

Taehwan Kim

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RESEARCH INTERESTS Electronic-photonic integrated systems for communication/sensing
Novel signal processing techniques for sensor systems

EDUCATION **University of California, Berkeley** *Aug. 2014 to Present*
Ph.D. Student in Electrical Engineering and Computer Sciences
Seoul National University *Mar. 2007 to Feb. 2014*
B.S. in Electrical and Computer Engineering
B.A. in Economics (Double Major)

RESEARCH EXPERIENCE **Graduate Technical Intern** *May. 2017 to Aug. 2018*
PHY Research Lab, Intel Labs, Santa Clara, CA

- Advanced system-level techniques for integrated optical links
 - US patent filed

Graduate Student Researcher *Aug. 2014 to present*
Integrated Systems Group, University of California, Berkeley (Advisor: Vladimir Stojanović)

- Free-space optical systems in electronic-photonic integration platform
 - Project goal: realization of an monolithic solution for high-resolution LIDAR and free-space optical communication links leveraging advanced silicon photonics/CMOS technology
 - System and circuit-level solutions for scalable beam-steering system based on optical phased array/focal plane array
 - System-level trade-off analysis for realistic LIDAR/communication applications
 - Large-scale optical phased array system for monolithic beam-steering: chip tape-out done in early 2016 in 65nm 10LPe CMOS/300mm photonics 3D-integration platform (currently under testing)
 - Constructed experimental setup for beam characterization and free-space system demonstration
- Circuit/system-level techniques for laser phase noise management
 - Project goal: low-power, low-complexity solutions for enhancing laser linewidth-limited performance in coherent communications/LIDAR systems
 - Developing active control systems for laser phase control leveraging tight integration of photonics and electronics
 - Optical PLL for chirp linearization and coherence distance enhancement for FMCW LIDAR: chip tape-out done in 2017 in 45nm SOI (currently under testing)
- Signal processing techniques for sensing systems
 - Project goal: exploring new algorithms for various sensors that can enhance the performance or extract overlooked information by leveraging signal priors
 - Developed optimal detection algorithm for long-range FMCW LIDAR operating in the range beyond the coherence distance by exploiting known laser spectral characteristics: experimentally demonstrated, paper published
 - Developed neural network-based framework for multi-dimensional super-resolution single-molecule localization fluorescent microscopy, experimentally demonstrated
- Model Predictive Control algorithm (MPC) based equalization of high-speed links
 - Project goal: demonstration of transmitter-side equalization scheme based on channel models for flexible, energy-efficient equalization of asymmetric high-speed interfaces (e.g. processor-memory, switches)
 - Built/measured chips in 28nm FDSOI & 45nm SOI, paper published

Undergraduate Researcher

Jun. 2012 to Feb. 2014

Mixed-Signal IC and System Group, Seoul National University (Advisor: Jaeha Kim)

- Formal verification of analog/mixed-signal circuits
 - Developed an algorithm to verify correctness of start-up behavior of ring oscillators in presence of variability
 - Implemented GCHECK: a Python-based tool for detection of start-up failures of coupled ring oscillators (transferred to Samsung Electronics, patent issued)
- Variability-aware circuit optimization
 - Developed global optimizer for analog/mixed-signal circuits based on statistical metamodeling

PUBLICATIONS **T. Kim**, S. Moon, K. Xu, “Information-Rich Localization Microscopy through Machine Learning,” *bioRxiv*, 2018.

T. Kim, P. Bhargava, V. Stojanović, “Overcoming the Coherence Distance Barrier in Long-Range FMCW LIDAR,” *Conference on Lasers and Electro-Optics (CLEO)*, 2018.

T. Kim, P. Bhargava, V. Stojanović, “Optimal Spectral Estimation and System Trade-Off in Long-Distance Frequency-Modulated Continuous-Wave LIDAR,” *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2018.

T. Kim, P. Bhargava, V. Stojanović, “A Model Predictive Control Equalization Transmitter for Asymmetric Interfaces in 28nm FDSOI, *IEEE Asian Solid-State Circuits Conference (ASSCC)*, 2016.

T. Kim, D.-G. Song, S. Youn, J. Park, H. Park, and J. Kim, “Verifying Start-Up Failures in Coupled Ring Oscillators in Presence of Variability Using Predictive Global Optimization,” *IEEE/ACM International Conference on Computer-Aided Design (ICCAD)*, 2013.

J. Kim, J. Lee, D.-G. Song, **T. Kim**, K.-H. Kim, S. Jung, and S. Youn, “Discretization and Discrimination Methods for Design, Verification, and Testing of Analog/Mixed Signal Circuits,” *Custom Integrated Circuits Conference (CICC)*, 2013.

HONORS & AWARDS

Kwanjeong Scholarship for Abroad Studies

2014-2019

National Scholarship for Science and Engineering, Korea Science Foundation

2007-2013

SKILLS

Languages: C, C++, Python, Verilog, Verilog-A

Tools: Custom IP block and VLSI design/verification tools (Virtuoso, ADS, DC, ICC, RC, SOC-ENC, Calibre), MATLAB