

# UNIVERSITY of **HOUSTON** | ENGINEERING

Department of Electrical & Computer Engineering

## 14<sup>th</sup> Graduate Research Conference

April 27, 2018

The Hilton UH Hotel & Conference Center

Houston, Texas

8:30 - 8:55 am	Registration, Conrad, Ballroom, Lobby Opening
8:55 - 9:00 am	Remarks by Dr. Wanda Wosik, Classroom 180
9:00 - 10:05 am	Technical Program - Oral Session <b>A</b> , Classroom 180
10:05 -10:30 am	Welcoming Remarks, Conrad Ballroom <ul style="list-style-type: none"><li>• Dr. Joe Tedesco, Dean, College of Engineering</li><li>• Dr. Suresh Khator, Associate Dean, College of Engineering</li><li>• Dr. Badri Roysam, Chairman, Electrical and Computer Engineering</li></ul>
10:30 - 10:45 am	Coffee Break, Conrad, Ballroom, Lobby
10:45- 11:50 am	Technical Program - Oral Session <b>B</b> , Classroom 180
11:50- 12:45 pm	Lunch, Conrad, Ballroom
12:30 - 1:15 pm	Keynote Presentation, “Lost in Translation: A Tragedy of our Times”, <i>Dr. Mauro Ferrari</i> , President & CEO, Houston Methodist Research Institute; Director, Institute for Academic Medicine; Executive Vice President, Houston Methodist; Senior Associate Dean and Professor of Medicine, Weill Cornell Medical College, New York
1:15 - 2:20 pm	Technical Program - Oral Session <b>C</b> , Classroom 180
2:20 - 2:30 pm	<i>Coffee Break</i> , Conrad, Ballroom, Lobby
2:30 - 3:35 pm	Technical Program - Oral Session <b>D</b> , Classroom 180
3:35 - 5:30 pm	Technical Program - Poster Session, Conrad, Ballroom Elevator Talks
5:30 - 6:00 pm	by CDC students, Conrad, Ballroom Awards Ceremony Conrad,
6:00 - 6:30 pm	Ballroom

# GRC 2018

The Hilton UH Hotel & Conference Center

April 27, 2018

8:30 – 8:55 am Registration, Conrad, Ballroom, Lobby

8:55 – 9:00 am Opening Remarks in Classroom 180 by Dr. Wanda Wosik

## TECHNICAL PROGRAM

### Session A:

- Numerical Optimization, Deep Learning, and Inversion Methods
- Power: Computing, Hardware, and Batteries

Session Type: Oral

Time: 9:00 – 10:05 am

Faculty Chair: Dr. David Jackson

Poster #

9:00 – 9:05 am

#### SEMI-SUPERVISED DEEP LEARNING FOR HYPERPECTRAL IMAGE CLASSIFICATION

*Souvik Mukherjee and Saurabh Prasad*

A1



9:06 – 9:11 am

#### PARALLEL MCMC FOR LARGE-SCALE GEOSTEERING INVERSION AND UNCERTAINTY QUANTIFICATION

*Han Lu, Qiuyang Shen, Xuqing Wu, Jiefu Chen, and Xin Fu*

A2



9:12 – 9:17 am

#### APPLICATION OF PSO METHOD ON GEOSTEERING INVERSE PROBLEMS

*Li Yan, Han Lu, Qiuyang Shen, and Jiefu Chen*

A3

9:18 – 9:23 am

#### NUMERICAL OPTIMIZATION, DESIGN, AND TESTING OF AN UNDERWATER-FIRING SELF-ASSEMBLED GAUSS GUN

*Mohammad M. Sultan, Jarrett Lonsford, Javier Garcia, Julien Leclerc, Mohamad Ghosn and Aaron T. Becker*

A4

9:24 – 9:29 am

#### ENERGY EFFICIENT FOG COMPUTING WITH ARCHITECTURE OF SMART TRAFFIC LIGHT SYSTEM

*Yawen Luo and Yuhua Chen*

A5



<b>9:30 – 9:35 am</b>	<b>SOLID STATE AUTO-TRANSFORMER CONCEPT FOR MULTI-PULSE RECTIFIERS</b> <i>Srikanth Yerra and Harish S. Krishnamoorthy</i>	A6
<b>9:36 – 9:41 am</b>	<b>COUPLED INDUCTOR HYBRID CIRCUIT BREAKER FOR HVDC GRID APPLICATION</b> <i>Anindya Ray, Satish Naik, and Kaushik Rajashekara</i>	A7
<b>9:42 – 9:47 am</b>	<b>A MATRIX CONVERTER BASED SINGLE STAGE DC AC CONVERTER WITH REDUCED DEVICE COUNT</b> <i>Parthasarathy Nayak, Sumit Pramanick and Kaushik Rajashekara</i>	A8
<b>9:48 – 9:53 am</b>	<b>MODELING THE STRUCTURE OF SODIUM SOLID STATE ELECTROLYTES</b> <i>Haotian Zheng and Yan Yao</i>	A9
<b>9:54 – 9:59 am</b>	<b>AQUEOUS RECHARGEABLE BATTERIES UTILIZING VERSATILE ORGANIC REDOX ELECTRODES</b> <i>Michael de la Torre, Saman Gheytani, and Yan Yao</i>	A10
<b>10:00 –10:05 am</b>	<b>DEVELOPING PLASMONIC IMAGING FOR IN-SITU UNDERSTANDING OF SOLID ELECTROLYTE INTERPHASE FORMATION</b> <i>Chaojie Yang and Xiaonan Shan</i>	A11
<b>10:05 –10:30 am</b>	<b>Welcoming Remarks and Addresses in Plaza Ballroom</b> <ul style="list-style-type: none"> <li>• Dr. Joe Tedesco, Dean, College of Engineering</li> <li>• Dr. Suresh Khator, Associate Dean, College of Engineering</li> <li>• Dr. Badri Roysam, Chairman, Electrical and Computer Engineering</li> </ul>	
<b>10:30 – 10:45 am</b>	<i>Coffee Break</i>	

**Session B: Fabrication Methods, Design, and Control of Micro- and Nano Probes, Structures, and Microrobots**

**Session Type: Oral**

**Time: 10:45 – 11:50 am**

**Faculty Chair: Dr. Jiming Bao**

<b>10:45 – 10:50 am</b>	<b>A WATER DROPLET SMARTPHONE MICROSCOPE</b> <i>Yulung Sung, Zhenyu Hu, and Wei-Chuan Shih</i>	B1
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<b>10:51 – 10:56 am</b>	<b>PB<sup>2+</sup> DETECTION IN DRINKING WATER USING DARK FIELD SMARTPHONE MICROSCOPE</b> <i>Hoang Nguyen and Wei-Chuan Shih</i>	B2
<b>10:57 – 11:02 am</b>	<b>SUPPRESSION OF HYDRATE FORMATION DURING PALLADIUM DEPOSITION USING LEAD</b> <i>M. Yarali, K. Ahmadi, W. Yang, and S. R. Brankovic</i>	B3
<b>11:03 – 11:08 am</b>	<b>DO-IT-YOURSELF VEIN-MAPPING WITH A SECURITY CAMERA AND INFRARED LEDS</b> <i>Mohsen Rakhshanderoo, Yulung Sung, and Wei-Chuan Shih</i>	B4
<b>11:09 – 11:14 am</b>	<b>DESIGNING SYNTHETIC MICROVASCULAR MODELS WITH REALISTIC STRUCTURE AND FLOW</b> <i>Jiaming Guo, Paul Ruchhoeft, and David Mayerich</i>	B5 
<b>11:15 – 11:20 am</b>	<b>MAGNETIC MANIPULATION OF UNTETHERED MINIATURE ROBOTS FOR SURGICAL APPLICATION</b> <i>Julien Leclerc and Aaron T. Becker</i>	B6 
<b>11:21 – 11:26 am</b>	<b>FABRICATION OF ULTRA-SENSITIVE GOLD NANOPARTICLES WITH FAR FIELD COUPLING AND UNDERCUTTING</b> <i>Ibrahim Misbah and Wei Chuan Shih</i>	B7
<b>11:27 – 11:32 am</b>	<b>STUDY OF CAVITATION DYNAMICS OF MICROBUBBLES THROUGH PHOTOTHERMAL EFFECT ON NANOPOROUS GOLD DISC (NPGD)</b> <i>Abu Farzan Mitul, and Wei-Chuan Shih</i>	B8
<b>11:33 – 11:38 am</b>	<b>HYDROGEN ADSORPTION AND HYDROGEN EVOLUTION REACTION ON SINGLE CRYSTAL Au(111), Ru(0001),Pd(111) and Pt(111) ELECTRODES STUDIED BY IN-SITU ELECTROCHEMICAL INFRARED SPECROSCOPY</b> <i>Mehrnaz Shirazi and Stanko Brankovic</i>	B9
<b>11:39 – 11:44 am</b>	<b>STUDY OF ELECTROLESS DEPOSITION OF PB MONOLAYER ON GOLD BY EQCM</b> <i>W. Yang, S.R.R. Brankovic, and F. C. Robles Hernández</i>	B10 
<b>11:45 – 11:50 am</b>	<b>A UAV FOR DESTRUCTIVE SURVEYS OF MOSQUITO POPULATION</b> <i>An Nguyen, Dominik Krupke, Mary Burbage, Shriya Bhatnagar, S'andor P. Fekete, and Aaron T. Becker</i>	B11 
<b>11:50 – 12:45 pm</b>	<b>Lunch, Conrad Ballroom</b>	

**12:30 – 1:15 pm** Keynote Presentation, “Lost in Translation: A Tragedy of our Times”, *Dr. Mauro Ferrari*, President & CEO, Houston Methodist Research Institute; Director, Institute for Academic Medicine; Executive Vice President, Houston Methodist; Senior Associate Dean and Professor of Medicine, Weill Cornell Medical College, New York

**Session C: Broad Engineering Tools at nano-, micro-, and macro-scale for Biomedical Diagnostics, Treatment, and Rehabilitation of Patients**

**Session Type: Oral**

**Time: 1:15 – 2:15 pm**

**Faculty Chair: Dr. Jack Wolfe**

**1:15 – 1:20 pm** **A STATE-SPACE APPROACH FOR DETECTING STRESS FROM ELECTRODERMAL ACTIVITY** C1

*Dilranjan S. Wickramasuriya, Chaoxian Qi, and Rose T. Faghih*

**1:21 – 1:26 pm** **SYSTEM IDENTIFICATION OF ELECTRODERMAL ACTIVITY VIA HARTLEY MODULATING FUNCTION** C2

*Md. Rafiul Amin and Rose T. Faghih*

**1:27 – 1:32 pm** **HIGH RANGE PORTABLE BIOIMPEDANCE SPECTROMETER WITH FOUR ELECTRODE ANALOG FRONT END FOR CHARACTERIZATION OF MITOCHONDRIA BIOENERGETICS** C3

*Uday Kiran Karlapudi, Joe Charlson, Jarek Wosik, Jinghong Chen and Wanda Wosik*

**1:33 – 1:38 pm** **A WIDEBAND COMPLEMENTARY NOISE AND DISTORTION CANCELING LNA FOR HIGH-FREQUENCY ULTRASOUND IMAGING APPLICATIONS** C4

*Yuxuan Tang, Yulang Feng, Qingjun Fan, and Jinghong Chen*

**1:39 – 1:44 pm** **OBSERVATION AND STATISTICS OF THE MECHANICS OF MEMBRANE VIBRATIONS IN HELA CELLS USING SPR IMAGING** C5

*Suraj Khochare and Xiaonan Shan*



**1:45 – 1:50 pm** **COMPUTATIONAL METHODS FOR PROFILING CELLULAR HETEROGENEITY & SPATIAL PATTERN DISCOVERY IN WHOLE BRAIN RAT SLICES AFTER TRAUMATIC BRAIN INJURY** C6



*Jahandar Jahanipour and Badri Roysam*



**1:51 – 1:56 pm** **PREDICTING HAND GRIP FORCES FROM NONINVASIVE** C7

## ELECTROENCEPHALOGRAPHY

*Andrew Y. Paek, Alycia Gailey, Pranav Parikh, Marco Santello, and Jose Contreras-Vidal*




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|-----------------------|---|--|
| <b>1:57 – 2:02 pm</b> | <b>PREDICTION OF JOINT ANGLES DURING TREADMILL WALKING USING EEG AND LSTM</b><br><i>Sho Nakagome, Trieu Phat Luu, Yongtian He and Jose L. Contreras-Vidal</i>   | C8<br>  |
| <b>2:03 – 2:08 pm</b> | <b>DEVELOPMENT OF A PEDIATRIC LOWER-EXTREMITY GAIT SYSTEM</b><br><i>David Eguren, Atilla Kilicarslan, Trieu Phat Luu, Samuel Akinwande, Marianna Zanovello, Anirudh Arunkumar<sup>1</sup> and Jose L. Contreras-Vidal</i> | C9<br>  |
| <b>2:09 – 2:14 pm</b> | <b>TOWARDS AUTOMATIC FEATURE EXTRACTION IN ARTISTIC MOBILE BRAIN BODY IMAGING</b><br><i>Jesus G. Cruz-Garza and Jose Luis Contreras-Vidal</i>   | C10<br> |
| <b>2:15 – 2:20 pm</b> | <b>DESIGN OF AUTOMATED SYSTEM FOR EMOTIONAL CONTENT RETRIEVAL IN IMAGES</b><br><i>Saikiran Ambati and Bhavin R. Sheth</i>   | C11  |
| <b>2:20 – 2:30 pm</b> | <i>Coffee Break</i>   |  |









## Session D: Cellular Imaging Techniques and Inverse Problems Solving; Mapping and Controlling Particles and Robot Motions.

Session Type: Oral

Time: 2:30 – 3:35 pm

Faculty Chairs: Dr. Aaron Becker

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| <b>2:30 – 2:35 pm</b> | <b>DIGITAL STAINING OF FTIR SPECTROSCOPIC IMAGES</b><br><i>Mahsa Lotfollahi, Sebastian Berisha, Davar Daeinejad, David Mayerich</i>  | D1<br> |
| <b>2:36 – 2:41 pm</b> | <b>MITIGATING FRINGING IN DISCRETE FREQUENCY INFRARED IMAGING USING TIME-DELAYED INTEGRATION</b><br><i>Shihao Ran, Sebastian Berisha, Rupali Mankar, Wei-Chuan Shih, and David Mayerich</i>                                | D2<br> |
| <b>2:42 – 2:47 pm</b> | <b>SECOND-GENERATION GPU-BASED SEGMENTATION FOR HIGH-THROUGHPUT TIME-LAPSE IMAGING MICROSCOPY IN NANOWELL GRIDS (TIMING 2)</b><br><i>Jiabing Li, Leila Saadatifard, Navin Varadarajan, Badri Roysam and David Mayerich</i> | D3<br> |

2:48 – 2:53 pm	<p><b>ACTIVE LEARNING FOR EFFICIENTLY TRAINING CONVOLUTIONAL NEURAL NETWORKS</b>  <i>Aditi Singh, Hien Nguyen, and Badri Roysam</i></p>	<p>D4  </p>
2:54 – 2:59 pm	<p><b>A FULLY-AUTOMATED DEEP LEARNING TECHNIQUE FOR DETECTING AND CLASSIFYING CELLS IN PHASE-CONTRAST TIME-LAPSE IMAGES</b>  <i>Leila Saadatifard, Melisa Martinez, Navin Varadarajan, and David Mayerich</i></p>	<p>D5  </p>
3:00 – 3:05 pm	<p><b>STUDIES ON A TRANSMISSION MECHANISM OF CONDUITS FILLED WITH RIGID MEDIA</b>  <i>Haoran Zhao, Aaron T. Becker, and Nikolaos V. Tsekos</i></p>	<p>D6  </p>
3:06 – 3:11 pm	<p><b>EXPLOITING NON-SLIP WALL CONTACTS TO POSITION TWO PARTICLES USING A SHARED INPUT</b>  <i>Shiva Shahrokhi, Jingang Shi, Benedict Isichei and Aaron T. Becker</i></p>	<p>D7  </p>
3:12 – 3:17 pm	<p><b>ASSEMBLY AND SORTING OF POLYOMINOES UNDER UNIFORM CONTROL INPUTS</b>  <i>Sheryl Manzoor, Aaron T. Becker, Li Huang, Arne Schmidt, Phillip Keldenich, Dominik Krupke, and Sándor P. Fekete</i></p>	<p>D8  </p>
3:18 – 3:23 pm	<p><b>ROBOT MOTION PLANNING USING GLOBAL INPUTS AND OBSTACLE INTERACTION</b>  <i>Parth Joshi and Aaron Becker</i></p>	<p>D9  </p>
3:24 – 3:29 pm	<p><b>MAPPING AN UNKNOWN REGION USING HOMOGENEOUS AND HETEROGENEOUS PARTICLES</b>  <i>Arun V. Mahadev, Daniel Bao, and Aaron T. Becker</i></p>	<p>D10  </p>
3:30 – 3:35 pm	<p><b>AUTOMATED LABEL-FREE MEASUREMENT OF TRABECULAR BONE IN BONE MARROW</b>  <i>Rupali Manakr, Mustafa Kansiz, Carlos Bueso-Ramos and David Mayerich</i></p>	<p>D11  </p>

**Session E: POSTER PRESENTATIONS**

**Time: 3:35 – 5:30 pm, Conrad, Ballroom**

**All posters will match talks presented by the graduate students in oral sessions.**

**5:30– 6:00 pm      Elevator Talks by CDC Students**, hosted by Dr. Len Trombetta,  
Conrad, Ballroom

**6:00 – 6.30 pm      Awards Ceremony and Reception**, Conrad, Ballroom



***Plenary Speaker: Mauro Ferrari, Ph.D.***

***“Lost in Translation: A Tragedy of our Times”***

ABSTRACT: The time required for translation into clinical use of a medical discovery or invention (say, a new drug or device) is estimated to be between 10-17 years, at a cost of \$ 2-3 Billion. Thus, the vast majority of discoveries that could potentially benefit patients never makes it to the clinic. These are not scientific failures, in most cases, they are process failures. The measure of the tragedy associated with these process failures is evident upon considering, for instance, that the average life expectancy of a cancer patient from the time of discovery of metastases is about 18-24 months. The cost and timelines associated with clinical translation drive the price of the newest generation drugs and devices to unsustainable levels, even for the small fraction of the world population that lives in countries that can afford them now. Failures in medical translation are a true tragedy of our times.

In this talk, I will report of our experience at Houston Methodist, aimed at improving the process of clinical translation of leading-edge medical discoveries. We found that it is essential to establish core GMP/GLP facilities, competitively allocate funds for the cost of preclinical and early-stage clinical trials, and develop new professional education degree programs for clinical translation. I will illustrate with examples drawn from our portfolio: Novel contrast agents for the early detection of neurodegenerative diseases; Neurorehabilitation devices; Injectable nano-particle generators for metastatic cancer; Nanofluidics implants for long-term delivery of drugs and cell transplantation; T-Cell clonality diagnostics for the selection of transplant recipients; Novel cardiovascular intervention devices, among others.



## ***Mauro Ferrari, Ph.D.***

President and CEO

Ernest Cockrell, Jr. Presidential

Distinguished Chair

***Houston Methodist Research Institute***

Director, Institute for Academic Medicine

Executive Vice President

***Houston Methodist Hospital System***

Senior Associate Dean & Professor of  
Medicine

***Weill Cornell Medical College, New York***

Mauro Ferrari, Ph.D. is President and CEO of Houston Methodist Research Institute, where he directs more than 2,300 employees and credentialed clinicians engaged in basic science and over 1,000 clinical research protocols in cancer, cardiovascular diseases, neurology, and many others domains of medicine. He also serves as Executive Vice President of the Houston Methodist Hospital System, recently recognized by U.S. News and World Report as one of the top twenty hospitals in the USA. Concurrently, Dr. Ferrari serves as Senior Associate Dean and Professor of Medicine at Weill Cornell Medical School in Manhattan, New York. His laboratory develops new drugs for cancer.

He is recognized as the pioneer of nanomedicine and transport oncophysics. He was the principal architect of the Cancer Nanotechnology Plan at the National Cancer Institute of the USA (2003-2005), which is the largest nanomedicine research program to date, worldwide. He has published over 500 scientific articles, 7 books, and is inventor of over 50 patents issued in the USA and internationally. Dr. Ferrari is a Fellow of AIMBE, AAAS (Biological Sciences), and ASME. He has won numerous scientific awards and recognitions, including the Founders' Award from the Controlled Release Society, the Blaise Pascal Medal from the European Academy of Sciences, the Aurel Stodola Medal from ETH Zurich. Dr. Ferrari is a Foreign Member of the Italian National Academy of Sciences (Accademia dei Quaranta), a Member of the European Academy of Sciences, and a Corresponding Member of the Pontifical Academy for Life, by appointment of Pope Francis. Born in Italy, Dr. Ferrari holds a degree in Mathematics from the Università di Padova, Masters and Ph.D. degrees in Mechanical Engineering from the University of California, Berkeley, and attended medical school at the Ohio State University. Dr. Ferrari holds honorary faculty positions at several universities in the USA and internationally. He has received honorary doctorates in biotechnology, electrical engineering, and letters (theology). His prior employment includes tenured faculty positions in Engineering at the University of California, Berkeley, in Engineering and Medicine at the Ohio State University, and the University of Texas M.D. Anderson Cancer Center and Health Sciences Center in Houston, Texas.