



IEEE
Jordan Section



5th IEEE Middle East and Africa Conference on Biomedical Engineering

27-29 October, 2020
Amman - Jordan

Sponsors





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Welcome Message

On behalf of the Conference Organizing Committee, it gives us a great pleasure to welcome you to the 5th IEEE Middle East and Africa Conference on Biomedical Engineering (MECBME 2020). As Chair and Vice-Chair of the Organizing Committee, we are honored to be at your service in this conference. This conference is an important event for the biomedical engineering field in the region as a whole. The conference is organized by Yarmouk University, IEEE Jordan Section, and IEEE EMBS Jordan Chapter under the Royal Patronage of Her Royal Highness Princess Sumaya bint El Hassan, President of the Royal Scientific Society. Due to the global effect of COVID-19 pandemic on travels and meetings, the conference will take place online on October 27-29, 2020.

The MECBME Conference is in its fifth edition. It was previously held in the United Arab Emirates, Qatar, Lebanon, and the latest in Tunisia. It is an international conference that provides a unique forum for engineers, scientists, and researchers to present their state-of-the-art findings in Biomedical Engineering. The conference is an opportunity for them to interact in a scientific platform and share their experiences in related industry and technology applications. Moreover, we are proud to have three distinguished keynote speakers from renowned academic institutions: Professor Nitish Thakor, Johns Hopkins University, USA; Professor Emad Ebbini, University of Minnesota Twin Cities, USA; and Professor Mohammed Odeh, University of West England, UK.

MECBME 2020 is a peer-reviewed full-paper conference and has received 60 full papers in seven tracks, covering the various aspects of biomedical engineering. Each paper was sent to at least three expert reviewers. Out of all papers submitted, 33 papers were accepted and are included in the conference program. All presented papers will be submitted for publication to the IEEE Xplore® digital library and will be indexed in Scopus.

We want to thank Yarmouk University and IEEE Jordan Section for their support in organizing and sponsoring this conference. Moreover, a word of thanks is extended to the main conference supporters and sponsors: Jordan Chamber of Industry, Keysight Technologies, Al Faisaliah Healthcare Systems, Irbid Electricity, Nucleus for Medical Devices, and Jordan Tourism Board.

Last but not least, we would like to express our most profound appreciation to all members of the organizing committee for their valuable efforts in making MECBME 2020 a successful event, as well as the advisory committee, scientific committee, expert reviewers, and student volunteers.

We would also like to thank the conference participants for their contributions, for their support, and their attendance. We wish you all a successful and fruitful experience, and we hope to see you all in your second home in Jordan in the near future.

Prof. Awad Al-Zaben,
Conference Chair
Yarmouk University

Dr. Mohammad Al-Abed,
Conference Vice-Chair
The Hashemite University



MECBME 2020 Keynote Speakers

Prof. Nitish V. Thakor

Brains-Machines-and Computing - Present and Future of Neuroengineering



Nitish V. Thakor (Life Fellow, IEEE) is a Professor of Biomedical Engineering, Electrical and Computer Engineering at Johns Hopkins University since 1983. He is also the Founding Director of Singapore Institute for Neurotechnology at the National University of Singapore (2012-2018) and currently the Professor of Biomedical Engineering at the National University of Singapore. Prof. Thakor's technical expertise is in Neuroengineering, where he has pioneered many technologies for brain monitoring, implantable neurotechnologies, neuroprosthesis, and brain-machine interface. He has published over 395 refereed journal papers (H-Index 82), 16 US and international patents, and co-founded three active companies. He was previously the Editor in Chief of IEEE Transactions on Neural Systems and Rehabilitation Engineering, and currently the EIC of Medical and Biological Engineering and Computing (Springer/Nature). He is the Editor of an upcoming authoritative reference Handbook of Neuroengineering. Prof. Thakor is a recipient of the Technical Achievement Award (Neuroengineering) as well as the Academic Career Award from the IEEE Engineering in Medicine and Biology Society. He received a Research Career Development Award from the National Institutes of Health and a Presidential Young Investigator Award from the National Science Foundation. He is a Fellow of the American Institute of Medical and Biological Engineering, Life Fellow of IEEE, Biomedical Engineering Society, and International Federation of Medical and Biological Engineering. He is a recipient of a Distinguished Alumnus Award from the Indian Institute of Technology, Bombay, India, and a Centennial Medal from the University of Wisconsin School of Engineering.

Abstract: The nervous system, the human brain, in particular, is complex, difficult to study and understand, and, in cases of diseases, difficult to treat. Therefore, any study of the brain (and nervous system in general) is a deep and exciting field, and engineering, more specifically neuroengineering, can play a pivotal role. This is recognized by major initiatives around the world, such as the BRAIN (a technology oriented) initiative in the US and the Human Brain program in Europe (a computationally focused program). At the same time, entrepreneurs and industry have dived in to innovate and develop technologies ranging from brain monitors, implantable neuromodulation devices, brain-inspired computers and machine learning (and AI) tools, and the exciting frontier of brain-machine interfaces. This talk will give an overview of these frontiers along with examples from the present to illustrate the innovative technological and translational work, to discover and learn more about the brain and to treat the nervous systems disorders. As examples, the talk will focus on the topic of neuroprosthesis, a brain-machine interface to provide functional restoration to amputees, and neuromorphic engineering to build brain-inspired sensors, robotics, and computers.



Prof. Emad S. Ebbini
**Image-guided Transcranial Focused Ultrasound for the Treatment of
Neurological Disorders**



Emad S Ebbini (Fellow, IEEE): Received his BSc from the University of Jordan in 1985, and the MS and PhD degrees from the University of Illinois Urbana-Champaign in 1987 and 1990, respectively. In 1990, he joined the Department of Electrical Engineering and Computer Science at the University of Michigan Ann Arbor as an Assistant Professor. In 1998, he joined the University of Minnesota Twin Cities, where he is currently a Professor of Electrical and Computer Engineering. His current research interests include signal and array processing, image processing, and medical imaging with a particular interest in medical ultrasound applications in image-guided interventions. He served as Associate Editor of the IEEE TUFFC (1997 - 2002) and IEEE TBME (2008 - 2013) and the Editorial Board of Ultrasonic Imaging (2013 - 2018).

Prof. Ebbini was the recipient of the NSF Young Investigator Award (1993 - 1998) for his work on New Ultrasound Arrays for Imaging and Therapy and the NIH FIRST Award (1996 - 2002) for his work on Acoustic and Temperature Feedback for Image-guided Interventions in addition to numerous grants from NIH, NSF and other public and private organizations.

Prof. Ebbini contributed to both diagnostic and therapeutic aspects of medical ultrasound, including optimal array pattern synthesis for imaging and therapy, temperature imaging, nonlinear contrast agent imaging, high-speed parallel imaging. He pioneered the concept of dual-mode ultrasound array (DMUA) systems for image-guided surgery, for which he holds several US and international patents. His research team at Minnesota recently demonstrated the real-time use of this technology for stereotaxic guidance of transcranial focused ultrasound surgery in vivo. The team is currently investigating a number of novel approaches involving 3D imaging, real-time ultrasound thermometry in vivo, and self-focusing arrays in the presence of strongly scattering objects.

Abstract: Advances in medical imaging have led to improved understanding of brain functions in addition to the exquisite rendering of its anatomical structures. Brain disorders are increasingly diagnosed and assessed using noninvasive imaging tests, with and without contrast agents. Functional imaging tools are widely used in the assessment of the state and progression of brain conditions. These advances have renewed interest in noninvasive methods for treating brain conditions, where imaging provides guidance, monitoring, and quantitative assessment of treatment outcomes. Transcranial focused ultrasound (tFUS) is gaining increased acceptance as a modality for precise targeting of brain circuits and anatomical structures noninvasively. MR-guided tFUS has already been used clinically in a range of noninvasive treatments of brain conditions, including Parkinson's disease, essential tremor, and epilepsy. Numerous laboratories worldwide are investigating the use of tFUS using exposures ranging from low intensities (neuromodulation) to mild heating (drug delivery) to tissue ablation (cancer therapy). In this talk, we describe cutting edge technologies and algorithms for guidance, monitoring, and control of tFUS application for neuromodulation in vivo. We also describe current research on using 3D imaging methods for the design of wearable tFUS applicators for on-demand neuromodulation in freely-moving, awake subjects.



Prof. Mohammed Odeh

The Role of Cancer Care Informatics in Empowering the Cancer Patient Journey



Mohammed Odeh: Heads the Software Engineering Research Group in the Faculty of Environment and Technology of the University of West of England and is KHCC Professor of Cancer Care Informatics. Mohammed has co-founded Cancer Care Informatics as a dedicated initiative and discipline that includes the 1st International Conference on Cancer Care Informatics, the 1st MSc in Cancer Care Informatics taught, and a research program jointly run by King Hussein Cancer Center and the University of Jordan, with input from the University of West of England, Bristol, UK. He is also the co-founder and co-editor in

chief of the forthcoming International Journal on Cancer Care Informatics. He has more than 34 years of research and development experience in the engineering of software systems with an in-depth interest in Systems of Systems software engineering applied to cancer care and aerospace, Knowledge-driven Requirements Engineering, and Bridging the Gap between Business Processes and IT Systems. Mohammed was co-organiser of the 5th IEEE CloudCom Conference in December 2013 and introduced the first Requirements Engineering for Cloud Computing (RECC) in the IEEE CloudCom Conference. He has been the UWE Bristol principal investigator on the OntoREM (Ontology-driven Requirements Engineering Methodology) and as a joint inventor of OntoREM with Dr. Kossmann from Airbus, with a US patent that has been fully granted. He was an associate editor of the INCOSE/Wiley Systems Engineering and sat on the editorial board of the IAJIT journal. Also, he is on the steering committee of the ACIT conference series. He has been UWE Bristol co-investigator on EU FP5, FP6, and FP7 projects. Mohammed was the program leader and co-organizer of the 2015 EICM Conference in Bristol, UK.

Abstract: Cancer Care Informatics is concerned with the employment of informatics to empower the process of cancer care, where the cancer patient is holistically the focus in the cancer care journey involving all the concerned stakeholders. A number of socio-technical systems work together in order to serve the holistic process of care for the cancer patient. Hence, cancer care will emerge as systems of systems arrangement - of autonomous and heterogeneous systems - providing cancer care software services during the cancer patient journey, including lifelong services for all stakeholders concerned. In this keynote, a systems and software engineering holistic approach will be presented that has already led to the establishment of the new discipline of cancer care informatics. A number of sub-disciplines will be critically explored in empowering the process of cancer care, including the employment of requirements engineering, information strategy, and architecture, quality governance, change management, cancer bioinformatics with reference to advances in next-generation sequencing vs. optical mapping, cancer genetic counseling, cancer registries and cancer surveillance, data analytics for cancer processes improvement, etc. Throughout the delivery of this keynote speech, a number of examples will be provided to state-of-the-art research and development work, where informatics have been contributing to the holistic empowerment of the process of cancer care.



DETAILED PROGRAM

Tuesday, October 27, 2020	
10:00-10:30	Opening & Welcome
10:30- 10:40	Virtual Break
10:40 - 12:00	Keynote Speaker : Prof. Mohammed Odeh The Role of Cancer Care Informatics in Empowering the Cancer Patient Journey Chair: Mohammad Awwad
12:10- 13:30	Chair: Muder Almiani, Mohamad Khalil Session 1 Biomedical Signal and Image Processing-I
	<ul style="list-style-type: none"> ● Md F Wahid and Reza Tafreshi. Recognition of Upper-lim Movement Using Electroencephalogram Signals with Deep Learning. ● Sajedah Al-Momani, Hasan Al-Nashash and Hasan, Mir. Comparison Between Independent Component Analysis and Wiener-Hopf Filter Techniques for Eye Blink Removal. ● Sepehr Ataei, Javad Alirezaie and Paul Babyn. Low Dose CT Denoising Using Dilated Residual Learning with Perceptual Loss and Structural Dissimilarity. ● Yusuf Ozkan and Buket Barkana. Multi-class Mental Task Classification Using Statistical Descriptors of EEG by KNN, SVM, Decision Trees, and Quadratic Discriminant Analysis Classifiers
13:30- 14:00	Virtual Lunch Break
14:00- 15:20	Keynote Speaker : Prof. Emad S. Ebbini Image-guided Transcranial Focused Ultrasound for the Treatment of Neurological Disorders Chairs: Abdallah Kassem, Khaldon Lweesy



15:30-17:00	Session 2 Biomedical Imaging	Chairs: Omar Falou, Areen Al-Basheer
		<ul style="list-style-type: none"> ● Azar Tolouee, Javad Alirezaie and Paul Babyn, Reconstruction of Cardiac Perfusion MRI with Motion Compensated Compressed Sensing. ● Malak Fora, Isam Abu Qasmieh and Ali Mohammad Alqudah., Effective Computed Tomography Generation and Simulation Tool for Education and Research Purposes. ● Sadeq S Alsharafi, Ahmed M. Badawi and AbdEl-Monem M El-Sharkawy, Design of a Self-Shielded Transverse MRI Gradient Coil Taking into Account Track Width. ● Amer Zaylaa, Wassim El Falou, Ahmad Diab, Mohamad Khalil and Catherine Marque, Wavelet and Over-Segmentation Elimination Techniques Effect on Automatic Uterine EMG Segmentation Performance / Quality. ● Areej Malkawi, Rawan Al-Assi, Taimaa Salameh, Bara'ah Sheyab, Hiam Alquran and Ali Mohammad Alqudah, White Blood Cells Classification Using Convolutional Neural Network Hybrid System.
17:10- 18:30	Keynote Speaker : Prof. Nitish V. Thakor Brains-Machines-and Computing - Present and Future of Neuroengineering Chairs: Hasan Al-Nashash, Mohammad Al-Abed	

Wednesday, October 28, 2020		
10:00 -11:30	Session 3 Biomedical Signal and Image Processing – II	Chairs: AbdEl-Monem M El-Sharkawy, Abed Al Raouf Bsoul
		<ul style="list-style-type: none"> ● Mohamed Moustafa Azmy, Comparison of Denoising EEG Signals Between Modified Non Local Means Filter and Wavelet Transform. ● Nader Lutfi Almuflleh, Amani Al-Othman, Hasan A Al-Nashash and Mohammad Al-Sayah, Implantable Electrodes Based on Poly-aniline (PANI) and Silicone for Neural Sensing/Stimulations. ● Nashaat El Halabi, Roy Abi Zeid Daou, Roger Achkar, Ali Hayek and Josef Boercoek, Comparative Study for Classification Methods to Predict and Detect Epilepsy Seizure. ● Mohamed Mroueh, Farah Mourad-Chehade and Fahed Abdallah, Multi-label Classification and Evidential Approach in Diseases Diagnoses Using Physiological Signals. ● Dima Alsbeih, Mohammad I. Daoud, Abdel-Karim Al-Tamimi and Mohammad Al-Jarrah, A Dynamic System for Tracking Biopsy Needle in Two Dimensional Ultrasound Images



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11:40-13:10	<p>Session 4 Bioinformatics, Healthcare Information Systems and e- Health I</p>	<p style="text-align: center;">Chairs: Sukaina Alzyoud, Lina Al-ebbini</p> <ul style="list-style-type: none"> ● Oumeyma Jouini and Kaouther Sethom, Physical Layer Security Proposal for Wireless Body Area Networks. ● Jad Abbass and Jean-Christophe Nebel, Enhanced Rosetta-based Protein Structure Prediction for non-Beta Sheet Dominated Targets. ● Khadidja Fellah Arbi, Kh., Ibrahim Kromba, Fayçal Saffih, Amina Ben-Ramdane, Ahmed Slami, Anes Hadjersi, Soulimane Sofiane and Mohammed ELAmine, Brixi Nigassa Intelligent IoT (I2oT) Biomedical Wearable System Based on Smartphone Application ● Luay Fraiwan and Abdul Rahman Rajab, Smart Indoor Environment Monitoring System. ● Spiros Georgakopoulos, Paris Gallos and Vassilis Plagianakos, Using Big Data Analytics to Detect Fraud in Healthcare Provision.
13:10- 13:40	Virtual Lunch Break	
13:40-14:40	<p>Industrial Session</p> <p>Chair : Enas Abdulhay Julien Sarrade from Keysight Technologies. Battery life challenges and solutions for a connected medical device,</p>	
14:50-16:20	<p>Session 5 Biomedical Signal and Image Processing – III</p>	<p style="text-align: center;">Chairs: Ahmad Diab , Isam Abu Qasmieh</p> <ul style="list-style-type: none"> ● Amani Al-Ghraibah, Mohammad Algharibeh, Waseem Al-Muhtaseb, Fatima Al- Khatieb and Ismail Al-Anis, Investigating the Significance of New Features Extracted from Long Bones X-ray Images. ● Bassam Al-Naami, H Owida and Hossam Fraihat Quantitative Analysis Signal-Based Approach Using the Dual Tree Complex Wavelet Transform for Studying Heart Sound Conditions ● Mohammad Al-Abed, Shibley Al-Jahawsheh, Duha Al-Batayha and Basheer Na'amneh, Analysis of Corrected QT Interval Dispersion (QTcd) in Normotensive Subjects Performing Breath-hold Challenge. ● Soumaya Berro, Ahmad Diab, Mohamad Hajj- Hassan, Mohamad Khalil, Hassan Amoud and Sofiane Boudaoud, Exploration of Motor Unit Activation Pattern Using High Density sEMG Minimum Norm Estimation.



Thursday, October 29, 2020

Thursday, October 29, 2020		
10:00- 11:30	<p style="text-align: center;">Session 6</p> <p style="text-align: center;">Bioinstrumentati on Nanomedicine and Biosensors – I</p>	<p style="text-align: center;">Chairs: Reza Tafreshi, Hisham M Almasaeid</p> <ul style="list-style-type: none"> ● Shady Halaby, George Khoury, Roy Abi Zeid Daou, Ali Hayek and Josef Boercsoek, Novel Approach of a Smart Medical Mirror System for Medical Applications. ● Weisi Guo, Zhuangkun Wei and Bin Li, Secure Internet-of-Nano Things for Targeted Drug Delivery: Distance-based Molecular Cipher Keys. ● Amira J. Zaylaa, Rania Ghotmi and Samara Barakat, Urine Analysis Device from Research to Design. ● Kateryna Muzyka, Yuriy T. Zholudov, Anatoliy Kukoba, Danylo Martynov, Serhii Misochenko and Ghazi Khaled, Coreactant-change Based Strategy Towards Selective Electrochemiluminescent Detection of Polycyclic Aromatic Hydrocarbons in Aqueous Media. ● Munder Al-hashem, Raneen Bani Hani, Yasmeen Al- Quraan, Sundos Al-Akhras, Eman Al-Omari, Qasem Qananwah and Ali Mohammad Alqudah, Blood Pressure Estimation Using Optical Technique and Surface Fitting
11:40- 13:10	<p style="text-align: center;">Session 7</p> <p style="text-align: center;">Bioinformatics, Healthcare Information Systems and e- Health II</p>	<p style="text-align: center;">Chairs: Javad Alirezaie, Adel Salah Alsharei</p> <ul style="list-style-type: none"> ● Khalid Alhussaini, Saad Alkhalaf and Adham Aleid, Software Application for Auditory Temporal Resolution Screening Outside the Clinic. ● Lina Nachabe, Roula Raiyee, Omar Falou, Marc C. Girod-Genet and Bachar ElHassan, Diabetes Mobile Application as a Part of Semantic Multi-Agent System for E-Health. ● Abdallah Kassem, Mustapha Hamad, Georges Harbieh and Chady El Moucary, A Non-Invasive Blood Glucose Monitoring Device. ● MD Shafiqul Islam, Marwa Qaraqe, Hasan Abbas, Madhav Erraguntla and Muhammad Abdul-Ghani, The Prediction of Diabetes Development: A Machine Learning Framework. ● Ahmad ElSayed, Mohamad I.C. HajjHassan, Zouelfikar Ali El Hawi, Mohamed Wadaane, Abdulhalim Mohamad, Hussein Wehby, Lara Hamawy, Mariam Khayreldeen, Mohamad Hajj-Hassan, Mohammad Abou Ali and Abdallah Kassem, MATLAB/Simulink Medical CO2 Insufflator Model with a Pressure PID Controller.
13:10-13:40	Virtual Lunch Break	



Chair: Khalil Yousef		
13:40-14:40	Session 8 Biomaterials and Biomechanics	<ul style="list-style-type: none">● Hassanain Ali Lafta Mossa, Gemma Whatling and Cathy Holt, Impact of Upper Body Anthropometrics on Spatiotemporal Parameters During Manual Wheelchair Propulsion in Able-bodied Users.● Abdelrahman Mostafa and Lutfi Albasha, Low Frequency Bimorph Cantilever Energy Harvester for Pacemaker Applications.● Hamed Al-Anazi, Majid Nour and Mohammad A Hussain, Surface Nano-Characterization of Dialysis Membranes for Quality Purpose.



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Track Chairs

Track	Name	Affiliation
Biomedical Signal and Image Processing	Hiam Quran	Yarmouk University , Jordan
	Bassam Al-Naami	Hashemite University, Jordan
Bioinstrumentation; Nanomedicine and Biosensors	Mohammad Al-Ayyad	Al-Ahliyya Amman University, Jordan
	Jamal Nabulsi	Al-Ahliyya Amman University, Jordan
Biomechanics; Artificial Organs and Prosthesis	Mohammad Al-Amri	Cardiff University ,UK
	Othman Smadi	Hashemite University, Jordan
Bioinformatics, Healthcare Information Systems and e-Health	Lina Ebbini	Yarmouk University, Jordan
	Sukaina-alzyoud	Hashemite University, Jordan
Biomaterials and Tissue Engineering	Ateka Keder	Yarmouk University, Jordan
Biomedical Imaging	Isam Abuqasmieh	Yarmouk University, Jordan
	Areen Al-Bashir	Jordan University of Science and Technology, Jordan
Rehabilitation and Medical Robotics	Reza Tafreshi	Texas A&M University at Qatar

Program At a Glance

Tuesday, October 27, 2020		Wednesday, October 28, 2020		Thursday, October 29, 2020	
10:00-10:30	Opening and Welcome				
10:30-10:40	Virtual Coffee Break				
10:40-12:00	Keynote Speaker Prof. Mohammed Odeh The Role of Cancer Care Informatics in Empowering the Cancer Patient Journey	10:00-11:30	Session 3 Biomedical Signal and Image Processing II	10:00-11:30	Session 6 Bioinstrumentation Nanomedicine and Biosensors
		11:30-11:40	Virtual Coffee Break	11:30-11:40	Virtual Coffee Break
12:00-12:10	Virtual Coffee Break				
12:10-13:30	Session 1 Biomedical Signal and Image Processing-I	11:40-13:10	Session 4 Bioinformatics, Healthcare Information I	11:40-13:10	Session 7 Bioinformatics, Healthcare Information II
		13:10-13:40	Virtual Lunch Break	13:10-13:40	Virtual Lunch Break
13:30-14:00	Virtual Lunch Break				
14:00-15:20	Keynote Speaker Prof. Emad S. Ebbini Image-guided Transcranial Focused Ultrasound for the Treatment of Neurological Disorders	13:40-14:40	Industrial session	13:40-14:40	Session 8 Biomaterials and Biomechanics
		14:40-14:50	Virtual Coffee Break		
15:20-15:30	Virtual Coffee Break				
15:30-17:00	Session 2 Biomedical Imaging	14:50-16:20	Session 5 Biomedical Signal and Image Processing III		
17:00-17:10	Virtual Coffee Break				
17:10-18:30	Keynote Speaker Prof. Nitish V. Thakor Brains-Machines-and Computing - Present and Future of Neuroengineering				

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