Naveen Verma

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RESEARCH

1. Integrated circuit design with advanced and emerging technologies
   - Thin-film circuits and devices for large-scale sensing systems
   - Circuits for data-acquisition, power conversion, and communication.

2. Circuits and systems for advanced biomedical devices
   - Applied machine-learning for physiological signal analysis
   - Specialized processor architectures and hardware implementations

EDUCATION

09/05-06/09	**Massachusetts Institute of Technology** **Ph.D. - Electrical Engineering**	**Cambridge, MA**
09/03-06/05	**Massachusetts Institute of Technology** **M.Sc. - Electrical Engineering**	**Cambridge, MA**
09/98-06/03	**University of British Columbia** **B.A.Sc. – Computer Engineering**	**Vancouver, BC**

ACADEMIC AND TEACHING APPOINTMENTS

07/09-	**Princeton University** **Assistant Professor of Electrical Engineering**	**Princeton, NJ**
09/03-06/09	**Massachusetts Institute of Technology** **Graduate Student Research Assistant**	**Cambridge, MA**
09/08-12/08	**Massachusetts Institute of Technology** **Teaching Assistant** EECS 6.341 – Digital Signal Processing	**Cambridge, MA**

INDUSTRY POSITIONS

06/05-09/05	**Analog Devices** **Precision Nyquist Converter Design Intern**	**Wilmington, MA**

- Developed fast INL estimation methodology for high-resolution (16/18b) calibrating Nyquist ADC's that achieved ~30x speed up
- Worked with test engineers to map estimation algorithms to physical production tests

01/02-09/02	**NetLogic Microsystems** **High-Speed Integrated Circuit Design Intern**	**Mountain View, CA**

- Designed circuit-level structures for 1Gb/s, source-synchronous HSTL IO transceivers
- Designed control circuitry for dynamic impedance matching of 500Mb/s output buffers

05/01-08/01	**AcceLight Networks** **ASIC/FPGA Design Engineering Intern**	**Ottawa, ON**

- Designed high-speed mesochronous I/F and internal protocols for inter-ASIC signaling

05/00-12/00	**Nortel Networks** **ASIC Design and Verification Engineering Intern**	**Ottawa, ON**

- Developed VHDL behavioral models of plesiochronous ASIC's and ASIC emulators for system verification of high-bandwidth core network router

AWARDS AND DISTINCTIONS

2012
- Alfred Rheinstein Faculty Award – Princeton School of Eng. and App. Science
- Innovation Forum, 1st Prize – Princeton University

2008
- Jack Kilby Outstanding Student Paper Award – Int. Solid-State Circuits Conf.
- Intel Foundation Ph.D. Fellowship Program Award (2008-2006) – Intel
- NSERC Postgraduate Fellowship (2008-2006) – NSERC

2006
- DAC/ISSCC Student Design Contest Winner – DAC/ISSCC

2003
- Association of Professional Engineers Achievement Award – APEGBC
- Undergraduate Scholar Award (2003-2001) – UBC

2002
- PMC-Sierra Founders Award - UBC
- Charles and Jane Banks Major Scholarship – UBC

2000
- Charles Lindsay Thompson Major Scholarship - UBC
- MMZ Kharadly Student Project Prize in Electrical Engineering - UBC
- Outstanding Student Initiative Scholarship (2000-1998) - UBC

1999
- Roger's Communications Engineering Award - UBC

1998
- David Crombie Major Entrance Scholarship - UBC

SERVICE ROLES

- Technical Committee, Design and Implementation of Signal Processing Systems, IEEE Signal Processing Society.
- Editorial board, Journal of Low-power Electronics and Applications.
- Guest Editor, IEEE Journal on Emerging and Selected Topics in Circuits and Systems.
- Reviewer for IEEE Journal of Solid-state Circuits, IEEE Trans. VLSI Systems, IEEE Tran. Circuits and Systems, and IEEE Tran. Biomedical Engineering.

PUBLICATIONS

Conference:
- K. H. Lee and N. Verma, "A 1.2-0.55V General-purpose Biomedical Processor with Configurable Machine-learning Accelerators for High-order, Patient-adaptive Monitoring," to appear *ESSCIRC*, Sept 2012.
- S. Mohammed, N. K. Jha, and N. Verma, "A Compressed-domain Processor for Seizure Detection to Simultaneously Reduce Computation and Communication Energy," to appear *Custom Integrated Circuits Conf.*, Sept. 2012.
- Y. Hu, W. Rieutort-Louis, L. Huang, J. Sanz-Robinson, S. Wagner, J. Sturm, and N. Verma, "Flexible Solar-Energy Harvesting System on Plastic with Thin-film LC Oscillators Operating Above f_t for Inductively-coupled Power Delivery," to appear *Custom Integrated Circuits Conf.*, Sept. 2012.
- J. Sanz-Robinson, W. Rieutort-Louis, N. Verma, S. Wagner, and J. Sturm, "Frequency Dependence of Amorphous Silicon Schottky Diodes for Large-Area Rectification Applications" *Device Research Conf.*, June 2012.
- W. Rieutort-Louis, L. Huang, Y. Hu, J. Sanz-Robinson, S. Wagner, J. Sturm, and N. Verma, "Figure of Merit for Oscillator-based Thin-film Circuits on Plastic for High-performance signaling, Energy Harvesting and Driving of Actuation Circuits," *Device Research Conf.*, June 2012.
- Y. Hu, W. Rieutort-Louis, J. Sanz-Robinson, K. Song, J. Sturm, S. Wagner, and N. Verma, "High-resolution Sensing Sheet for Structural-health Monitoring via Scalable Interfacing of Flexible Electronics with High-performance ICs," *VLSI Symp. Circuits,* June 2012.
- L. Huang, W. Rieutort-Louis, Y. Hu, J. Sanz-Robinson, S. Wagner, J. Sturm, and N. Verma, "Integrated All-silicon Thin-film Power Electronics on Flexible Sheets For Ubiquitous Wireless Charging Stations based on Solar-energy Harvesting, "*VLSI Symp. Circuits,* June 2012.
- W. Rieutort-Louis, J. Sanz-Robinson, J. C. Sturm, S. Wagner, and N. Verma, "Thin-film Transistors and Circuit-design Styles for Scalable Control and Access Functionality over Sensor Arrays on Plastic," *Materials Research Society Meeting*, April 2012.
- J. Sanz-Robinson, W. Rieutort-Louis, N. Verma, S. Wagner, and J. C. Sturm, "A Full-wave Bridge Rectifier Based on Thin-film Amorphous-silicon Schottky Diodes for Wireless Power and Signal Transfer in Systems-on-plastic," *Materials Research Society Meeting*, April 2012.
- T. Moy, Y. Wong, C. Galaiya, S. Archibald, B. Pesaran, N. Verma, and S. Wagner, "Flexible Microelectrode Arrays with Dural Regeneration for Chronic Neural Recording," *Materials Research Society Meeting*, April 2012.

- N. Verma, K. H. Lee, K. Jang, and A. Shoeb, "Enabling System-level Platform Resilience Through Embedded Data-driven Inference Capabilities in electronic Devices," *IEEE Int. Conf. on Acoustics, Speech and Signal Processing,* March 2012. (invited)
- S. Mohammed, N. K. Jha, and N. Verma, "Enabling Advanced Inference on Sensor Nodes Through Direct Use of Compressively-sensed Signals," *Design Automation and Test in Europe,* March 2012.
- B. Glisic and N. Verma, "Sensing sheet for SHM based on Large Area Electronics," *5th Int. Conf. Structural Health Monitoring of Intelligent Infrastructure*, Dec. 2011.
- B. Glisic and N. Verma, "Very dense arrays of sensors for SHM based on Large Area Electronics," *8th Int. Workshop on Structural Health Monitoring*, Sept. 2011.
- S. Mohammed, N. K. Jha, N. Verma, "Sub-threshold Computational Circuits for High-order Data-driven Analysis of Physiological Signals" *IEEE Subthreshold Microelectronics Conference*, Sept. 2011.
- K. H. Lee, K. Jang, A. Shoeb, and N. Verma, "A Data-driven Modeling Approach to Stochastic Computation for Low-energy Biomedical Devices," *IEEE Annual Int. Conf. EMBS, Boston*, MA, Aug. 2011.
- K. Jang, G. Balakrishnan, Z. Syed, and N. Verma, "Scalable Customization of Atrial Fibrillation Detection in Cardiac Monitoring Devices: Increasing Detection Accuracy through Personalized Monitoring in Large Patient Populations," *IEEE Annual Int. Conf. EMBS, Boston*, MA, Aug. 2011.
- S. Mohammed, N. Jha, and N. Verma, "A Low-Energy Computation Platform for Data-Driven Biomedical Monitoring Algorithms", *Design Automation Conference*, San Diego, CA, June, 2011.
- K. H. Lee, S.-Y. Kung, and N. Verma, "Improving Kernel-Energy Trade-offs for Machine Learning in Implantable and Wearable Biomedical Applications," *IEEE Int. Conf. Acoustics, Speech and Signal Processing*, Prague, Czech Republic, May, 2011.
- A. Miller, .., and N. Verma, "Microelectrode Arrays Employing Collagen for Improved Neuronal Recording," *Materials Research Society Meeting*, San Francisco, CA, April, 2011.
- N. Verma, "Intelligent Patient Monitoring: the sensing and computation challenges for low-power electronics," *CMOS Emerging Technologies*, Whistler, Canada, May, 2010.
- M.E. Sinangil, N. Verma, and A. Chandrakasan, "A 45nm 0.5V 8T Column-Interleaved SRAM with on-Chip Reference Selection Loop for Sense-Amplifier," *Asian Solid –State Circuits Conference*, Taipei, Taiwan, Nov. 2009.
- N. Verma, A. Shoeb, J. Guttag, and A. Chandrakasan, "A Micro-power EEG Acquisition SoC with Integrated Seizure Detection Processor for Continuous Patient Monitoring," *VLSI Symp. on Circuits*, Kyoto, Japan, June 2009.
- M.E. Sinangil, N. Verma, and A. Chandrakasan, "A Reconfigurable 65nm SRAM Achieving Voltage Scalability from 0.25-1.2V and Performance Scalability from 20kHz-200MHz," *European Solid –State Circuits Conference*, Edinburgh, Scotland, Sept. 2008.
- N. Verma, D. Daly, N. Ickes, J. Kwong, B. Ginsburg, Y. Ramadass, V. Sze, and A. Chandrakasan, "Low-Voltage System Design for Highly Energy-Constrained Applications," to be presented at *Faible Tension Faible Consommation (FTFC)*, Louvain-la-Neuve, Belgium, May 2008.
- N. Verma and A. P. Chandrakasan, "A High-Density 45nm SRAM Using Small-Signal Non-Strobed Regenerative Sensing," *IEEE ISSCC Dig. Tech. Papers*, San Francisco, CA, Feb. 2008.
- A. Wang, B. H. Calhoun, N. Verma, J. Kwong, and A. Chandrakasan, "Ultra-Dynamic Voltage Scaling for Energy Starved Electronics," *Proc. of GOMAC Tech*, March 2007.
- J. Kwong, Y. Ramadass, N. Verma, M. Koesler, K. Huber, H. Moormann, and A. Chandrakasan, "A 65nm Sub-V_t Microcontroller with Integrated SRAM and Switch Capacitor DC-DC Converter," *IEEE ISSCC Dig. Tech. Papers*, San Francisco, CA, Feb. 2008.
- N. Verma and A. P. Chandrakasan, "A 65nm 8T Sub-V_t SRAM Employing Sense-Amplifier Redundancy," *IEEE ISSCC Dig. Tech. Papers*, San Francisco, CA, Feb. 2007.
- B. H. Calhoun, A. Wang, N. Verma, and A. P. Chandrakasan, "Sub-threshold Design: The Challenges of Minimizing Circuit Energy," *IEEE ISLPED Dig. Tech. Papers*, Tegernsee, Germany, pp. 366-368, Oct. 2006.
- A. P. Chandrakasan, N. Verma, J. Kwong, D. Daly, N. Ickes, D. Finchelstein, and B. H. Calhoun, "Micropower Wireless Sensors," *NSTI Nanotech*, vol. 3, pages 459-462, May 7-11, 2006.
- N. Verma and A. P. Chandrakasan, "A 25μW 100kS/s 12b ADC for Wireless Micro-Sensor Applications," *IEEE ISSCC Dig. Tech. Papers*, San Francisco, CA, Feb. 2006.

Journal/Article:

- K. H. Lee, S.-Y. Kung, N. Verma, "Low-energy Formulations of Support Vector Machine Kernel Functions for Biomedical Sensor Applications" *J. Signal Processing Systems,* April 2012 (online).
- M. Mannoor, H. Tao, J. Clayton, A. Sengupta, D. Kaplan, R. Naik, N. Verma, F. Omenetto, M. McAlpine, "Graphene-based wireless bacteria detection on tooth enamel," *Nature. Comm.*, March 2012.

- N. Verma, K. H. Lee, A. Shoeb, "Data-driven Approaches for Computation in Intelligent Biomedical Devices: A Case Study of EEG Monitoring for Chronic Seizure Detection," *Journal of Low Power Electronics and Applications*, April 2011.
- N. Verma, "Analysis Towards Minimization of Total SRAM Energy Over Active and Idle Operating Modes," *IEEE Tran. VLSI Systems*, Dec. 2010 (online), Sept. 2011 (in print).
- N. Verma, A. Shoeb, J. Bohorquez, J. Dawson, J. Guttag, A. P. Chandrakasan, "A Micro-Power EEG Acquisition SoC With Integrated Feature Extraction Processor for a Chronic Seizure Detection System," *IEEE Journal of Solid-State Circuits*, April 2010.
- A.P. Chandrakasan, D.C. Daly, D.F. Finchelstein, J. Kwong, Y.K. Ramadass, M.E. Sinangil, V. Sze, N. Verma, "Technologies for Ultra-Dynamic Voltage Scaling," *Proceedings of the IEEE*, Feb. 2010.
- M.E. Sinangil, N. Verma, A.P. Chandrakasan, "A Reconfigurable Ultra-Dynamic Voltage Scalable (U-DVS) SRAM in 65nm", *IEEE J. Solid-State Circuits*, Nov. 2009.
- N. Verma, and A. P. Chandrakasan, "A High-Density 45nm SRAM Using Small-Signal Non-Strobed Regenerative Sensing," *IEEE J. Solid-State Circuits, ISSCC Special Issue,* Jan. 2009.
- J. Kwong, Y. Ramadass, N. Verma, and A. Chandrakasan, "A 65nm Sub-V_t Microcontroller with Integrated SRAM and Switch Capacitor DC-DC Converter," *IEEE J. Solid-State Circuits, ISSCC Special Issue,* Jan 2009.
- A.P. Chandrakasan, N. Verma, and D. Daly, "Ultra Low Power Electronics for Biomedical Applications," to appear in *Annual Review of Biomedical Engineering*, Aug. 2008.
- N. Verma and A. P. Chandrakasan, "A 65nm 8T Sub-V_t SRAM Employing Sense-Amplifier Redundancy," *IEEE J. Solid-State Circuits, ISSCC Special Issue*, Jan. 2008.
- N. Verma, J. Kwong and A. P. Chandrakasan, "Nanometer MOSFET Variation in Minimum Energy Sub-Threshold Circuits," *IEEE Trans. Elect. Devices*, Jan. 2008.
- N. Verma and A. P. Chandrakasan, "An Ultra Low Energy 12-bit Rate-Resolution Scalable SAR ADC for Wireless Sensor Nodes," *IEEE J. Solid-State Circuits*, June 2007.
- B. H. Calhoun, D. C. Daly, N. Verma, D. F. Finchelstein, D. D. Wentzloff, A. Wang, S.-H. Cho, and A. P. Chandrakasan, "Design Considerations for Ultra-Low Energy Wireless Microsensor Nodes," *IEEE Transactions on Computers*, June 2005.

Book Chapters:
- N. Verma and A. P. Chandrakasan, "Ultra Low Voltage SRAM Design," in *Embedded Memory for Nanoscale VLSI,* Integrated Circuit and Systems Series, Springer US (2008).
- Y. Ramadass, J. Kwong, N. Verma, and A. P. Chandrakasan, "Adaptive Supply Voltage Delivery for Ultra Dynamic Voltage Scaled Systems," in *Adaptive Techniques for Processor Optimization* (2008).

INVITED PANELS AND SEMINARS

- "Enabling Inference in Ultra-low-power Sensors for Scalable Biomedical Monitoring" Forum on Integrated Sensors for Cybersystems, SFI/NSF/SRC, March 2012.
- "Turning Data into Knowledge in Energy-constrained Sensors: biomedical devices for large-scale patient monitoring," Annual Review, GSRC, Nov. 2011
- "From embedded DSP to Embedded AI: towards low-power biomedical sensors with intelligence," ISL Colloquium, Stanford, Nov. 2011
- "Getting Invasive Implants Thinking About Restoration," Integra LifeSciences Research Summit, July 2011.
- "From embedded DSP to Embedded AI: making chronic patient monitoring scalable," Body Area Network technology and Applications, WPI, June 2011.
- "From Embedded DSP to Embedded AI: algorithmic opportunities for energy-frugal biomedical devices," Energy Frugal Systems, GSRC, Sept. 2010.
- "Ultra-low-power Platforms for Biomedical Sensing and Patient Monitoring Networks," Half Yearly Review, GSRC, May 2010.
- "Opportunities for Stochastic Processing in Biomedical Sensing and Detection," Biomedical Sensing: probabilistic methods and ultra-low-power devices, GSRC, May 2010.
- "Micro-power EEG Sensing and Processing SoC for Patient Specific seizure detection Algorithm," Next-generation Medical Electronics, MIT, Dec. 2009.