

YOONMYUNG LEE

Ph.D., Assistant Research Scientist
Dept. of Electrical Engineering & Computer Science
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Last updated September 2014

Education

- Ph.D.** in Electrical Engineering, University of Michigan, Ann Arbor, MI, USA Apr. 2012
Thesis: Ultra-Low Power Circuit Design for Cubic-Millimeter Wireless Sensor Platform
Advisor: Professor David T. Blaauw
- M.S.** in Electrical Engineering, University of Michigan, Ann Arbor, MI, USA Apr. 2008
Advisor: Professor David T. Blaauw
- B.S.** in Electronic and Electrical Engineering (Minor in Computer Science and Engineering) Feb. 2004
Pohang University of Science and Technology (POSTECH), Pohang, Korea
Graduated at the top of the class of 2004, *Summa Cum Laude*

Professional Experience

- Nov. 2012 – Present **Assistant Research Scientist (Research Faculty)** *Ann Arbor, MI*
Michigan Integrated Circuits Lab (MICL), University of Michigan
Research interests:
- Millimeter-scale sensor systems for biomedical implantable and other applications
- Near/sub-threshold computing systems
- Ultra-low power digital/mixed-signal integrated circuit design
- Dec. 2013 – Present **Co-founder, CubeWorks Inc.** *Ann Arbor, MI*
Start-up company specialized in mm-scale sensor platform
- May. 2012 – Oct. 2012 **Post-doctoral Research Fellow** *Ann Arbor, MI*
Michigan Integrated Circuits Lab (MICL), University of Michigan
- Jun. 2009 – Aug. 2009 **Visiting Scholar** *Yorktown Heights, NY*
T.J. Watson Research Center, IBM
- Collaboration research on HETT-based low power circuit and memory
- Evaluated the effect of variations on HETT and developed compact VerilogA model
- May 2008 – Aug. 2008 **Graduate Technical Intern** *Hillsboro, OR*
Circuit Research Lab, Intel Corporation
- Research on circuit-switched on-die interconnect fabrics for Intel's sub-32nm 64-node multi-core microprocessor platforms
- Filed an invention disclosure for novel active-time static power reduction scheme
- Evaluated as an outstanding intern by the supervisor
- Oct. 2006 – Apr. 2012 **Graduate Student Research Assistant** *Ann Arbor, MI*
Michigan Integrated Circuits Lab (MICL), University of Michigan
- 1mm³ modular generic sensing platform with multi-modal energy harvesting
- 660pW low jitter temperature compensated timer for wireless sensor node synchronization
- Low power 2T dual Vth gain cell eDRAM
- Hetero-junction Tunneling Transistor(HETT)-based ultra-low power 7T SRAM
- Standby power reduction strategy for ultra-low power sensor nodes
- Jan. 2004 – Jul. 2006 **Firmware Engineer** *Icheon, Korea*
Siemens Automotive Systems Corporation

Teaching Experience

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|------------------------|---|----------------------|
| Jan.2014 – Apr.2014 | EECS 627 : VLSI Design II, University of Michigan <i>Guest Lecturer</i> - Advanced integrated circuit design course for graduate students - Guest lectured 3 classes | <i>Ann Arbor, MI</i> |
| Jan.2010 – Apr.2010 | EECS 627 : VLSI Design II, University of Michigan <i>Graduate Student Instructor</i> - Led discussions/tutorials, developed exams and provided CAD tool support - Student evaluation: 4.83 / 5.00 | <i>Ann Arbor, MI</i> |
| Aug.2003 – Dec.2003 | EECS 235 : Electrical Circuits, POSTECH <i>Undergraduate Teaching Assistant</i> - Led discussions/tutorials for an undergrad course EECS235: Electrical Circuits - First undergraduate student to be a teaching assistant for an undergraduate course | <i>Pohang, Korea</i> |

Selected Honors and Awards

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| Silver Prize - Samsung Human-Tech Thesis Prize | February 2012 |
| Best Poster Award - SRC/MuSyC Research Consortium Annual Review | November 2011 |
| Intel PhD Fellowship - Full study support for 1 year | August 2011 |
| DAC/ISSCC Student Design Contest Winner - Design title: “Design and Implementation of Centip3De, a 7-layer Many-Core System” | July 2011 |
| Best Paper Award - International Symposium on Low-Power Electronics and Design (ISLPED) | August 2009 |
| DAC/ISSCC Student Design Contest Winner - Design title: “Phoenix: an Ultra-low Power Processor for Cubic Millimeter Sensor Systems” | June 2009 |
| Samsung Scholarship - Full graduate study support for 4 years | November 2005 |
| KFAS Doctoral Scholarship for Study Abroad - Korea Foundation of Advanced Studies, Full graduate study support - Gratefully declined in order to observe institutional regulation | August 2005 |
| Presidential Award for Honor Students - Deputy Prime Minister and Minister of the Ministry of Education and Human Resource Development, Republic of Korea | February 2004 |
| Official commendation for the graduate of the greatest distinction - The Dean of POSTECH | February 2004 |
| Siemens Scholarship - Siemens Automotive Systems Corporations | May 2003 |
| KFAS Distinguished Undergraduate Student Scholarship - Korea Foundation of Advanced Studies | 2002 - 2004 |

Publications

Journal Articles

1. Y.-P. Chen, D. Jeon, **Y. Lee**, Y. Kim, Z. Foo, I. Lee, G. Kruger, H. Oral, O. Berenfeld, Z. Zhang, D. Blaauw, D. Sylvester, "An Injectable 64nW ECG Mixed-Signal SoC in 65nm for Arrhythmia Monitoring" *IEEE Journal of Solid-State Circuits (JSSC)*, submitted, invited
2. W. Jung, S. Oh, S. Bang, **Y. Lee**, D. Sylvester, D. Blaauw, "An Ultra-Low Power Fully Integrated Energy Harvester Based on Self-Oscillating Switched-Capacitor Voltage Doubler" *IEEE Journal of Solid-State Circuits (JSSC)*, accepted, invited
3. S. Jeong, Z. Foo, **Y. Lee**, J.-Y. Sim, D. Blaauw, D. Sylvester, "A Fully-Integrated 65nW CMOS Temperature Sensor for Ultra-Low Power Wireless Sensor Nodes" *IEEE Journal of Solid-State Circuits (JSSC)*, September, invited paper
4. **Y. Lee**, M. Seok, S. Hanson, D. Sylvester, D. Blaauw, "Achieving Ultralow Standby Power with an Efficient SCCMOS Bias Generator" *IEEE Transactions on Circuit and Systems II (TCAS-II)*, December 2013
5. M. H. Ghaed, G. Chen, R.-U. Haque, M. Wiecekowski, Y. Kim, G. Kim, **Y. Lee**, I. Lee, D. Fick, D. Kim, M. Seok, K. Wise, D. Blaauw, D. Sylvester, "Circuits for a Cubic-Millimeter Energy-Autonomous Wireless Intraocular Pressure Monitor" *IEEE Transactions on Circuits and Systems I (TCAS-I)*, December 2013
6. K.-K. Huang, J. K. Brown, E. Ansari, R. R. Rogel, **Y. Lee**, H. Kim, D. Wentzloff, "An Ultra-Low-Power 9.8GHz Crystal-Less UWB Transceiver with Digital Baseband Integrated in 0.18 μ m BiCMOS," *IEEE Journal of Solid-State Circuits (JSSC)*, Invited Paper to the Special Issue on ISSCC, December 2013
7. R. G. Dreslinski, D. Fick, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, **Y. Lee**, D. Kim, N. Liu, M. Wiecekowski, G. Chen, D. Sylvester, D. Blaauw, T. Mudge, "Centip3De: A Many-Core Prototype Exploring 3D Integration and Near-Threshold Computing" *Communications of the ACM*, November 2013
8. **Y. Lee**, B. Giridhar, Z. Foo, D. Sylvester, D. Blaauw, "A Sub-nW Multi-stage Temperature Compensated Timer for Ultra-Low-Power Sensor Nodes," *IEEE Journal of Solid-State Circuits (JSSC)*, October 2013
9. **Y. Lee**, D. Kim, J. Cai, I. Lauer, L. Chang, S. J. Koester, D. Blaauw, D. Sylvester, "Low Power Circuit Analysis and Design Based on Heterojunction Tunneling Transistors (HETTs)," *IEEE Transactions on Very Large Scale Integration Systems (T-VLSI)*, September 2013
10. R. G. Dreslinski, D. Fick, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, **Y. Lee**, D. Kim, N. Liu, M. Wiecekowski, G. Chen, T. Mudge, D. Sylvester, D. Blaauw, "Centip3De: A 64-Core, 3D Stacked, Near-Threshold System" *IEEE Micro*, March-April 2013
11. **Y. Lee**, D. Yoon, Y. Kim, D. Blaauw, D. Sylvester, "Circuit and System Design Guidelines for Ultra-Low Power Sensor Nodes" *IPSJ Transactions on System LSI Design Methodology (TSLDM)*, February 2013, invited paper
12. **Y. Lee**, S. Bang, I. Lee, Y. Kim, G. Kim, P. Dutta, D. Sylvester, D. Blaauw, "A modular 1mm³ Die-Stacked Sensing Platform with Low Power I²C Inter-die Communication and Multi-Modal Energy Harvesting" *IEEE Journal of Solid-State Circuits (JSSC)*, Invited Paper to the Special Issue on ISSCC, January 2013
13. D. Fick, R. G. Dreslinski, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, **Y. Lee**, D. Kim, N. Liu, M. Wiecekowski, G. Chen, T. Mudge, D. Blaauw, D. Sylvester, "Centip3De: A Cluster-Based NTC Architecture with 64 ARM Cortex-M3 Cores in 3D Stacked 130nm CMOS" *IEEE Journal of Solid-State Circuits (JSSC)*, Invited Paper to the Special Issue on ISSCC, January 2013
14. S. Hanson, M. Seok, Y.-S. Lin, Z. Foo, D. Kim, **Y. Lee**, N. Liu, D. Sylvester, D. Blaauw, "A Low-Voltage Processor for Sensing Applications With Picowatt Standby Mode," *IEEE Journal of Solid-State Circuits (JSSC)*, Invited Paper to the Special Issue on SOVC, Apr 2009

Conference Proceedings

1. Y.-S. Kuo, P. Pannuto, G. Kim, Z. Foo, I. Lee, B. Kempke, P. Dutta, D. Blaauw, **Y. Lee** "MBus: A 17.5 pJ/bit/chip Portable Interconnect Bus for Millimeter-Scale Sensor Systems with 8 nW Standby Power" *IEEE Custom Integrated Circuits Conference (CICC)*, September 2014, to appear
2. I. Lee, Y. Kim, S. Bang, G. Kim, H. Ha, Y.-P. Chen, D. Jeon, S. Jeong, W. Jung, M. H. Ghaed, Z. Foo, **Y. Lee**, J.-Y. Sim, D. Sylvester, D. Blaauw "Circuit Techniques for Miniaturized Biomedical Sensors" *IEEE Custom Integrated Circuits Conference (CICC)*, September 2014, to appear, invited
3. S. Oh, **Y. Lee**, J. Wang, Z. Foo, Y. Kim, D. Blaauw, D. Sylvester "Dual-Slope Capacitance to Digital Converter Integrated in an Implantable Pressure Sensing System" *IEEE European Solid-State Circuits Conference (ESSCIRC)*, September 2014, to appear
4. G. Kim, **Y. Lee**, Z. Foo, P. Pannuto, Y.-S. Kuo, B. Kempke, M. Ghaed, S. Bang, I. Lee, Y. Kim, S. Jeong, P. Dutta, D. Sylvester, D. Blaauw, "A Millimeter-Scale Wireless Imaging System with Continuous Motion Detection and Energy Harvesting" *IEEE Symposium on VLSI Circuits (SOVC)*, June 2014
5. I. Lee, **Y. Lee**, D. Sylvester, D. Blaauw, "Low Power Battery Supervisory Circuit with Adaptive Battery Health Monitor" *IEEE Symposium on VLSI Circuits (SOVC)*, June 2014
6. D. Blaauw, D. Sylvester, P. Dutta, **Y. Lee**, I. Lee, S. Bang, Y. Kim, G. Kim, P. Pannuto, Y.-S. Kuo, D. Yoon, W. Jung, Z. Foo, Y.-P. Chen, S. Oh, S. Jeong, M. Choi "IoT Design Space Challenges: Circuits and Systems" *IEEE Symposium on VLSI Circuits (SOVC)*, June 2014, invited
7. G. Kim, A. Wolfe, R. Bell, S. Bang, **Y. Lee**, I. Lee, Y. Kim, L. Hsu, M. Arias-Thode, B. Chadwick, D. Sylvester, D. Blaauw, "Chip-On-Mud: Ultra-Low Power ARM-Based Oceanic Sensing System Powered by Small-Scale Benthic Microbial Fuel Cells" *IEEE International Symposium on Circuits and Systems (ISCAS)*, June 2014
8. A. S. Teran, M. Dejarld, J. Hwang, W. Lim, J. Wong, D. Blaauw, **Y. Lee**, J. Millunchick, and J. D. Phillips, "Indoor Photovoltaic Energy Harvesting for mm-Scale Systems", Device Research Conference, June 2014
9. A. S. Teran, M. Dejarld, W. Lim, **Y. Lee**, D. Blaauw, J. M. Millunchick and J. D. Phillips, "Energy Harvesting with III-V Photovoltaics for Miniature Systems", Electronic Materials Conference, June 2014
10. K. Yang, D. Fick, M. Henry, **Y. Lee**, D. Blaauw, D. Sylvester, "A 23Mb/s, 23pJ/bit Fully-Synthesized True Random Number Generator in 28nm and 65nm CMOS" *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2014
11. W. Jung, S. Oh, S. Bang, **Y. Lee**, D. Sylvester, D. Blaauw, "3nW Fully Integrated Energy Harvester Based on Self-Oscillating Switched Capacitor DC-DC Converter" *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2014
12. D. Jeon, Y.-P. Chen, **Y. Lee**, Y. Kim, Z. Foo, G. Kruger, H. Oral, O. Berenfeld, Z. Zhang, D. Blaauw, D. Sylvester, "An Implantable 64nW ECG Monitoring Mixed-Signal SoC for Arrhythmia Diagnosis" *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2014
13. Y.-P. Chen, **Y. Lee**, J.-Y. Sim, M. Alioto, D. Blaauw, D. Sylvester, "45pW ESD clamp circuit for ultra-low power applications" *IEEE Custom Integrated Circuits Conference (CICC)*, September 2013
14. S. Bang, **Y. Lee**, I. Lee, Y. Kim, G. Kim, D. Blaauw, D. Sylvester, "A Fully Integrated Switched-Capacitor Based PMU with Adaptive Energy Harvesting Technique for Ultra- Low Power Sensing Applications" *IEEE International Symposium on Circuits and Systems (ISCAS)*, May 2013
15. J. Brown, K.-K. Huang, E. Ansari, R. Rogel, **Y. Lee**, D. Wentzloff, "An Ultra-Low Power 9.8GHz Crystal-Less UWB Transceiver with Modem Integrated in 180nm BiCMOS" *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2013
16. **Y. Lee**, D. Sylvester, D. Blaauw, "Circuits for Ultra-Low Power Millimeter-Scale Sensor Nodes" in *46th Asilomar Conference on Signals, Systems and Computers (ASILOMAR)*, November 2012, invited paper

17. D. Blaauw, D. Sylvester, **Y. Lee**, S. Bang, I. Lee, Y. Kim, G. Kim, M. H. Ghead, "From digital processors to analog building blocks: Enabling new applications through ultra-low voltage design" *IEEE Subthreshold Microelectronics Conference (SubVT)*, October 2012, invited paper
18. G. Kim, **Y. Lee**, S. Bang, I. Lee, Y. Kim, D. Sylvester, D. Blaauw, "A 695 pW Standby Power Optical Wake-up Receiver for Wireless Sensor Nodes" *IEEE Custom Integrated Circuits Conference (CICC)*, September 2012
19. Y. Kim, **Y. Lee**, D. Sylvester, D. Blaauw, "SLC: Split-Control Level Converter for Dense and Stable Wide-Range Voltage Conversion" *IEEE European Solid-State Circuits Conference (ESSCIRC)*, September 2012
20. **Y. Lee**, Y. Kim, D. Yoon, D. Blaauw, D. Sylvester, "Circuit and System Design Guidelines for Ultra-Low Power Sensor Nodes" *ACM/IEEE Design Automation Conference (DAC)*, June 2012, invited paper
21. I. Lee, S. Bang, **Y. Lee**, Y. Kim, G. Kim, D. Sylvester, D. Blaauw, "A 635pW Battery Voltage Supervisory Circuit for Miniature Sensor Nodes" *IEEE Symposium on VLSI Circuits (SOVC)*, June 2012
22. P. Pannuto, **Y. Lee**, B. Kempke, D. Sylvester, D. Blaauw, P. Dutta, "Ultra-constrained sensor platform interfacing," *ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN)*, April 2012
23. **Y. Lee**, G. Kim, S. Bang, Y. Kim, I. Lee, P. Dutta, D. Sylvester, D. Blaauw, "A Modular 1mm³ Die-Stacked Sensing Platform with Optical Communication and Multi-Modal Energy Harvesting" *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2012
24. D. Fick, R. G. Dreslinski, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, **Y. Lee**, D. Kim, N. Liu, M. Wiecekowski, G. Chen, T. Mudge, D. Sylvester, D. Blaauw, "Centip3De: A 3930 DMIPS/W Configurable Near-Threshold 3D Stacked System With 64 ARM Cortex-M3 Cores," *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2012
25. **Y. Lee**, D. Sylvester, D. Blaauw, "Synchronization of Ultra-Low Power Wireless Sensor Nodes," *IEEE International Midwest Symposium on Circuit and Systems (MWSCAS)*, Aug 2011, invited paper
26. **Y. Lee**, B. Giridhar, Z. Foo, D. Sylvester, D. Blaauw, "A 660pW Multi-stage Temperature Compensated Timer for Ultra-low Power Wireless Sensor Node Synchronization," *IEEE International Solid-State Circuit Conference (ISSCC)*, February 2011
27. **Y. Lee**, M.-T. Chen, J. Park, D. Sylvester, D. Blaauw, "A 5.42nW/kb Retention Power Logic-Compatible Embedded DRAM with 2T Dual-Vt Gain Cell for Low Power Sensing Applications," *IEEE Asian Solid-State Circuit Conference (A-SSCC)*, November 2010
28. **Y. Lee**, G. Chen, S. Hanson, D. Sylvester, D. Blaauw, "Ultra-low Power Circuit Techniques for a New Class of Sub-mm³ Sensor Nodes," *IEEE Custom Integrated Circuits Conference (CICC)*, September 2010, invited paper
29. D. Kim, **Y. Lee**, J. Cai, L. Chang, S. J. Koester, D. Sylvester, D. Blaauw, "Low Power Circuit Design Based on Hetero-junction Tunneling Transistors (HETTs)," *ACM/IEEE International Symposium on Low-Power Electronics and Design (ISLPED)*, August 2009, **Best Paper Award**
30. M. Seok, S. Hanson, Y.-S. Lin, Z. Foo, D. Kim, **Y. Lee**, N. Liu, D. Sylvester, D. Blaauw, "Phoenix: an Ultra-Low Power Processor for Cubic Millimeter Sensor Systems," *ACM/IEEE Design Automation Conference (DAC)*, June 2009, DAC/ISSCC Student Design Contest
31. **Y. Lee**, M. Seok, S. Hanson, D. Blaauw, D. Sylvester, "Standby Power Reduction Techniques for Ultra-Low Power Processors," *IEEE European Solid-State Circuits Conference (ESSCIRC)*, September 2008
32. M. Seok, S. Hanson, Y.-S. Lin, Z. Foo, D. Kim, **Y. Lee**, N. Liu, D. Sylvester, D. Blaauw, "The Phoenix Processor: A 30pW Platform for Sensor Applications," *IEEE Symposium on VLSI Circuits (SOVC)*, June 2008

Patents

Yoonmyung Lee, Michael Wieckowski, David Blaauw, Dennis Sylvester, "Memory cell structure, a memory device employing such a memory cell structure, and an integrated circuit having such a memory device,"

US Patent 8107290, Jan. 31 2012

CN Patent 101552275, Oct. 7 2009

Wanyeong Jung, Sechang Oh, Suyoung Bang, **Yoonmyung Lee**, Dennis Sylvester, David Blaauw, "Self-Oscillating Switched-Capacitor DC-DC Converter"

US Patent Filed 61935978, UM file number 6083, disclosure filed

Kaiyuan Yang, Dennis Sylvester, David Blaauw, David Fick, Michael Henry, **Yoonmyung Lee**, "Fully-Synthesized True Random Number Generator"

UM file number 5982, disclosure filed

Yen-Po Chen, **Yoonmyung Lee**, Jae-Yoon Sim, Massimo Alioto, David Blaauw, Dennis Sylvester, "ESD Clamp Circuit for Ultra-Low Power Applications"

US Patent Filed 61880412, UM file number 5953, provisional patent filed

Selected Invited Presentations

Ewha Womans University, "1mm³ Computer", Seoul, Korea, June 2013

Pohang University of Science and Technology (POSTECH), "1mm³ Computer", Pohang, Korea, July 2012

SungKyunKwan University (SKKU), "1mm³ Computer", Suwon, Korea, July 2012

Korea Advanced Institute of Science and Technology (KAIST), "1mm³ Computer", Daejeon, Korea, July 2012

Yonsei University, "1mm³ Computer", Seoul, Korea, July 2012

Seoul National University (SNU), "1mm³ Computer: A Modular Die-Stacked Sensing Platform with Low Power I²C Inter-Die Communication and Multi-Modal Energy Harvesting" Seoul, Korea, July 2012

King Abdullah University of Science and Technology (KAUST), "A Modular 1mm³ Sensing Platform for Biomedical Sensing Applications", Thuwal, Saudi Arabia, February 2012

Intel Corporation, Circuit Research Lab, "Circuit Design for mm-Scale Sensor Nodes", Hillsboro, OR, August 2011

SungKyunKwan University (SKKU), "Circuit Design for mm-Scale Sensor Nodes", Suwon, Korea, July 2011