IBITEC 2021

IBITEC 2021

THE EMPOWERMENT OF HEALTHCARE TECHNOLOGY TO ACHIEVE UNIVERSAL HEALTH COVERAGE

THE 2nd INTERNATIONAL BIOMEDICAL INSTRUMENTATION AND TECHNOLOGY CONFERENCE

PROGRAM BOOK

VIRTUAL CONFERENCE | 20 - 21 OCTOBER 2021

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IBITeC 2021

The Improvement of Healthcare Technology

To Achieve Universal Health Coverage

20 – 21 October 2021

Program Book

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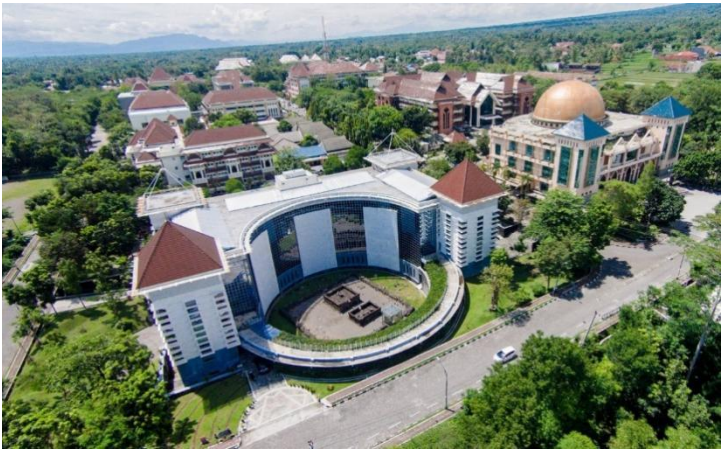

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Welcome Message

Prof. Dr. Ir. Hari Purnomo, M.T

Dean, Faculty of Industrial Technology

Universitas Islam Indonesia (UII)

Distinguished guests and participants,

Assalamu'alaikum warahmatullahi wabarakatuh

Firstly, let us thank Allah Almighty, who has given us His blessings and mercies so we can gather today, in good health and spirits.

On behalf of the Faculty of Industrial Technology, Universitas Islam Indonesia (UII), I welcome our speakers and participants.

The development of technology has become very rapid with the advent of Industry 4.0, and almost all aspects of our lives have been influenced by it.

In the field of health, technology and information systems have become vital tools to discuss. The demands of the health community must be followed by the development of the technology used. Healthcare technology is one of the technologies most affected by global regulations. Because technology is the only instrument to generate added *value*, mastery and the ability to create technology becomes a crucial problem.

Also, the application of information technology in the field of health is believed to provide various benefits for health care providers. With the support of these technologies, the benefits that can be obtained include the availability of accurate and comprehensive patient health information so that professionals can provide the best possible treatment.

To develop health technology, scientific meetings are needed as a means for sharing, disseminating, and communicating between practitioners, researchers, government agencies, non-governmental institutions, and industry.

On this occasion, the Electrical Engineering Department, Faculty of Industrial Technology, Universitas Islam Indonesia held The International Biomedical Instrumentation and Technology Conference, IBITeC 2021. This seminar is the second conference organized by the Electrical Engineering Department and co-organized by Diponegoro University (UNDIP) and Universiti Teknologi Malaysia (UTM). We hope this activity can provide a change of knowledge for researchers, practitioners, students, and lecturers to improve their abilities.

To our speakers and all those who support the seminar, we thank you for your cooperation in conducting this seminar. Finally, our congratulations on attending the seminar. Hopefully, what we achieve here will benefit institutions and society as a whole.

Wassalamu'alaikum warahmatullahi wabarakatuh

Dean,

Faculty of Industrial Engineering

Prof. Dr. Ir. Hari Purnomo, M.T

Welcome Message from Conference Chair

Firdaus, Ph.D

Department of Electrical Engineering

Universitas Islam Indonesia (UII)

Distinguished guests, respected colleagues, ladies, and gentlemen,

Assalamu'alaikum. All praise is for Allah, who guided us to do good deeds and gave us the health bounty. On behalf of the 2nd International Biomedical Instrumentation and Technology Conference (IBITeC) 2021 Committee, I would like to welcome you to this biannual conference held by the Department of Electrical Engineering, Faculty of Industrial Technology, Universitas Islam Indonesia, Yogyakarta. This conference is co-sponsored by IEEE Communication Society Indonesia Chapter, and co-organized by the Center for BioMechanics, Bio-Materials, Bio Mechatronics, and Bio Signal Processing (CBIOM3S) of Diponegoro University (UNDIP), Universiti Teknologi Malaysia (UTM), and UII IEEE Student Branch. The goal of this conference is to facilitate researchers, practitioners, students, and lecturers around the world to publish, explore and share their latest research in Biomedical Engineering and related fields in Biomedical Sensors Development, Biomedical and Informatics, Biomedical Imaging, Internet of Things (IoT) and Healthcare

Information System with its associated topics. This year's theme is "The Empowerment of Healthcare Technology to Achieve Universal Health Coverage."

The committee is delighted with the positive response of researchers to this conference. We received 50 submissions from Germany, France, Portugal, Morocco, Malaysia, Vietnam, China, India, Pakistan, Iraq, and our own Indonesia. The papers were peer-reviewed by our reviewers from several countries to maintain the quality of this conference. The acceptance rate of the 2nd IBITeC 2021 is 58%. All accepted and presented papers will be forwarded for consideration to be published in the IEEE Xplore Digital Library and indexed by Indexing Service Partners (Scopus, INSPEC, Semantic Scholar, EBSCO, and others that are available/eligible).

We are grateful for the contributions of our invited speakers. We will have three keynote speakers that we believe could spread the new insight for biomedical engineering disciplines to follow the industry 4.0 needs. The organization of a conference is very much a team effort. I want to thank all committees, editorial team, event-organizer, reviewers, and other parties who have carried a vast and complicated workload. The 2nd IBITeC 2021 strives to offer plenty of opportunities, especially networking. Authors and participants have the chance to meet and interact with each other to share and transfer their knowledge in similar fields. We hope that you can benefit from this conference during discussions and, most importantly, networking among our peers. We hope that this conference will be unforgettable moments and experiences. Thank you. *Wassalamu'alaikum.*

Yogyakarta, October 2021

Firdaus, Ph.D

Conference Chair of The 2nd IBITeC 2021

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Khalid Alhussaini, King Saud University, Saudi Arabia

Rimsha Siddiqui, Hamdard University, Pakistan

Hepsiba D, Karunya Institute of Technology and Sciences, India

Ihssan S. Masad, Yarmouk University, Jordan

Raimi Bin Dewan Abdul Rahman, Universiti Teknologi Malaysia, Malaysia

Program Schedule

Program at glance

Day 1 : Wednesday, 20 October 2021

Time (Western Indonesian Standard Time)	Activities
07.45 – 08.05	Participants enter the airmeet room
08.05 – 08.30	Opening Ceremony
08.30 – 09.30	Plenary Session I
09.30 – 10.30	Plenary Session II
10.30 – 11.30	Plenary Session III
11.30 – 11.45	Closing keynote session
11.45 – 13.00	Break
13.00 – 14.35	Parallel Session I (Room 1 – Room 3)
14.35 – 15.00	Break
15.00 – 16.35	Parallel Session II (Room 1 – Room 3)
16.35 – 17.00	Closing Ceremony

Day 2 : Thursday, 21 October 2021

Time (Western Indonesian Standard Time)	Activities
09.00 – 09.10	Opening by MC
09.10 – 10.00	Annual activity report IEEE Student Branch UII
10.00 – 11.30	Webinar
11.30 – 11.35	Closing by MC

Technical Program

Day 1 : Wednesday, 20 October 2021

Time (Western Indonesian Standard Time)	Activities
07.45 – 08.05	Participants enter the airmeet room
08.05 – 08.10	Opening by Master of Ceremony (MC)
08.10 – 08.15	Traditional dance performance
08.15 – 08.20	Welcoming speech by the dean
08.20 – 08.25	Welcoming speech by the IEEE ComSoc Indonesia Chapter Chair
08.25 – 08.30	Welcoming speech by the IBITeC Chair
08.30 – 09.30	**Plenary Session I** Keynote speaker : Prof. Dr. Edward Sazonov Title : *From Wearable Sensors to Behavioral Informatics : Frontiers in Digital Health* Moderator : Ahmad Raf'ie Pratama, S.T., M.I.T., Ph.D.
09.30 – 10.30	**Plenary Session II** Keynote speaker : Assoc. Prof. Ts. Dr. Noor Azurati Ahmad Title : *Cyber Physical System R&D, Innovation and Commercialisation for 21st Century Healthcare* Moderator : Alvin Syahroni, S.T., M.Eng., Ph.D.
10.30 – 11.30	**Plenary Session III** Keynote speaker : Desiree Abdurrachim, Ph.D. Title : *Artificial Intelligence and Medical Imaging in Biomedical Research* Moderator : Sisdarmanto Adinandra, S.T., M.Sc., Ph.D.
11.30 – 11.45	Closing plenary session
11.45 – 13.00	Break
13.00 – 14.35	**Parallel Session I**

	Room 1 : *Biomedical Technology, Application, and Science* Room 2 : *Material and Sensor Development for Medical and Rehabilition* Room 3 : *AI, Machine Learning, and Deep Learning Development for Biomedical* Application
14.35 – 15.00	Break
15.00 – 16.35	**Parallel Session II** Room 1 : *Biomedical Technology, Application, and Science* Room 2 : *Material and Sensor Development for Medical and Rehabilition* Room 3 : *AI, Machine Learning, and Deep Learning Development for Biomedical* Application
16.35 – 16.40	Opening by MC
16.40 – 16.45	Traditional dance performance
16.45 – 16.50	Closing speech from the IBITeC Chair
16.50 – 16.55	Best paper announcement
16.55 – 17.00	End Conference

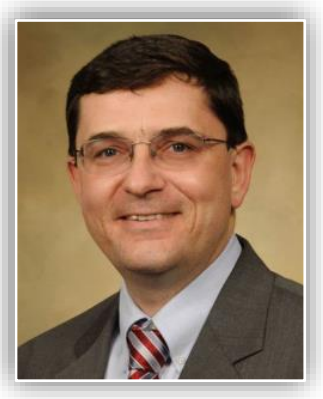
Day 2 : Thursday, 21 October 2021

Time **(Western Indonesian Standard Time)**	**Activities**
09.00 – 09.10	Opening by MC
09.10 – 10.00	Annual activity report IEEE Student Branch (SB) UII by Chair
10.00 – 11.30	Webinar "*Application of Electrical Capacitance Volume Tomography (ECVT) for Brain Imaging*" by M. Fathul Ihsan (PhD candidate Chiba University, Japan & Neuroscience Laboratory, Center for Medical Physics and Cancer Research,

	C-Tech Labs Edwar Technology, Tangerang, Indonesia)
11.30 – 11.35	Closing by MC

Plenary Sessions

Keynote Speaker 1



Prof. Dr. Edward Sazonov

Electrical and Computer Engineering Department

The University of Alabama College of Engineering (USA)

Title : From Wearable Sensors to Behavioral Informatics : Frontiers in Digital Health

Abstract

The emergence of wearable sensor technology paves the way for objective, sensor-driven assessment of health-related behaviors, which in modern society act as the major determining factors of life expectancy and quality of life. The modern sensor technology carries the promise to objectively measure and quantify complex human behaviors such as physical activity, food intake patterns, addictions, sleeping patterns, and social interactions. Furthermore, real-time recognition of the behavior enables novel approaches for just-intime behavior modification. The recognition, characterization and interpretation of behaviors form sensor data presents a challenging problem due

to complexity and variability of real-life behaviors as well as the indirect manner in which events of interest are inferred from behavioral and physiological manifestations registered by the sensors. The talk will provide an overview of our work on wearable sensors for monitoring of food intake in adults and infants, monitoring of cigarette smoking and smoke exposure, as well as monitoring of physical activity and energy expenditure.

Biography

Edward Sazonov (IEEE M'02, SM'11) received the diploma of systems engineer from Khabarovsk State University of Technology, Russia, in 1993, and his doctorate in computer engineering from West Virginia University in Morgantown, West Virginia, in 2002. Currently he is a professor in the electrical and computer engineering department at The University of Alabama College of Engineering in Tuscaloosa, Alabama, and the head of the Computer Laboratory of Ambient and Wearable Systems. His research interests span wireless, ambient and wearable devices, and methods of biomedical signal processing and pattern recognition. Devices developed in his laboratory include a wearable sensor for objective detection and characterization of food intake, a highly accurate physical activity and gait monitor integrated into a shoe insole, a wearable sensor system for monitoring of cigarette smoking, and others. His research has been supported by the National Science Foundation, National Institutes of Health, National Academies of Science, as well as by state agencies and private industry and foundations.

Source : https://eng.ua.edu/eng-directory/dr-edward-sazonov/

Keynote Speaker 2

Assoc. Prof. Ts. Dr. Noor Azurati Ahmad

Innovation and Commercialization Centre

Universiti Teknologi Malaysia (Malaysia)

Title : Cyber Physical System R&D, Innovation and Commercialisation for 21st Century Healthcare

Abstract

Numerous Cyber-Physical System (CPS) are in deployment in the healthcare industry in order to monitor and diagnose the current state and to facilitate the wellbeing of a patient in an autonomous way. Increasing global populations in need of care, abundance of low cost powerful smart devices, enormous progress of communication technologies and emergence of robust data analytics have influenced the rise of Cyber-Physical healthcare systems. The economic and societal potential of such systems is vastly greater than what has been realized, and major investments are being made worldwide to develop the

technology. When these smart devices or internet connected devices interact together, a cyber infrastructure is created. These cyber infrastructures face several serious concerns; sensor networks, realtime embedded operating systems, embedded system networking, smart spaces, dynamic service discovery, security and privacy, and mobility. Most CPS devices contain embedded systems in which are becoming safety-critical in medicine because they increasingly control functions of, and communicate with, patients themselves as well as engineered systems. Device life spans are shrinking due to more rapid innovation in enabling technologies and the demand for more robust systems. The pressures of rising health care costs, an aging population and diminishing medical professional resources are also driving health-care providers to seek technological innovations to maintain or improve patient care as efficiently as possible, especially, during and post COVID19 pandemic. In addition to addressing these research, development and disruption challenges, it is important to ensure that a credible "faster, better, cheaper" business case can be made to persuade device manufacturers to change their innovation and commercialisation practices and open markets to new participation.

Biography

Dr. Noor Azurati Ahmad@Salleh serves as an Associate Professor at Universiti Teknologi Malaysia Kuala Lumpur. She obtained her B.Eng. in Computer Engineering in 2001 and Master of Electrical Engineering in 2006 from Universiti Teknologi Malaysia. She graduated with a PhD in Embedded Systems from University of Leicester in 2013. She has 15 years of experience in teaching embedded system, microcontroller, microprocessor and real-time system courses and supervision of more than 10 undergraduates and 10 postgraduate students.

At present, she is the Director of Innovation and Commercialisation Centre, located at Technovation Park, Skudai Valley, Johor. There are 24 staff under her supervision. Currently, she is supervising the team on publishing 5 UTM innovation and commerxialisation policy and procedures including IP Management Procedure, Spin off Company Establishment Procedure, IP Commercialisation Procedure, Entrepreneurial Leave Scheme Procedure and Consultancy Procedure. She has introduced the new ICCubeX Incubator Program including structured entrepreneurial training, prototype development funding and incubator space. These initiatives are purposely hatchering our new spin off companys. In 2020, she managed to lead the MoU between Aberystwyth

University and Abber Innovation and UTM in collaboration work on Technology Transfer in Biorefining and Bioprocessing products for both universities.

She received Anugerah Citra Karisma award in 2016. She also won Bronze Award in INATEX2017 for the invention/innovation of ADIPS. In 2018, she received Anugerah Penulis Dalam Jurnal Berindeks award in Citra Karisma 2018. In 2019, She received 5 Star Rating award for her Knowledge Transfer Project (KTP) Project: Malaysia Embedded System Programming Challenge (MESPC18). In 2020, she received Gold Medal in INATEX2020. Recently, she successfully obtained Silver Medal in MTE2021 Competition. Her main invention is called ALWAIS (Adaptive, Light-Weight and Accurate Indoor Positioning System).

Source : https://people.utm.my/azurati/1567-2/

Keynote Speaker 3

Desiree Abdurrachim, Ph.D.

Merck Research Laboratory

Merck Sharp and Dohme (Singapore)

Title : Artificial Intelligence and Medical Imaging in Biomedical Research

Abstract

Studies in biomedical research to advance understanding in disease mechanisms or discover novel treatment rely on specific, reliable, and robust disease biomarkers. Medical imaging has played a significant role as the readouts may provide potential biomarkers of relevant biochemical, physiological, or anatomical changes associated with disease.

Artificial intelligence (AI) has changed the way we process and understand data. While traditional biomedical research focuses on hypothesis testing of specific biomarkers in association with diseases, research using AI could generate inferences by learning and recognizing patterns from multi-dimensional and complex data beyond hypothesis. As etiology and mechanism

of diseases are often complex and often a result of interplay between genetic factors and environment, the capability of understanding big data would lead to better disease biomarker discovery.

In this talk, the context of AI and medical imaging in biomedical research will be presented. A few examples include the application of medical imaging in providing disease biomarkers, and the application of AI for identification of biomarkers associated with disease progression and outcomes.

Biography

Desiree Abdurrachim, PhD, obtained a bachelor's degree in Electrical Engineering from Institut Teknologi Bandung (Indonesia) in 2006, a master's degree and a PhD in Biomedical Engineering from Eindhoven University of Technology (The Netherlands) in 2008 and 2014, respectively. Currently, she is an Associate Principal Scientist in Genomic and Biomarker Sciences within Merck Research Laboratories, Merck Sharp and Dohme (MSD) in Singapore. Prior to joining MSD in 2018, she was a post-doctoral research fellow in Singapore BioImaging Consortium (SBIC), Agency for Science, Technology and Research (A*STAR).

In her current role, she provides expertise in imaging biomarker discovery, in-vivo Magnetic Resonance Imaging (MRI) and Spectroscopy (MRS), and digital pathology in the field of cardiometabolic diseases. She leverages her experience in academic research and pharmaceutical industry to develop and validate novel imaging biomarkers to help unravel complex disease pathophysiology and advance drug discovery for unmet medical need. She has experience in setting up multi-disciplinary and multi-institute collaboration, and coordination and execution of preclinical studies from study design, data acquisition, to data analysis and interpretation. Her research has resulted in more than 20 publications in international scientific journals.

Conference Sessions

Parallel Session I

Wednesday, 20 October 2021 | 13.00 – 14.35

Room 1 : Biomedical Technology, Application, and Science **Session Chair : Dzata Farahiyah**		
Time	**Title**	**Author(s)**
13.00 – 13.15	*Quaternion-Based AHRS with MEMS Motion Sensor for Biomedical Applications*	Rui Azevedo Antunes (Uninova Monte da Caparica, Portugal); Lu´ıs Brito Palma (Uninova Monte da Caparica, Portugal)
13.20 – 13.35	*Stress Effect on Attention Level Detection Using Neurosky Mindwave Headset*	Rania Al-Ashwal (Universiti Teknologi Malaysia, Malaysia); Syafwendra Syafril (Universiti Teknologi Malaysia, Malaysia); Maheza Irna Mohd Sali (Universiti Teknologi Malaysia, Malaysia); Arief Ruhullah Harris (Universiti Teknologi Malaysia, Malaysia)
13.40 – 13.55	*Cortical Functional Connectivity by Partial Directed Coherence in Relation to Creative Thinking: A Case Study*	Julia Mohd Yusof (Universiti Teknologi Malaysia, Malaysia); Norlaili binti Mat Safri (Universiti Teknologi Malaysia, Malaysia); Puspa Inayat binti Khalid (Universiti Teknologi Malaysia, Malaysia); Roshida binti Abdul Majid (Universiti Teknologi Malaysia, Malaysia)

14.00 – 14.15	*Study of Effect of Silver Nano-Particles on the Electrical Excitability of Hippocampal Neuronal Network Based on "Voltage Threshold Measurement Method"*	Kun Hou (Southeast University, Nanjing, China); Chen Meng (Southeast University, Nanjing, China); Yan Huang (Southeast University, Nanjing, China); Xiao-Ying Lü (Nantong University, China); Zhi-Gong Wang (Nantong University, China)
14.20 – 14.35	*Texture Analysis of Ultrasound Images to Differentiate Pneumonia and Covid-19*	Saeful Bahri (Institut Teknologi Bandung, Indonesia); Suprijanto (Institut Teknologi Bandung, Indonesia); E. Juliastuti (Institut Teknologi Bandung, Indonesia)

Room 2 : Material and Sensor Development for Medical and Rehabilition **Session Chair : Teguh Prakoso**		
Time	**Title**	**Author(s)**
13.00 – 13.15	*Preparation and Evaluation of Folic Acid-TPGS Polymeric Micelle as a Quercetin Anticancer Drug Carrier*	Siti Fatimah Ibharm (Universiti Teknologi Malaysia, Malaysia); Norjihada Izzah Ismail (Universiti Teknologi Malaysia, Malaysia)
13.20 – 13.35	*Characterization of Silver Resistive Electrode as Heating Module for Portable Thermocycler Device*	Yudan Whulanza (Universitas Indonesia, Indonesia); Rayhan Ammarsyah (Universitas Indonesia, Indonesia); Ardiyansyah Yatim (Universitas Indonesia, Indonesia)

13.40 – 13.55	*Hip Joint Implant Loading During Routine Activities of Elderly Indonesian*	Rilo Berdin Taqriban (Diponegoro University, Indonesia); Ismoyo Haryanto (Diponegoro University, Indonesia); Dwi Basuki Wibowo (Diponegoro University, Indonesia); Rifky Ismail (Diponegoro University, Indonesia)
14.00 – 14.15	*Optimization of Insole Shoe for Diabetic Mellitus Type 2 Using Finite Element Analysis*	L. P. Pradipta (Atma Jaya Yogyakarta University, Indonesia); P. W. Anggoro (Atma Jaya Yogyakarta University, Indonesia); P. K. Fergiawan (Diponegoro University, Indonesia); A.P. Bayuseno (Diponegoro University, Indonesia); Jamari (Diponegoro University, Indonesia)
14.20 – 14.35	*Green Synthesis of Silver Nanoparticles Using Citrus Aurantifolia (Bangladeshi Lemon Leaf)Extract and Its Antibacterial Activity*	Joy James Costa (Technical University of Munich, Germany); Hassan Hosseinzadeh (University of Wollongong, Australia); Dabasish Kumar Saha (Khulna University of Engineering & Technology, Bangladesh); Shihab Uddin Al Mahmud (Khulna University of Engineering & Technology, Bangladesh); Bhuiyan Mohammad Mahtab Uddin (Enam Medical College, Bangladesh); Zubair Ahmed Ratan (University of

		Wollongong, Australia & Khulna University of Engineering & Technology, Bangladesh)

Room 3 : AI, Machine Learning, and Deep Learning Development for Biomedical Application **Session Chair :** Hasbi Nur PW		
Time	**Title**	**Author(s)**
13.00 – 13.15	*Analysis and Detection of COVID-19 Cases on Chest X-Ray Images Using a Novel Architecture Self-Development Deep-Learning*	Hoang Nhut Huynh (Vietnam National University Ho Chi Minh City, Vietnam); Quoc Tuan Nguyen Diep (Doctor Quoc Ltd., Vietnam); Minh Bao Pham (Vietnam National University Ho Chi Minh City, Vietnam); Anh Tu Tran (Vietnam National University Ho Chi Minh City, Vietnam); Trung Nghia Tran (Vietnam National University Ho Chi Minh City, Vietnam)
13.20 – 13.35	*A Review on Opportunities and Challenges of Machine Learning and Deep Learning for Eye Movements Classification*	Muhammad Ainul Fikri (Universitas Gadjah Mada, Indonesia); Paulus Insap Santosa (Universitas Gadjah Mada, Indonesia); Sunu Wibirama (Universitas Gadjah Mada, Indonesia)
13.40 – 13.55	*Fetal Heart Rate Detection Algorithm from Noninvasive Fetal Electrocardiogram*	Hasna Nadila (Institut Teknologi Bandung, Indonesia); Donny Danudirdjo (Institut Teknologi Bandung,

		Indonesia); Hasballah Zakaria (Institut Teknologi Bandung, Indonesia)
14.00 – 14.15	*Performance Improvement of Breast Cancer Diagnosis Based on Mammogram Images Using Feature Extraction and Classification Methods*	Elvira Sukma Wahyuni (Universitas Islam Indonesia, Indonesia); Retno Rasmi (Universitas Islam Indonesia, Indonesia); Suatmi Murnani (Universitas Islam Indonesia, Indonesia)
14.20 – 14.35	*Classification of Markerless 3D Dorsal Shapes in Adolescent Idiopathic Scoliosis Patients Using Machine Learning Approach*	Janani Arivudaiyanambi (Anna University, India); Gunarajulu Renganathan (Hiroshima University, Japan); Sasa Cukovic (ETH Zurich, Switzerland)

Paper Abstact

Quaternion-Based AHRS with MEMS Motion Sensor for Biomedical Applications

Rui Azevedo Antunes (Uninova Monte da Caparica, Portugal); Lu´ıs Brito Palma (Uninova Monte da Caparica, Portugal)

Abstract

This work presents relevant theoretical and practical aspects towards the design of a quaternion-based real-time Attitude and Heading Reference System (AHRS). The motion sensor used in this work is the TDK InvenSense MPU-9250 9-degree (gyro + accelerometer + compass) Microelectromechanical system. Results show that the AHRS developed device is “gimbal lock” immune, given that the 3D rotations are performed in quaternions. The tiny electronic device allows real-time transmission of the 3D orientation and can be used as an AHRS solution for medical, sports science, rehabilitation and assistive technology. The contribution of this paper is a theoretical methodology and a practical implementation of an AHRS device for biomedical applications.

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Stress Effect on Attention Level Detection Using Neurosky Mindwave Headset

Rania Al-Ashwal (Universiti Teknologi Malaysia, Malaysia); Syafwendra Syafril (Universiti Teknologi Malaysia, Malaysia); Maheza Irna Mohd Sali (Universiti Teknologi Malaysia, Malaysia); Arief Ruhullah Harris (Universiti Teknologi Malaysia, Malaysia)

Abstract

Stress has become the number one factor that results in decreased students' attention level. Thus, in this study we investigated the attention level under induced stress conditions and correlated alpha and beta waves with attention level using the Neurosky Mindwave Headset. This study involved 25 participants of college students age 19 to 23 years old. The used tools were the Stroop colour-word task and Myndplay pro software to measure the stress condition, extract the power of the wave between non-stress and stress conditions, induce the stress during the experiment and produce a power output. After the Incongruent Stroop test was applied, the observed results showed a reduction in attention in male and female groups by 18.47% to 18.60%, respectively. The result showed that non-stress attention and stress attention level means are highly correlation. The correlation between EEG power spectrum and attention level critical value was 0.279, and the alpha and beta bands were weakly correlated with the attention level. However, there was a positive relationship between the EEG spectrum (low alpha, high alpha, low beta and high beta) with the attention level of the female brainwave, and high beta of female brainwave is statistically significant with the attention level. Further studies with a larger sample size may reveal a stronger correlation between the brain waves and attention level during stress.

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Cortical Functional Connectivity by Partial Directed Coherence in Relation to Creative Thinking: A Case Study

Julia Mohd Yusof (Universiti Teknologi Malaysia, Malaysia); Norlaili binti Mat Safri (Universiti Teknologi Malaysia, Malaysia); Puspa Inayat binti Khalid (Universiti Teknologi Malaysia, Malaysia); Roshida binti Abdul Majid (Universiti Teknologi Malaysia, Malaysia)

Abstract

This paper investigates the underlying brain process in creative thinking. The investigation is about the directional brain connectivity for creative thinking between architectural students and nonarchitectural students. This study involved four students from the Faculty of Built Environment and School of Electrical Engineering, Universiti Teknologi Malaysia, Skudai, Johor. The participants were required to complete two sketches of the creative thinking task. The creative thinking task is guided by the Torrance Test for Creative Thinking. While sketching, the brain signals of the participants were captured using electroencephalography. Then, partial directed coherence was applied to analyze the information pathway. The results show that there were differences in both outputs: thinking product (participants' sketches) and thinking process (brain pathways). These initial findings show that it is feasible to use objective measures (thinking process) to assess creativity to augment the subjective assessment of creativity.

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Study of Effect of Silver Nano-Particles on the Electrical Excitability of Hippocampal Neuronal Network Based on "Voltage Threshold Measurement Method"

Kun Hou (Southeast University, Nanjing, China); Chen Meng (Southeast University, Nanjing, China); Yan Huang (Southeast University, Nanjing, China); Xiao-Ying Lü (Nantong University, China); Zhi-Gong Wang (Nantong University, China)

Abstract

The purpose of this study is to investigate the effect of silver nanoparticles (SNPs) on the electrical excitability of hippocampal neuronal networks by using the voltage threshold measurement method (VTMM) based on micro-electrode array (MEA). First, SNPs were prepared and characterized, and then, the hippocampal neuronal network was prepared on an MEA, and the normal voltage threshold (VTh) of the hippocampal neuronal network (control group) was measured by VTMM. After that, 5-μM and 100-μM SNPs were added and the VTh of the hippocampal neuronal networks were measured. The results showed that the normal VTh of the hippocampal neuronal network in the control group were 55.14, 55.00, 54.71, 54.85 and 55.00 mV after 4, 12, 24, 48 and 72 h culture, respectively; The VTh of the hippocampal neuronal networks after treated by 5-μM SNPs for 4, 12, 24, 48 and 72 h were 51.71, 52.57, 53.14, 53.42 and 53.85 mV, respectively, which were all lower than the normal VTh, Thus, it proved the effect of 5-μM SNPs on the electrical activity of the hippocampal neuronal network was excitatory; The VTh of the hippocampal neuronal network treated by 100-μM SNPs for 4, 12, 24, 48 and 72 h were 51.57, 52.14, 53.85, 56.57 and 57.57 mV, respectively, which were lower than the normal VTh after 4, 12 and 24 h treatment and higher than the normal VTh after 48 and 72 h treatment. This proved the effect of 100-μM SNPs on the electrical activity of the hippocampal neuronal network was first excitatory and then inhibitory with the increase of action time. The study proved that the effects of 5 and 100-μM SNPs on the electrical activity of neuronal networks are different, and the VTMM can be applied to investigate the effect of SNPs on the electrical activity of hippocampal neuronal networks.

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Texture Analysis of Ultrasound Images to Differentiate Pneumonia and Covid-19

Saeful Bahri (Institut Teknologi Bandung, Indonesia); Suprijanto (Institut Teknologi Bandung, Indonesia); E. Juliastuti (Institut Teknologi Bandung, Indonesia)

Abstract

Lung ultrasound can potentially diagnose lung abnormalities such as pneumonia and covid-19, but it requires high experience. Covid-19, as a global pandemic, has similar common symptoms as pneumonia. The proper diagnosis of covid-19 and pneumonia necessitates clinicians' high expertise and skill to classify Covid-19 disease. This paper presents an approach to differentiate pneumonia and covid-19 based on texture analysis of ultrasound images. The proposed scheme is based on the Gray Level Co-occurrence Matrix (GLCM) features computing with Contrast Limited Adaptive Histogram Equalization (CLAHE) and gamma transformation for image enhancement. The results of the feature extraction analysis for lung ultrasound images suggest that differentiating pneumonia and Covid-19 is possible based on image texture features.

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Preparation and Evaluation of Folic Acid-TPGS Polymeric Micelle as a Quercetin Anticancer Drug Carrier

Siti Fatimah Ibharm (Universiti Teknologi Malaysia, Malaysia); Norjihada Izzah Ismail (Universiti Teknologi Malaysia, Malaysia)

Abstract

Quercetin is a bioactive compound with anticancer property. However, it is poorly soluble in water which limits its clinical applications. In the present study, polymeric micelles consist of quercetin core at different proportions and FA-TPGS shell were prepared and analyzed for their particle size, surface morphology, critical micelle concentration (CMC), in vitro drug release and in vitro cytotoxicity. It was observed that the quercetin polymeric micelles (QUE PMs) size increase with increasing drug concentration and exhibited spherical shape. Low CMC values in the range of 0.008 %w/v and 0.04 %w/v observed in analyzed QUE PMs indicated that these micelles were stable. In vitro drug release profile of QUE PMs revealed that initial burst of quercetin occurred within 12 h of incubation followed by sustained release of quercetin until 48 h of incubation. Higher cellular uptake of QUE PMs by MCF-7 breast cancer cells was observed from reduced cell viability in between 54.2% to 75.1% after treatment for 24 h. From these results, the ability of FA-TPGS to carry quercetin in its polymeric core has been successfully evaluated. It is suggested that these synthesized polymeric micelles can be a promising quercetin drug carrier specifically for cancer treatment.

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Characterization of Silver Resistive Electrode as Heating Module for Portable Thermocycler Device

Yudan Whulanza (Universitas Indonesia, Indonesia); Rayhan Ammarsyah (Universitas Indonesia, Indonesia); Ardiyansyah Yatim (Universitas Indonesia, Indonesia)

Abstract

Medical devices such as in-vitro diagnostic, micrototal analysis system, cell-on-chip, lab-on-chip, bio-microelectromechanical system are products of miniaturization technology. These micro/mini products enable us to run similar process as the macro products with the same result but deliver it faster with portability as main benefit. Several processes that have been introduced such as cell/tissue culture, polymerase chain reaction, drug screening etc. These devices commonly require heating module in performing their task. This study focuses on developing heating modules by utilizing Joule heating effect on a silver electrode. The silver electrode was casted from silver paste that was chosen due to its good heating properties with relatively low price. The specific objective of this research is to carry out initial characterization of the resistive electrode that realized using doctor blade techniques. Doctor blade has been known as technique that realized thick layer with some castable materials in form of paste. The silver electrode was then applied with 0.1-1.6 VDC. The accumulated heat can be observed in the temperature reading system. Our measurement showed that the electrode with a dimension of 1 mm wide, 0.03 mm thick and 20 mm length can generate heat at around 160 ^{o}C in 60 seconds at the applied 1.0 VDC. Our characterization showed that the electrode has conductivity at around 6x10^{5} S/m. this study also reported a break down if the electrode was applied above 1.5 VDC as showed by endurance testing. This finding convinced us to move forward in realizing portable device with extra low energy and compact in size.

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Hip Joint Implant Loading During Routine Activities of Elderly Indonesian

Rilo Berdin Taqriban (Diponegoro University, Indonesia); Ismoyo Haryanto (Diponegoro University, Indonesia); Dwi Basuki Wibowo (Diponegoro University, Indonesia); Rifky Ismail (Diponegoro University, Indonesia)

Abstract

The hip joint implant is a critical implant that must be safe for any activity done by the user. In this study, the UNDIP hip joint implant is simulated for daily activity loading by Indonesian adult users using finite element analysis. This approach uses ANSYS Static Structural software and refers to ASTM F2996-13 for analysis setting. The materials used for the implant in this study are investment casted AISI 316L and Ti6Al4V metal. This analysis aims to determine the value of deformation, strain, von-Mises stress, and safety factor from the hip joint implant. The results show that the UNDIP hip joint implant with AISI 316L and Ti6Al4V can withstand daily routines with safety factors not less than 1.

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Optimization of Insole Shoe for Diabetic Mellitus Type 2 Using Finite Element Analysis

L. P. Pradipta (Atma Jaya Yogyakarta University, Indonesia); P. W. Anggoro (Atma Jaya Yogyakarta University, Indonesia); P. K. Fergiawan (Diponegoro University, Indonesia); A.P. Bayuseno (Diponegoro University, Indonesia); Jamari (Diponegoro University, Indonesia)

Abstract

Diabetics need shoes as footwear to walk comfortably. One part of the shoe base is the insole. The insole is located on the inside of the shoe which has direct contact with the sole, so it has a function to maintain body balance. Insole for diabetic foot sufferers is used to correct biomechanical problems of the foot when standing or walking and to reduce damage to foot tissue. This study discusses the use of the Finite Element Analysis (FEA) method in determining the optimal mechanical comfort factor from the 3D design of the insole model in diabetics. Design optimization stages to test 3D insole with Abaqus 2020 software through three tests, namely bending, torsion, and plantar pressure testing. The test produces parameter values of the mechanical properties of the material which are used as a reference in determining the optimal material. The mechanical properties of the material in the form of stress, strain, pressure, and energy values are used as parameters of mechanical comfort based on FEA. The analysis results obtained Memory Foam material as the most optimal material because it meets the parameters for mechanical comfort with the lowest average values such as stress-strain on bending test (Left insole: 0.161199 MPa ; 0.004915 and Right insole: 0.210815 MPa ; 0.006366), stress-strain on torsion test (Left insole: 0.117053 MPa ; 0.003437 and Right insole: 0.062537 MPa ; 0.001711), plantar contact pressure (Left insole: 516.26 MPa and Right insole: 576.11 MPa), and total energy (Left insole: 380.4 mJ and Right insole: 326.9 mJ). These results make the material has flexible properties to the shape of the foot and good shock absorption.

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Green Synthesis of Silver Nanoparticles Using Citrus Aurantifolia (Bangladeshi Lemon Leaf) Extract and Its Antibacterial Activity

Joy James Costa (Technical University of Munich, Germany); Hassan Hosseinzadeh (University of Wollongong, Australia); Dabasish Kumar Saha (Khulna University of Engineering & Technology, Bangladesh); Shihab Uddin Al Mahmud (Khulna University of Engineering & Technology, Bangladesh); Bhuiyan Mohammad Mahtab Uddin (Enam Medical College, Bangladesh); Zubair Ahmed Ratan (University of Wollongong, Australia & Khulna University of Engineering & Technology, Bangladesh)

Abstract

Antimicrobial resistance in bacterial pathogens has become a global concern. Classical techniques to invent new antibacterial agents are not sufficient to fulfil the gap. Different metallic nanoparticles, especially the silver nanoparticles (AgNPs), have shown promising effect to kill bacteria, however, their chemical synthesis often involves toxic byproducts. AgNPs synthesis should be biocompatible and non-toxic. Therefore, biological synthesis of AgNPs and its anti-bacterial effect opens a new horizon in antibiotics research. In this study, green mediated synthesis process was used which is very conducive to environment and hazardless. The AgNPs were synthesized using the leaf extract of Bangladeshi Lemon (Citrus aurantifolia) and this worked as a reducing agent as well as a stabilizing agent. Characterization of the particles were done to perform the color transform analysis and UV-Vis spectroscopy. Moreover, a catholic bacteria E. Coli was objected to exemplify the antibacterial activity compared to a modern antibiotic drug Cefalotoxin. The “Zone of inhibition” was measured to determine the anti-bacterial effect. After the incubation of 24 hours, the zone of inhibition by AgNPs was 11.33 mm in compared to Cefalotoxin (18 mm). In near future, the green synthesized AgNPs could be used a potential anti-bacterial agent.

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Analysis and Detection of COVID-19 Cases on Chest X-Ray Images Using a Novel Architecture Self-Development Deep-Learning

Hoang Nhut Huynh (Vietnam National University Ho Chi Minh City, Vietnam); Quoc Tuan Nguyen Diep (Doctor Quoc Ltd., Vietnam); Minh Bao Pham (Vietnam National University Ho Chi Minh City, Vietnam); Anh Tu Tran (Vietnam National University Ho Chi Minh City, Vietnam); Trung Nghia Tran (Vietnam National University Ho Chi Minh City, Vietnam)

Abstract

The recent ongoing pandemic coronavirus disease 2019 (COVID-19) is growing increasingly out of control globally, posing a severe threat to human health. The use of artificial intelligence (AI) in predicting COVID-19-positive individuals becomes a promising tool that may enhance the existing diagnosis modality. Algorithms in supporting classifications for chest X-ray images face challenges in terms of dependability. With this aim, a convolutional neural network (CNN) model FASNet is proposed to identify chest X-ray images of three distinct conditions: pneumonia, COVID-19, and normal (or healthy) cases. The FASNet model consists of four convolution layers and two fully connected layers. The pre-trained deep learning models were used and included in our self-development FASNet CNN model. In the first convolutional layer, the size of the kernel 1×1 is used on each pixel as a fully connected connection with the aim of reducing the channel depth and number of parameters of the model. The early-stopping class and dropout layer are used to limit the number of neural connections and prevent overfitting. The dataset for this study was derived from an open-source collection of 6,432 images for training and testing. As the result, our approach successfully detected COVID-19 infected individuals, pneumonia, and healthy ones with a 98.48% accuracy. This promising preliminary results lead us to expect that the FASNet model can be used in further development research to assist in diagnosing COVID-19. The result with FASNet model has a high correlation in comparison with other popular models such as ResNet50V2 and MobileNetV2.

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A Review on Opportunities and Challenges of Machine Learning and Deep Learning for Eye Movements Classification

Muhammad Ainul Fikri (Universitas Gadjah Mada, Indonesia); Paulus Insap Santosa (Universitas Gadjah Mada, Indonesia); Sunu Wibirama (Universitas Gadjah Mada, Indonesia)

Abstract

Eye tracking has been used in touchless and assistive technologies to support disabled people as well as to provide more intuitive user interfaces. In this case, classification of events in eye tracking data is important to achieve higher object selection accuracy. Machine learning and deep learning have been used in events classification due to their ability to automatically learn patterns in eye tracking data. To the best knowledge of authors, however, there is no study that investigates opportunities and challenges on implementing various machine learning and deep learning techniques for events classification in eye tracking data. Here we present a systematical review to examine the use of machine learning and deep learning in events classification. We observed how machine learning and deep learning were used in development of reliable eye movements classification. At the same time, we summarized various challenges faced by previous researchers. In future, this paper may be used as a reference for entry level researchers interested in applying machine learning and deep learning for events classification in eye tracking data.

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Fetal Heart Rate Detection Algorithm from Noninvasive Fetal Electrocardiogram

Hasna Nadila (Institut Teknologi Bandung, Indonesia); Donny Danudirdjo (Institut Teknologi Bandung, Indonesia); Hasballah Zakaria (Institut Teknologi Bandung, Indonesia)

Abstract

Noninvasive fetal electrocardiogram (NIFECG) has the potential to measure fetal heart rate (FHR). However, it has a low signal-to-noise ratio (SNR) because of many interferences, mainly from the mother's biosignal. The algorithm to measure FHR from NIFECG mainly consists of three main steps, preprocessing, FECG extraction, and fetal QRS (FQRS) detection. One of the methods to extract FECG is template subtraction (TS), which does not require many channels. Nevertheless, it cannot significantly enhance the SNR. While for the QRS detection, the Pan-Tompkins algorithm is frequently used but initially designed for adult ECG. Other than low SNR, NIFECG also faces a problem related to the standard configuration. It is still unknown where the electrode placement can produce an optimal FECG signal quality. Hence, this study aimed to increase FHR accuracy by developing an algorithm based on template subtraction and modified Pan-Tompkins. This study also proposed a channel selection process to eliminate low SNR channels interfering with FHR detection. Another objective was to analyze the electrode placement of NIFECG that has an optimal FECG quality based on its SNR value. The results showed that the proposed algorithm could produce a mean absolute error (MAE) of 1.68 ms and a mean square error (MSE) of 8.04 bpm^2. Increasing the SNR threshold for channel selection could decrease MAE and MSE to 1.00 ms and 1.11 bpm^2. Electrodes placement analysis from the Matonia dataset configuration showed that channel three has the highest SNR FECG value (20.18 dB) compared to the other channels.

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Performance Improvement of Breast Cancer Diagnosis Based on Mammogram Images Using Feature Extraction and Classification Methods

Elvira Sukma Wahyuni (Universitas Islam Indonesia, Indonesia); Retno Rasmi (Universitas Islam Indonesia, Indonesia); Suatmi Murnani (Universitas Islam Indonesia, Indonesia)

Abstract

Breast cancer is the most common cause of death in the elderly women category. In 2018, there were almost 0.63 million cases of death found in 2.09 million new cases of breast cancer. Early detection is a key to lower the rate of death caused by breast cancer. One of the most typical methods for early detection is utilizing digital image processing on mammogram images. The detection process has three main steps, namely preprocessing, feature extraction, and classification. Feature extraction plays a significant role in providing an accurate detection system. In this study, we evaluated three different methods of feature extraction. They are feature extraction based on texture, gray level co-occurrence matrix (GLCM), and morphology. In the classification step, we compared the performance of K-Nearest Neighbor, Naive Bayes, and Support Vector Machine methods. We used a mammogram dataset from the Mammographic Image Analysis Society (MIAS) consisting of 100 images labeled as normal and 51 images specified as abnormal. The experimental results show that combining all extracted features and using Naive Bayes classifier obtained the highest accuracy of 98.68%. The results suggest that early detection of breast cancer can be performed accurately using appropriate detection methods.

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Classification of Markerless 3D Dorsal Shapes in Adolescent Idiopathic Scoliosis Patients Using Machine Learning Approach

Janani Arivudaiyanambi (Anna University, India); Gunarajulu Renganathan (Hiroshima University, Japan); Sasa Cukovic (ETH Zurich, Switzerland)

Abstract

Adolescent Idiopathic Scoliosis (AIS) is a musculoskeletal condition commonly seen in pediatric children that causes deformity of the spine. The study aims for early detection and diagnosis as these are the possible options to delimit the progression of the disorder. The work has explored the development of an algorithm that could detect the landmarks and extract the shape-based features from the markerless 3D surface data in AIS patients. An approach to classifying these extracted features using the machine learning algorithm, Support Vector Machine (SVM), has been investigated. The objectives of the work were divided into three frameworks. Framework-1 is aimed at classifying the data based on the asymmetry pattern observed in the spinal surface of the patients. The data corresponding to normal posture were considered as 'without deformity' and data with an asymmetry spinal curve were considered as 'with deformity' based on indicators extracted using the ScolioSIM tool. Framework-2 is aimed at classifying the AIS patients' data based on the three deformity levels namely, mild, moderate and severe. Framework-3 is aimed at classifying the shape orientation of the AIS condition as right or left based on the extracted shape features. The SVM algorithm was able to classify the asymmetry spinal surface pattern and the three deformity levels with accuracy values of 72.4% and 80%, respectively. Furthermore, an accuracy of 94.9% was obtained to classify the shape orientation either as right- or left-oriented. Hence, this non-invasive diagnosis and assessment study paves a new way of approach for the 2D and 3D shape classifications of AIS and expedites the treatment planning process.

Parallel Session II

Wednesday, 20 October 2021 | 15.00 – 16.35

Room 1 : Biomedical Technology, Application, and Science **Session Chair : Elvira Sukma Wahyuni**		
Time	**Title**	**Author(s)**
15.00 – 15.15	*Combating Bias in COVID-19 Disease Detection Using Synthetic Annotations on Chest X-Ray Images*	Arkaan Ashadi (Bina Nusantara University Jakarta, Indonesia); Ardimas Andi Purwita (Bina Nusantara University Jakarta, Indonesia); Nunung Nurul Qomariyah (Bina Nusantara University Jakarta, Indonesia)
15.20 – 15.35	*A Hybrid Risk Assessment Kit by Using Observing and Instrument Methods*	Mohammed Alfaqawi (Capgemini-Altran Engineering Velizy-Villacoublay, France); Mouna Ben Mabrouk (Capgemini-Altran Engineering Velizy-Villacoublay, France); Stephane Davai (Capgemin-Altran Engineering Saint-Herblain, France)
15.40 – 15.55	*The Statistical Analysis of Urodynamic Parameters with Different Stress Urinary Incontinence*	Hayder Hadi Mohammed (Al-Nahrain University, Iraq); Hassanain Lafta (Al-Nahrain University, Iraq)
16.00 – 16.15	*Pressure Ulcer Prediction, Prevention and Assessment Using Biomedical System Design*	Zeena Sh Saleh (Engineering Al-Nahrain University, Iraq); Auns Qusai Al-Neami (Engineering Al-Nahrain University, Iraq); Haider Khaleel Raad (Xavier University, USA)

16.20 – 16.35	*GGB Color Normalization and Faster-RCNN Techniques for Malaria Parasite Detection*	Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia; Rizki Nurfauzi (Universitas Gadjah Mada, Indonesia)

Room 2 : Material and Sensor Development for Medical and Rehabilition **Session Chair : Teguh Prakoso**		
Time	**Title**	**Author(s)**
15.00 – 15.15	*Computer-Aided Simulation for Analyzing the Influence of Single Radius on Flexion Angle of Artificial Knee Joint*	D. Darmanto (Wahid Hasyim University, Indonesia); R. Novriansyah (Diponegoro University, Indonesia); R. Ismail (Diponegoro University, Indonesia); J. Jamari (Diponegoro University, Indonesia); A. P. Bayuseno (Diponegoro University, Indonesia); P.W. Anggoro (Atma Jaya Yogyakarta University, Indonesia)
15.20 – 15.35	*Performance Evaluation of a New Dry-Contact Electrode for EEG Measurement*	Aaisha Diaa-Aldeen Abdullah (Al-Nahrain University); Auns Q. Al-Neami (Al-Nahrain University)
15.40 – 15.55	*Designing and Manufacturing of Low Load Compressive Testing Device for Soft Tissue*	Balsam M. Rashid (Al-Nahrain University); Sadiq J. Hamandi (Al-Nahrain University); Eman G. Khalil (Al-Nahrain University)
16.00 – 16.15	*Conceptual Design of Bionic Foot for Transtibial Prosthesis*	Ade Reza Ismawan (Diponegoro University, Indonesia); R. Ismail

		(Diponegoro University, Indonesia); R. Novriansyah (Diponegoro University, Indonesia);B. Setiyana (Diponegoro University, Indonesia); M. Ariyanto ();T. Prahasto (Diponegoro University, Indonesia)
16.20 – 16.35	*A Stress Analysis of Active Prosthetic Hand "Asto Hand V4" to Hook Position*	G.P. Annanto (Diponegoro University, Indonesia); I. Haryanto (Diponegoro University, Indonesia); R. Ismail (Diponegoro University, Indonesia)

Room 3 : AI, Machine Learning, and Deep Learning Development for Biomedical Application **Session Chair : Iftitah**		
Time	**Title**	**Author(s)**
15.00 – 15.15	*Experiment on Deep Learning Models for COVID-19 Detection from Blood Testing*	Fiqhy Bismadhika (Bina Nusantara University Jakarta, Indonesia); Nunung Nurul Qomariyah (Bina Nusantara University Jakarta, Indonesia); Ardimas Andi Purwita (Bina Nusantara University Jakarta, Indonesia)
15.20 – 15.35	*Effect of Chest X-Ray Contrast Image Enhancement on Pneumonia Detection Using Convolutional Neural Networks*	Agung W. Setiawan (Institut Teknologi Bandung, Indonesia)
15.40 – 15.55	*Classification of the Degree of Dehydration in*	Ilham Ari Elbaith Zaeni (Universitas Negeri Malang,

	Diarrhea Using the Naïve Bayes Algorithm	Indonesia); Dwiajeng Puspita Ratri (Universitas Negeri Malang, Indonesia); Agusta Rakhmat Taufani (Universitas Negeri Malang, Indonesia)
16.00 – 16.15	*Inverse Reinforcement Learning for Healthcare Applications: A Survey*	Mohamed Amine Chadi (Cadi Ayyad University, Morocco); Hajar Mousannif (Cadi Ayyad University, Morocco)

Paper Abstract

Combating Bias in COVID-19 Disease Detection Using Synthetic Annotations on Chest X-Ray Images

Arkaan Ashadi (Bina Nusantara University Jakarta, Indonesia); Ardimas Andi Purwita (Bina Nusantara University Jakarta, Indonesia); Nunung Nurul Qomariyah (Bina Nusantara University Jakarta, Indonesia)

Abstract

Detecting a COVID-19 case by using a deep learning model poses a challenge due to the use of public datasets, where people can contribute and submit images without quality screenings. One of the challenges is that we found many images contain burned-in annotations, such as tubes, letters, numbers, pads, arrows, etc. The annotations become more problematic if multiple datasets are combined due to the limited number of data for COVID-19 cases, and the other datasets do not contain as many burned-in annotations as in datasets containing samples for COVID-19 cases. An example of the issues is that by using a saliency map method, we can find the troubled areas coincide with areas where the annotations are located. In order to combat this annotation bias, we investigate the effect of deliberately adding synthetic annotations to images for all classification classes. Encouraging results are shown in this paper. That is, by using the proposed method, the F1-score can be improved, e.g., an improvement of F1-score of 0.88 can be increased up to 0.94. Therefore, we conclude that adding synthetic annotations in the pre-processing pipeline for datasets having annotation bias could improve a machine learning model.

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A Hybrid Risk Assessment Kit by Using Observing and Instrument Methods

Mohammed Alfaqawi (Capgemini-Altran Engineering Velizy-Villacoublay , France); Mouna Ben Mabrouk (Capgemini-Altran Engineering Velizy-Villacoublay, France); Stephane Davai Capgemin-Altran Engineering Saint-Herblain, France)

Abstract

Risk assessment methods are promising to remedy the work-related musculoskeletal disorders (WRMSD). For this reason, self-reporting, observing and instrumental risk assessment methods were proposed, in the literature. Amongst these assessment methods, the instrumental risk assessment method has the highest level of efficiency and accuracy. However, the instrument method, such as smart-garment, provide data regarding the postures of an operator while does not provide information for the operator's surrounding. In case of processing the instrument method's data by an ergonomist, additional information regarding the operator environment will be mandated. This research work aims to propose a hybrid risk assessment kit (HRAK) that combines the observing and instrument risk assessment methods in real-time. The HRAK employs Bluetooth low energy (BLE) technology to connect the operators remotely with an ergonomist. Moreover, we design a smart-garment for the instrument-based risk assessment method. Furthermore, we develop a graphical risk assessment platform (GRAP) to configure and monitor the postures of operators and to assist the ergonomist to quantify the hazard postures. Graphical results are obtained and analysed for the operator's postures by using GRAP. Finally, the posture's results are classified based on adaptable thresholds into hazard or alerting, attention and normal postures.

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The Statistical Analysis of Urodynamic Parameters with Different Stress Urinary Incontinence

Hayder Hadi Mohammed (Al-Nahrain University, Iraq); Hassanain Lafta (Al-Nahrain University, Iraq)

Abstract

Approximately 10 million from female globally who endure pain from stress urinary incontinence (SUI). This study purposed to detect and evaluate the variations of the urodynamic results of SUI in different groups with bladder outlet obstruction (BOO) and overactive bladder (OAB). Information from 100 patients who underwent urodynamic examine procedures associated to the suspicion of SUI were analyzed. The characteristics connected to bladder feeling were discovered during filling cystometry. So, uroflowmetric results were registered while the bladder was emptying. Tukey multiple comparisons test was used to do multiple comparisons between different patients' groups. A statistical correlation analysis was performed for the maximum bladder capacity (Vmax) with urodynamics parameters. The mean maximum flow rate (Qmax) was significantly highest in SUI group and SUI with OAB group. The mean first desire to void (FDV) was significantly highest in SUI group. The mean void volume (VV) was significantly highest in SUI with OAB group and SUI patients. The mean strong desire to void (SDV) was significantly highest in SUI with OAB group and SUI group. When the highest FDV values were found in the SUI group, the highest SDV values were found in the SUI with OAB group and the SUI group, according to the correlation analysis. Premature bladder filling feelings and decreased bladder capacity were found in patients with SUI and OAB. BOO patients record no correlation.

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Pressure Ulcer Prediction, Prevention and Assessment Using Biomedical System Design

Zeena Sh Saleh (Engineering Al-Nahrain University, Iraq); Auns Qusai Al-Neami (Engineering Al-Nahrain University, Iraq);Haider Khaleel Raad (Xavier University, USA)

Abstract

The Pressure ulcers (PU) are irreversible skin damage targeting vulnerable areas of the human body, it is an unfortunate consequence of aging, diabetes, paralysis and post surgery hospitalization. Managing PU is challenging as treatment usually fails to reverse the damage. This study proposes a new method to prevent PU at very early stages using a monitoring/predictive system. The PU prediction system contains a wireless sensing device that continuously monitors the vital signs of the living tissue which is prone to develop PU. Data collected from the sensing device are used to drive a mathematical equation that describes the Behaviour of the living system and uses this model to predict future values indicating PU's onset, predicted data are then used in a decision-making structure to evaluate PU risk. The results were recorded for (4 hours) as three volunteers took the supine position, (14400) discrete data were acquired and used to derive a fourth-degree polynomial equation able to predict future data with an error of (± 0.264 %), when PU is predicted an alarm is sent to the user interface to notify healthcare givers.

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GGB Color Normalization and Faster-RCNN Techniques for Malaria Parasite Detection

Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia; Rizki Nurfauzi (Universitas Gadjah Mada, Indonesia)

Abstract

Malaria is a disease transmitted by a female mosquito anopheles bite. Malaria commonly occurs in tropical and sub-tropical regions that having minimum health facilities. Promising news for us, early malaria diagnosis is a proven effective preventive a malaria-related mortality. In addition, automated malaria detection studies have shown a promising performance in reducing the manual microscopy-based examination times. However, since the quality input image is not standardized, a proper image preprocessing technique is notable in recognizing the object. Therefore, this study applies green, green, blue (GGB) color normalization as a preprocessing step in malaria detection. We evaluate our technique in a large public dataset containing 2,418 infected thin blood smear images by 49,900 parasites. The results show that our technique has malaria detection performance consistently better sensitivity and consistently similar precision in several intersection over union (IoU) thresholds. Furthermore, it indicates that using GGB color normalization in malaria parasite detection is valuable in reducing the false positive error.

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Computer-Aided Simulation for Analyzing the Influence of Single Radius on Flexion Angle of Artificial Knee Joint

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Abstract

The range of flexion in the knee joint is one of the most important factors that enable the performance of daily activities. However, patients with artificial knee joints (AKJ) experience difficulties in carrying out activities that involve deep flexion angles. Sitting cross-legged, kneeling, and squatting are important parts of the daily routines of the Asian population, since they support religious, social, and cultural activities, and they all require a flexible range of 150º-165º. The range of the flexion angle is increased, using the single radius (SR) system the development of AKJ. This study aims to analyze the effect of single radius design on AKJ, as it suits the needs of Asians in religion, society, and culture. Einscan Pro 2X Plus brand scanner, De Puy's physical model, and the Autodesk Fusion 360 were utilized during modelling. Then, reconstruction was performed which includes, surface digitization, curve processing, and improvement of components. The computer-aided design (CAD) based AKJ which utilized the SR system had a significant effect on the design that suits the needs of Asians, especially Indonesians. This design is capable of producing flexible angles from 150.4º to 169.4º

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Performance Evaluation of a New Dry-Contact Electrode for EEG Measurement

Aaisha Diaa-Aldeen Abdullah (Al-Nahrain University); Auns Q. Al-Neami (Al-Nahrain University)

Abstract

Monitoring electroencephalography (EEG), is the important measurement for diagnosis the pathological and physiological conditions of human brain. EEG recording is done by using traditional wet electrode which is required skin preparation and gel application before using. Repeating this process causes problems for users over time, a waste of time and effort, as well as a loss of signal when the gel or conductive fluid dries up. In order to overcome these problems, a dry-contact electrodes with multi—pins are designed and manufacturing in the present study to measure brain signals without prior preparation of the skin. These electrodes made from Brass metal and coated with conductive material to enhanced the electrical conductivity. Scanning electron microscopy SEM and Energy dispersive x-ray spectroscopy EDX tests are used to study surface morphology of electrode and to identify the chemical element of electrode's materials. Electrode skin electrode impedance interface ESI is also measured in this study. To evaluate the dry-contact electrodes, EEG measurement are performed and the result compared with standard wet electrodes by using correlation coefficient. The result showed there is no considerably different between dry-contact electrodes and wet electrodes. To conclude, the dry-contact EEG electrodes can reliably measure brain activity through a fast and convenient preparation method, so they are expected to be used in clinical practice.

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Designing and Manufacturing of Low Load Compressive Testing Device for Soft Tissue

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Abstract

Several difficulties faced the researchers when tested a small and thin specimen in compression testing device. Therefore, some of them forced to use the high load device for the small specimen and this was not accurate and cost too much. According to the significant of the compression test in finding the mechanical characteristics of the specimen, therefore this paper focuses on designing and manufacturing of low load compressive testing device, low cost and tabletop design. The device will use not only for the soft tissue but also for synthetic materials such as composites and elastomers, some of biomaterials, tissue samples and tissue-engineered constructs and other soft materials. The mechanical and electronic parts of the device selected carefully to suit the measuring requirements. The device controlled by the computer application using visual studio 2019 to start the test and display the results. A significant accurate reading of soft tissue specimen had provided by using digital dial gauge and high sensitive load cell for displacement and force measurement respectively as compared with standard reading of previous studies. Moreover, the results had been drawing as load-distance curve or could be saved by the application to the Microsoft Excel to get more results and give broader understanding of the material's properties. In this paper the designed device test; articular cartilage, tendon and liver specimens got maximum load at 78.76N, 397.23N and 15.73N respectively. The range reading of the designed device was from 0N to 1500N, which was important in finding the mechanical characteristics of different material.

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Conceptual Design of Bionic Foot for Transtibial Prosthesis

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Abstract

The main way to restore limb function in transtibial amputations is to use a transtibial prosthesis. Plantarflexion and dorsiflexion are characteristics of the human ankle and are also important considerations in designing a transtibial prosthesis. Most commercial transtibial prostheses available in Indonesia are passive transtibial prostheses, and users of passive prostheses exhibit an asymmetrical gait pattern that can cause musculoskeletal injuries. In addition, passive prostheses cannot generate thrust like the human ankle and consume more metabolic energy so they tire quickly when using them. Transtibial Bionic Prosthesis can overcome the weakness of passive prosthesis because it can move in dorsiflexion and plantarflexion and can provide repulsion force during the heel-off and toe-off phases. This study aims to design and analyze the strength of the Transtibial Bionic Prosthesis prototype, morphological methods and decision matrices are used in the selection of design concepts. Lightweight aluminum 6061 was used as a material for making transtibial prostheses. The design and strength analysis in this study showed that the Transtibial Bionic Prosthesis prototype was able to accept a maximum load of 100 kg and had a Range of Motion of 20° dorsiflexion and 30° plantarflexion

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A Stress Analysis of Active Prosthetic Hand "Asto Hand V4" to Hook Position

G.P. Annanto (Diponegoro University, Indonesia); I. Haryanto (Diponegoro University, Indonesia); R. Ismail (Diponegoro University, Indonesia)

Abstract

Upper limb disabilities become a serious concern in Indonesia. By that, an active prosthetic hand become a market demand. There were already active prosthetic hand products in the market, which most of them were from other countries, yet they rarely fit to Indonesian citizen, neither for the price nor the size. Based in these problem, Diponegoro University conducted a research on active prosthetic hand to provide solution for the problem that currently faced by the Indonesian citizen especially for trans-radial amputee patient. Asto Hand V4 was expected to be useful and suitable for Indonesian, in terms of price and size. In order to ensure the reliability of the product, the design safety becomes the main concern in the development. This paper investigated the capability of the Asto Hand under the hook load. Based on the analysis for the hook position, it was known that the lowest safety factor in Asto Hand V4 was occur in palm component with the value 2.17. The study shows that Asto Hand V4 was capable to withstand the load due to hook position and it can be declared that Asto Hand V4 is safe to perform hook position.

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Experiment on Deep Learning Models for COVID-19 Detection from Blood Testing

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Abstract

Due to the equipment and expert shortages in diagnosing COVID-19 disease, detecting an individual infected with Coronavirus using hematochemical data could provide a cheaper and faster alternative. The quicker and less expensive alternative could be realized by utilizing deep learning to classify Coronavirus infection using complete blood count test results. Two architectures are developed and implemented in this study, which is custom-built DNN (Deep Neural Network) and TabNet. Also, three datasets from the hospitals in Italy, Brazil, and Indonesia are used for training the models. The deep learning models trained with the datasets from San Raphael Hospital in Italy, Albert Einstein Hospital in Brazil, and Pasar Minggu Hospital in Indonesia obtained average AUC scores of 0.87, 0.90, and 0.88, respectively. Based on the results obtained, this method of diagnosis could serve as an alternative in developing countries to diagnose COVID-19 disease without costly RT-PCR equipment and the expert to operate it.

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Effect of Chest X-Ray Contrast Image Enhancement on Pneumonia Detection Using Convolutional Neural Networks

Agung W. Setiawan (Institut Teknologi Bandung, Indonesia)

Abstract

The problem in pneumonia detection using a chest X-ray is the differences in the image quality due to the difference in the image acquisition procedure. To overcome the issue, the image enhancement technique is used in the preprocessing step. The purpose is to examine the effect of three image enhancement techniques to detect pneumonia, i.e. histogram equalization (HE), contrast limited adaptive HE and exposure fusion framework. These enhanced images are used as input images in pneumonia detection using VGG16 convolutional neural network architecture. In total, 3,151 chest X-ray images are used. The best performance is achieved by the exposure fusion framework image enhancement technique. The combination of exposure fusion framework and VGG16 give the training loss and accuracy of 0.2113 and 0.9451, and validation and accuracy loss of 0.6034 and 0.8670. Deeper analysis shows that the exposure fusion framework not only stretches the image intensity but also keeps the shape of the histogram remains. This technique will minimize the information loss in the enhanced image during the enhancement process.

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Classification of the Degree of Dehydration in Diarrhea Using the Naïve Bayes Algorithm

Ilham Ari Elbaith Zaeni (Universitas Negeri Malang, Indonesia); Dwiajeng Puspita Ratri (Universitas Negeri Malang, Indonesia); Agusta Rakhmat Taufani (Universitas Negeri Malang, Indonesia)

Abstract

Diarrhea is a global health issue with significant morbidity and fatality rates. Diarrhea is the second leading cause of mortality in children under the age of five, behind pneumonia. Many reasons can obstruct the diagnosis of diarrhea, including a lack of parental information about diarrhea, a continued underestimation of diarrhea, a lack of understanding about the kind of diarrhea, and misdiagnosis. The goal of this study is to identify and define the kind of diarrhea disease in toddlers, as well as to offer basic treatment options that can be conducted by the parents. The public health center of Mojopanggung provided the dataset for this study, which included 166 cases and 21 attributes. However, only eight attributes were shown have relation with the class following the Bivariate Pearson correlation test, namely defecate frequency, feces consistency, fever, nausea/vomiting, eye condition, thirst, and skin turgor. The categorization yielded a degree of dehydration, namely none, mild/moderate dehydration, and severe dehydration. Because the percentage of the number of classes in this dataset is still unbalanced, an oversampling approach is used to correct the problem, resulting in a final data count of 318 instances. The Naive Bayes Classifier (NBC) algorithm, which is a statistical classification approach for predicting the likelihood of membership in a class, is used in this work. Cross Validation was used in this study with a 10 folds test. For the categorization of kinds of diarrhea illnesses based on the degree of dehydration in toddlers, the findings of this study utilizing Confusion Matrix show an average value of 97.48 percent accuracy, precision of 96.55 percent, recall of 96.27 percent, and an error rate of 2.52 percent.

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Inverse Reinforcement Learning for Healthcare Applications: A Survey

Mohamed Amine Chadi (Cadi Ayyad University, Morocco); Hajar Mousannif (Cadi Ayyad University, Morocco)

Abstract

Reinforcement learning (RL) provides promising techniques to solve complex sequential decision making problems in healthcare domains since the process of medical treatment can be considered as a sequential interaction process between doctors and patients. But, to ensure good performance of such applications, an explicit reward function should be provided beforehand, which can be either unavailable or too expensive to obtain or not representative enough to cover all possible areas in real applications. Inverse reinforcement learning (IRL) is the problem of inferring the reward function of an agent, given its policy or observed behavior. In this survey, we will discuss the theoretical foundations of IRL techniques and the problem it solves. Then, we will provide state of the art of the current applications of IRL in healthcare specifically. Following that, we will summarize the challenges and what makes IRL in healthcare domains so limited despite its progress in other research areas. And finally we will point out some potential directions for future research.

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