



Electron Devices

Reliability of High-k Gate Dielectrics in sub-45nm CMOS Devices

Dr. Durga Misra
New Jersey Institute of Technology
EDS Distinguished Lecturer
Friday 23 May - 2:00pm
ASB 9896 - SFU Campus

Stringent power requirements in the chips by the International Technology Roadmap for Semiconductors (ITRS) dictate replacement of silicon dioxide as it has already reached the direct tunneling regime. Therefore, for high speed and low power applications high-k dielectric materials are being integrated into standard CMOS technologies. At present, reliability requirements of advanced gate stacks with high-k dielectrics are of intensive research interests as these high-k dielectrics needs to meet the silicon dioxide standards. In this talk some of the on-going research work on charge trapping in high-k dielectrics such as HfO₂ and HfSixOy will be discussed in detail. Detection mechanism of electrically active intrinsic traps will be outlined. Based on the negative bias temperature instability (NBTI) the results will be correlated with theoretical models. Breakdown measurements of HfO₂ and HfSixO will be discussed with respect to poly and metal gates, as well High-k on alternate substrates like Ge substrate.



Speaker: Dr. Durga Misra is a Professor in the Department of Electrical and Computer Engineering of New Jersey Institute of Technology (NJIT). He received his M.S. and Ph.D. degrees both in Electrical Engineering from University of Waterloo, Waterloo, Canada in 1985 and 1988 respectively. He has been a faculty member since the fall of 1988 at NJIT. His current research focus is study of nanoscale CMOS gate stacks. He received several research awards from the National Science Foundation and Industry. In 1997 he worked at the VLSI Research Department at Bell Laboratories of Lucent Technologies. He received IEEE Regional Activities Board's International Leadership Award and is currently a Distinguished Lecturer of Electron Device Society of IEEE. He has organized many International Symposiums on Solid-State Science and Technology field during the Technical Meetings of the Electrochemical Society and IEEE. He served as the Chairman of North Jersey Section of IEEE during 2003 and 2004. Currently he serves as the EDS-SRC Chair for Regions 1-3 & 7 of IEEE. He is also a Fellow of the Electrochemical Society.

Info: EDS Chair Bonnie Gray bgray@sfu.ca

Circuits and Systems

Fast, Efficient & Practical Algorithms for Compressed Sensing

Dr. Trac D. Tran
The Johns Hopkins University
Thursday 22 May - 3:00 pm to 4:00 pm
Room 10041, Building ASSC-1
Simon Fraser University, Burnaby
Webcast information
http://www.ensc.sfu.ca/~jiel/ieee/2008_Trان.html

In the conventional uniform sampling framework, the Shannon/Nyquist theorem tells us to sample a signal at a rate at least two times faster than its bandwidth for the original signal to be perfectly reconstructed from its samples. Recently, compressed sensing has emerged as a revolutionary signal sampling paradigm which shows that Shannon theorem is indeed overly pessimistic for signals with a high degree of sparsity or compressibility. The compressed sensing framework demonstrates that a small number of random linear projections, called measurements, contains sufficient information for signal reconstruction, even exactly. The two key components of compressed sensing are: (i) the sensing matrix at the encoder must be highly incoherent with the sparsifying signal transformation; and (ii) sophisticated non-linear algorithms such as basis pursuit or orthogonal matching pursuit are employed at the decoder to recover the sparsest signal from the received measurements.

The first part of this talk gives an overview of the new compressed sensing framework along with the most elegant breakthrough results in the field. The second part focuses on two recent compressed sensing discoveries from the JHU Digital Signal Processing Lab. Particularly, a fast and efficient sampling algorithm for compressed sensing based on structurally random matrices will be presented. Our proposed sampling scheme provides several crucial features for practical implementation: fast computable, memory efficient, streaming capable, and hardware friendly while retaining comparable theoretical performance bounds with current state-of-the-art techniques. Secondly, at the decoder side, we present a novel iterative reconstruction algorithm for compressed sensing called Generalized Orthogonal Matching Pursuit (GOMP) that can adaptively, at each iteration step, admit new atoms to join the current selected set from a small candidate set while discard from the selected set atoms that might be highly regarded in previous steps. Simulation re-

sults show that GOMP's performance far exceeds the best existing iterative algorithms with reasonable complexity overhead. Finally, future research directions in compressed sensing are also discussed if time permits.

Speaker: Trac D. Tran received the B.S. and M.S. degrees from the Massachusetts Institute of Technology, Cambridge, in 1993 and 1994, respectively, and the Ph.D. degree from the University of Wisconsin, Madison, in 1998, all in Electrical Engineering. In July of 1998, Dr. Tran joined the Department of Electrical and Computer Engineering, The Johns Hopkins University, Baltimore, MD, where he currently holds the rank of Associate Professor. His research interests are in the field of digital signal processing, particularly in sampling, multi-rate systems, filter banks, transforms, wavelets, and their applications in signal analysis, compression, processing, and communications. He was the co-director (with Prof. J. L. Prince) of the 33rd Annual Conference on Information Sciences and Systems (CISS'99), Baltimore, MD, in March 1999. In the summer of 2002, he was an ASEE/ONR Summer Faculty Research Fellow at the Naval Air Warfare Center - Weapons Division (NAWCWD) at China Lake, California. He has served as Associate Editor of the IEEE Transactions on Signal Processing as well as IEEE Transactions on Image Processing. He currently serves as a member of the IEEE Technical Committee on Signal Processing Theory & Methods. Dr. Tran received the NSF CAREER award in 2001 and the William H. Huggins Excellence in Teaching Award from Johns Hopkins University in 2007. **Sponsor:** IEEE Circuits and Systems Society Joint Chapter of the Vancouver/Victoria Sections **Info:** CAS Chair Ljiljana Trajkovic - ljilja@cs.sfu.ca



Joint Communications

Radio Navigation Systems

Peter Bennett
TRIUMF
Wednesday 14 May 7-9pm
BCIT SW1-1025

This presentation will discuss Radio Aids to Navigation, for both Marine and Air applications, from the original non-directional beacons initially installed in the early 1920s through to the present-day Loran-C and GPS systems. Some systems developed during World War II which may be considered as ancestors of Loran-C will also be discussed. Peter has been employed as an electronic technologist at TRIUMF since 1982. He is an active boater and has been involved with Canadian Power and Sail Squadrons since 1968. He currently teaches the Marine Radio Operator and Electronic Navigation courses for Vancouver Power Squadron.



Speaker: Attended BCIT in its first year of operation (1964/65) taking the Broadcast Technical course, and worked as a TV maintenance technician for both BCTV and CBC Vancouver before joining TRIUMF in 1982. Holds an Amateur Radio Advanced license, VE7CEI.) **Info:** Joint ComSoc Chair Alon Newton anewton.ieee@gmail.com

sults show that GOMP's performance far exceeds the best existing iterative algorithms with reasonable complexity overhead. Finally, future research directions in compressed sensing are also discussed if time permits.

Speaker: Trac D. Tran received the B.S. and M.S. degrees from the Massachusetts Institute of Technology, Cambridge, in 1993 and 1994, respectively, and the Ph.D. degree from the University of Wisconsin, Madison, in 1998, all in Electrical Engineering. In July of 1998, Dr. Tran joined the Department of Electrical and Computer Engineering, The Johns Hopkins University, Baltimore, MD, where he currently holds the rank of Associate Professor. His research interests are in the field of digital signal processing, particularly in sampling, multi-rate systems, filter banks, transforms, wavelets, and their applications in signal analysis, compression, processing, and communications. He was the co-director (with Prof. J. L. Prince) of the 33rd Annual Conference on Information Sciences and Systems (CISS'99), Baltimore, MD, in March 1999. In the summer of 2002, he was an ASEE/ONR Summer Faculty Research Fellow at the Naval Air Warfare Center - Weapons Division (NAWCWD) at China Lake, California. He has served as Associate Editor of the IEEE Transactions on Signal Processing as well as IEEE Transactions on Image Processing. He currently serves as a member of the IEEE Technical Committee on Signal Processing Theory & Methods. Dr. Tran received the NSF CAREER award in 2001 and the William H. Huggins Excellence in Teaching Award from Johns Hopkins University in 2007. **Sponsor:** IEEE Circuits and Systems Society Joint Chapter of the Vancouver/Victoria Sections **Info:** CAS Chair Ljiljana Trajkovic - ljilja@cs.sfu.ca

Signal Processing

From Image Analysis to Content Extraction: Are We There Yet?

Prof. Tsuhan Chen
Carnegie Mellon

SPS Distinguished Lecturer

Thursday 08 May - 2:00pm to 3:00pm
Room KAIS 2020, Fred Kaiser Building
2332 Main Mall, University of British Columbia

Traditionally, image processing is considered low-level processing. In the past decade, image processing has grown to become an area where a variety of tools are created to solve high-level problems that conventionally would be studied exclusively by computer vision or machine learning researchers. For example, multi-resolution analysis inspired popular image features like SIFT (scale-invariant feature transform), and statistical analysis gave birth to graphical models including HMM (hidden Markov models) and topic models. In this talk, we will use one application to illustrate this trend, object discovery, i.e., extracting the "object of interest" from a set of images in a completely unsupervised manner. Based on image features like SIFT, and the topic models, we will outline our approach to object discovery and apply it to both still images and motion videos. We will propose a novel spatial-temporal framework that applies statistical models to both appearance modeling and motion modeling. The spatial and temporal models are integrated so that motion ambiguities can be resolved by appearance, and appearance ambiguities can be resolved by motion. In addition, we will show how hierarchical relationships among objects can be extracted completely from images without any manual labeling.



Speaker: Tsuhan Chen has been with the Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, Pennsylvania, since October 1997, where he is currently a Professor and Associate Department Head. From August 1993 to October 1997, he worked at AT&T Bell Laboratories, Holmdel, New Jersey. He received the M.S. and Ph.D. degrees in electrical engineering from the California Institute of Technology, Pasadena, California, in 1990 and 1993, respectively. He received the B.S. degree in electrical engineering from the National Taiwan University in 1987. Tsuhan served as the Editor-in-Chief for IEEE Transactions on Multimedia in 2002-2004. He also served in the Editorial Board of IEEE Signal Processing Magazine and as Associate Editor for IEEE Trans. on Circuits and Systems for Video Technology, IEEE Trans. on Image Processing, IEEE Trans. on Signal Processing, and IEEE Trans. on Multimedia. He co-edited a book titled Multimedia Systems, Standards, and Networks. Tsuhan received the Charles Wilts Prize at the California Institute of Technology in 1993. He was a recipient of the National Science Foundation CAREER Award, from 2000 to 2003. He received the Benjamin Richard Teare

Teaching Award at the Carnegie Mellon University in 2006. He is elected to the Board of Governors, IEEE Signal Processing Society, 2007-2009. He is a member of the Phi Tau Phi Scholastic Honor Society. He is Fellow of IEEE, and a 2007-08 Distinguished Lecturer of Signal Processing Society. **Info:** SPS Chair Z. Jane Wang zjanew@ece.ubc.ca

Circuits and Systems

Digital Signal Processing: Road to the Future

Dr. Sanjit K. Mitra
UCLA

Thursday 15 May 15 3:00 pm to 4:00 pm

Room 10041, Building ASSC-1
Simon Fraser University, Burnaby
Webcast information
http://www.ensc.sfu.ca/~jiel/ieee/008_Mitra.html

The field of digital signal processing (DSP) has been a very active area of research and application for more than 4 decades. This broad development has paralleled in time the rapid development of high-speed electronic digital computers, microelectronics, and integrated circuit fabrication technologies. An ever-increasing assortment of integrated circuits specifically tailored to perform common DSP functions is available to the design engineer as system building blocks or parts-in-trade. DSP methodologies have been applied to consumer electronics, communications, automotive electronics, instrumentation, medical electronics, tomography and acoustic imaging, cartography, seismology, speech recognition, robotics etc. In this talk we first provide a brief overview of the initial developments in DSP, followed by a review of some of the important advances made during the forty year period of its growth, and describe a number of key applications. We conclude with a speculation on the future trends and directions.



Speaker: Sanjit K. Mitra is the Stephen and Etta Varra Professor of Engineering in the Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles. Dr. Mitra has served IEEE in various capacities including service as the President of the IEEE Circuits & Systems Society in 1986. Dr. Mitra is the recipient of the 1989 Education Award, and the 2000 Mac Van Valkenburg Society Award of the IEEE Circuits & Systems Society, the 1996 Technical Achievement Award, the 2001 Society Award and the 2006 Education Award of the IEEE Signal Processing Society, the IEEE Millennium Medal in 2000, the McGraw-Hill/Jacob Millman Award of the IEEE Education Society in 2001, the 2002 Technical Achievement Award of the European Association for Signal Processing (EURASIP), the 2005 SPIE Technology Achievement Award of the International Society for Optical Engineers, the University Medal of the Slovak Technical University, Bratislava, Slovakia in 2005, and the 2006 IEEE James H. Mulligan, Jr. Education Medal. He has been awarded Honorary Doctorate degrees from the Tampere University of Technology, Finland, the Technical University of Bucharest, Romania, and the Technical University of Iasi, Romania. He is a member of the U.S. National Academy of En-

gineering, a member of the Norwegian Academy of Technological Sciences, an Academician of the Academy of Finland, a corresponding member of the Croatian Academy of Sciences and Arts, corresponding member of the Academy of Engineering, Mexico, and a Foreign Fellow of the National Academy of Sciences, India and the Indian National Academy of Engineering. **Sponsors:** IEEE Circuits and Systems Society Joint Chapter of the Vancouver/Victoria Sections **Info:** CAS Chair Ljiljana Trajkovic - ljilja@cs.sfu.ca

Solid State Circuits

Analog/RF Circuits for Wideband Communications

Ramesh Harjani
University of Minnesota

Friday 25 April - 400pm
2020 Kaiser Bldg, UBC, Vancouver Campus

The analog/RF front-ends for wired and wireless communication systems continue to set the overall performance of such systems. In particular, wireless solutions require high performance designs in compact form factors and low power consumption, while wired communication systems continue to push the speed envelope. In this talk, we will provide an overview of some of the analog/RF circuit designs developed at the University of Minnesota. In particular, we describe some recent developments in circuits for power efficient UWB communications, high speed I/O and power control. The talk will provide an overview of both recent and ongoing research results.



Speaker: Ramesh Harjani is a Professor in the Department of Electrical & Computer Engineering at the University of Minnesota and a Fellow of the IEEE. He received his Ph.D. in Electrical Engineering from Carnegie Mellon University in 1989. He co-founded Bermaj, Inc, a startup company developing CMOS chips for wireless multi-media applications in 2001. His research interests include analog/RF circuits for wired and wireless communication systems. Dr. Harjani received Best Paper Awards at the 1987 DAC, the 1998 GOMAC, the 2007 TECHCON, and the "Best of ICCAD" in 2002. His research group was the 1st prize winner of the SRC Design Challenge in 2000, 2003 and 2nd prize in 2008. He was an Associate Editor for IEEE Transactions on Circuits and Systems II in 1995, Guest Editors for the International Journal of High-Speed Electronics and Systems and for Analog Integrated Circuits and Signal Processing in 2004. He was the Chair of the IEEE Circuits and Systems Society technical committee on Analog Signal Processing from 1999 to 2000 and a Distinguished Lecturer of the IEEE Circuits and Systems Society from 2001 to 2002.

Info: SCS Chair Res Saleh res@ece.ubc.ca

Power Engineering

500 kV Series Capacitor & a Shunt Reactor Protection Applications in BC Hydro/BCTC System

Frank Plumptre and Meliha Selak
BC Hydro
Wednesday 07 May Noon-1:30 pm
BC Hydro Aud'm, 2nd Flr 333 Dunsmuir, Van

From the first installation in 1928 to the present, series capacitors have formed an important component of the AC power transmission system. Series capacitors are applied where ever there is a benefit in reducing the series impedance of the power system. Typical applications include improvement of load division in transmission lines, reduction of series impedances in HV and EHV transmission lines to improve stability margins and reduction of system losses.

The reactor as a component of the power system is used to compensate for the capacitive reactance of transmission lines and cables. This capacitance produces VAR result in high voltages. The reactor is connected usually in shunt with power system and used as shunt inductive compensation. So, the main task of shunt compensation is voltage regulation. This presentation will focus on the protection planning aspects of these installations, and the role protection takes assuring the specified performance of such important elements in power system.

Speakers: Frank Plumptre (BC Hydro) graduated from the University of Calgary with a B. Sc. in Electrical Engineering in 1975. He has over 30 years experience in the field of protective relaying and is presently a Specialist Engineer with B C Hydro. For the past approximately 20 years he has been responsible for the protection planning for the refurbishment of existing series capacitor banks, as well as new and forthcoming projects. On behalf of B C Hydro, he has also provided consulting services on several international series compensation projects. In addition to work on series compensation projects, Frank Plumptre has been one of the main architects of B C Hydro's 500 kV line protection replacement program. He is also, a key technical resource on Independent Power Producer interconnections. He is a member of the IEEE Power System Relay Committee (PSRC) and is active in several working groups. He is past chair of a working group that recently produced an IEEE guide "Protective Relay Application to Transmission-Line Series Capacitor Banks", and past chair of the Awards and Recognition Committee of the PSRC. He has written numerous documents and technical papers associated on the subjects indicated for the B C Hydro organization, IEEE and CIGRE.

Meliha B. Selak is a Specialist Engineer in Electrical Power Systems with BC Hydro. She has an Electrical Engineering degree from the University of Sarajevo and has over 30 years of experience in various aspects of power systems engineering

AGM

Hilton Metrotown
6083 McKay Avenue, Burnaby
Crystal ballroom
Monday 12 May 2008 6:00 pm



Member or member's partner \$30
Non member \$40
Students, life members, execs \$15
Student non member \$20
To register contact
Eugen Trandafir at AGM2008@telus.net
or 604-422-4055 (day) or 604-839-5705

You can buy tickets and pay with
PayPal at the website
<http://www.ieee.ca/vancouver>

including utility protection, research & development, project management and consulting on international projects.



Prior to joining BC Hydro in 2000, Meliha worked as a research engineer in the Power System Group at the University of British Columbia on Real-Time Power System Simulator in connection with EMTP. Her technical activities include power system protection and control applications, power system analysis, evaluations and interconnection studies for the various plants connecting to the power system, as well as development of protection guidelines. She authored and co-authored several technical papers and she is also a paper reviewer. She is a Registered Professional Engineer in the Province of British Columbia and is a Senior Member of IEEE. Under her leadership, PES Vancouver won a prestigious award of IEEE Power Engineering Society "2006 Outstanding Large Chapter".

Info: For more information on upcoming events for the Vancouver Chapter of the IEEE PES, please visit our web page <http://ewh.ieee.org/reg/7/vancouver/powereng/> or contact the PES Chair, Meliha Selak, by e-mail at meliha.selak@bchydro.com or Glen Tang at glen.tang@powerex.com

CALL FOR IEEE VOLUNTEERS Vancouver Section Executive 2008/2009

The IEEE Vancouver Section is seeking volunteers to take on a leadership role in helping to deliver high quality technical programs to our members.

We seek volunteer Chairs for these societies:

- Aerospace & Geoscience Remote Sensing
- Industry Applications
- Engineering Management.

The main requirements of IEEE volunteer leaders are willingness to help the technical development of their peers, and membership in the IEEE technical society that they volunteer for.

Volunteers are also needed in the following appointed positions:

- Advertising Committee Chair
- Membership Committee Chair
- Life Members Affinity Group.

CONTACT INFORMATION Please contact Jose R. Marti by telephone at 604-822-2364 or by email at jrms@ece.ubc.ca

You are all invited to IEEE Vancouver Control Systems Annual Social event LUNCH AT

KiKu Sushi

Saturday 26 April - Noon

4900 Kingsway (604-434-6020)
Intersection of Nelson and Kingsway



I hope you will be able to join us. Please let me know via email if you plan to attend so I can reserve the right number of seats (though, if you don't register, please still feel free to come... I am sure we will be able to accommodate)

Bryan Bell IEEE CSS Vancouver Chair
604 528-1562 (w) 604 931-0727 (h)
bbell@ieee.org

2008 UBC IEEE Project Fair - A HUGE Success

by Edgar Cave, Zanyar Sigarchy and Shima Khayam

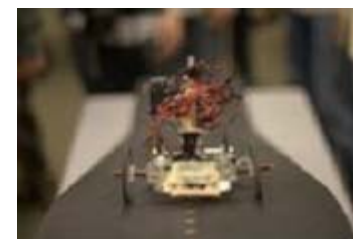


Once again UBC IEEE's annual Project Fair was a smashing success! This annual fair presented a great opportunity for students to showcase their projects, learn vital presentation skills and compete with their peers in winning substantial monetary prizes. With twelve senior level teams and four junior level teams, there was a great variety of talent to be seen. The teams presenting had only five minutes to demonstrate and another five minutes to discuss before the judges made their call, leaving very little room for error. With the judging based on 40% Presentation and 60% Demonstration, the final decision was not easy.

The judges were highly impressed with the progress the junior teams had made in only 8 months of pure electrical engineering. "I am amazed at how far the second year students in the PIP program have come in such a short time" commented Daniel Georges, SAP Business Objects, after seeing the four different Project Integrated Program (PIP) Electromagnetic Guided Rover Designs. Georges, as well as other judges, was impressed by how far the second year PIP students have come in their understanding of micro circuits and electronics design. Dr. Edmund Cretu, a UBC professor, later commented that "it was hard to make the final choices; there were so many young students with inspiring ideas." Some of the key considerations for the judges were the implementation, innovation, marketability, and general presentation of the design, creating a broad basis for judging.

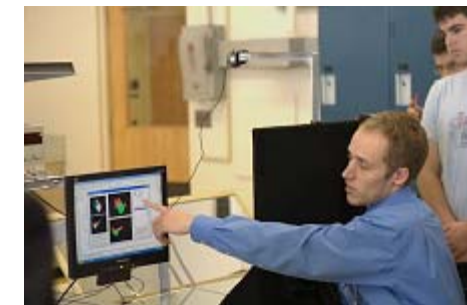
After the all the teams displayed their creative ideas, the final winners were determined. There were prize levels in the Senior Level and two in the Junior Level. In the Senior Level Projects the winners were, in first place dScribe Your Finance, by AJ Moss, Andrew Wong, Clive Lau, Michelle Dong, and Yuanuan Yin. The dScribe system consists of an optional digital card that records receipts for all

point of sale transactions. The transactions could then be viewed via an online database where they are grouped into different categories in a pie graph for analysis. The runners up were the ASL Scholar - Finger Spelling, by Ben Kerby, Darin Savage, Safinaaz Rawji, and S i n h a n o o k Fernando. The ASL Scholar- Finger Spelling system reads hand positions, using image processing, and teaches and tests a user their American Sign Language Alphabets in a user-friendly language learning environment. Finally, an honorable mention was presented to The Marlin Blue, by Brad McKenzie. The design was an implementation of a low-cost embedded microprocessor board designed with its own onboard wireless transceivers which allows communication between multiple boards. The isolated design gives an inspiring idea for a "drop-in" type microprocessor for a variety of applications. Other project on display in the Senior level were The Ultrafast Mechanical Shutters for Laser Cooling Applications, a cost efficient design using Apple iPod™ hard drives; The Touch-Screen Controlled RC car, a biometric driver authentication system using facial recognition; The Automated Warehouse management System, a programmed RC forklift with stack command abilities; The 2-Way Vehicle Monitoring System, an Automated cellular phone messaging design for automotive emergency alerts; The Lightcursor, a 3D human computer interaction platform using a handheld photosensitive gun for video game applications; The Formal Verification of Robotic Systems Under Shared Control, a linear velocity measurement sys-



tem for collision avoidance; and The Infrared 3D Tracking Using WiiRemote Controller, a potential three dimensional window manager system.

The Junior category was open to first and second year students. Four PIP teams participated in the competition. The winning project was the Sonic Piezo Tomography Design, by Keven Chen, Scott Chris, Bruce Haines, Carl Yang, Mark Zukowski. The Design had 15 piezo buzzers, with 14 broadcasting sound and 1 collecting reverse vibrations. The reverse sound waves were then processed via Matlab to create an image of an object placed in the



center. The runner up in the Junior category was The Magnetic Car (Group 2), by Andy Tsai, Felix Poon, Paul Chiu, Peter Laufernicki, Qian Ma, and William Yan. The robotic car was designed in the PIP program to follow magnets on a ramp as efficiently as possible, using energy regeneration. Their regeneration design was powered by a set of 2.5-5.4F capacitors charged from on board batteries.

The competition was a friendly yet fierce one. Some teams had spent the last year and others the last semester designing and building their final projects. With so many wonderful and innovative projects in competition, the judges had their hands full. The UBC IEEE Student branch would like to send out a special thank you to all the sponsors and volunteer judges who enabled UBC students in participating in yet another successful annual IEEE student branch project fair. This event of course could not have happened without the generous support of many contributing sponsors; Platinum: Omicron Total Building Solutions, IEEE Vancouver Section, and Electrical and Computer Engineering Department; Gold: Zeugma Systems and SAP Business Objects; Silver: PMC Sierra. The UBC IEEE Student branch would like to send out a special thank you to all the sponsors that enabled UBC students to participate and for the project fair to continue.

If you would like to be involved or sponsor next year's student project fair, please contact the UBC IEEE Student Branch by: Phone: (604)822-5190, UBC McNaughton Center Office Email: ieee@ece.ubc.ca