39%, Recall of 94.19%, Precision of 87.80% and F2 score of 92.05. Similarly, on the CVC-ClinicDB dataset, removing the skip connection at stage 3 yields

enhanced metrics, including an IoU of 89.62%, Dice of 94.09%, Recall of 94.27%, Precision of 93.98% and F2 score of 94.60. These findings suggest that certain skip connections may be redundant, and their removal can lead to both simplification and improved segmentation accuracy. Our results highlight the importance of skip connection design in building lightweight, effective, and clinically deployable segmentation models.

(2524) In Silico Screening of BCL-2 Inhibitors Using Machine Learning, Molecular Docking, and Molecular Dynamics Approaches

Bui Quoc Huy Nguyen, Hong Gia Luan Nguyen, Giang Thi Kim Lien (The University of Danang – VN-UK Institute for Research and Executive Education, Danang, Vietnam) and Minh Hien Nguyen (University of Health Sciences, Vietnam National University Ho Chi Minh City, Ho Chi Minh City, VietNam)

Abstract

In the fight against cancer, developing effective Bcl-2 inhibitors is crucial for enhancing apoptosis in cancer cells. This study leverages machine learning models to identify potential inhibitors using open data sources from the PubChem and ChEMBL databases. These compounds were marked as “active” or “inactive” based on their Bcl-2 inhibitory potential. Using the Random Forest model with compound SMILES encrypted in Morgan3 Fingerprint, 17 were identified as “active” and met ADMET criteria from more than 6,000 screened compounds. These compounds will undergo molecular docking to predict binding affinity, followed by molecular dynamics (MD) simulations to assess stability, flexibility, and interactions with Bcl-2 over time. MD simulations will provide insights into conformational changes and binding persistence, aiding in the selection of promising candidates. This research aims to identify novel Bcl-2 inhibitors with favorable ADMET profiles for targeted cancer therapy. The integration of computational techniques,

including machine learning, molecular docking, and MD simulations, enhances the drug discovery process, accelerating the identification of potential candidates for preclinical and clinical development.

(2587) Integrating computational chemistry and In vitro studies to screen anti-Bacillus cereus activity from Vietnamese Ganoderma sp

Nguyen Thi Thu Trang, Tran Linh Thuoc, Nguyen Duc Hoang (Faculty of Biology and Biotechnology, University of Science, Ho Chi Minh city, Vietnam), Pham Tran Vinh Phu (VN-UK Institute for Research and Executive Education, The University of Danang, Danang, Vietnam), Ngo Thai Bich Van (Faculty of Chemical Engineering, University of Science and Technology, The University of Danang, Danang, Vietnam), Truong Phu Chi Hieu and Tran Manh Hung (School of Medicine and Pharmacy, The University of Danang, Danang, Vietnam)

Abstract

Introduction: The Phospholipase C Regulator (PlcR) is a critical transcriptional regulator operating within the quorum-sensing network of the Bacillus genus. PlcR controls the expression of phospholipase C, an enzyme responsible for membrane disruption, as well as a broad array of virulence-associated genes involved in pathogenicity, sporulation, and environmental resilience. Deciphering the molecular mechanisms underlying PlcR regulation is of principal importance for the development of novel antibacterial strategies that target virulence regulation rather than bacterial viability.

Methodology: A combination of computational chemistry tools as molecular docking and molecular dynamics (MD) simulations were employed to screen natural secondary metabolites derived from the medicinal mushroom Ganoderma sp. against the PlcR protein. The in vitro antibacterial activity against Bacillus cereus was agar disk diffusion method.

Results: Among the 80 compounds, and ganosinensin C emerged as the most promising ligand, exhibiting the strongest binding affinity to PlcR with docking score of -9.82 kcal/mol. Subsequent 100-nanosecond MD simulations confirmed the binding stability and conformational compactness of the PlcR–ganosinensin C complex, with consistent root mean square deviation (RMSD) and radius of gyration (rGyr) metrics. Root mean square fluctuation (RMSF) analysis indicated moderate flexibility within loop regions while maintaining a stable protein core and helical secondary structure. About the in vitro agar disk diffusion, Ganoderma multiplicatum VNKKK1901 and Ganoderma sinense VNKKK1902 exhibited the highest zones of inhibition against Bacillus cereus, supporting their bioactive potential.

Conclusion and Discussion: This study provides the first scientific evidence of Ganoderma sp. exhibiting PlcR-targeted antibacterial activity. The identification of ganosinensin C as a potent PlcR inhibitor highlights its potential as a lead compound for the development of anti-virulence therapies targeting Bacillus cereus infections.

(2653) Antioxidant and Hepatoprotective Effects of Eurycoma longifolia Jack Extract in Paracetamol-Induced Hepatotoxicity in Swiss Mice

Giang Lien, Hoang Linh (VN-UK Institute for Research and Executive Education – The University of Danang, Danang, Vietnam), Nguyen Tram and Vu Duc (University of Science and Education – The University of Danang, Danang, Vietnam)

Abstract

Eurycoma longifolia Jack is a valuable medicinal plant, widely used in Europe and the United States as a dietary supplement and health drink. In Vietnam, it is traditionally employed to support treatment of various diseases, particularly those related to liver function. This study aimed to evaluate the hepatoprotective potential of Eurycoma longifolia Jack extract against paracetamol induced liver damage in Swiss mice. Animals were divided into control and treatment groups; hepatotoxicity was induced by a single oral dose of paracetamol. Treatment groups received Eurycoma longifolia Jack extract at different doses. Serum levels of AST and ALT and hepatic malondialdehyde (MDA) were measured as indicators of liver injury and lipid peroxidation. Paracetamol significantly elevated AST, ALT, and MDA ($P < 0.05$). Co treatment with E. longifolia extract produced a dose dependent reduction in these markers, with the 125 mg/kg dose restoring values close to control levels. These results demonstrate that Eurycoma longifolia Jack extract exerts strong hepatoprotective and antioxidant effects against paracetamol induced liver toxicity, supporting its potential as a natural therapeutic agent for liver related conditions.

(4287) Synthesis & Anticancer Activity Evaluation of Thiophene Derivatives

Quang Tran Thuong, Ly Giang Thi Phuong, My Nguyen Thi Tra (Hanoi University of Science and Technology, Hanoi, Vietnam) and Tin Kieu Tran Ngoc (ngoctinkieutran@gmail.com)

Abstract

Thiophene-based drugs have infiltrated various corners of medicine, from established medications like oseltamivir (antiviral) and ritonavir (antiretroviral) to exciting new frontiers. Researchers are actively exploring novel thiophene derivatives with a remarkable range of potential applications. These include treatments for chronic inflammatory diseases by leveraging their anti-inflammatory properties, and offering a glimmer of hope for combating neurodegenerative diseases. However, the most captivating area of exploration lies in oncology. Thiophene derivatives' ability to target specific cancer cell pathways holds immense promise for the development of nex

tgeneration cancer therapies. Current research continues the reaction sequence with di(3-thienyl)methanol by researchers at Kwangwoon University to identify the pharmacophore of thiophene-based double-ring compounds with potential anti-cancer activity. The reaction sequence consists of 8 steps, starting from thiophene as the raw material to the final product Cyclopenta[2,1-b:3,4-b’]dithiophene, using the raw materials reported in the paper. The compounds were purified by column chromatography and their structures were identified by NMR. The results obtained were highly pure thiophene derivatives. 3 compounds were selected to evaluate their anti-cancer activity against A549 lung cancer cells, with results suggesting more rational and appropriate synthetic directions. Overall, this study revisits the findings of researchers at Kwangwoon University and provides a more indepth understanding of the appropriate modification sites based on the original structure of di(3-thienyl)-methanol.

(4623) Single-Cell RNA Sequencing Identifies Dysregulated Signaling in the Prefrontal Cortex of Alzheimer’s Disease

Van An Tran, Trang Mac Thu, Duc Anh Pham, Trang Nhung Nguyen, Tran Phuong Thao Nguyen, Luong Thang Pham, Van Khanh Do and My-Linh Nguyen (Phenikaa University, Hanoi, Vietnam)

Abstract

Introduction: Alzheimer’s disease (AD) is a neurodegenerative disorder characterized by progressive cognitive decline, with the prefrontal cortex (PFC) being among the earliest affected regions. Recent advances in single-cell RNA sequencing (scRNA-seq) have enabled the identification of cell-type-specific transcriptomic alterations, providing deeper insights into AD pathology.

Methodology: This study systematically integrates multiple scRNA-seq datasets to analyze transcriptional changes and dysregulated signaling pathways in the PFC of AD individuals. A comprehensive literature search from 2019 to 2025 identified relevant human brain scRNA-seq studies comparing AD patients and controls, with three studies meeting inclusion criteria. A total of 2,557,393 cells from individuals aged 55 to over 90 years, spanning six Braak stages, were analyzed. Raw sequencing data underwent preprocessing using standardized pipelines, including quality control, read alignment, normalization, and batch correction. Cell-type annotation was performed using established marker gene databases. Identified differentially expressed genes (DEGs) were analyzed through Gene Ontology (GO) and pathway enrichment analyses to characterize biological dysfunctions. Ligand-receptor interaction networks, constructed using cell-cell communication, revealed altered neuronal-glial signaling, while pseudotime trajectory analysis identified key regulatory genes associated with disease progression.

Results: DEG analysis highlighted microglia-specific transcriptomic changes, including downregulation of post-translational protein modification and upregulation of cytokine response genes. AD exhibited increased translation and protein synthesis, altered ECM organization, and dysregulated cholesterol metabolism, potentially affecting oligodendrocyte differentiation. Mitochondrial dysfunction and impaired membrane transport were observed, along with transcriptional and translational impairments contributing to neuronal degeneration. Additionally, upregulated immune and inflammatory pathways, including MAPK/TGF-beta signaling, suggested their role in neuroinflammation and disease progression.

Conclusion and Discussion: These findings provide novel insights into AD pathology by highlighting disruptions in protein synthesis, mitochondrial function, neuronal signaling, and immune regulation, offering potential therapeutic targets.

(6539) Active surveillance of respiratory viruses in influenza-like illness and severe acute respiratory infection following the COVID-19 pandemic in Vietnam

Vu Mai Phuong Hoang, Thi Quynh Mai Le, Le Khanh Hang Nguyen, Thi Hong Trang Ung, Thi Thanh Le, Vu Son Nguyen, Phuong Anh Nguyen, Duc Cuong Vuong and Thi Thu Huong Tran (National Institute of Hygiene and Epidemiology, Hanoi, Vietnam)

Abstract

Introduction: After the COVID-19 pandemic, the influenza-like illness (ILI) and severe acute respiratory infection (SARI) surveillance system in Vietnam was disrupted. From November 2024, the study was conducted with the objective to detect influenza viruses, SARS-CoV-2 and Respiratory Syncytial Virus (RSV) in ILI and respiratory viruses in SARI cases in Vietnam.

Methodology: The surveillance system comprises seven sentinels located in Northern (three sentinels), Central (two sentinels), and Southern (two sentinels) regions. Nasopharyngeal swabs were collected and performed realtime RT-PCR with specific primers and probes for screening and subtyping respiratory viruses.

Results: From November 2024 to May 2025, 1632 ILI and 1224 SARI samples were collected. The ILI positive rate was 32.0% (522/1632) showing influenza A/H3 (13.6%), A/H1pdm09 (10.8 %), influenza B Victoria (2.8%), 4.3% RSV and 0,5% SARS-CoV-2. SARI cases exhibited 53,5% (656/1224) with prominent influenza A/H3 16.6% (203/1224), influenza B Victoria 9.3%, A/H1pdm09 7.2%; other viruses, RSV and hMPV reached 6.3% each pathogen, 3.3% Adenovirus, 0.6% SARS-CoV-2. Children under 5 years with SARI had the rate of RSV 11.7% (85/720), hMPV 11.7% (85/720) and Adenovirus 8.2% (59/720). Co-infections were observed in children and elderly SARI (3.9%) in that

Adenovirus co-infected with other viruses in 50% cases. Over six months, influenza viruses were the main pathogen in November and December 2024. Influenza B Yamagata did not appear during this period.

Conclusion and Discussion: Temporal analysis revealed distinct circulation patterns for influenza, RSV and SARS-CoV-2, with influenza peaking earlier. The higher influenza positivity and RSV, hMPV co-circulation in SARI underscore their potential to cause severe respiratory illness, particularly in young children. SARS-CoV-2 showed low circulation during this time of study. The resumption of active ILI and SARI surveillance system is necessary to monitor the circulation of respiratory viruses which contributes to develop effective measures for protection and prevention strategies in Vietnam.

(8000) Synthesized sgRNA databases with optimal GC-content as Davenport-Schinzel sequences

Phuong-Nam Nguyen (National Economics University, Hanoi, Vietnam)

Abstract

CRISPR technology promises to revolutionize biomedical science and medicine, in which the merit of this advancement lies in its ability to edit genes with high precision and efficiency. gRNA design of the CRISPR-associated proteins is the key to advancing this technology but requires large computations due to the massive search space. This work introduces CRISPR-SCORE and DS-CRISPR to address: (1) a robust scoring metric of the gRNA based on its intrinsic-genetic contents and (2) a cost-efficient and effective approaches to synthesize gRNA, respectively. First, we demonstrate that the proposed CRISPR-SCORE positively correlates with efficacy scores, evaluated using six publicly available databases. Second, we show that the synthesized database

from DS-CRISPR is quality in silico designed gRNAs, which could reduce the cost and improve the success of in vivo or in vitro experiments.

(8521) Arthroscopic reconstruction of the anterior talofibular and calcaneofibular ligaments for chronic ankle instability: Early outcomes from Military Hospital 175

Huu Luong Do, Bao Ngoc Tu, Trung Hai Do, Thanh Tu Nguyen, Trong Hai Dang Nguyen, Khoi Luan Tran, Quoc Hung Vu, Quoc Doanh Tran (Military Hospital 175, Ho Chi Minh City, Vietnam) and Anh Sang Nguyen (Vietnam Military Medical University, Hanoi, Vietnam; Military Hospital 175, Ho Chi Minh City, Vietnam)

Abstract

Introduction: Chronic lateral ankle instability (CLAI), often resulting from complete rupture of the anterior talofibular ligament (ATFL) and calcaneofibular ligament (CFL), remains a frequent and functionally limiting condition, particularly in young, active individuals. While open surgical techniques have long been standard, arthroscopic reconstruction has emerged as a less invasive alternative that allows for precise anatomical restoration. This study evaluates the early clinical outcomes of arthroscopic ATFL and CFL reconstruction performed at Military Hospital 175.

Methodology: A total of 26 patients diagnosed with CLAI underwent endoscopic ligament reconstruction between 2019 and 2024. Inclusion criteria required MRI confirmation of complete ATFL and CFL tears. The surgical technique involved harvesting the autologous semitendinosus tendon, creating bone tunnels in the fibula, talus, and calcaneus, and fixation using suture anchors. Functional outcomes were measured using the American Orthopaedic Foot & Ankle Society (AOFAS) score at 1, 3, and 6 months postoperatively.

Results: The mean patient age was 27.38 years, and the average symptom duration was 16.65 months. AOFAS scores improved

significantly from a baseline of 71.88 ± 2.37 to 97.42 ± 4.41 at 6 months post-surgery ($p < 0.001$). There were no intraoperative complications. Minor postoperative events included two superficial infections and four cases of transient paresthesia, all of which resolved spontaneously. The radiographic evaluation confirmed satisfactory graft positioning and restoration of joint stability. All patients reported good to excellent satisfaction.

Discussion and Conclusion: Arthroscopic anatomical reconstruction of ATFL and CFL using autologous tendon grafts is a safe, effective, and minimally invasive option for treating CLAI. The procedure yields favorable short-term functional outcomes and high patient satisfaction, supporting its application as a modern alternative to open surgery.

(9574) MedXplain-VQA: Multi-Component Explainable Medical Visual Question Answering

Dang Nguyen Hai (VNU University of Engineering and Technology, Hanoi, Vietnam), Anh Dang Minh (Hanoi University of Science and Technology, Hanoi, Vietnam), Tan Le Minh (National Economic University, Hanoi, Vietnam) and Tuan Le Minh (Banking Accademy, Hanoi, Vietnam)

Abstract

Explainability is critical for the clinical adoption of medical visual question answering (VQA) systems, as physicians require transparent reasoning to trust AI-generated diagnoses. We present MedXplain-VQA, a comprehensive framework integrating five explainable AI components to deliver interpretable medical image analysis. The framework leverages a fine-tuned BLIP-2 backbone, medical query reformulation, enhanced Grad-CAM attention, precise region extraction, and structured chain-of-thought reasoning via multi-modal language models. To evaluate the system, we introduce a medical-domain-specific framework replacing traditional NLP metrics with

clinically relevant assessments, including terminology coverage, clinical structure quality, and attention region relevance. Experiments on 500 PathVQA histopathology samples demonstrate substantial improvements, with the enhanced system achieving a composite score of 0.683 compared to 0.378 for baseline methods, while maintaining high reasoning confidence (0.890). Our system identifies 3-5 diagnostically relevant regions per sample and generates structured explanations averaging 57 words with appropriate clinical terminology. Ablation studies reveal that query reformulation provides the most significant initial improvement, while chain-of-thought reasoning enables systematic diagnostic processes. These findings underscore the potential of MedXplain-VQA as a robust, explainable medical VQA system. Future work will focus on validation with medical experts and large-scale clinical datasets to ensure clinical readiness.

(7590) Cancer-Associated Fibroblasts in Breast Cancer: Molecular Signatures and Their Influence on Anti-PD-1 Immunotherapy Response

Thu Trang Mac, Van An Tran, Duc Anh Pham, My Linh Nguyen, Luong Thang Pham and Van Khanh Do (Phenikaa University, Hanoi, Vietnam)

Abstract

Introduction: Anti-PD-1 monoclonal antibodies have emerged as a promising approach in breast cancer therapy, aiming to restore immune functionality within the tumor microenvironment. Cancer-associated fibroblasts (CAFs) play a critical role in tumor progression, yet their specific markers and contributions to immunotherapy response remain poorly defined.

Methodology: We reviewed 15 publications and selected the dataset from Bassez et al., published in Nature Medicine in 2021, as it met all

necessary criteria, including cancerous and non-cancerous conditions, treated and untreated samples, and response to treatment. Using Bioturing, a data analytics ecosystem, we analyzed this public dataset, which includes various immunophenotypes and associated gene sets, focusing on pre- and on-treatment biopsies from breast cancer patients. Our study identified four distinct CAF gene expression patterns, each correlating either positively or negatively with T cell expansion following anti-PD-1 therapy.

Results: CAF1, defined by ESAM, LGI4, CDH6, GJA4 and ITGA7, corresponds vascular CAFs (vCAFs), correlated strongly with treatment response, suggesting a role in promoting pembrolizumab sensitivity through angiogenesis and vascularization. Conversely, CAF4, characterized by RPL30, RPS27, TMSB4X, FTL, identified as THBS2_CAF, was more prevalent in non-responders. Notably, THBS2 signaling emerged as a distinct outgoing non-response signal, suggesting a unique role in immune suppression and therapy resistance. CAF2, representing myofibroblastic CAFs (m/myCAFs), and CAF3, classified as inflammatory CAFs (iCAFs), demonstrated minimal correlation with treatment response, indicating a limited role in determining therapeutic sensitivity or resistance.

Conclusion and Discussion: The identification of specific CAF gene signatures and their correlation with T cell expansion provides valuable insights into the mechanisms by which CAFs influence the immune response in breast cancer. The study suggests potential clinical implications for targeting CAF-related markers and pathways in breast cancer treatment. Additionally, the findings may have broader applicability to other cancer types, informing future research on the heterogeneity of CAFs and their role in immunotherapy.

(4766) The status of single-use plastic waste generation and associated

factors among lecturers and staff of two public universities in Danang city, Vietnam

Linh Hoang Nguyen Nhat, Linh Bui Thi My (Danang University of Medical Technology and Pharmacy, Danang, Vietnam) and Bich Nguyen Thi (School of Medicine and Pharmacy, University of Danang)

Abstract

Introduction: Plastic waste and plastic bags account for 8 – 12% of municipal solid waste, with approximately 2.5 million tons of waste discarded every year. In Danang, approximately 1,100 tons of solid waste are generated daily, of which 15.7 tons are plastic waste. Although there have been reduction solutions, the habit of using single-use plastics remains widespread, requiring the implementation of research on single-use plastic waste generation.

Methodology: The study was conducted on 300 lecturers and staff from two public universities in Danang. A cross-sectional descriptive design was used, with a self-administered anonymous questionnaire to collect data.

Results: The most common types of single-use plastic waste include plastic bags (59%), plastic cups (56.33%), plastic bottles (54.67%), candy packaging (46.67%); straws (45.33%); foam boxes (39.67%); plastic spoons and forks (30.67%). The average single-use plastic waste generation (g/person/week) is 65.90 ± 88.89, respectively: plastic bottles (29.28 ± 54.89); plastic cups (10.61 ± 16.10); plastic bags (9.99 ± 13.61).

There is a statistically significant association between several factors and the average weekly single-use plastic waste generation, such as: Institution ($p = 0.024 < 0.05$); knowledge about plastics ($p = 0.013 < 0.05$); frequently staying at work for lunch ($p = 0.02 < 0.005$); the cost of alternative products is higher than single-use plastics ($p = 0.008 < 0.005$); convenience of single-use plastics ($p = 0.000 < 0.005$); low cost of

single-use plastics ($p = 0.033 < 0.005$); there is no need to reduce plastic waste because it can be recycled ($p = 0.004 < 0.005$).

Conclusion and Discussion: The use of single-use plastics remains prevalent and generates significant waste. To reduce plastic waste generation, it is necessary to enhance communication about the harmful effects of plastics on human health, the environment and climate, while promoting the use of alternative products, despite their higher cost.

(5804) A combined adjuvant and ferritin nanocage based mucosal vaccine against Streptococcus pneumoniae induces protective immune responses in a murine model

Tien Duc Nguyen (Chonnam National University, Gwangju, Korea)

Abstract

Streptococcus pneumoniae is the leading cause of bacterial pneumonia worldwide, especially in children. It causes 1.2 million deaths every year, and children in developing countries are the most vulnerable individuals. Antibodies against capsular polysaccharides have proven protective, and prophylactic vaccines have been developed against prevalent capsular serotypes. The polysaccharide vaccine can stimulate protective humoral immunity in immune competent subjects but weakly induces cellular immunity and durable immune memory, making the vaccine less effective in high-risk groups such as children, elderly populations, and immunocompromised individuals. Despite their well-proven benefits, pneumococcal conjugate vaccines (PCV) have limitations, such as limited coverage against clinical strains and serving the selective pressure that leads to new serotypes.

In this study, we develop a ferritin-based nanocage vaccine concomitantly displaying both the tPspA antigen from Streptococcus pneumoniae and FlaB mucosal adjuvant, using the SpyTag-SpyCatcher

technology. The built in adjuvanted ferritin nanocage mucosal vaccine against S. pneumoniae induce high-quality protective immune responses. We thus propose a nanocarrier vaccine platform that could be applied to developing mucosal vaccines against multitudinous pathogens.

(9542) Toward a Global Sustainable Nutrition System: Bridging Health Science and Planetary Resilience

Anh Hao Bui (Danang University of Medical Technology and Pharmacy, Danang, Vietnam)

Abstract

The global health landscape is facing a dual crisis: the rise of non-communicable diseases driven by poor dietary patterns, and the accelerating environmental degradation linked to unsustainable food systems. Health science must play a pivotal role in addressing both, by guiding the transition toward a global sustainable nutrition system – one that optimally supports human health while preserving planetary boundaries.

This paper proposes a systems-oriented framework that synthesizes current evidence from nutrition science, environmental health, and global policy to envision a unified model of sustainable nutrition. It draws on cross-disciplinary research, including WHO dietary risk burden data, EAT-Lancet recommendations, and successful grassroots interventions from diverse regions, including Southeast Asia and Sub-Saharan Africa.

We identify five core pillars for building a global sustainable nutrition system:

(1) Reframing dietary guidelines to include environmental metrics;

(2) Investing in sustainable food value chains;

(3) Empowering community-led nutrition education;

(4) Embedding sustainability in professional health curricula; and

(5) Catalyzing global governance and funding mechanisms to support these transitions.

Our findings underscore that sustainable nutrition is not only a health imperative but also a global development strategy. By integrating sustainability into nutrition science and practice, we can reduce the global burden of disease, promote equity, and mitigate climate change. This vision requires bold leadership, inclusive collaboration, and long-term investment across sectors and continents.

(7457) Conserved Oligonucleotides in Noncoding Regions of SARS-CoV-2 and Their Potential Roles in Viral Pathogenesis

Kieu D. M. Nguyen (University of Tsukuba, Ibaraki, Japan) and Long D. Dang (VN-UK Institute for Research and Executive Education, the University of Danang, Danang, Vietnam)

Abstract

This study identifies conserved motifs in the untranslated regions (UTRs) of the SARS-CoV-2 genome, exploring their roles in viral pathogenesis. A 5'UTR motif (5'CGATCTCTGTG 3'), similar to eukaryotic 5' terminal oligopyrimidine (TOP) motifs, may enhance viral RNA translation through recapping. A 3'UTR motif (5' GGAAAGGC3'), a potential miRNA seed region, could suppress host immune responses, contributing to delayed innate immunity. These findings, derived from bioinformatics analysis, highlight molecular signatures that may serve as targets for diagnostic tools and therapeutic strategies.

Session 4

AI and Data Science for Health

INVITED SPEAKERS

Dr. Quy Vo-Reinhard,
Genorare, Switzerland

Dr. Quy Vo-Reinhard is the CEO & Founder of Genorare, a Swiss-Dutch venture pioneering AI-powered, privacy-first diagnostics for rare diseases. With a PhD in Computational Biomedicine and an MBA from EBS University (Germany), she brings 20 years of experience in bioinformatics, artificial intelligence, and health data privacy. She co-founded dHealth Network (Switzerland), a blockchain-enabled ecosystem for secure healthcare data exchange, and is CEO of V-Space (France), an AI platform for global talent development. Dr. Vo-Reinhard is a strong advocate for ethical innovation in digital health, focusing on improving access, resilience, and equity. Her work has earned her recognition as *Europe's Most Influential Woman in Blockchain* (2018) and *Switzerland's Female Digital Innovator* (2020). In addition to her ventures, she actively mentors healthtech founders, teaches at Swiss universities, and serves on international advisory boards. She is deeply committed to transforming healthcare for underserved communities-especially in the field of rare diseases.

Abstract

Rare disease diagnosis faces two major challenges: prolonged diagnostic odysseys for patients and stringent privacy requirements for sensitive genomic and phenotypic data. This paper presents a privacy-preserving

framework that allows accurate prediction of rare diseases while maintaining full confidentiality of patient data through Full Homomorphic Encryption (FHE). Our solution achieves 99.8 percent top-1 diagnostic accuracy in 400+ rare diseases, matching plain text methods despite the computational overhead inherent in FHE. Although encryption increases prediction latency by 1,363× to 2,388× compared to unencrypted methods, the system remains clinically feasible, generating predictions for 446 diseases in under two hours on standard hardware. By securing genomic variant analysis and phenotypic symptom matching, this approach enables cross-institutional collaboration without exposing sensitive patient data, addressing a critical bottleneck in rare disease research. The framework's integration with standardized ontologies (e.g., Human Phenotype Ontology) and realworld genomic pipelines ensures compatibility with existing clinical infrastructure.

(0524) Death Prediction of Heart Failure Patients using Machine Learning Techniques

Vu Tran, Ly Trinh, Hoang Vu, Hoang Huy, Minh Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam) and Huong Pham (International School, Vietnam National University, Hanoi, Vietnam)

Abstract

Heart failure is a complex and debilitating condition that affects millions of people worldwide. Accurate prediction of heart failure progression is crucial for timely interventions and improved patient outcomes. This study compares the effectiveness of two predictive approaches: a statistical model and a domain knowledge-based model. Both models were trained using three machine learning algorithms — XGBoost, Logistic Regression, and Support Vector Machine — and evaluated using standard performance metrics. Our findings underscore the importance of incorporating both statistical data and domain-specific knowledge in heart failure diagnosis, as both models achieved comparable results. The statistical model achieved a Receiver Operating Characteristic Area Under the Curve (ROC AUC) score of up to 86.33% and a cross-validation score of up to 93.78%, while the domain knowledge model attained a ROC AUC of up to 83% and a cross-validation score of up to 93%. These comparable performance outcomes suggest that both types of data contribute meaningfully to forecasting heart failure progression. Furthermore, the study demonstrates that supervised machine learning techniques can accurately predict survival outcomes in heart failure patients using only a select set of patient attributes.

(0620) Retrieval-Verified Trust Envelopes: Hallucination-Safe Brain Tumor Classification with Frozen Large Language Models

Phat Huynh, José Azucena, Joao Paulo Jacomini Prioli, Hasti Namazi, Anthony Apatika (North Carolina A&T State University, Greensboro, USA), Phi Huynh (International University, Vietnam National University – Ho Chi Minh, Ho Chi Minh City, Vietnam), Duy Nguyen (Posts and Telecommunications Institute of Technology, Hanoi, Vietnam), Jacques Kpodonu (Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, USA) and Minh Le (Interventional Cardiology Department, Methodist Hospital, Merrillville, USA)

Abstract

Deep learning pipelines for brain tumor magnetic resonance imaging (MRI) have achieved high accuracy, yet most remain opaque "black boxes" that can hallucinate unsupported findings, undermining clinical trust. We develop a retrieval-verified trust envelope that converts frozen large-language models (LLMs) — ChatGPT o3 and Gemini 2.5 Pro — into interpretable classifiers of glioma, meningioma, pituitary tumor, and no-tumor scans. An image-conditioned prompt first produces class probability estimates. Next, three chained prompts then supply a 50-token radiologist-style rationale, a 20-token contrastive cue that clarifies the decision boundary, and a single PubMed identifier that corroborates the cited imaging feature. Experiments used the 7023-image Brain Tumor MRI dataset, with 120 images randomly sampled (30 per class) for evaluation. ChatGPT o3 achieved 85.0% accuracy with macro precision, recall, and F1 of 86.0%, 85.2%, and 84.9%, respectively, whereas Gemini reached 71.1% accuracy with corresponding macro scores of 81.6%, 79.7%, and 80.6%. Micro-average area under the curve (AUC) was 0.93 for o3 and 0.90 for Gemini. Reliability diagrams yielded expected calibration errors of 0.036 and 0.141, confirming superior calibration for o3. Applying a dual

uncertainty threshold (maximum class confidence below 0.80 or instance-level calibration error above 0.20) deferred 31.7% of o3 outputs and 41.3% of Gemini outputs to human review, capturing all residual errors. The prompt-driven envelope thus delivers hallucination-safe, evidence-linked explanations while leaving the underlying LLM weights untouched, advancing transparent decision support for neuro-oncologic MRI.

(0761) Omnidirectional Camera-Based Fall Detection Using Deep Learning

Viet Dung Nguyen, Le Minh Duong (BME Lab, Department of Electronics, SEEE, Hanoi University of Science and Technology, Hanoi, Vietnam) and Duc Hieu Nguyen (FPT Schools, Hanoi, Vietnam)

Abstract

Introduction: Falls among the elderly pose a major health risk, particularly for individuals living alone. Automated fall detection systems play a crucial role in ensuring timely assistance and reducing severe consequences. Omnidirectional cameras offer a wider field of view than traditional pinhole cameras, making them ideal for surveillance applications. However, the distortion in omnidirectional images poses challenges for conventional object detection models. This study evaluates fall detection performance using the BOMNI dataset, specifically focusing on Scenario #1, which includes various human actions such as walking, sitting, drinking, and fainting. Different preprocessing techniques and deep learning models are analyzed to determine the most effective approach for detecting falls.

Methodology: The BOMNI dataset consists of videos recorded with two omnidirectional cameras — one mounted on the ceiling and the other on a side wall. This study focuses on Scenario #1, which captures

single-person actions, including fainting. Three different preprocessing strategies were applied. In the first test, pixel value normalization, bilateral filtering, and rotated bounding boxes were used before training DETR-ResNet-50, a model specifically trained to detect "fainted" cases. The second test involved preprocessing using undistortion and background subtraction before training YOLOv11 models. The third test used the original BOMNI dataset without preprocessing, directly training YOLOv11 models. Model performance was evaluated using precision, recall, and mean average precision.

Results: DETR-ResNet-50, trained on preprocessed data, achieved a precision of 0.958 and an mAP@50 of 0.923 for detecting fainted cases. YOLOv11-M, trained on preprocessed data with undistortion and background subtraction, obtained a precision of 0.978, a recall of 0.957, an F1-score of 0.967, and an mAP@50 of 0.982. When trained on the original BOMNI dataset, YOLOv11-M achieved a precision of 0.858, a recall of 0.933, an mAP@50 of 0.952, and an mAP@50-95 of 0.788.

Conclusion and Discussion: The results suggest that preprocessing techniques significantly impact detection performance. The YOLOv11 family performed well in detecting various classes, while DETR-ResNet-50 focused solely on "fainted" cases with high precision. Compared to the work of V. D. Nguyen et al. (2022), which applied background subtraction and classified falls using traditional machine learning classifiers (SVM, KNN, Naïve Bayes, Decision Tree) with an average accuracy of around 93%, our deep learning models demonstrated superior performance. These findings indicate that deep learning-based methods, particularly YOLOv11, can provide robust and real-time fall detection. Future work will explore model optimization and deployment in real-world surveillance systems.

(0773) A Deep Learning Approach for Skin Cancer Classification Using Vision Transformer and YOLOv8 Segmentation

Manh Tuyen Dao, Tuan Truong Cong, Van Hiep Phung and Thi Thoa Mac (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Skin cancer represents one of the most prevalent forms of cancer worldwide, necessitating accurate and efficient diagnostic tools for early detection and treatment. This paper presents a novel approach for automated skin cancer classification using Vision Transformer (ViT) architecture combined with YOLOv8-based image segmentation. Our methodology addresses the challenge of multi-class skin lesion classification by leveraging the ISIC2019 dataset containing 25,331 images across eight distinct skin lesion categories. The proposed system implements a two-stage approach: first, YOLOv8 is employed for precise lesion segmentation to isolate affected skin regions with 92% accuracy, followed by ViT-based classification trained for 50 epochs on Google Colab Pro. Preprocessing techniques including image resizing to 224 × 224 pixels and white balance correction are applied to enhance model performance. Our experimental results demonstrate an overall accuracy of 77.1% with an F1-score of 0.76 on the validation set, representing a significant improvement over traditional machine learning approaches (SVM: 52%, KNN: 42%, DT: 40%). The model shows particularly strong performance in detecting melanocytic nevus (F1-score: 0.87) and basal cell carcinoma (F1-score: 0.74), while maintaining competitive results across other lesion types. This research contributes to the advancement of computer-aided diagnosis in dermatology, offering a promising tool for clinical decision support that can potentially reduce diagnostic time and improve early detection rates in skin cancer screening programs.

(1502) Development of an EfficientNetV2L and YOLO Model for Lung Anomaly Detection

Rin Bui Thanh, Anh Dao Trong Ngoc, Phuc Nguyen Huu, Thao Dao Le Thu, Hoang Tran Manh, Quang Tran Minh and Phat Nguyen Huu (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Lung diseases such as pneumonia, tuberculosis, and lung cancer are among the leading causes of death worldwide. Early detection and accurate diagnosis play a crucial role in improving treatment outcomes. This paper presents an artificial intelligence-based system for detecting lung anomalies from X-ray images. The proposed system integrates EfficientNetV2L for classification, Energy-Based Models (EBM) for refining results, and a combination of DenseNet-121 and YOLO for lesion localization. The dataset consists of over 5,500 X-ray images from Kaggle and VinAI. Experimental results demonstrate high accuracy (94%) on the training dataset that can be applied to real-world applications. This system has the potential to assist doctors in making faster and more precise diagnoses, reducing workload in the healthcare sector.

(1558) Multimodal Deep Learning for Breast Ultrasound Lesion Classification

Tat-Chuyen Mai, Khanh-Ly Trinh, Huyen-Trang Ong Thi, Viet-Dung Nguyen, and Hai-Long Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: Breast cancer remains a leading cause of mortality among women, emphasizing the need for accurate early detection to improve survival rates. Breast ultrasound is widely used for lesion diagnosis, yet most studies focus solely on imaging, neglecting valuable metadata such as patient age and lesion characteristics. This study proposes a novel multimodal deep learning approach that integrates metadata with ultrasound images to enhance breast lesion classification using the BrEaST dataset.

Methodology: Our MultimodalModel, based on MobileNetV2 pretrained on ImageNet and fine-tuned on the BUSI dataset, was trained on 256 breast ultrasound images using 5-fold cross-validation. Clinically relevant metadata — including age, shape, echogenicity, posterior features, halo, calcifications, and skin thickening — were selected based on their clinical significance and statistical analysis using t-tests for continuous features and chi-square tests for categorical ones. These metadata features were processed through a dense layer before being concatenated with the extracted image features prior to the classification layer, ensuring optimal fusion of multimodal information.

Results: Our multimodal approach achieved a mean validation accuracy of 86.90%, sensitivity of 84.69%, and specificity of 88.31%, significantly outperforming the image-only model (accuracy: 76.59%, sensitivity: 75.51%, specificity: 77.27%) and other architectures such as DenseNet121, EfficientNetB0, and ResNet50. These results demonstrate that integrating metadata with imaging data provides superior diagnostic accuracy.

Conclusion and Discussion: This study is among the first to incorporate structured clinical metadata into deep learning models for breast ultrasound analysis, offering a more comprehensive AI-driven diagnostic tool. By leveraging both imaging and patient-specific features, our approach has strong potential for clinical implementation, enhancing automated breast cancer diagnosis and aiding radiologists in more precise decision-making.

(2500) Machine Learning-Based Assessment of Traumatic Brain Injury Severity for Digital Health Applications

Hoang Bach Nguyen, Chi Thanh Nguyen, Quang Tung Pham (Institute of Information Technology, AMST, Hanoi, Vietnam), Xuan Huy Manh, Thanh Hai Tran, Hai Vu (School of Electronics and Electrical Engineering (SEEE), HUST, Hanoi Vietnam) and Huu Khanh Nguyen (Department of neurosurgery, 103 Military Hospital, Hanoi, Vietnam)

Abstract

Traumatic brain injury (TBI) poses a significant public health challenge, often resulting in long-term neurological deficits or mortality, which requires an early and precise severity classification for effective clinical management. This study introduces a machine learning framework that automates the classification of severity of TBI using clinical data (e.g. Glasgow Coma Scale, pupil response, vital signs) and Computed Tomography (CT) scan assessments (e.g. presence of hematoma, midline shift). The proposed framework consists of data pre-processing with imputation of missing values, feature importance analysis, and the application of algorithms such as decision trees, random forests, and XGBoosts, evaluated by cross-validation and metrics such as accuracy, precision, and AUC. Tested on two comprehensive datasets, the proposed framework achieved an accuracy of 94% and an F1 exceeding 82%, with strong sensitivity for moderate to severe cases of TBI. These findings highlight the potential of machine learning to improve TBI assessment in resource-scarce or remote settings, combining clinical and imaging features for robust automated triage. Future works will aim

to refine the generalization of the model and integrate it into tele-health systems for emergency care support.

(3386) Stress Detection Using Machine Learning: A Case Study on Human Mental States

Viet Dung Nguyen, Dinh Duc Vu and Diep Anh Truong (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Stress is a significant influencing factor on both mental and physical well-being, impacting a variety of aspects of daily activities and job performance. The purpose of this research is to apply machine learning algorithms to identify stress levels from biosignals taken during sleep from the publicly available SaYoPillow dataset. The dataset consists of physiological parameters such as snoring rate, respiratory rate, heart rate, and sleep duration, among others, which are utilized as indicators of stress severity. The process involves preprocessing of data, feature selection, and execution of various machine learning models like tree-based models, instance-based model, and boosting algorithm for classification of the stress into five categories. The models are evaluated with respect to performance metrics with very high accuracy and some of them with 100% in specific classifications of the stress level. This study underscores the promise of machine learning for early stress detection, thereby facilitating improved stress management and mental well-being.

(3822) Developing an AI-Enhanced Individualized Prediction Tool for

Psychopathological Symptoms in Vietnam: A Study Protocol

Hung Nguyen (RMIT University Vietnam, Ho Chi Minh City, Vietnam), Minh Khau (University of Science – Vietnam National Univeristy Ho Chi Minh City, Vietnam), Huyen Nguyen and Hieu Pham (Vin University, Hanoi, Vietnam)

Abstract

Artificial intelligence (AI) is increasingly leveraged in mental healthcare for early detection, monitoring, and personalized intervention. However, most existing AI applications are based on categorical diagnostic systems like DSM-5 or ICD-11, which often lead to comorbidity issues, ambiguous diagnoses, and insufficient personalization. These tools typically target specific disorders (e.g., depression or anxiety), neglecting the broader, interconnected nature of psychopathological symptoms. Addressing these limitations, recent innovations in psychopathology emphasize transdiagnostic and network-based approaches, such as the Hierarchical Taxonomy of Psychopathology (HiTOP), which conceptualize mental disorders as dimensional and interconnected constructs. This study proposes an AI-powered tool that integrates data-driven principles from both the HiTOP and symptom network models to generate individualized risk profiles for internalizing mental disorders (e.g., depression, anxiety, bipolar disorders). Our solution aims to assess individuals' current psychopathological traits and symptom components, providing a comprehensive, nuanced profile supporting clinical diagnoses and monitoring.

The study unfolds in three phases: (1) model development, data collection, and validation of assessment tools; (2) training and refinement of the model; and (3) application in clinical and psychological practice settings in Vietnam. Central to our method is the development of a Risk-aware Taxonomy-enhanced Symptom Encoder (RiTaSE), which encodes symptom data and their severities into rich representations

processed via a Transformer-based model. The model is trained using high-quality, validated datasets mapped to the HiTOP framework.

This project is among the first to employ AI for personalized psychopathological profiling in Vietnam as well as in other low-and-middle-income countries. Expected outcomes include an advanced diagnostic-support tool for clinical use, improved cross-cultural insights into symptom comorbidity, and practical utility in mental health monitoring and intervention evaluation. Future extensions aim to broaden the scope across all HiTOP dimensions and predict transitions to clinical states through longitudinal and multi-modal data integration.

(4962) Sparse Deep Neural Networks for Pubic Symphysis-Fetal Head Segmentation

Luu Duc Lam, Nguyen Viet Dung (Hanoi University of Science and Technology, Hanoi, Vietnam) and Szilagyi Laszlo (Obuda University, Budapest, Hungary)

Abstract

Introduction: Pubic symphysis–fetal head (PS-FH) segmentation in transperineal ultrasound is essential for measuring the angle of progression (AoP) and assessing labor advancement. Manual delineation is time-consuming and prone to observer variability, while state-of-the-art deep learning models-though accurate-are often too large for real-time deployment on resource-limited clinical devices.

Methodology: We build upon a U-Net architecture with an EfficientNet-B0 encoder augmented by scSE attention modules and an IoU-based loss. After baseline training, we apply one-shot magnitude-based fine-grained pruning guided by layer sensitivity, removing

low-magnitude weights to induce sparsity. The pruned network is then fine-tuned at a reduced learning rate to recover performance.

Results: Evaluated on the JNU-IFM dataset (6,224 frames), the original model achieves 0.96 accuracy, 0.96 Dice score, and 0.93 IoU. Fine-grained pruning reduces parameter count by 40% (from 6 M to 3.5 M), with a minimal Dice drop to 0.95. The pruned + fine-tuned network retains nearly its original Dice performance while enabling real-time inference on embedded hardware.

Conclusion and Discussion: Our anatomically guided pruning framework delivers a compact, high-performance PS-FH segmentation model suitable for edge deployment. The approach balances computational efficiency with clinical accuracy, paving the way for automated obstetric diagnostics in resource-constrained settings. Future work will explore multi-center validation and integration into ultrasound systems.

(5788) CBSSNet: A Semi-Supervised Medical Image Segmenting Algorithm with Teacher-Student Binding via Cosine dissimilarity

Duy-Thai Nguyen, Van-Quoc-Viet Nguyen, Thi-Thao Tran and Van-Truong Pham (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: Deep learning algorithms have been increasingly used for tasks in the medical sector, where accuracy and optimal time are highly regarded. The traditional way of training a deep learning model is by going through iterations of comparing the prediction with the ground-truth and adjusting the model via gradient descent. However, for a model to achieve good results, it has to be trained on a sufficiently large

dataset, which is not always available in the medical sector, especially for segmentation tasks. In such tasks, the hardest part of the dataset preparation process is producing the ground-truth masks, which is time-consuming and requires high expertise.

Methodology: To contribute an algorithmic solution to this challenge, in this study, a semi-supervised segmentation model named CBSSNet is proposed with a valuable idea of using the Cosine dissimilarity to effectively determine the quality difference between the feature maps of the student's and the teacher's architectures around the encoding phase. Moreover, a new block named MSFE (Memorized-Selective Feature Extractor) is introduced to take advantage of the condensed feature at the bottleneck.

Results: The model is assessed using the Data Science Bowl (DSB) and the International Skin Imaging Collaboration (ISIC18) datasets.

Conclusion and Discussion: Ablation study and comparison with state-of-the-arts shows optimistic results. Further model details and the model's source code will be available at:

https://github.com/thzhere/CBSSNet.git.

(6169) Controllable Medical Image Generation Using Text Prompts on Multi-Phase Contrast CT Data

Nguyen-Duong Nguyen Nhat, Thanh-Huyen Dang Thi and Viet-Dung Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Developing AI applications for medical imaging requires diverse, high-quality datasets, especially for contrast-enhanced CT scans. However, data collection faces challenges like privacy concerns, annotation costs, and limited diversity. This research proposes a controllable text-to-

image generation approach for multi-phase CT scans using the VinDr-Multiphase dataset. By leveraging Imagen's diffusion model adapted for medical imaging, and using textual prompts based on patient metadata and imaging parameters, our method synthesizes phase-aware CT images with anatomical fidelity. Classifier-free guidance improves control over generation, enabling the model to produce clinically plausible images for different contrast phases. Preliminary evaluations show promising results with FID around 58 and qualitative evidence of realistic phase-specific patterns. This work offers potential for data augmentation, radiologist training, and improved AI diagnostics in data-scarce settings.

(6691) CTM-PolypNet: A Unified Convolution-Transformer-Mamba Model for Polyp Segmentation

Minh-Ngoc Luong, Minh Le, Van-Truong Pham and Thi-Thao Tran (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: A critical challenge in computer-aided diagnosis of colorectal cancer is the accurate segmentation of polyps from endoscopic images, which plays a crucial role in early detection, enabling quick interventions and improving patient outcomes. Although deep learning techniques, especially Transformers and Convolutional Neural Networks (CNNs), have shown promising results in this field, they still face several challenges. Polyp features vary significantly in size and shape, and their boundaries are often blurred and indistinct, making it difficult to distinguish them from the background.

Methodology: To address these challenges, we introduce a novel architecture integrating Convolution, Transformer, and Mamba-based components. The proposed model's backbone encoder, PVT-v2, captures a global receptive field rather than relying solely on local receptive fields like traditional CNNs. In our architecture, we designed Mamba-MLP Fusion to exploit multi-level features during the decoder stage. Also, we proposed the Reverse Attention Feature Enhancement (RAFE) block, which indicates ambiguous areas and enhances the objects' edges. As well as integrating a deep supervision procedure, we outperformed other state-of-the-art methods with notable outcomes.

Results: We evaluate our approach on the Kvasir-SEG, CVC-ClinicDB, CVC-ColonDB, and ETIS datasets.

Conclusion and Discussion: The experimental results compared with SOTA demonstrate the performance of the proposed approach for polyp segmentation. Our code will be made publicly available at: https://github.com/Ngoc-LM/CTM-PolypNet.

(6947) Comparative Analysis of Deep Neural Networks for Brain Tumor Classification in MRI Images

Thanh-Hung Nguyen, Thi-Thoa Mac, Hoang-Hiep Ly, Duc-Dat Mai, Dang-Khoa Pham, Duy Phan and Xuan-Thuan Nguyen (School of Mechanical Engineering, Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: Artificial intelligence (AI) is now widely used in healthcare, especially for helping doctors diagnose diseases using medical images. Deep learning is one of the common tools, which can learn patterns from data. This study focuses on using AI to classify brain tumors from MRI scans. It looks at three types of tumors: glioma, meningioma, and pituitary adenoma.

Methodology: We examined five deep learning models to analyze their effectiveness in identifying brain tumors. These models include VGG16, EfficientNetB3, DenseNet121, MobileNetV2, and a new one called Swim-EfficientNet, which mixes Swin Transformer with EfficientNet. Each model was trained on MRI images and evaluated using accuracy, recall, and the time it takes to make a prediction.

Results: All models gave good results, with accuracy higher than 99%. The Swim-EfficientNet model gave the best results, reaching 99.9% accuracy and recall. MobileNetV2 was the fastest in giving predictions, which is useful when speed is important.

Conclusion and Discussion: This study shows that combining different model ideas, like in Swim-EfficientNet, can improve how well AI systems classify medical images. These models can help doctors detect brain tumors quickly and accurately. In the future, this approach could be expanded to other medical imaging tasks or used in real-time healthcare tools.

(7192) AI Accelerator Based on Uniformly Segmented Linear Regression for Real-Time Diagnostics and Wearable Health Monitoring Systems

Dat Ngo (Korea National University of Transportation, Korea), Tan Hung Nguyen (Advanced Institute of Science and Technology, The University of Danang, Danang, Vietnam) and Van Tho Nguyen (VN-UK Institute for Research and Executive Education, The University of Danang, Danang, Vietnam)

Abstract

Introduction: AI inference in healthcare often runs on edge devices with limited computational resources, where efficient arithmetic operations are critical. Traditional multiplication and division in digital signal processing (DSP) can be performance bottlenecks. The logarithmic number system (LNS) addresses this challenge by replacing multiplication/division with addition/subtraction, thus reducing computational load. However, existing LNS approaches often compromise accuracy, limiting their use in high-precision medical applications.

Methodology: This paper proposes a high-precision method for computing binary logarithms and antilogarithms using uniformly segmented linear regression, tailored for accelerating AI inference in healthcare applications. The input is decomposed into integer and fractional parts. The fractional domain is uniformly segmented based on a fixed number of its most significant bits (MSBs), and each segment is modeled using linear regression functions for logarithmic and antilogarithmic computations.

Results: Compared to benchmark LNS approximation techniques, the proposed method achieves higher accuracy, demonstrating its suitability as a core component in AI accelerators for real-time diagnostics and wearable health monitoring systems.

Conclusion and Discussion: The proposed method provides a practical and accurate solution for accelerating AI inference on resource-constrained healthcare devices. By balancing computational efficiency with high precision, it enables real-time medical applications where both speed and reliability are critical. Future work will explore dynamic segmentation and integration into complete edge-AI pipelines for medical imaging and patient monitoring.

(7340) Prediction of non-alcoholic fatty liver disease based on anthropometric and paraclinical laboratory data in the Vietnamese population

Thuy Thi Pham, Phong Huu Nguyen, Tham Thi Hong Pham, Hai Duy Vu, Hai Vu (Hanoi University of Science and Technology, Hanoi, Vietnam), Giang Binh Tran (Emergency abdominal surgery Department, Viet Duc University Hospital, Hanoi, Vietnam), Hung Nguyen Luu (Department of Epidemiology, School of Public Health, University of Pittsburgh, Pittsburgh, PA, USA), Anh Gia Pham (Department of Surgical Oncology, Viet Duc University Hospital, Hanoi, Vietnam) and An Vu Khanh Le (General Planning Department, Viet Duc University Hospital, Hanoi, Vietnam)

Abstract

Non-alcoholic fatty liver disease (NAFLD) is becoming a major global health concern. The prevalence of NAFLD worldwide is about 30% and is increasing. NAFLD can progress to non-alcoholic steatohepatitis (NASH), which can lead to cirrhosis, liver failure, and hepatocellular carcinoma (HCC) if not diagnosed and treated promptly. In Vietnam, the prevalence of NAFLD is increasing, especially in the young population.

Diagnosis of NAFLD is often based on blood tests, ultrasound, and liver biopsy. Liver biopsy is the gold standard for diagnosing liver disease. However, it is an invasive procedure with a high level of risk and potential for dangerous complications. In this study, we used three machine learning techniques, namely KNN, Random Forest, and XGBoost, to identify NAFLD patients based on anthropometric information and paraclinical test results. Our experiments were conducted on the VD-Liver dataset, collected from the Vietnam-Germany University Hospital in Hanoi, Vietnam. The experimental results indicate that anthropometric information (BMI, gender) and blood test indicators such as AST, NFS, GGT, and AST/ALT ratio are meaningful in classifying NAFLD. However, if only relying on the combination of those features, the classification performance is not

high. Still, applying the three machine learning algorithms above to classify NAFLD based on the CAP index measured by the FibroScan ultrasound machine combined with the AST/ALT ratio gives the best prediction results, with performance measures of accuracy, specificity, and precision approximately equal to +1 and recall approximately equal to 0.92. The findings of this study contribute to early assessment of NAFLD risk for people who have not yet performed ultrasound and liver biopsy by taking advantage of anthropometric data and paraclinical tests.

(7527) Deep Gym Analysis: Real-Time Leg Workout Segmentation and Knee Motion Tracking Using an Unsupervised Learning Approach

Quan Dinh Nguyen, Tien Truong Vo, Phuong Quy Le, Jaeyeop Choi and Junghwan Oh (Pukyong National University, Busan, Korea)

Abstract

This study proposes a novel approach for monitoring and classifying leg exercises performed in gym environments by leveraging single sensors and deep learning based on AutoEncoders (AEs). The primary aim is to segment leg exercise activities and evaluate the accuracy of knee open angles during workouts. We employ Autoencoders (AEs) to learn latent representations from motion sensor-derived knee angle data, enabling real-time detection and classification of various leg exercises. These allow the framework to segment distinct exercise types (goblet squats, leg extension, leg curls and leg press), count repetitions, and assess the accuracy of knee joint angles relative to biomechanically optimal ranges. Additionally, the real-time implementation provides immediate feedback on exercise execution, identifying deviations in knee flexion/extension angles to support corrective guidance. Experimental results demonstrate the potential of the proposed method for effective

exercise segmentation and accurate knee angle validation, paving the way for smarter, sensor-driven fitness applications.

(8103) Classification of Fetal Health Status Based on application of Deep Learning and Support Vector Machine from Cardiotocogram Data

Anh Bui Bao and Hang Dang Thuy (Le Quy Don Technical University, Hanoi, Vietnam)

Abstract

This study proposes and evaluates machine learning models for fetal health classification based on cardiotocogram (CTG) signals, which record fetal heart rate and uterine contractions in pregnant women. CTG is widely utilized in obstetrics to assess fetal well-being. Leveraging deep learning in combination with a support vector machine (SVM), this research develops and compares two models: AlexNet-SVM and ResNet50-SVM. The models are trained and evaluated on the CTG dataset, employing preprocessing and feature extraction techniques to optimize classification performance. Experimental results indicate that the classification accuracy of AlexNet-SVM and ResNet50-SVM is 97.18% and 96.98%, respectively. These findings suggest that the AlexNet-SVM model exhibits superior performance compared to ResNet50-SVM, highlighting its potential application in assisting clinicians with fetal health assessment. The adoption of this model could facilitate early detection of abnormalities, mitigate pregnancy-related risks, and enhance the quality of maternal and fetal healthcare.

(8769) Generative Imputation and Graph-Neural-Network-based Classification to improve Mortality Prediction on Electronic Health Record Data

Tran Phuc Nhat Mai (Ho Chi Minh City University of Technology (HCMUT) – Vietnam National University Ho Chi Minh City, Ho Chi Minh City, Vietnam) and Nhat Tan Le (lenhattan@hcmut.edu.vn)

Abstract

Predicting ICU-based mortality using electronic health record (EHR) data faces significant challenges due to missing data, which can negatively affect model performance. To address this issue, this study explores the use of Generative Adversarial Networks (GANs), specifically the Generative Adversarial Imputation Network (GAIN), for imputing missing values in tabular data, such as the MIMIC-III dataset. The GAN framework includes a generator that learns to fill in missing components based on observed data and a discriminator that distinguishes between real and generated values. In parallel, Graph Neural Networks (GNNs) are employed for mortality prediction, where patients are represented as nodes connected by edges based on cosine similarity between feature vectors. The GNN model uses Graph Convolutional Networks (GCNs) to aggregate information from neighboring nodes and extract meaningful features for classification. Experimental results show that GAN-based imputation significantly outperforms traditional methods, improving accuracy, AUC, and F1-score by 5 – 10%. Additionally, GNNs demonstrate strong performance in handling class imbalance, with AUC increasing by up to 25% and F1-score by as much as 65%. Statistical analysis confirms that the imputation process preserves the original data distribution, ensuring reliable and robust predictions. Overall, the study highlights the effectiveness of combining GANs and GNNs for improving predictive

modeling in ICU mortality prediction under conditions of missing and imbalanced data.

(9402) A linear regression analysis of smoking, vaping, and respiratory diseases

Vu Tran, Tram Nguyen, Hoang Huy (Hanoi University of Science and Technology, Hanoi, Vietnam), Huong Pham (International School, Vietnam National University, Hanoi, Vietnam) and Duc Do (University of Transport and Communications, Hanoi, Vietnam)

Abstract

In this study, we analyzed the correlation between smoking, vaping, and lung diseases, using self-reported COPD diagnosis data from the 2022 and 2023 Behavioral Risk Factor Surveillance System (BRFSS) surveys. Participants were categorized into six groups: current smokers, dual users, ex-smokers, current vapers who were ex-smokers, current vapers who never smoked, and never users. Using weighted univariable and multivariable logistic regression models, we concluded that dual users and current smokers have the highest adjusted odds (aOR) of COPD with aOR = 4.35 and 3.78 respectively. Notably, current vapers who never smoked showed increased aOR of 1.45, suggesting an independent risk associated with vaping. Age played a significant role, with older adults showing stronger associations across all categories.

(7559) Machine Learning-Based Classification of EEG Signals for Differentiating Between Stress and Relaxation States

Vu Duy Hai, Nguyen Ha Anh, Tran Bao Tram, Hoang Quang Huy, Pham Thi Hong Tham and Tran Anh Vu (School of Electrical & Electronic Engineering, Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

This study evaluates the performance of machine learning models in classifying stress and relaxation states from electroencephalogram (EEG) signals. Timely stress detection is necessary, and EEG stands out as an objective and effective tool. The main objective is to review the method of stress detection from EEG based on frequency band power ratio and analyze the data processing/evaluation strategy to improve the generalization ability. The EEGMAT dataset from 36 subjects is used for this research. The study compares two data partitioning strategies: global blending (Case 1) and subjectspecific partitioning (Case 2). Features based on power spectral density and EEG frequency band power ratio are extracted. Two feature selection methods, Mutual Information (MI) and ANOVA F-test, are applied, along with popular machine learning models such as KNN, SVM, Random Forest (RF), XGBoost, and Voting Ensemble. The results of Case 1 achieved high accuracy (up to 96.32% for KNN/KNN + SVM with MI), but did not accurately reflect the generalization ability due to the risk of overfitting. In contrast, Case 2 (subject-specific separation) gave lower performance (up to 87.6% for RF with MI) but demonstrated better generalization ability to new subjects. In particular, MI provided significantly more effective and stable results than ANOVA F-test due to its ability to detect non-linear relationships. The study emphasizes the importance of designing appropriate data processing and evaluation strategies, opening up the potential for developing stress recognition systems for new subjects.

(9403) Privacy-Preserving Rare Disease Diagnosis via Integrated AI and Fully Homomorphic Encryption

Vu Thu Nguyet Pham (Applied AI Institute, Deakin University, Australia; EnostaLabs, Enosta Group, Vietnam; Genorare B.V., Netherlands), N. Nga Nguyen (The national reference center for neuromuscular diseases, Department of Neurology, Montpellier University Hospital, France), Valeria Gottardo (Genorare B.V., Netherlands; NLC Health Ventures, Amsterdam, The Netherlands), Quy Vo-Reinhard (dHealth, Switzerland; Genorare B.V., Netherlands)

Abstract

Rare disease diagnosis faces two major challenges: prolonged diagnostic odysseys for patients and stringent privacy requirements for sensitive genomic and phenotypic data. This paper presents a privacy-preserving framework that allows accurate prediction of rare diseases while maintaining full confidentiality of patient data through Full Homomorphic Encryption (FHE). Our solution achieves 99.8 percent top-1 diagnostic accuracy in 400+ rare diseases, matching plain text methods despite the computational overhead inherent in FHE. Although encryption increases prediction latency by 1,363× to 2,388× compared to unencrypted methods, the system remains clinically feasible, generating predictions for 446 diseases in under two hours on standard hardware. By securing genomic variant analysis and phenotypic symptom matching, this approach enables cross-institutional collaboration without exposing sensitive patient data, addressing a critical bottleneck in rare disease research. The framework's integration with standardized ontologies (e.g., Human Phenotype Ontology) and realworld genomic pipelines ensures compatibility with existing clinical infrastructure.

These advancements represent a significant step toward global, secure rare disease databases, empowering clinicians to leverage collective knowledge while complying with GDPR, HIPAA, and other privacy regulations.
Keywords: rare disease diagnosis, homomorphic encryption, similarity-based prediction, genomic data analysis, phenotypic encoding, privacy-preserving machine learning.

(3789) Developing Crack Detection Method using Deep Learning to Investigate Self-healing Capacity of Bioceramic materials

Hanh Thi Minh Tran, Tien Ho Phuoc (The University of Danang – University of Science and Technology, Danang, Vietnam) and Son Nguyen Thanh (National Institute of Technology, Kushiro College, Hokkaido, Japan)

Abstract

Introduction: In this study, we focus on the problem of accurately segmenting pixels that belong to cracks and those that do not. Additionally, the cracks specifically considered in this research are small cracks on the surface of ceramic materials. These cracks are in the range of nanometers that need to be detected automatically before the material fractures due to crack propagation.

Methodology: To tackle this, we employ deep learning for crack detection and segmentation. Moreover, we compare and evaluate CNN-based segmentation models with encoder-decoder architecture using a dataset collected by our research team.

Results: The results show that combining traditional image processing with deep segmentation DeepLabv3+ improves the performance significantly.

Conclusion and Discussion: We presented our proposed method that combines digital image processing and deep segmentation model. Our

method has significantly improved the accuracy of detecting cracks on the surface of ceramic material. Future work will explore how our crack detection model will be used to extract the information of the cracks on artificial biomaterials such as calcium phosphate cements (CPC), the major materials for bone defect treatment.

(0103) Chromosome Detection and Classification using U-Net and DETR

Nguyen-Duong Nguyen Nhat, Thanh-Huyen Dang Thi and Viet Dung Nguyen (Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Chromosome karyotype analysis, which involves examining a person's chromosome to find genetic anomalies, is a crucial technique for diagnosing genetic disorders. This process primarily relies on chromosome banding and microscopic image to visualize chromosome structures and identify structural or numerical abnormalities. However, manual karyotyping is complex and requires high domain expertise, as it takes an amount of time. To enhance accuracy, efficiency, and consistency, artificial intelligence (AI) techniques, particularly deep learning models, have been introduced for automation. In this method, we employed a deep learning-based approach to automate chromosome extraction. Initially, a U-Net model was applied to the original micrographs to eliminate background noise, including nuclei and other artifacts. Subsequently, DETR was utilized to detect and isolate individual chromosomes. Finally, a second U-Net model was employed to accurately refine the extraction of each chromosome. The experimental results demonstrate that this method effectively removes external interferences and accurately extracts chromosomes from complex micrographs. Preliminary findings reveal that the U-Net + DETR framework outperforms the established U-Net + YOLOv3

approach, as well as standalone DETR or YOLOv3 models, in terms of overall detection and extraction performance. Unlike traditional anchor-based detectors like YOLOv3, our innovative integration of DETR's transformer architecture offers a pioneering solution for karyotype automation. This hybrid approach uniquely combines segmentation and transformer-based detection, providing superior performance over prior methods. While the exact accuracy is still under refinement, initial results are highly promising, surpassing previous benchmarks. This suggests that the U-Net + DETR framework provides a robust foundation for automated karyotype analysis, warranting further optimization to achieve even greater accuracy and reliability.

(1516) Based Data Source Classification for Skull Defect Reconstruction using AI

Long Nguyen, Hai Hoang Hong and Hung Nguyen Thanh (School of Mechanical Engineering, HUST, Hanoi, Vietnam)

Abstract

Cranial bone defects are a common medical condition caused by various factors such as accidents, brain tumors, and bone loss. These defects significantly impact both the health and aesthetics of patients. Currently, numerous studies focus on cranial bone defects, particularly on the design and manufacturing processes of bone grafts to ensure aesthetics, durability, and patient acceptance.

In the design phase of bone defect grafts, various methods are employed, including 3D design software and AI-based reconstruction. While commercial 3D design software is widely available, it requires extensive design time and skilled technicians. In contrast, AI-based reconstruction is gaining popularity due to the rapid advancement of AI technologies. A major challenge in applying AI networks for cranial

bonedefect reconstruction is the need for a large, openly accessible dataset. Hospital-specific data is often restricted by legal regulations and limited to certain regions, making research difficult. Although some open datasets are available for researchers, they often contain a wide range of skull bone conditions, requiring significant effort to filter the necessary data.

In this study, we propose an based method to filter and verify cranial bone defect images for AI reconstruction. Our approach analyzes and classifies these images based on patient age, gender, geographical location, skull defect location, and defect volume.

Our study includes a survey of three open data sources, resulting in a dataset of cranial bone defects categorized by age group, gender, and geographical region. This filtered data serves as input for training AI networks in cranial bone defect reconstruction.

(1782) High-Throughput ARG Detection: Leveraging Scalable Gaussian Processes in Metagenomics

Long Dang and Long Vo (VN-UK Institute for Research and Executive Education, the University of Danang, Danang, Vietnam)

Abstract

Introduction: Gaussian Processes (GPs) are highly effective for modeling complex data, but their cubic scaling with dataset size poses a significant computational challenge, particularly in large-scale applications such as metagenomics. Metagenomic assembly and analysis play a crucial role in understanding microbial communities and detecting antibiotic-resistant genes (ARGs) in environmental samples, which is vital for combating antimicrobial resistance. This research aims to develop scalable GP methods to address the computational

limitations and facilitate efficient ARG identification in extensive metagenomic datasets.

Methodology: This study explores approximation techniques to reduce the computational complexity of GPs, enabling their application to large metagenomic datasets. These techniques approximate the GP kernel, allowing for efficient inference and prediction of resistance patterns. The approach leverages high-throughput sequencing data derived from environmental samples known to contain diverse microbial communities and ARGs.

Results: The application of these scalable GP methods demonstrated a substantial reduction in computation time compared to standard GP implementations, while maintaining a high level of predictive accuracy. Specifically, the analysis of environmental metagenomic data successfully identified distinct resistance patterns and accurately predicted the presence and abundance of ARGs. The methods showed a reduction in processing time by a factor of 10, while maintaining an F1 score above 0.9 in ARG prediction.

Conclusion and Discussion: The findings indicate that scalable GP methods provide a robust and efficient framework for analyzing large metagenomic datasets, significantly enhancing the ability to monitor and predict antibiotic resistance in environmental samples. This research highlights the potential of these methods to advance our understanding of ARG distribution and dynamics, with implications for public health monitoring and environmental policy. Future research should focus on optimizing these methods for real-time analysis and integrating them into environmental surveillance systems.

(5168) Applying Machine learning and Artificial neural network for virtual screening of thiazole-2-imine as nAchR inhibitors

Dat Le Quy, Thang T. Dang and Toan Dao-Huy (School of Chemistry and Life Science, Hanoi University of Science and Technology, Hanoi, Vietnam)

Abstract

Introduction: In this project, we construct a virtual screening model for thiazole-2-imine-based nAChR inhibitors. Targeting the nicotinic acetylcholine receptor (nAChR) is a promising strategy for Alzheimer's disease therapy, and this study supports the early-phase identification of novel compounds with potential therapeutic value.

Methodology: This study employs a comprehensive set of computational methods, including Machine Learning algorithms, Artificial Neural Network, and molecular docking, to screen potential inhibitors of nAchR. Multiple algorithms were compared to develop the ML model to identify the most effective ones, while the ANN model used the molecular fingerprints as input features. Model architectures were determined by hyperparameters selected from Bayesian optimizations using the Optuna library. AutoDock 4 was used to perform molecular docking. In the virtual screening phase, the screening set underwent a sequential process involving drug-likeness assessment, the ensemble AI model, and molecular docking to select the most promising nAchR inhibitors.

Results and Discussion: The machine learning XGBoost algorithm exhibited compelling results with an external validation EV− f1 score of 0.87 and an EV-Average Precision (AP) of 0.81, alongside with a cross-validation CV-f1 score of 0.883 and a CV-AP of 0.918. Besides, the deep-learning-based Artificial Neural Network model expressed promising performance with a CV-f1 score of 0.876 and a CV-AP of 0.93. These two models were employed with molecular docking to screen a total of 33,365 thiazole-2-imine derived compounds, leading to

the identification of 10 potential nAchR inhibitors. The study recommends further molecular dynamics simulations and in vitro tests.

(5174) Feasibility Study of Monte Carlo Multi-layer Media Simulation for Generating a Database to Support AI-driven Skin Diagnosis

Anh Thu T. Nguyen, Thanh Nguyen T. Hoang (University of Science and Technology – The University of Danang, Danang, Vietnam) Tuan V. Pham, Xuan Dat Ho, Nguyet Ha T. Tran and Thang V. Hoang (LYDINC Institute of Education and Engineering – Technology, L.Y.D.I.N.C Co. Ltd.)

Abstract
Spectral imaging has recently emerged as a noninvasive method for human skin conditions diagnosis, has been researched and applied recently due to its advantages of low cost, non-invasivity, and harmlessness. With advancements in computing, researchers have been studying the integration of artificial intelligence (AI) with these imaging techniques to enhance diagnostic efficiency. However, one key obstacle in the development of AI-spectral imaging-based diagnostic systems is the lack of a comprehensive and reliable database of the optical properties of various human skin tones and conditions. Monte Carlo Simulation on Multi-layered tissues (MCML) has shown its applicability in demonstrating the light-tissue interaction and has been used to generate spectral reflectance data for specific tissue, especially skin. However, this process typically requires a long duration. This study has investigated and validated the fast MCML simulation (with CUDA support) result with the real measured spectral diffuse reflectance data, on the normal healthy skin condition at three different skin tones, at wavelengths between 900 nm and 1700 nm. The findings demonstrate that the simulation data aligns with the real measurement data which supports the hypothesis about the development of MCML skin spectral

diffused reflectance database. This could serve as the foundation for AI-driven, non-invasive, computer-aided skin health diagnostics and treatment methods.

(9189) A no-code digital platform for orthopedic workflow and research management using AppSheet

Anh Sang Nguyen (Military Hospital 175, Ho Chi Minh City, Vietnam; Vietnam Military Medical University, Hanoi, Vietnam), Tra My Nguyen Thi (DNA International Hospital, Ho Chi Minh City, Vietnam), Dang Huy Nguyen, Quang Vu An, Van Binh Nguyen, Tien Dat Bui, Tuan Bao Huynh, Khoi Luan Tran, Quoc Hung Vu, Long Hoang, Quoc Doanh Tran (Military Hospital 175, Ho Chi Minh City, Vietnam) and Dang Khoa Nguyen (Military Hospital 121, Can Tho, Vietnam)

Abstract

Introduction: Digital transformation in healthcare is a critical but often overlooked need in low- and middle-income countries. The lack of integrated digital solutions in orthopedic departments disrupts efficiency and data continuity. This study describes the development of a no-code digital platform using AppSheet to enhance workflow and research management for clinical doctors in Vietnam.

Methodology: Built on Google Sheets as the backend database, the platform includes 28 relational data tables and 107 customized views, featuring modules for patient records, admissions, surgeries, laboratory monitoring, follow-ups, scientific publications, Continuing Medical Education (CME) tracking, and task scheduling.

Results: Tested at Military Hospital 175, the system documented over 10 patient profiles, 60 scientific publications, and 10 research projects during the initial trial phase. It implemented real-time dashboards and automated CME tracking. Usability evaluations with 12 pilot users

resulted in a System Usability Scale score of 79.6 ± 6.7 and a Net Promoter Score of 8.17 ± 1.4, indicating high satisfaction and adoption potential.

Discussion and Conclusion: The system improved documentation efficiency, research productivity, and continuity of care, making it a viable solution for resource-limited healthcare settings. Our findings emphasize the importance of involving clinicians in developing digital solutions to bridge the gap between frontline needs and technology.

This event is sponsored by Vingroup Innovation Foundation
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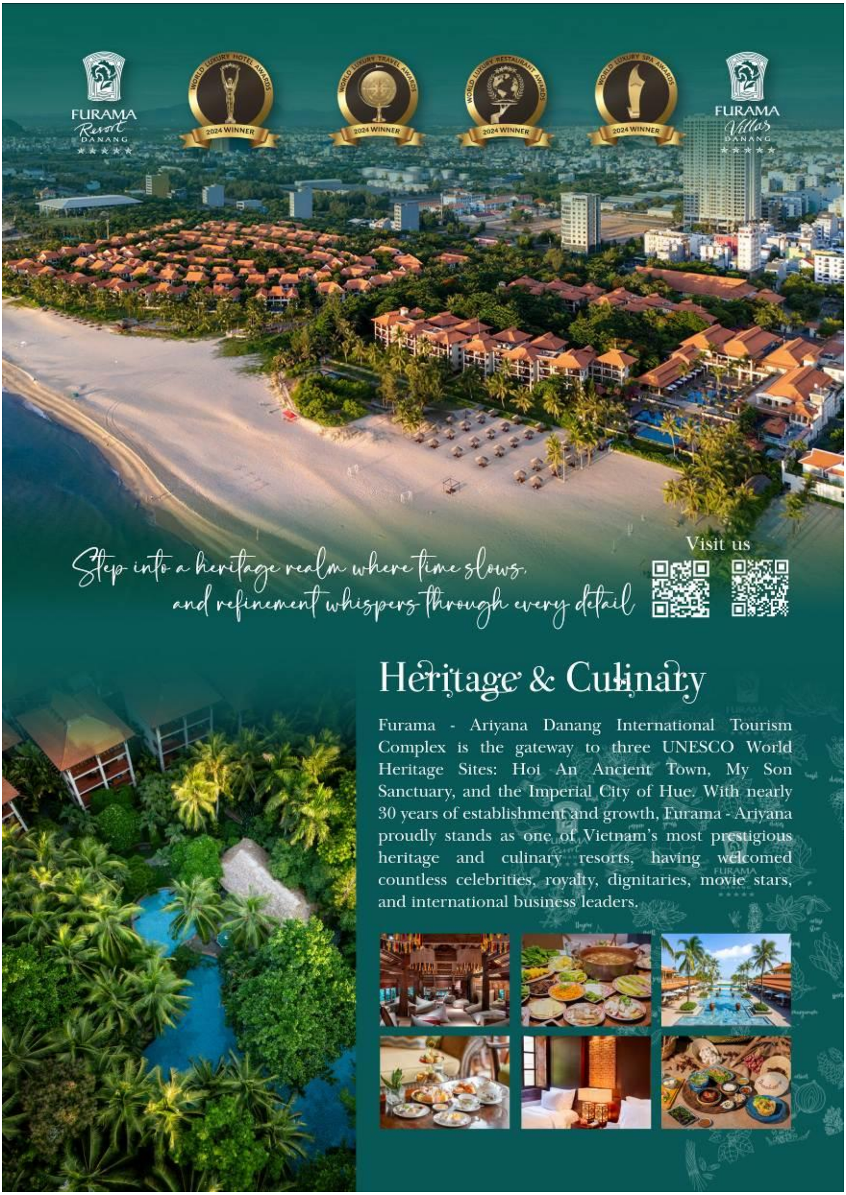
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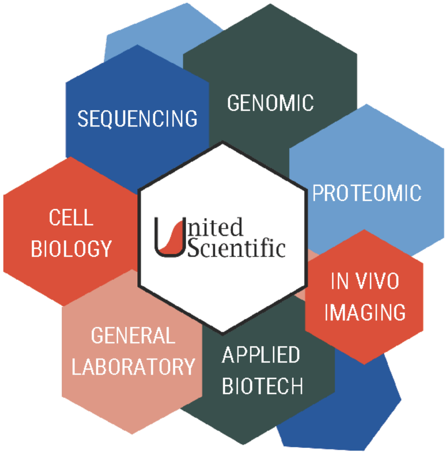

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