

## Introductions

### DEPARTMENT INTRODUCTION

By ALEX JAMES

**Mission** As a leading Electrical and Electronics Engineering Department in Kazakhstan, our mission is to: (1) enable an environment for excellent human values and provide high-quality engineering training, and (2) be recognized as a school that carry out relevant, timely and high-level research at all levels of education taking into account the needs of society and industry, influence positive social changes through intellectual contributions with external communities both at national and international levels.

**Vision** Electrical and Electronics Engineering department in the School of Engineering, Nazarbayev University trains world-class engineering and researchers to be leaders who can bring about transformations in their respective fields. This supports the school's vision to build a top Engineering School that leads the university to world stature. The department will rely on: (1) its ongoing efforts and ability to innovate in teaching and research practices, (2) growing partnerships with industry (3) effectiveness and efficiency of its management processes.

**Faculty, Staff, and Resources** The Electrical and Electronics Engineering (EE) department is the newest department in School of Engineering, Nazarbayev University, established in 2012. The department started with a modest number of students (~20) in its undergraduate program, practically, having to build laboratory infrastructure from scratch. Over the years, EE programs have become the most popular program among students, with the majority of the students in engineering registering their first interest. Currently, the department hosts, 1 MSc, 1 B.Eng., and 1 Ph.D. program, with approximately 60 students per cohort in B.Eng., 15 students per cohort in MSc, and five students per cohort in Ph.D. The department had 11 FTE faculty members, with six more expected to join by the end of the year. Also, from August 2017, the department will enlarge its infrastructure and lab facilities moving to the new building.

The department has currently five labs functioning in the areas of electronics, communications, and power engineering. The department is building its capacity to labs in digital communications, communication systems, and RF circuits, Internet of

things, circuits, power systems, electrical machines, high voltage systems, power electronics and signal processing. Thematic focuses of the labs are in the following areas: (1) Electronics and Communications, (2) Power and Control Engineering, (3) Circuits and Systems, and (4) Signal processing and machine learning.



Electrical Engineering

Since the start of the university till 12th of march 2017, a total of 158 articles have been published, within an SNIP of 1.47 (top 10% journals, these are 2225 out of 22256 journals listed in Scopus). The Department of Electrical and Electronics Engineering has published 33 papers out of 158 articles, i.e. 20.9% of all the papers published in NU. Overall, the School of Engineering contributes to more than half of the publications in NU.

**Educational Programs** The objectives of the EE educational programs are that in the immediate years after graduation, students are expected to: (1) build a career path with informed choices about its EE/CSE aspects, (2) be competitive in the EE/CSE job market, (3) contribute to the well-being of profession/community, and (4) facilitate the 2050 vision of Kazakhstan to become a knowledge-based economy AND pursue one or more of the following: (a) graduate education in engineering or allied fields, (b) the breadth of responsibilities in a small company environment including entrepreneurship, (c) specialized expertise within a large company environment. (d) Sales/Marketing positions in technology companies, and (e) basic and applied research to solve the complex problems of our times.

The B.Eng. program in Electrical and Electronics Engineering focuses on Power Engineering, and Communication Engineering, while, minor topics are on Signal Processing, Circuits, and Real-time Computational Systems. The department has been successfully running the program with many of our students placed in some of the top schools in the world for

graduate study. Further, a vast majority of the students find jobs well ahead of completing their degrees. This is the most popular program in School of Engineering and provides a range of opportunities including industry internships, projects and research projects. Many courses in the program follow project based learning, inquiry-based learning and research based learning, making students prepared to take up a high-flying career in Electrical/Computer Engineering. The undergraduate capstone project has resulted in several top ranking conference and journal publications and has constantly been appreciated by the outside visitors, and students.

The department offers 1.5 years MSc program in Electrical and Electronics Engineering, with a research-intensive curriculum focused in the areas of communications, circuits, signal processing, and power engineering. The students are expected to prepare a high-quality research thesis, by the end of the 3rd semester, which is externally reviewed by an expert in the area. The program also heavily encourages industry collaborations for the research projects and has partnerships build with several of the international and local companies. The program is planned to be revised to a 2-year degree program with longer research thesis duration to enhance the depth and breadth of the program. The focus of the programs will be in the areas of Electrical and Computer Engineering - which the department has solid expertise as evidenced through the strong research outputs over the last three years.

**Professional societies** The department is a host to initiate first chapters and sections of several well-known professional societies in Kazakhstan. The IEEE Kazakhstan subsection, IEEE Student Branch, and IET Student club were all launched by the efforts of faculty and students in Electrical Engineering.

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## NEW FACULTY INTRODUCTIONS, FALL 2017

By DEPARTMENT CORRESPONDENT

The department is striving further to build an international reputation in some of the core areas of circuits and systems, signal processing and power systems. To support this, we manage to recruit several high-quality professors to support the mission and vision of the department. It gives me great pleasure to introduce the new faculty members to the department, who will join us from August/September of 2017. Besides, we will be hiring several postdocs and faculty in the months ahead to further make the department one of the strongest in the Eurasian region.

**Muhammad Tahir Akhtar** will be joining the department of EE as an Associate Professor in Signal Processing. Muhammad Tahir Akhtar received his PhD degree in Electronic Engineering from Tohoku University, Sendai, Japan, in 2004 (through Japanese Government Scholarship), MSc in Systems Engineering form Quaid-i-Azam University,



M. Tahir Akhtar

Islamabad, Pakistan (under fellowship from Pakistan Institute of Engineering and Applied Sciences) in 1999, and BSc Electrical (Electronics and Communication) Engineering from the University of Engineering and Technology, Taxila, Pakistan in 1997. From 2008 to 2014, he was an Assistant Professor at the University of Electro-Communications, Tokyo, Japan, and a Special Visiting Researcher at the Tokyo Institute of Technology, Tokyo, Japan. He was a visiting researcher at Institute of Sound and Vibration Research (ISVR), University of Southampton, UK (Dec. 2008 - Feb. 2009), and at Institute for Neural Computations (INC), University of California San Diego (Nov. 2010 - Mar. 2011), with funding from Japan society for promotion of sciences under the grant "Institutional Program for Young Researcher Overseas Visits". Prior to that, he was a COE postdoctoral fellow at Tohoku University, Sendai Japan (2004-2005), and has worked as an Assistant Professor at the United Arab Emirates University, UAE (2006-2008). His research interests include adaptive signal processing, active noise control, blind source separation, and biomedical signal processing. He has published about 90 papers in journals and conference proceedings. He won Best Student Paper at the IEEE 2004 Midwest Symposium on Circuits and Systems, Hiroshima, Japan, and student paper award (with Marko Kanadi) at 2010 RISP International Workshop on Nonlinear Circuits, Communications and Signal Processing. He was included in MARQUIS Who's Who in Science and Engineering in 2008, and MARQUIS Who's Who in the world in 2013. Dr. Akhtar has acted as a reviewer for many international journals and conferences. He is on the editorial board of Hindawi Advances in Mechanical Engineering, and has served as a member technical program committee for many international conferences. He is a member of The European Association for Signal Processing (EURASIP), a member of Asia-Pacific Signal and Information Processing Association (APSIPA), and is a Senior Member IEEE.

**Mohammad Shabi Hashmi** will be joining the department of EE as an Associate Professor in RF circuits. Mohammad Hashmi attended Prifysgol Caerdydd (Cardiff University) for a PhD degree in Electronics Engineering, Technische Universitt Darmstadt for an MS degree in Information and Communication Engineering, and Aligarh Muslim University for a BTech degree in Electrical Engineering. He carried out his doctoral research at the Agilent Center for High Frequency Engineering. Since 2012, he has been a member of the faculty at IIIT Delhi. Previously he had stints at Philips Technology Center in Nuremberg, Thales Design Center in Berlin, and iRadio Lab in Calgary.



Dr. Hashmi works in the broad area of RF Electronics with particular emphasis on RF Measurements, RF and Mixed Signal Electronics, PA Design, Modeling and Linearization. His immediate research focus is on developing innovative design methodologies for multi-band RF/microwave circuits and systems for enabling optimal SDR applications and 'Green Communications'. In addition, he also investigates innovative

solutions for implantable devices and their test and evaluation. He is also fully engaged with this beautiful startup. His awards and achievements include DAAD-Siemens Scholarship (2001), Nokia Fellowship (2005-2008), UK Govt's Dorothy Hodgkin Award (2005-2009), best paper award at the IEEE International Microwave Symposium (2009), third prize in the IEEE-MTT originality and creativity competition (2008), ARFTG Microwave Measurement Fellowship (2008), Young Researcher Grant from INMMiC (2008), Alberta Innovates Fellowship (2009-2011), and Young Faculty Research Fellowship (2016 - 2021) from DeitY, Govt of India. He has co-authored the book titled "Load-Pull Techniques with Applications to Power Amplifier Design".

**Grant A. Ellis** will be joining the department of EE as an Assistant Professor in RF circuits. Grant A. Ellis earned his Ph.D. in Electrical Engineering at the University of Washington (Seattle, USA), in 1996.

His B.Sc. in Electrical Engineering (1983) and M.Sc. in Electrical Engineering (1986) were earned at Washington State University (Pullman).

He has 19 years of industrial engineering experience and has held positions at the Boeing Company in Seattle, HRL, and Agilent / Avago Technologies in Penang. His duties included monolithic microwave integrated circuit (MMIC) design for phased-array communication antennas and wireless basestation applications and antenna design including propagation analysis for implementation on aircraft including rotocraft. His MMIC design work includes state-of-the-art high linearity amplifier design using GaAs, InP, and GaN device technologies covering frequencies from VHF to millimeter-wave range.

He has 7 years of academic experience as a faculty member at the Universiti Teknologi Petronas (UTP) in Tronoh, Malaysia and the National University of Singapore (NUS). At UTP, he liaised with local industry in MMIC research projects. He has served as an External Lecturer in Communications Engineering at the RWTH in Aachen, Germany in July of 2006 and 2007. He has also taught a short course in Monolithic Microwave Integrated Circuit Design at the Thai - German Graduate School (TGGS) in Bangkok.

His research interests are Monolithic Microwave Integrated Circuit (MMIC) and RFIC design, millimeter wave MMIC design, Microwave computer aided design techniques, and electromagnetic propagation. Dr Ellis has written over 40 technical papers and publications and holds 5 US patents. He is the founding chairman of the IEEE MTT-S/EDS/SSCS Penang chapter. He has served as a reviewer for several professional journals including the IEEE Transactions on Antennas and Propagation and the Journal of the Applied Computational Electromagnetics Society (ACES). He is a member of the Tau Beta Pi and Eta Kappa Nu National Engineering Honor Societies and the Sigma Xi Scientific Research Society. He is a registered professional engineer in the State of California, and has been a Senior Member of the IEEE since 2004. He is very interested



Grant A. Ellis

in academic and industrial lecturing, mentoring, and research collaboration with local, international and multicultural teams.

**Vipin Kizheppatt** will be joining the department of EE as an Assistant Professor in FPGA. Vipin Kizheppatt graduated from Rajiv Gandhi Institute of Technology, under Mahatma Gandhi University, Kottayam in 2007 with Distinction in Electronics and Communication Engineering. From 2007 to 2010, he worked as an FPGA design and development engineer at Processor Systems India Pvt. Ltd in Bangalore. In 2010 he joined School of Computer Engineering, Nanyang Technological University under the Division of Hardware and Embedded Systems to pursue his PhD. He completed his PhD in 2015 January. His research is mainly focused on adaptive systems with particular emphasis on design automation of hardware supported adaptive systems based on partial reconfiguration of field programmable gate arrays (FPGAs).



Vipin Kizheppatt

**Aresh Haresh Dadlani** will be joining the department of EE as an Assistant Professor in Complex Systems and Networking. Aresh earned his Ph.D. from Gwangju Institute of Science and Technology (GIST), South Korea in 2015. Since then, he has been a postdoc at the Center for Integrated Access Systems in South Korea. He received his B.Sc. and M.Sc. degrees in Computer Engineering from University of Tehran in 2007 and 2010, respectively. His areas of research interests revolve around stochastic modeling, modern queueing theory, network performance analysis and simulation, epidemic modeling, applied optimization, network science, and social network analysis.



Aresh Dadlani

**H S V Sivanand Kumar Nunn** will be joining the department of EE as an Assistant Professor in Power Systems. Kumar graduated from Jawaharlal Nehru Technological University Hyderabad (JNTUH) with distinction in Electrical and Electronics Engineering in 2007. From 2007 to 2008, he served as an Assistant Professor at L



B R College of Engineering, Andhra Pradesh, India. Kumar obtained his Master's degree from National Institute of Technology Calicut, Kerala, India with distinction in Computer Controlled Industrial Power in 2010. He obtained PhD from Indian Institute of Technology (IIT) Bombay, India with Excellence in Thesis award in 2014, and since then he was working as a Postdoctoral Fellow at National University of Singapore, Singapore. His main areas of interest are Smart Power Systems (Smartgrids), Multi-Agent Systems, Demand Side Management, Smart Power Distribution Systems and Microgrids.

**Carlo Molardi** joined the department of EE as a Post-doctoral research fellow in optoelectronic modeling. was born in Mantova, Italy, in 1978. He received the M.Sc. degree (5-year program) in telecommunication engineering from the University of Parma in 2011. He completed the Ph.D. degree at the Department of Information Engineering, University of Parma. His current research interests include photonic crystal fiber design, fiber lasers for high power applications, and numerical methods for electromagnetic field analysis.



Carlo Molardi

such as circuits and systems, wireless communications, power electronics and systems, and signal processing.

**Alex Pappachen James** received the PhD degree in Electrical and Computer Engineering from the Griffith School of Engineering and Queensland Micro and Nanotechnology Center, Griffith University in a short two years duration. He worked in embedded systems and VLSI areas for HCL Technologies, Visionics, Netgear, and IBM, where he was involved as signal integrity engineer, physical design for analog circuits and programming low-level device drivers for high-speed networking interfaces. He participated in the venture funded startups, and is a consultant to several start-ups through Technology-parks and MIT-Fablabs, as a technology angel. He is currently an Associate Professor and chairing the Department of Electrical Engineering at the School of Engineering at the Nazarbayev University, Astana, Kazakhstan (joined in 2013). Before this, he worked as Lecturer/Assistant Professor with Queensland Microtechnology Facility (Fab - Si/SiC devices as Research Fellow), and Griffith University and Griffith College (2008-2013). He won IEEE CASS outreach awards in 2017, 2015, 2014 and 2012; and has obtained several research grants, including industry fellowships from Intel, and NVIDIA. His research interests include the broad areas of emerging circuits and systems, neuromorphic systems, imaging and pattern recognition. Dr James has been a reviewer and author to several of top quality international journals and conferences. He has served as Editor Board Member of Information Fusion, Elsevier. He is currently an editor to several journals including IEEE TRANSACTIONS ON EMERGING TOPICS IN COMPUTATIONAL INTELLIGENCE, IET Cyber-Physical Systems: Theory and Applications, IEEE ACCESS, Human-centric Computing and Information Sciences, and PeerJ. He developed the IEEE Kazakhstan subsection, and IEEE NU student branch; and in the past developed various IEEE CASS chapters. He is an executive committee member of IET Imaging and Vision community. He is a Senior Member of IEEE, Life Member of ACM, and Senior Fellow of HEA.



Alex Pappachen James

## NEW FACULTY INTRODUCTIONS, SPRING 2018

By DEPARTMENT CORRESPONDENT

**Ikechi Augustine Ukaegbu** (M'12) received his B.Sc. in Electrical Engineering, Electro mechanics and Electro-technology at Moscow Power Engineering Institute (Technical University), Moscow, Russia in 2004 and M.Sc. in Electronics and Microelectronics at the same university in 2006. He obtained his Ph.D. at Korea Advanced Institute of Science and Technology (KAIST) in 2012. He has worked as a Post-Doctoral researcher in Electrical Engineering Department at KAIST from 2012 to 2013. He held R&D positions at Electronics and Telecommunications Research Institute (ETRI), Korea, from 2008 to 2009 and at Lightron Fiber-Optics Inc., Korea in 2013. He also worked as a senior engineer with the design technology team at Samsung Electronics Co. Ltd, Korea from 2013 to 2016. Since then, he has served as the CTO of a venture company where he works on the integration and automation of sub-systems. His research interests include signal and power integrity for memory (LPDDR3/4/5) and high speed interfaces (MPHY, PCIe, USB, etc), RF/analog/MMIC circuit and passive component design, optoelectronic circuit design for optical transceiver modules, integration and packaging of optoelectronic components. He will be joining the Electrical Engineering Department, at Nazarbayev University in January 2018.



Ikechi A. Ukaegbu

## CURRENT FACULTY PROFILES

By DEPARTMENT CORRESPONDENT

The department currently has expertise in the traditional interdisciplinary areas of Electrical and Computer Engineering

**Theodoros A. Tsiftsis** (S'02, M'04, SM'10) was born in Lamia, Greece, in 1970. He received the B.Sc. degree in physics from the Aristotle University of Thessaloniki, Greece, in 1993, the M.Sc. degree in digital systems engineering from the Heriot-Watt University, Edinburgh, U.K., in 1995, the M.Sc. degree in decision sciences from the Athens University of Economics and Business, in 2000, and the Ph.D. degree in electrical engineering from the University of Patras, Greece, in 2006. He joined the Technological Educational Institute of Central Greece, in 2010. He is currently an Associate Professor



Theodoros A. Tsiftsis

in communication technologies with the School of Engineering at the Nazarbayev University, Astana, Kazakhstan. He has authored or co-authored over 120 technical papers in scientific journals and international conferences. His research interests include the broad areas of cooperative communications, cognitive radio, communication theory, wireless powered communication systems, and optical wireless communication systems. Dr. Tsiftsis acts as a Reviewer for several international journals and conferences. He has served as Senior or Associate Editor in the Editorial Boards of IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY and IEEE COMMUNICATIONS LETTERS. He is currently an Area Editor for Wireless Communications II of the IEEE TRANSACTIONS ON COMMUNICATIONS and an Associate Editor of the IEEE TRANSACTIONS ON MOBILE COMPUTING.

**Alexander Ruderman** (M'07) received the M.Sc. (with honors) degree in electrical engineering from the Leningrad Electrical Engineering Institute, Saint Petersburg, Russia, in 1980, and the Ph.D. degree in electrical engineering from the Leningrad Polytechnic Institute, Saint Petersburg, Russia, in 1987. From 1995 to 2003, he was a Research Scientist with the Intel Microprocessor Development Center, Haifa, Israel, investigating microprocessor thermal stabilization, power delivery, and fast and accurate static timing calculation including coupling and other issues. After teaching several electronics-related courses at Bar Ilan University, Ramat Gan, Israel, and Holon Institute of Technology, Holon, Israel, from 2004 to 2005, as an Adjunct Faculty, he joined Elmo Motion Control, Petach Tikva, Israel, makers of compact intelligent servo drives, as a Chief Scientist. Since December 2013, he has been an Associate Professor with the Department of Electrical and Electronics Engineering, Nazarbayev University School of Engineering, Astana, Kazakhstan.



Alexander Ruderman received the M.Sc. (with honors) degree in electrical engineering from the Leningrad Electrical Engineering Institute, Saint Petersburg, Russia, in 1980, and the Ph.D. degree in electrical engineering from the Leningrad Polytechnic Institute, Saint Petersburg, Russia, in 1987. From 1995 to 2003, he was a Research Scientist with the Intel Microprocessor Development Center, Haifa, Israel, investigating microprocessor thermal stabilization, power delivery, and fast and accurate static timing calculation including coupling and other issues. After teaching several electronics-related courses at Bar Ilan University, Ramat Gan, Israel, and Holon Institute of Technology, Holon, Israel, from 2004 to 2005, as an Adjunct Faculty, he joined Elmo Motion Control, Petach Tikva, Israel, makers of compact intelligent servo drives, as a Chief Scientist. Since December 2013, he has been an Associate Professor with the Department of Electrical and Electronics Engineering, Nazarbayev University School of Engineering, Astana, Kazakhstan.

**Nazim Mir-Nasiri** has obtained his Degree in Electrical (Power) Engineering (B.Sc.) (with distinction) from Azerbaijan Oil Academy in 1983 and PhD in Technical Sciences from Azerbaijan Technical University (former USSR) in 1989. Throughout his career he has published about 80 scientific papers in the fields of his interest: robotic design and control, machine vision, intelligent systems, design of mechanisms, renewable energy sources. Prof. Mir-Nasiri has received several awards at the International Exhibitions and Competitions in Kuala Lumpur (Malaysia) for his innovative design work. In 2016 he has received Nazarbayev University Research Grant (through ORAU evaluation) "Energy and Cost Saving Design of Legs Supporting Exoskeleton for Human Motion and Medical Assistance" (USD 300,000). He is the member of IEEE for ten years as well as member of IMechE and Chartered Engineer



Nazim Mir-Nasiri

(UK), editorial board member of the "International Journal of Mechatronics and Automation (IJMA)" and "International Journal of Automation and Computing (IJAC)".

**Amin Zollanvari** received Ph.D. in electrical engineering from Texas A&M University, College Station TX, in 2010. He held a postdoctoral position in Harvard Medical School and Brigham and Women's Hospital, Boston MA (2010-2012) and then joined the Department of Statistics at Texas A&M University as an Assistant Research Scientist (2012-2014). He is currently an Assistant Professor in the Department of Electrical and Electronic Engineering at Nazarbayev University. His research interest includes signal processing, machine learning, and bioinformatics.



Amin Zollanvari

**Behrouz Maham** (S07, M10, SM15) received the B.Sc. and M.Sc. degrees in electrical engineering from the University of Tehran, Iran, in 2005 and 2007, respectively, and the Ph.D. degree from the University of Oslo in 2010. From September 2008 to August 2009, he was with the Department of Electrical Engineering, Stanford University, USA. He is currently an Assistant Professor with the School of Engineering, Nazarbayev University (NU). He was a faculty with the School of Electrical and Computer Engineering, University of Tehran, from Sep. 2011 to Aug. 2015. Dr. Maham is a senior member of IEEE and has around 120 publications in major technical journals and conferences. His fields of interest include wireless communication and networking and molecular nano-communications.



Behrouz Maham

**Daniele Tosi** received the B.Eng. and M.Eng. degrees in telecommunication engineering and the Ph.D. degree in electronics engineering from the Politecnico di Torino in 2004, 2006, and 2010, respectively. He is an Assistant Professor of Electrical and Electronic Engineering with the School of Engineering, Nazarbayev University. His research activity includes optical fiber sensors, biophysical and biological sensors, fiber Bragg gratings, Fabry-Perot interferometers, medical measurements, and signal processing. He received a Marie Curie Intra-European Fellowship at the University of Limerick. He is currently an Associate Editor to IEEE SENSORS journal.



Daniele Tosi

**Mehdi Bagheri** (S '07, M '12) received his MSc degree in power engineering from Sharif University of Technology, Tehran, Iran, in 2007. He joined the Iran Transformer Research Institute (ITRI) in Tehran as a research engineer, and was head of the Test and Diagnostic Department between 2008 and 2010. In 2014 he gained his PhD from the University of New South Wales (UNSW), Sydney, Australia. From 2015 to 2016 he served as a postdoctoral research fellow in the Electrical Engineering Department, National University of Singapore, working closely with Rolls-Royce Pte. Ltd. on condition monitoring and predictive maintenance of marine transformers and filters. He is currently an assistant professor in the School of Electrical and Electronic Engineering, University of Nazarbayev, Astana, Kazakhstan. He is a member of the IEEE Dielectrics and Electrical Insulation Society (DEIS). His research interests include field and marine applications of high-voltage engineering, power quality, condition monitoring and diagnosis of power transformers and electrical rotating machines, transients in power systems, smart energy systems and dynamic wireless charging.



Mehdi Bagheri

**Prashant Jamwal** (M'15) received the M.Tech. degree from the Indian Institute of Technology Roorkee, Roorkee, India, and the Ph.D. degree from The University of Auckland, Auckland, New Zealand. He is a Faculty Member at Nazarbayev University, Astana, Kazakhstan. His research interests include artificial intelligence, fuzzy mathematics and its applications, smart sensors and actuators, bio-mechatronics, biomedical robotics, evolutionary algorithms, and multiobjective optimization. He has more than 20 years of teaching and research experience in mechatronics, medical robotics, and advanced manufacturing technologies. He is an Associate Editor of the International Journal of Biomechanics and Robotics and is acting as a Reviewer for many international journals and conferences.



Prashant Jamwal

**Refik Caglar Kizilirmak** (M'12) was born in Izmir, Turkey, in 1981. He received the B.Sc. and M.Sc. degrees in Electrical and Electronics Engineering from Bilkent University, Ankara, Turkey, in 2004 and 2006, respectively, and the Ph.D. degree from Keio University, Yokohama, Japan, in 2010. He worked for the Communications and Spectrum Management Research Center, Turkey, on several telecommunication and defense industry projects. Currently, he is with the Department of Electrical



Refik Caglar Kizilirmak

and Electronics Engineering, Nazarbayev University, Astana, Kazakhstan. He is the recipient of IEEE VTS Japan 2008 Young Researcher's and IEICE WBS Best Paper Awards.

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## PUBLICATION HIGHLIGHTS

By DEPARTMENT CORRESPONDENT

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### 1 Research work done with NU students

There has been an increase in the quantity and quality of publications. Below is the selected list of publications resulting from the works done involving NU students and faculty. The publications resulting purely based on external collaborations are not included in this list.

#### 1.1 Robotics

1. S. Hussain, P. K. Jamwal, M. H. Ghayesh, and S. Q. Xie, "Assist-as-needed control of an intrinsically compliant robotic gait training orthosis," in **IEEE Transactions on Industrial Electronics**, vol. 64, pp. 1675-1685, 2017.
2. P. K. Jamwal, S. Hussain, M. H. Ghayesh, and S. V. Rogozina, "Impedance Control of an Intrinsically Compliant Parallel Ankle Rehabilitation Robot," in **IEEE Transactions on Industrial Electronics**, vol. 63, pp. 3638-3647, 2016.
3. P. K. Jamwal and S. Hussain, "Multicriteria Design Optimization of a Parallel Ankle Rehabilitation Robot: Fuzzy Dominated Sorting Evolutionary Algorithm Approach," in **IEEE Transactions on Systems, Man, and Cybernetics: Systems**, vol. 46, pp. 589-597, 2016.

#### 1.2 Circuits and Systems

1. A. P. James, I. Fedorova, T. Ibrayev and D. Kudithipudi, "HTM Spatial Pooler With Memristor Crossbar Circuits for Sparse Biometric Recognition," in **IEEE Transactions on Biomedical Circuits and Systems**, vol. 11, no. 3, pp. 640-651, June 2017. doi: 10.1109/TB-CAS.2016.2641983.
2. O. Krestinskaya, T. Ibarayev, A.P. James, "Hierarchical Temporal Memory Features with Memristor Logic Circuits for Pattern Recognition," in **IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems**; Accepted, August 2017.
3. A. K. Maan, D. A. Jayadevi and A. P. James, "A Survey of Memristive Threshold Logic Circuits," in **IEEE Transactions on Neural Networks and Learning Systems**, vol. 28, no. 8, pp. 1734-1746, August 2017. doi: 10.1109/TNNLS.2016.2547842.

4. M. Milacic, A.P. James, S. Dimitrijević, "Recognizing isolated words with minimum distance similarity metric padding," in **Journal of Intelligent & Fuzzy Systems**, vol. 32, no. 4, pp. 2933-2939, 2017.
5. J. J. Mathew, A. Zollanvari, A. P. James, "Edge-Aware Spatial Denoising Filtering Based on a Psychological Model of Stimulus Similarity," in **IEEE Access**; Accepted, August 2017.
6. K. Aliakhmet, D. Sadykova, J. Mathew, A. P. James, "On-chip Face Recognition System Design with Memristive Hierarchical Temporal Memory," in The International Symposium on Intelligent Systems Technologies and Applications (ISTA'17); **Journal of Intelligent and Fuzzy Systems**; Accepted, July 2017.
7. T. Ibrayev, U. Myrzakhan, O. Krestinskaya, A. Irmanova, A. P. James, "Memristive Circuit Design for Variable Pixel G-Neighbor Denoising Filter," in The International Symposium on Intelligent Systems Technologies and Applications (ISTA'17); **Journal of Intelligent and Fuzzy Systems**; Accepted, July 2017.
8. A. Irmanova, A. P. James, "Neuron inspired multi-level memory cell," in **Oxford Circuits and Systems Conference/Springer Journal of Analog IC and Signal Processing**; Accepted, August 2017.
9. K. Smagulova, A. P. James, "Memristor-based Long Short Term Memory circuit," in **Oxford Circuits and Systems Conference/ Springer Journal of Analog IC and Signal Processing**; Accepted, August 2017.
10. O. Krestinskaya, T. Ibrayev, A. P. James, "Feature extraction without learning in Spatial Pooler design of Hierarchical Temporal Memory," in **Oxford Circuits and Systems Conference/Springer Journal of Analog IC and Signal Processing**; Accepted, August 2017.
11. A. P. James, A. Dorzhigulov, J. R. Kim, B. F. Spencer Jr, "UAV based mobile platform for wireless sensor data collection, aggregation and terrain mapping and imaging," in **Oxford Circuits and Systems Conference/Springer Journal of Analog IC and Signal Processing**; Accepted, August 2017.
12. A. Irmanova, A. P. James, "Multi-level Memristive Memory with Resistive Networks," in **IEEE Asia Pacific Conference on Postgraduate Research in Microelectronics and Electronics, 2017 (IEEE PrimeAsia)**; Accepted, August 2017.
13. A. K. Mann, A.P. James, Design of Memristor Threshold Logic Gates Arrays, 2017 **IEEE Asia Pacific Conference on Postgraduate Research in Microelectronics and Electronics (PrimeAsia)**; Accepted, August 2017.
14. A. Irmanova, O. Krestinskaya, A.P. James, "Neuromorphic adaptive edge-preserving denoising filter," in **IEEE International Conference for Rebooting Computing**, Washington, DC, on November 8-9, 2017; Accepted, August 2017.
15. A. P. James, O. Krestinskaya and J. J. Mathew, "Unified Model for Contrast Enhancement and Denoising," in **IEEE Computer Society Annual Symposium on VLSI (ISVLSI)**, pp. 379-384, Bochum, 2017. doi: 10.1109/ISVLSI.2017.73.
16. Y. Akhmetov, J. Mathew, A. P. James, "Variable Pixel G-Neighbor Filters," in **IEEE International Symposium on Circuits & Systems (IEEE ISCAS 2017)**, Baltimore, MD, USA from May 28-31, 2017.
17. Akzharkyn Izbassarova, A. P. James, "Automated Rating of Recorded Classroom Presentations using Speech Analysis in Kazakh," The Fifth **International Symposium on Intelligent Informatics (ISI'17)**; Accepted, July 2017.
18. D. Sadykova, A.P. James, "Quality Assessment Metrics for Edge Detection and Edge-aware Filtering: A Tutorial Review," **IEEE International Conference on Advances in Computing, Communications and Informatics (ICACCI)**; Accepted, July 2017.
19. S. Kauanova, I. Vorobjev, A. P. James, "Automated image segmentation for detecting cell spreading for metastasizing assessments of cancer development," **IEEE International Conference on Advances in Computing, Communications and Informatics (ICACCI)**; Accepted, July 2017.
20. O. Krestinskaya, A. P. James, "Facial Emotion Recognition Using Min-Max Similarity Classifier," **IEEE International Conference on Advances in Computing, Communications and Informatics (ICACCI)**; Accepted, July 2017.
21. O. Krestinskaya, A. P. James (2016) Human factors inspired deep memory architecture for efficient storage and intelligent data processing In: **7th International Conference on Applied Human Factors and Ergonomics (AHFE 2016)** Orlando, Florida, USA July 27-31, 2016.
22. A. Izbassarova, A. P. James, Human factors in ranking presentations using human speech analysis: Case study of Kazakh language presentations In: **7th International Conference on Applied Human Factors and Ergonomics (AHFE 2016)** Orlando, Florida, USA July 27-31, 2016.
23. T. Ibrayev, A. P. James, C. Merkel, D. Kudithipudi, A Design of HTM Spatial Pooler for Face Recognition Using Memristor-CMOS Hybrid Circuits, 2016 **IEEE Int'l Symposium on Circuits & Systems (IEEE ISCAS 2016)**, Canada, May 22-26, 2016. <http://ieeexplore.ieee.org/document/7527475>.
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5. **Energy and Cost Saving Design of Legs Supporting Exoskeleton for Human.** ORAU- NU Funded project. Contact: Prof Nazim Mir-Nasiri for RA positions.
6. **Physical Layer Design for the Advancement of VLC Based Intelligent Transportation Systems.** ORAU- NU Funded project. Contact: Prof Refik Caglar Kizilirmak for RA positions.

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## INDUSTRY COLLABORATIONS

By DEPARTMENT CORRESPONDENT

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1. **KW project to investigate underground pipeline interaction with different soils:** Funded by Petrofac Services Ltd (London), wherein a mechatronic system is developed to control two 3kW geared induction motors connected to actuators; thirty six sensors comprising of LVDTs, pressure sensors, force sensors and inclinometers synchronized for data acquisition through a dSPACE system.
2. **Kamkor Management LLP, Astana:** Development of a Railway Inspection System.
3. **Skuchain, USA:** Cybersecurity lab and building blockchain IOT systems.

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## RESEARCH PROJECTS

By DEPARTMENT CORRESPONDENT

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1. **Ankle joint rehabilitation robot:** Collaborating with Dr. Svetlana V. Rogozina, with the Department of Rehabilitation, Institute for Scientific Research of Traumatology and Orthopedics, Astana, Kazakhstan. Contact - Prof Prashant Jamwal
2. **Cognitive Human Robot Interaction:** Research on certain critical issues of current BCI methodologies, namely, improvement in the sensors technology, their signal processing methods, and use of this technology in the upper limb exoskeleton. Contact - Prof Prashant Jamwal
3. **Physical Human Robot Interaction:** Development of an upper limb exoskeleton for neurorehabilitation of forearm. Contact - Prof Prashant Jamwal
4. **Nazarbayev Oxford Image Sensor with Enhanced Speed, Integration and Processing.** ORAU- NU Funded project. Contact: Prof Alex Pappachen James for RA positions.

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## Recognitions

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### EDITORIAL RECOGNITIONS

By DEPARTMENT CORRESPONDENT

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**Dr Beharouz Meham** became the Editorial member of the Elsevier's Physical Communication (PHYCOM) journal, from April 2017. Beharouz Meham is an Assistant Professor in the Department of Electrical and Electronics Engineering for the past 2 years. His area of expertise is the area of wireless communications.

**Dr Amin Zollanvari** is the leading guest editor for a special issue of Cancer Informatics (SAGE publication) on Signal Processing Applications in Genomics. Amin Zollanvari is an Assistant Professor in the Department of Electrical and Electronics Engineering. His area of expertise is the area of genomic signal processing.

**Dr Theodoros Tsiftsis** is currently an Associate Editor to IEEE Transactions on Mobile Computing (Feb. 2017), and Area Editor to IEEE Transactions on Communications (Jan. 2016). Theodoros Tsiftsis is an associate professor in the Department of Electrical and Electronics Engineering. His area of expertise is wireless communications.

**Dr Daniele Tosi** is currently the Associate Editor to IEEE Sensors Journal. Daniele Tosi is an Assistant Professor in the Department of Electrical and Electronics Engineering. His area of expertise is the area of optical biosensors.

**Dr Alexander Ruderman** is currently the Associate Editor to IET Power Electronics. Alexander Ruderman is an associate professor in the Department of Electrical and Electronics Engineering. His area of expertise is the area of power electronics.

**Dr Alex James** is currently the Associate Editor to IEEE Transactions on Emerging Topics in Computational Intelligence, IEEE Access, HCIS, and PeerJ. Alex James is acting as the de-

partment chair in the Department of Electrical and Electronics Engineering. His area of expertise is the area of circuits and systems.

## STUDENT RECOGNITIONS

By DEPARTMENT CORRESPONDENT

**Timur Ibrayev** graduated with BEngg (EE) in 2017 and is now enrolled to the Purdue University for PhD studies with full-scholarship under the famous group directed by Prof. Kaushik Roy. He was advised by Prof Alex James.

**Ratbek Zhapparov** graduated with BEngg (EE) in 2017 and is now enrolled to the University of Texas at Austin to start his MSc and continue to PhD studies under the famous group directed by Prof. Robert Heath. He was advised by Prof Theodoros Tsifsis.

**Rassul Bairamkulov**, graduated in 2016 with BEngg (EE), and joined for PhD at University of Rochester, advisor - Eby Friedman. He was advised by Prof Alexander Ruderman.

**Kaisarbek Omirzakhov**, graduated in 2017 with BEngg (EE) and is now enrolled for PhD at University of Pennsylvania. He was advised by Prof Alexander Ruderman.

**Olga Krestinskaya** (MSc EE) and **Irina Fedorova (Dolzhikova)** (MSc EE) was selected for an internship with Prof. Khaled Salama on full scholarship. They are advised by Prof Alex James.

**Radkhan Sarmukhanov**, graduated in 2017 with BEngg (EE) and is now enrolled for PhD at Munich Technical University, Germany. He was advised by Prof Mehdi Behgari.

**Ilyas Soltanbayev**, graduated in 2017 with BEngg (EE). His project *Smart Aging Rate and Load Detector for Dry-type Transformers*, is now under commercialization as a start-up AE LAB Company. He was advised by Prof Mehdi Behgari.

**Darya Mikhailenko** was selected for an internship with Prof. Kaushik Roy at Purdue University. She was advised by Prof Alex James.

**Ainur Zhaikhan** was selected for an internship with Prof. Debashisha Jena Lab, National Institute of Technology Karnataka, Surathkal. She was advised by Prof Alexander Ruderman.

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## IEEE Activities

### IEEE KAZAKHSTAN SUBSECTION

By DEPARTMENT CORRESPONDENT

On June 24th 2017, the IEEE Kazakhstan, Subsection was formally approved by IEEE MGA Board. This is the



only subsection approved for Kazakhstan. IEEE Student branch of Nazarbayev University was also approved earlier this year, and has an active student body, planning a wide range of activities. Official page: [www.ieekz.org](http://www.ieekz.org)

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## IEEE RESEARCH TALKS

By IEEE SECTION OFFICE

### IEEE Distinguished Talk, Prof Bhaskar Choubey, University of Oxford

Title: Digital Cameras: More than the eye

Date: 30 March 2017, 4:00 pm

Speaker: Prof Bhaskar Choubey, University of Oxford

Abstract: *Digital Cameras have revolutionized the commercial electronics industry. This has been possible by replacing the old film with a digital sensor build in the same process as that of most other computer chips. However, these cameras are still not as good as the natural camera - the human eye. They still cannot do focal plane processing or capture wide dynamic range of intensities. Rather, all additional expectations from a digital camera have been subsumed in the race for more pixels per imager. However, this increasing number of pixels is leading to a large amount of data being produced, putting the stress of the readout and storage. In this presentation, I will present circuit approaches for intelligent imaging. Furthermore, image sensors have historically been limited to three colors and visible band. I will present our work on extending these abilities. Finally, being inspired by the variability of pixels and transistors, I will discuss variability in the eye as well as nano-systems.*

### IEEE Distinguished Talk, Prof Mohamed-Slim Alouini, KAUST

Title: Paving the Way Towards 5G Wireless Communication Networks

Date: 2 Feb 2017, 4:00 pm

Speaker: Prof Mohamed-Slim Alouini

Abstract: *5G wireless communication networks are expected to fulfill the demand for higher data rates, lower latency, and/or massive connectivity of a growing number of users/devices exploiting a variety of wireless applications. This envisioned rapid increase in the use of wireless services lead the wireless research community to start looking at new technologies to address problems related to the radio-frequency (RF) spectrum exhaustion. This includes the development of (i) new techniques and concepts such as massive multiple input multiple output (MIMO) systems and heterogeneous networks to improve the spectral efficiency at the link and network layers, respectively,*

and (ii) novel schemes to better utilize the unregulated bandwidth in particular in the upper millimeter wave, THz, and optical portion of the spectrum. This talk will first go briefly over the vision and goals of 5G wireless communication networks. Then it presents some of these emerging enabling technologies that need to be developed to pave the way towards the successful roll-out and operation of these future wireless networks. Finally, the talk offers at the end an overview of some of the recent results in the areas of massive MIMO systems, full-duplex communication systems, and optical (Li-Fi) wireless communication systems.



### IEEE Distinguished Talk, Prof Khaled N. Salama, KAUST

Title: Energy-Efficient Capacitance-to-Digital Converters for Low-Energy Sensor Nodes

Date: 2 Feb 2017, 5:00 pm

Speaker: Prof Khaled N. Salama

Abstract: Energy efficiency is a key requirement for wireless sensor nodes, biomedical implants, and wearable devices. The energy consumption of the sensor node needs to be minimized to avoid battery replacement, or even better, to enable the device to survive on energy harvested from the ambient. Capacitive sensors do not consume static power; thus, they are attractive from an energy efficiency perspective. In addition, they can be employed in a wide range of sensing applications, such as pressure, humidity, biological, and chemical sensing. However, the capacitive sensor readout circuit - i.e., the capacitance-to-digital converter (CDC) - can be the dominant source of energy consumption in the system. Thus, the development of energy-efficient CDC architectures is crucial to minimizing the energy consumption of capacitive sensor nodes. In the first part of this talk, we propose several energy-efficient CDC architectures for low-energy sensor nodes. In the second part, we study the matching properties of small integrated capacitors, which are an integral component of energy-efficient CDCs. Despite conventional wisdom, we experimentally illustrate that the mismatch of small capacitors can be directly measured, and we report experimental mismatch measurements for sub-femtofarad integrated capacitors. We also correct the common misconception that lateral capacitors match better than vertical capacitors, and we identify the conditions that make one implementation preferable.

### IEEE Distinguished Talk, Prof Vladimir Lumelsky, University of Wisconsin-Madison

Title: Human-Robot Interaction and Human-Robot Teams

Date: May 12

Speaker: Dr. Vladimir Lumelsky, University of Wisconsin-Madison

Abstract: The ability by a robot to operate in an uncertain environment, such as near humans or far away under human control, potentially opens a myriad uses. Examples include robots preparing the Mars surface for human arrival; robots for assembly of large space telescopes; robot helpers for the elderly; robotic search and disposal of war mines. So far advances in this area have been coming slowly, with a focus on specific tasks rather than a universal ability typical in nature. Challenges appear both on the robotics side and on human side: robots have hard time adjusting to an unstructured environment, whereas human cognition has serious limits in adjusting to robots and grasping complex 2D and 3D motion tasks. As a result, applications where robots operate near humans - or far away under their control - are exceedingly rare. The way out of this impasse is to supply the robot with a whole-body sensing - the ability to sense surrounding objects at the robot's whole body - and algorithms capable of utilizing these data in real time. This calls for large-area flexible sensing arrays - sensitive skin covering the whole robot body akin to the skin covering the human body. Whole-body sensing brings interesting, even unexpected, properties: powerful robots become inherently safe; human operators can move them fast, with "natural" speeds; robot motion strategies exceed human spatial reasoning skills; it becomes realistic to utilize natural synergy of human-robot teams and allow a mix of supervised and unsupervised robot operation. We will review the cognitive science, mathematical, algorithmic, and hardware (materials, electronics, computing) issues involved in realizing such systems.





### Objectives:

- To assist student members with their personal career goals
- To make students aware of the latest technological advances
- To connect with employers by holding networking events and tours
- To promote research and startup culture among students
- To stress the importance of communication and leadership skills and thereby encourage members to organize events and take officer roles in the branch
- To promote global IEEE career services, conferences and workshops

## Our board for AY 2017/2018:

### Chair - Miras Sovetov



*Class year:* '20

*Major:* EEE

*Bio:* Born in Aktobe, Kazakhstan, I studied in Kazakh Turkish High school for gifted boys.

After graduation, I spent a year studying petroleum engineering in Middle East Technical University in Turkey. Currently, I am going to start the second year of EEE program at NU. My research interests are optimization of power systems, high-voltage engineering, and renewable energy sources. Currently working in KEGOC.

### Vice-chair - Batyrbek Alimkhanuly



*Class year:* '18

*Major:* EEE

*Bio:* During high school, I became an alumni of Future Leaders Exchange (FLEX) program. Organized social project "Green city - green future" which won grant from U.S. Embassy in Kazakhstan. Currently, I am a 4th year student in

the department of Electrical and Electronics Engineering of Nazarbayev University. The main academic interests include Power Engineering, specifically, Power Electronics, Renewable Energy Sources and Electric Drive Vehicles. After 2nd year, I had summer internship in the department of Electrical Engineering in "SML Construction" company. Currently, working on project on dynamic charging of electric vehicles. Also working in International Exhibition EXPO-2017 as Thailand Pavilion Ambassador.

### Treasurer - Anvar Khamitov

## IEEE NAZARBAYEV UNIVERSITY STUDENT BRANCH

By DEPARTMENT CORRESPONDENT

Nazarbayev University IEEE Student Branch is a fast-growing student organization with more than 50 registered members joined since its establishment in February of 2017. *Mission:* To foster technical and professional skills of Electrical and Electronics Engineering, computer science and robotics students at NU



*Vision:* To integrate country's professionals into the global technical community and to be internationally recognized for the contributions of technology





*Class year:* '18

*Major:* EEE

*Bio:* A senior student in Electrical and Electronics Engineering department of Nazarbayev University. Academic interests include Power Engineering, namely, Power Electronics and Alternative Energy Sources. Has two published papers (one journal and one conference paper) in the field of Power Electronics. After 2nd year had summer research internship in the University of Bologna, Italy. After 3rd year in summer, participated in cultural exchange program between Nazarbayev University and Renmin University of China as part of "Belt and Road" initiative. Also worked in EXPO-2017 in the pavilion "Energy Best Practices Area" for the German company "Viessmann".

#### Secretary - Adilya Bakambekova



*Class year:* '20

*Major:* EEE

*Bio:* After graduating from Nazarbayev Intellectual School of Physics and Mathematics in Astana in 2016, I was directly admitted to the School of Engineering. Prior to getting my high school diploma I spent a year in the USA as a Future Leaders Exchange Program finalist. I placed second in the Exxon Mobile's "Sci-Tech" Challenge National Competition; currently working on a research in the area of mathematical modeling.

*Past-chair:* Kamilla Aliakhmet

*External Affairs:* Yntymak Abukhanov

*PR:* Khamida Begaliyeva, Symbat Kurasbek

*Web support:* Kassymzhomart Kunanbayev

*Programming committee:* Aigerim Borasheva, Yerzhan Orazayev, Rustem Semenov, Daniyar Amantayev, Aldiyar Semedyarov, Medet Auyenur, Aisultan Alimkhan



## Recent activities

### Information session for students - February 21, 2017

The main aim of this meeting was to demonstrate benefits of becoming IEEE member to NU students. We presented local as well as international membership benefits to the audience,

including professional networking, current technical updates and discount on IEEE services. This session was also a good chance to share information about available scholarships and summer internships and thereby to motivate students to join the branch if they want to further receive exclusive offers. By the end of the meeting, we presented future branch activities and invited students to fill up vacant positions.



### Graduate Talk - April 18th, 2017

For those interested in continuing their education, there was workshop from top students graduating with the class of 2017 from Electrical and Electronics Engineering program. They shared their experience and provided helpful advices on graduate school application process, including tips on program selection and exam preparation. They also kindly agreed to become mentors for those who needed help. Profiles of these students are given below.

*Kaisarbek Omirzakhov (University of Pennsylvania)*

- Nazarbayev University: "Time Domain Optimization of Multilevel Converters Voltage and Current Quality", in a department of Electrical and Electronic Engineering under the supervision of Prof. Alexander Ruderman

- Advanced Digital Sciences Center (Singapore): Worked on a computer vision problem, 'License Plate Recognition', in a hardware division

- King Abdullah University of Science and Technology (Kingdom of Saudi Arabia): Designed and built a presentable printed circuit board prototype of two innovative devices wirelessly communicable between each other.

- Taibuyryl stipend: Monthly stipend from Taiburyl Fond.

*Ratbek Zhapparov (University of Texas Austin)*

- Nazarbayev University: "Cognitive Radio Network using Xbee with Prof. Theodors Tsiftis.

- Kind Abdullah University of Science and Technology (Kingdom of Saudi Arabia): "Indoor localization system using ultrasonic signal"

- The University of Texas at Austin (US): Hand Gesture Recognition using RADAR.

- Yessenov Foundation: full scholarship for summer research; KazEnergy - monthly stipend.

*Ulan Myrzakhan (KAUST)*

- Nazarbayev University: “Memristor CMOS Deep Temporal Memories For Pattern Recognition” under supervision of Prof. Alex James

- Kind Abdullah University of Science and Technology (KAUST, Kingdom of Saudi Arabia): Worked on development and implementation of a small transceiver for a specific application requiring low power consumption and flexible design.

- University of Illinois at Urbana - Champaign (UIUC, USA): As an exchange student attended summer school in the department of Electrical and Computer Engineering.

- KazEnergy - monthly stipend.



### Research Talk - April 4th, 2017

Due to considerable interest in research opportunities from 1st and 2nd year students, the session on current projects proposed by SEng faculty and National Laboratory Astana (NLA) was organised by board officers. We shared profiles of researchers, their concentration area as well as requirements for those who want to work on their projects. We have noticed that many students were not aware of these opportunities, thus we are planning to regularly post about them on our website.

### FoodCAS - Dance your project - April 19th, 2017

For this event, 3rd year EEE students were asked to present their coursework projects in the very new format. No more ppt presentations, but dancing to explain your ideas! They were given 2 minutes to make a video of their dance and this was also supported by 1 page A4 format poster. The projects were targeted on developing electronics systems for food production, preparation, monitoring and preservation.



## Upcoming events

### IEEE Eurasian Outreach Workshop on IoT applications - September 5-7, 2017

The IEEE Student Branch, IEEE Kazakhstan subsection invites you to participate in the outreach workshop on Internet of Things Applications, that aim to cover a wide range of topics such as Video over internet, voice over internet, real-time data analytics, sensory signal processing and cognitive computing in internet of things.

Young professionals and students are welcome to present new ideas and projects, designs, and applications of Internet of Things by participating in IoT Design Competition and Student Symposium. There will be Project Innovation Awards for the contest winners to support their project implementation up to 200,000KZT sponsored by IEEE. Deadline of submission is August 25, 2017.

For more information: [www.ieee.kz.org/iot-workshop-2017](http://www.ieee.kz.org/iot-workshop-2017)

### IEEEExtreme - October 22, 2017

IEEEExtreme is a global challenge in which teams of IEEE Student members—advised and proctored by an IEEE member, and supported by an IEEE Student Branch—compete in a 24-hour time span against each other to solve a set of programming problems. The competition is for IEEE members only. The competition will begin on 21 October 2017.



## Notifications

### LIST OF CONFERENCES APPROVED BY DEPARTMENT

By DEPARTMENT CORRESPONDENT

The department has compiled a list of conferences in consultation with external experts to ensure the minimum standards on quality of publications. The school will be supporting funding for faculty, students and fellows only if the conferences belong to the list. Any other conferences will require additional justification for approval from the chair and dean. All conferences that is listed in <http://www.conferenceranks.com/> in either A/B ERA ranking or A-B1 Qualis (2012) ranking is acceptable. In addition following list of conferences is also accepted.

## Circuits and Systems

1. IEEE International Solid-State Circuits Conference
2. IEEE International Symposium on Circuits and Systems

3. IEEE Symposium on VLSI Circuits (VLSIC)
4. IEEE International Midwest Symposium on Circuits and Systems
5. Design Automation Conference (DAC)
6. Asia and South Pacific Design Automation Conference (ASP-DAC)
7. IEEE Radio Frequency Integrated Circuits Symposium
8. International Conference on VLSI Design
9. IEEE Computer Society Annual Symposium on VLSI
10. Great Lakes Symposium on VLSI
11. Ph. D. Research in Microelectronics and Electronics (PRIME)
12. IEEE Asia Pacific Conference on Circuits and Systems, APCCAS
13. IEEE Latin American Symposium on Circuits and Systems (LASCAS)
14. Symposium on Field Programmable Gate Arrays (FPGA)
15. Conference on Reconfigurable Computing and FPGAs
16. IEEE Biomedical Circuits and Systems Conference (BioCAS)
17. IEEE International Conference on Electronics, Circuits and Systems
18. IEEE International New Circuits and Systems Conference
10. IEEE International Conference on Computer and Communications
11. IEEE Consumer Communications and Networking Conference
12. IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)
13. International Conference on Advanced Communication Technology, ICACT
14. IEEE International Conference on High Performance Computing and Communications
15. International Conference on Computer Communications and Networks
16. International Wireless Communications and Mobile Computing Conference (IWCMC)
17. IEEE Wireless Communications and Networking Conference Workshops (WCNCW)
18. Vehicular Technology Conference
19. IEEE International Symposium on Personal, Indoor and Mobile Radio Communications

## Communications Engineering

1. GLOBECOM
2. Joint Conference of the IEEE Computer and Communications Societies (INFOCOM)
3. IEEE International Conference on Communications
4. Optical Fiber Communication Conference
5. IEEE Wireless Communications and Networking Conference
6. IEEE International Conference on Pervasive Computing and Communications (PerCom)
7. IEEE International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom) European Conference on Optical Communications
8. Allerton Conference on Communication, Control, and Computing
9. International Conference on Computing, Networking and Communications

## Informatics and electronics

1. International Conference on Computer Communication and Informatics
2. International Conference on Advances in Computing, Communications and Informatics
3. International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)
4. International Conference on Consumer Electronics
5. Electronic Components and Technology Conference, ECTC
6. International Quantum Electronics Conference
7. Quantum Electronics and Laser Science Conference
8. European Quantum Electronics Conference
9. International Conference on Rebooting Computing

## Power Electronics and Systems

1. IEEE Applied Power Electronics Conference and Exposition
2. IEEE Conference of Industrial Electronics
3. European Conference on Power Electronics and Applications
4. Power Electronics and Motion Control Conference
5. IEEE International Power Electronics and Motion Control Conference
6. IEEE International Conference on Power Electronics
7. IET International Conference on Power Electronics, Machines and Drives
8. IEEE Conference on Industrial Electronics and Applications
9. IEEE/IAS Industrial and Commercial Power Systems Technical Conference
10. IEEE International Symposium on Power Electronics for Distributed Generation Systems
11. Power Systems Computation Conference (PSCC)
12. International Conference on Power System Technology
13. Joint International Conference on Power Electronics, Drives and Energy Systems (PEDES)
14. International Conference on Power Electronics and Drive Systems
15. IEEE International Conference on Smart Grid Communications (SmartGridComm)
16. IEEE PES Innovative Smart Grid Technologies Conference Europe (ISGT Europe)
17. IEEE PES Innovative Smart Grid Technologies Conference Europe (ISGT Europe)
18. IEEE PowerTech
19. IEEE/IAS Industrial and Commercial Power Systems Technical Conference
20. IEEE Applied Power Electronics Conference
21. IEEE International Conference on Power System Technology
22. IEEE International Conference on Condition Monitoring and Diagnosis, CMD
23. IEEE International Conference on the Properties and Applications of Dielectric Materials
24. IEEE International Power and Energy Conference (PECon)

25. IEEE International Conference on Sustainable Energy Engineering and Application

26. IEEE International Symposium on Diagnostics for Electric Machines, Power Electronics & Drives (SDEMPED)

## Mechatronics

1. IEEE International Conference on Robotics and Automation
2. IEEE/RSJ International Conference on Intelligent Robots and Systems
3. IEEE-RAS International Conference on Humanoid Robots
4. IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechanics
5. IEEE International Conference on Rehabilitation Robotics
6. IEEE International Conference on Robotics and Biomimetics
7. International Conference on Methods and Models in Automation and Robotics
8. IEEE/ASME International Conference on Advanced Intelligent Mechatronics
9. International Conference on Mechatronics and Automation
10. IEEE International Conference on Mechatronics

## Optics

1. Optical Fiber Communication Conference
2. National Fiber Optic Engineers Conference
3. European Conference on Optical Communications
4. The European Conference on Lasers and Electro-Optics
5. International Conference on Optical Network Design and Modeling
6. International Conference on Transparent Optical Networks
7. IEEE Optical Interconnects Conference
8. IFIP International Conference on Wireless and Optical Communications Networks

## Signal processing

1. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)
2. European Signal Processing Conference (EUSIPCO)
3. IEEE Global Conference on Signal and Information Processing (GlobalSIP)
4. Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA)
5. International Conference on Communications and Signal Processing (ICCSP)
6. International Conference on Digital Signal Processing
7. Conference of the International Speech Communication Association (INTERSPEECH)
8. Asilomar Conference on Signals, Systems, and Computers

## Computer Vision and machine learning

1. IEEE Conference on Computer Vision and Pattern Recognition, CVPR
2. European Conference on Computer Vision
3. IEEE International Conference on Computer Vision, ICCV
4. Asian Conference on Computer Vision (ACCV)
5. International Conference on Computer Vision Theory and Applications
6. International Conference on Machine Learning (ICML)
7. European Conference on Machine Learning and Knowledge Discovery in Databases
8. ACM SIGKDD International Conference on Knowledge discovery and data mining
9. ACM International Conference on Web Search and Data Mining
10. IEEE International Conference on Data Mining (ICDM)
11. SIAM International Conference on Data Mining (SDM)
12. International Conference on Educational Data Mining (EDM)
13. Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)
14. International Joint Conference on Neural Networks
15. International Conference on Artificial Neural Networks
16. European Symposium on Artificial Neural Networks (ESANN)

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## LIST OF JOURNALS APPROVED BY DEPARTMENT

By DEPARTMENT CORRESPONDENT

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The department supports the page charges and open access fees for the articles published in the following journals.

1. All journals published by IEEE
2. Other journals listed in top 25% of SNIP.
3. New flagship society journals from IEEE or IET

## CAPSTONE PROJECT DEADLINES

By DEPARTMENT CORRESPONDENT

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### Important Deadlines For Students

- Last date for submission of expression of interest form: 10 May 2017
- Last date for confirmation with Supervisor: 25 May 2017
- Last date for submission of capstone project proposals: 15 Aug 2017
- Last date for submission of final capstone project proposals: 1 Sep 2017
- Proposal defense: 5th September 2017
- IEEE Student Symposium submission date: 1 Nov 2017
- IEEE Student Symposium poster presentation: 15 Nov 2017
- Submission of capstone 1 project report: 30 Nov 2017

### Important Deadlines for Supervisors

- Submission of feedback preliminary capstone project proposals: 25 Aug 2017
  - Assessment of final project proposal: 5th September 2017
  - Monthly progress report: 25th of every month
  - IEEE Student Symposium poster presentation evaluation: 15 Nov 2017
  - Assessment of capstone 1 project report: 5 Dec 2017
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# Research News

## INTERPRETIVE TIME-FREQUENCY ANALYSIS OF GENOMIC SEQUENCES

By AMIN ZOLLANVARI

Dr. Zollanvari and his colleagues have recently developed a framework to extend one of the most successful mathematical analysis used in signal processing to genomic sequences. The article is published in BMC Bioinformatics, a prestigious journal in the biomedical community that focuses on mathematical-biological findings. The journal has an impact factor of 2.43 and is being published under Springer Nature publishing group. Below is a summary of the project.

Citation: Hassani Saadi, H., Sameni, R., Zollanvari, A., Interpretive Time-Frequency Analysis of Genomic Sequences, BMC Bioinformatics, 18(S. 4):154, 2017.

**Background:** Time-Frequency (TF) analysis has been extensively used for the analysis of non-stationary numeric signals in the past decade. At the same time, recent studies have statistically confirmed the non-stationarity of genomic non-numeric sequences and suggested the use of non-stationary analysis for these sequences. The conventional approach to analyze non-numeric genomic sequences using techniques specific to numerical data is to convert non-numerical data into numerical values in some way and then apply time or transform domain signal processing algorithms. Nevertheless, this approach raises questions regarding the relative magnitudes under numeric transforms, which can potentially lead to spurious patterns or misinterpretation of results.

**Results:** In this project, using the notion of interpretive signal processing and by redefining correlation functions for non-numeric sequences, a general class of TF transforms are extended and applied to non-numerical genomic sequences. The technique has been successfully evaluated on synthetic and real DNA sequences.

**Conclusion:** The proposed framework is fairly generic and is believed to be useful for extracting quantitative and visual information regarding local and global periodicity, symmetry, (non-) stationarity and spectral color of genomic sequences (see Fig. 1 for an application).

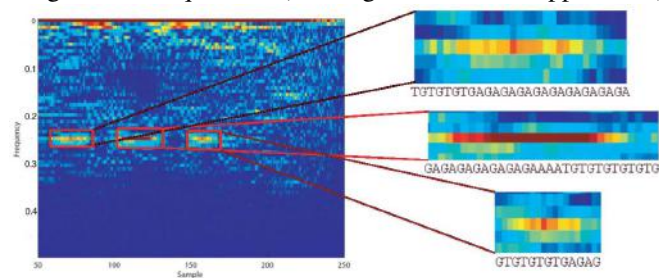


Fig. 1: Applying Wigner-Ville transform to a DNA sequence.

## INTERACTION NETWORK OF ALCOHOLISM

By AMIN ZOLLANVARI

Dr. Zollanvari recent work has led to genetic-environment dissection of alcoholism. The article is published in BMC Systems Biology, a well-respected journal in the biomedical community that focuses on systems biology. The journal has an impact factor of 2.21 and is being published under Springer Nature publishing group.

Citation: Zollanvari, A., Alterovitz, G., SNP by SNP by Environment Interaction Network of Alcoholism, BMC Systems Biology, 11(S. 3):19, 2017.

**Background:** Overconsumption of alcohol is known to be a contributing factor to more than 60 diseases, including several types of cancer, and accounts for approximately 2.5 million deaths each year. Alcoholism has a strong genetic component. Twin studies have demonstrated the heritability of a large proportion of phenotypic variance of alcoholism ranging from 50%-80%. The search for genetic variants associated with this complex behavior has epitomized sequence-based studies for nearly a decade. The limited success of genome-wide association studies (GWAS), possibly precipitated by the polygenic nature of complex traits and behaviors, however, has demonstrated the need for novel, multivariate models capable of quantitatively capturing interactions between a host of genetic variants and their association with non-genetic factors. In this regard, capturing the network of SNP by SNP or SNP by environment interactions has recently gained much interest.

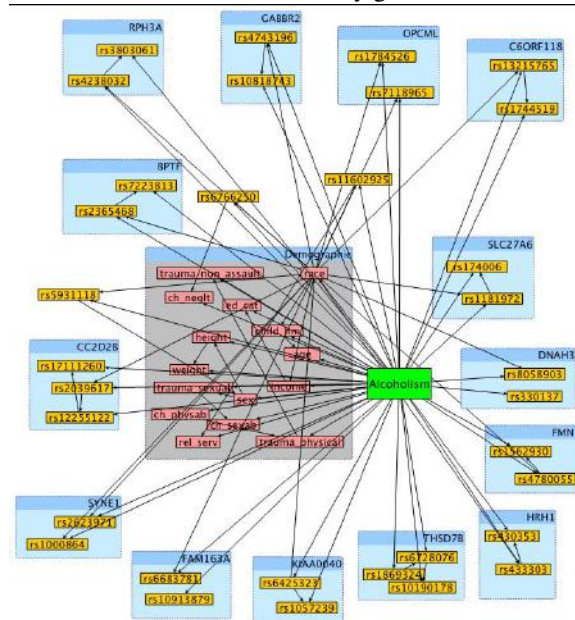


Fig. 2: A subgraph of the identified SNP x SNP x E network.

**Results:** In this project, Dr. Zollanvari and his colleague assessed 3,776 individuals to construct a network capable of detecting and quantifying the interactions within and between plausible genetic and environmental factors of alcoholism. In this regard, they proposed the use of first-order dependence tree of maximum weight as a potential statistical learning technique to delineate the pattern of dependencies underpinning such a

complex trait. Using a predictive based analysis, they further ranked the genes, demographic factors, biological pathways, and the interactions represented by our SNP×SNP×E network. Fig. 2 depicts a subnetwork of the identified genetic-environment interaction network.

**Conclusion:** The proposed framework can be potentially used to capture the complex multifactor effects between many genetic and environmental factors, providing a characterization of the underlying biological and environmental mechanism that determines the phenotype. The underlying framework is quite general and can be applied to the study of other complex traits.

## UAV CHARGING VIA POWER LINES

By MAXIM LU, ALEX JAMES AND MEHDI BAGHERI

Unmanned Aerial Vehicles (UAVs) have recently become popular for various applications around the World. In this regard, a significant technical application of UAVs is in high voltage powerlines and electrical networks monitoring and inspection. However, the battery capacity of a medium scale drones limits their travel distance and mission duration. Therefore, in order to foster the use of drones for routine monitoring operations, it is crucial to improve the energy feeding system of drones and overcome the battery capacity problem. Researchers from the Electrical and electronic engineering department of School of Engineering, Nazarbayer University, Maxim Lu, Dr. Mehdi Bagheri and Dr. Alex James in cooperation with Prof. Toan Phung from the University of New South Wales, Australia, working on a new technique for Unmanned Aerial Vehicle (UAV) wireless battery recharging.



Photo<sup>1</sup>: Tetracam

A review on Wireless charging techniques for UAVs studied the techniques most frequently employed for extending UAVs flight range and mission duration. Since lack of battery capacity is considered as one of the crucial technical challenges in modern UAVs application, there is an open discussion on how to make UAV mission duration longer and make drones more durable.

Generally, there are two options available in order to increase the flight time. The first one is to increase the battery capacity, which in the conditions of current state-of-the-art battery material technologies is a very limited option. Precisely,

the battery might be too large for the drone to fly, or the material of the battery might be too expensive for the deployment to be feasible. The second option is to intermittently charge the battery from an external source of energy. It can be either wired or wireless approaches. While the wired technique is associated with some complexities such as insufficient mobility of a drone during charging or large charging time; wireless options provide sufficiently greater freedom of movement. In addition, they can be applied on request, in other words the drone does not need to return to its base for charging.

The review of existing literature sources on the subject of UAV charging reveals that, apart from a conventional charging type via a cord, there are numerous wireless options to prolong UAVs mission duration. Gust soaring [1], solar PV arrays installation [2], laser beaming [3]- [4], wireless charging [5]- [6] are some of them to name a few. In addition, some of the researchers propose and recommend charging UAV via a transmission line [7].

In addition, wireless energy transfer techniques such as inductive power transfer as well as resonant coupled wireless power transfer are reviewed in the context of UAV battery charging from power lines.

### • IS IT POSSIBLE TO USE POWERLINES AS A SOURCE OF POWER FOR UAV CHARGING?

This question has been under intensive consideration by the researchers at Electrical and electronic engineering department of School of Engineering. Maintaining powerlines and their components in proper condition is a task of imperial importance in order to ensure uninterrupted power supply. For this very reason, crews of engineers have to cover large distances either on foot or car or using helicopters in order to monitor powerline towers, insulation and conductors' condition. Such missions are extremely time consuming, effortful and highly expensive in case of employing a helicopter. UAVs can substitute people on the missions and replace helicopters, simultaneously. But how do one enable them to fly hundred kilometers along the powerline? And how can the powerline itself can help? The research resulted in submitting an article on the topic of UAV battery charging from the high voltage transmission lines to the 2017 IEEE Asia-Pacific Power and Energy Engineering Conference (APPEEC'17). This article was developed in cooperation with Maxim Lu, Dr. Alex James and Dr. Mehdi Bagheri.

The article highlights that UAVs are progressively gaining popularity within various fields of application and they can potentially replace people for power line visual monitoring [8]- [9]. However, one of the biggest technical limitations associated with drones is battery, which significantly constrains mission range and duration [10]. One of the options to overcome the posed problem is to use available sources of energy to recharge UAV battery during the mission. Such techniques as dynamic soaring [1], PV installation [2] and laser beaming [3]- [4] are commonly used to prolong the UAV mission duration. However, this study proposes to use transmission lines in order to charge the drone's battery.

There are generally two approaches which can be used to implement this idea. They are powerline perching [7], [11] and wireless power transfer [5]- [6]. While the first one presents

significant challenges in terms of landing a drone on a power line conductor, the latter can be utilized to charge a UAV remotely using the electromagnetic field of the conductor.



Photo<sup>2</sup>: T&DWorld

A set of experiments conducted utilizing a laboratory setup emulating a powerline conductor reveals that a simple coil with multiple turns positioned close to the current carrying conductor is able to receive voltage in the range of millivolts. The induced voltage is directly proportional to the number of coil turns and current flowing the conductor. On the other hand, it is inversely proportional to and significantly influenced by the distance from the conductor.

One of the limitations of the proposed approach is the fact that the receiving coil needs to be steadily positioned close to the power line conductor. This in turn means that a sophisticated control of the UAV position needs to be employed. On the other hand, it is possible to increase the distance from the power line, however, the received signal will be reduced significantly. In addition, country-specific legal restrictions of drones' deployment in the vicinity of the power lines have to be considered.

The future work on the proposed technique includes implementing a RC WPT approach on the same test setup and identify whether it is possible to achieve resonant wireless transfer with the electromagnetic field of the power line conductor. It is also important to work on improving the efficiency of the wireless power transfer as well as testing the proposed approach on a real UAV battery.

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## BRAIN ON CHIP: BREAKING FRONTIERS IN NEUROMORPHIC CHIPS WITH MEMRISTORS

By ALEX JAMES

In the last one decade, the mobile phone size has dramatically reduced from being a bulky device to a size of credit card. Today, some of them even have a "smart assistant" that not only understands your voice, but also learns your habits and makes suggestions on suitable applications. Such innovations are based on numerous research works done in the fields of theory, design and implementation of artificial intelligence, machine learning, and circuits and systems.

Since last 4 years, my research group in Nazarbayev University is working on top quality research in memristive systems. The research group comprises of undergraduate students, MSc students, PhD students, and full-time research assistants. The group works on various aspects of neuromorphic circuits, algorithms and systems.

The main collaborative groups are from Oxford, RIT, Purdue and KAUST; where my students frequently undertake internships. In our recent research work, we developed one of the first analog chip implementation of the cognitive learning algorithm - Hierarchical Temporal Memory (HTM). HTM is based on the concepts of neuroscience and by mimicking the working principles of human brain it is capable of learning and making predictions. The simplest example is that if you give it a sequence of numbers from 1 to 5, it can suggest you that the next numbers are 6 and then 7. Complex example may include prediction of tomorrow's exchange rates from dollar to tenge. Of course, some people may argue that "there are already such smart applications on my Apple or Samsung products. This is



not new anymore.” And they will be partially right as there is now a bunch of such software algorithms that may process your data and give useful suggestions. However, as being software programs all of these have certain limitations. One of the limitations is processing speed. You may just recall that it takes some time for “smart assistants” to look for information that you asked. It is interesting that these time delays between your request and the displayed output are due to the fact that processing actually happens not on your device, but on the internet clouds. In turn, this reveals the second limitation, which is the memory that such algorithms demand on your device.

The HTM realization in hardware will significantly increase the speed of data processing, because as the signals on chip in our world is purely analog. It means that we do not see the world as only 1’s and 0’s but also see different colors and shades of these colors. So, in order for a smart system to be as close as possible to a human brain, it should also process data in similar form, but not in the form of only digital information. Additionally, comparable small size of such chip may allow it to be one of the next components in your mobile devices. The proposed circuit design was verified on a challenge task of face recognition given only single image to train the system. We could achieve the recognition accuracy of 82%, which is a good result taking into account that the increase in the number of images to train the system will improve these indicators. Moreover, we also tested proposed circuit on voice recognition task. By using HTM in addition to conventional techniques used for speech signals we could achieve improvements in recognition accuracy by 10% compared to the usage of only conventional methods.

**What is next?** The work is still on and the research group is aiming at building a whole working system that will find its application in image processing and recognition tasks. We are in discussions for the real chip construction with people working in industry. Hopefully, the group may show the actual built system that will be capable of performing real-time biometric analysis in the up-coming year.

**Want to join?** So, if you are interested in the work of group, contact Dr James, or any of his students for preliminary discussions. The group is always open to people who seek an opportunity to start their research career at any levels starting from 1st year of undergraduate study. We are very interested in people who have passion and are willing to dedicate their time to invent something new. “The most important step of all is the first step. Start something.”

#### Our recent papers

[Journal] A.P. James, I. Fedorova, T. Ibarayev, D. Kudithipudi, HTM Spatial Pooler Memristor

Crossbar Circuits for Sparse Biometric Recognition, *IEEE Transactions on Biomedical Circuits and Systems* (2017) doi: 10.1109/TBCAS.2016.2641983; <http://ieeexplore.ieee.org/document/7865953>

[Journal] O. Krestinskaya, T. Ibarayev, A.P. James, Hierarchical Temporal Memory Features with Memristor Logic Circuits for Pattern Recognition, *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*(2017) (In press)

[Journal] AK.Maan, A.J. Deepthi, A.P. James, A Survey of Memristive Threshold Logic Circuits, *IEEE Transactions on Neural Networks and Learning Systems* (2017) <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7464347>

## Conferences

### IEEE INTERNATIONAL AND EURASIAN ENERGY CONFERENCE SIBCON-2017

By ASTANA, KAZAKHSTAN

IEEE SIBCON, an energy scientific conference held for the first time in Kazakhstan. The conference was attended by more than 120 scientists from 10 different countries and the topics went on energy, control and telecommunications. More than 167 research works were presented in this scientific event. As a keynote speaker, **Dr. Mehdi Bagheri**, Professor of electrical and computer engineering from Nazarbayev University (NU), presented a research program and discussed about sustainable energy and smart cities. Also three research works from NU, School of Engineering on smart EV wireless charging station, implementation of renewable energy in railway system of Kazakhstan and intelligent substation monitoring systems were presented and technically discussed. Practical results of the later were demonstrated to the industrial expertise of Kazakhstan in SIBCON and capabilities of intelligent substation monitoring system developed by NU research team demonstrated. Simulation results of the former research projects were also discussed in detail. Implementation of renewable energy in railway system of Kazakhstan can potentially reduce fossil fuel consumption, save money and reduce carbon emission. Using wagon roof and station canopies was suggested and discussed in detail. Above mentioned topics are under study at Nazarbayev University and project pilots are planning to be implemented in 2018-2019.

## Call for Papers

### IEEE Transactions on Emerging Topics in Computational Intelligence

*Special Issue on Large-Scale Memristive Systems and Neurochips for Computational Intelligence*

A special issue of the IEEE Transactions on Emerging Topics in Computational Intelligence will be dedicated to Large-Scale Memristive Systems and Neurochips for Computational intelligence. Original, unpublished research and application contributions matching the main theme of this special issue are welcome. Comprehensive tutorial and survey papers on Memristive Systems and Neurochips are considered for this special issue as well.

We seek original papers with novel research contributions in all aspects of theory, simulations, algorithms, and implementation of complex memristive systems and neurochips, with a strong emphasis on emerging cross-disciplinary applications of computational intelligence. Topics of interest for this issue include, but are not limited to:

Novel techniques for simulation and emulation of memristive systems and neurochips

Bioinspired circuits, algorithms and systems utilizing memristive arrays

Intelligent sensory signal processing algorithms for neuromemristive systems

Large-scale memristive systems and neurochips for internet of things

Neuromorphic models, algorithms and systems, and its computational intelligence applications

Intelligent memory systems, cognitive architectures and its implementations

Large-scale implementations and simulations of neurochips  
Spatio-temporal analysis with neurochips and memory systems

Deep learning architectures, theories, systems and its implementations

Neurochip systems of systems implementation, and architecture optimisations

#### Important Dates

*Submission deadline:* October 30, 2017

*Author notification:* January 15, 2017

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This book provides insights into modern nearest-neighbor techniques and introduces various aspects of feature processing, distance learning, and decision fusion. It aims to include practical examples, simulations, exercises and open problems and can be used as a textbook and reference book for data mining, pattern recognition, and machine learning courses at both undergraduate senior and graduate levels.

Introductory and tutorial level chapters on all aspects of nearest neighbor classifiers - fundamental theory, implementation issues and applications are welcome. You are required to prepare your files in Latex

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Before making a full-chapter submission, you are strongly encouraged to contact *Dr Alex James* regarding the suitability of the chapter with a brief abstract of 100 words anytime 15 September 2017.



Manuscript preparation details are available on:

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**Cancer Informatics:** *Special Collection on Cancer Biomarkers, Genomics, Proteomics, and Metabolomics Analysis*

Signal processing techniques have proven to be very effective in processing, extracting, and interpreting information in signals. In the past few decades, these techniques have found widespread applications such as signal (and image) compression, radar and sonar signal processing, filtering, smoothing, and prediction. Treating genomic sequences as spatial-varying digital signals paves the way for applications of signal processing techniques in genomics, thereby leading to new insights on the complex pattern of dependencies underpinning complex traits. This Special Collection aims to foster applications of signal processing and data analytics methods in genomics. These techniques include, but are not limited to:

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