Soroush Ghandiparsi

sparsi@ucdavis.edu; (408) 915-9965

Department of Electrical and Computer Engineering

1207 Kemper Hall, University of California-Davis, One Shield Avenue, Davis, CA 95616

Education

* **Ph.D., Electrical Engineering- Photonics/Optical Communication**  *Aug. 2020*

Department of Electrical and Computer Engineering, University of California-Davis, Davis, Ca.

# Dissertation Title: “High-speed Silicon-based Photodiode for Short-reach Interconnects in Data Centers.”

* **M.S., Nanophotonics Engineering** (Joint master program) *Feb. 2011*

 Nanoscience and Nanotechnology, Sharif University of Technology (INST), Tehran, Iran. (Research)

School of Engineering Emerging Technology, University of Tabriz, Tabriz, Iran. (Courses)

# Dissertation Title: “Analysis of the Properties of Plasmonic Waveguides with the Goal of Modifying their Optical Properties using Noble Metal Nanoparticles.”, (Best Science in Engineering Research Award, 2011).

* **B.S., Electrical Engineering-Electronics** *Aug. 2007*

Department of Electrical and Robotics Engineering, Shahrood University of Technology, Shahrood, Iran.

# Dissertation Title: “Application of 2D Furrier Transform in Image Processing Algorithm for Pattern Fault Recognition”.

Fellowships

* **Dissertation Fellowship Award** *Feb. 2020-Present*

Department of Electrical and Computer Engineering at the University of California- Davis, Ca.

* **Specialized training in Biophotonics and Bioimaging** (Ph.D. with emphasis)*Sept. 2017-Present*

Biomedical Engineering, College of Engineering, University of California-Davis, Davis, Ca.

# “The Designated Emphasis in Biophotonics and Bioimaging is a program designed to administer graduate training in conjunction with their Ph.D. granting program.”

# Courses: Advanced biophotonics, Drug delivery systems, Cell and molecular biophysics and bioengineering, Radiation detectors, and Three-quarters seminar in biophotonics.

* **JENA-DAVIS (JEDIS) Summer School on Biophotonics in Clinical Research** *Aug. 2019*

# “The Jena-Davis (JEDIS) alliance of excellence in biophotonics is designed to promote North American-German cooperation on research and development in the field of biophotonics.”

* **Keller Pathway Fellowship program** *Sept. 2017*

UC Davis Institute for Innovation and Entrepreneurship

“The year-long Keller Pathway Fellowship program provides a multi-faceted opportunity for UC Davis innovators and aspiring/early-stage entrepreneurs to expand their networks and move ideas out of the lab and into the world.”

* **Ph.D. Program Fellowship** *Aug. 2016- Aug. 2017*

Department of Electrical and Computer Engineering at the University of California- Davis, Ca.

* **Visiting Researcher Scholar** *Feb. 2015- Aug. 2016*

Inano Lab., University of California-Davis, Ca.

# Research Title: “Silicon-based and III-V Material Photodetectors for High-speed and LIDAR Applications.”

honors and awards

* **Outstanding Graduate Student Teaching Award 2018-2019 (Finalist Nominee)** *May 2019*
* **Best Graduate Research Poster Award** *Apr. 2018*

UC Davis ECE Industrial Affiliates

* **2nd Place, Selected Project on “Smart Buildings for Future”** *Oct. 2012*

International Digital Media Fair and Festival

* **Iran Nanotechnology Initiative Consul Award** *Dec. 2011*

Master Thesis, Nanotechnology in Engineering Thesis Award, 2011.

Research experience

* **Graduate Research Assistant;** Advisor: Professor M. Saif Islam Sept. 2016- present

Department of Electrical and Computer Engineering, University of California- Davis.

*“All-Silicon Mach-Zehnder photodiode with perturbed refractive index for 1310nm communication.”*

* Simulated an All-Silicon Mach-Zehnder modulator with perturbed refractive index (Optical and Electrical).
* Designed a Mach-Zehnder modulator integrated with light-trapping structure and optimized for 1310nm.

*“Monolithic integration of a silicon-based photodiode with TIA via SOI CMOS process technology.”*

* Designed an optimized high-speed Transimpedence Amplifier (TIA) to integrate with a high-speed photodetector.
* Designed and optimized a Feed-Forward Equalizer (FFE) for optical transceivers system application.
* Performed system characterization of high-speed photodetectors integrated with surface light trapping
micro/nanostructures.

*“High-speed and efficient Silicon-based photodiodes for Datacom wavelengths 850, 1310, and 1550nm.”*

* Designed, simulated, and optimized a surface photon trapping micro/nanostructures for Silicon-based (All Silicon and Silicon-on-Germanium) low dimensional high-speed photodetectors for communication wavelengths 850nm, 1310nm, and 1550nm.
* Fabricated vertical (PIN), lateral (PIN) and Metal-Semiconductor-Metal (MSM) Silicon high-speed
photodetectors for 850nm short-reach communication.
* Fabricated a vertical (PIN) and a Metal-Semiconductor-Metal (MSM) Silicon-on-Germanium high-speed photodetectors for 1310 and 1550nm.
* Performed a DC and RF characterization of high-speed photodetectors.
* Developed an optimized equivalent circuit model of photodetectors based on measured parameters.
* Executed evaluation of high-speed photodetector system performance (BERT) using full optical link simulation.
* Designed a photodiode array and performed electromagnetic simulation for electronic/photonic integrated circuit design in the CMOS fabrication process.
* **Graduate Research Assistant**  *Sep. 2017- Jan. 2018*

Biomedical Engineering, College of Engineering, University of California-Davis, Davis, Ca.

 “Study the interaction of visible light spectrum on blood cells for Far-Field imaging.”

* Studied the optical properties of blood cells in vitro in terms of absorption and dispersion.
* **Graduate Research Assistant;** Advisor: Professor Ali Rostami *Nov. 2009- Dec. 2010*

Dr. Bijan Rashidian

Institute for Nanoscience and Nanotechnology, Sharif University of Technology (INST), Tehran, Iran.

*“Analyze the optical properties of metal-semiconductor-metal plasmonic waveguides with noble metal nanoparticles.”*

* Studied the properties of light propagating in a Plasmonic waveguide theoretically and numerically.
* Analyzed the effect of noble nanoparticles on light confinement and optical loss in plasmonic waveguides.

Teaching experience

* **Head Teaching Assistant**

Department of Electrical and Computer Engineering, University of California-Davis.

EEC 140A, Semiconductor Device physics I Winter 2019 and Fall 2019

 Winter 2018 and Fall 2018

* **Teaching Assistant**

 Department of Electrical and Computer Engineering, University of California-Davis.

 EEC 196, Issues in Engineering Design *Fall 2019*

 EEC 246, Advanced projects in fabrication (Graduate Course) *Fall 2018*

 EEC 140A, Semiconductor Device physics I *Fall 2017 and winter 2017*

EEC 140B, Semiconductor Device physics II *Spring 2017*

* **Undergraduate Research Mentor (Co-PI)**

Department of Electrical and Computer Engineering, University of California-Davis.

Inano Research Group *Since fall 2018*

* **Laboratory Instructor**

Department of Electrical and Computer Engineering, University of California-Davis.

UC Davis Summer School *Summer 2017 and summer 2018*

* **Adjunct Faculty**

Electrical Engineering Department, Azad University of Karaj, Karaj, Iran.

Signal and systems *Fall 2012*

Electrical circuit design II *Spring 2012*

Electrical circuit design I *Winter 2012*

Filter design and synthesis *Fall 2011*

Digital circuit design *Fall 2011*

Professional Experience

* **R&D Staff Engineer** *Nov. 2014- Aug. 2016*

W&Wsens Devices, Inc., Palo Alto, CA 94022

“Designed, simulated, and characterized III-V material high-speed photodetectors.”

-Designed and numerically simulated thin-layer lateral and vertical GaAs photodetectors with 40GHz speed.

- Performed optical, DC, and RF characterization of fabricated photodetectors.

- Integrated photodetectors with CMOS circuits via hybrid integration.

“Design VECSEL laser for optical communication applications.”

- Designed VECSEL laser for 850nm and performed simulations.

* **Engineer and Technical Manager** *June 2012- Nov. 2013*

Industrial Development by Electronic application Inc., IDEA Inc., Tehran, Iran.

“Installation, Ramp up, calibration, Service, and Maintenance of Siemens medical imaging systems

(CT- Scan, and MRI)”

Professional Training

* **Silicon Photonics Design, Fabrication, and Data Analysis.**

Six weeks of the training course (simulation, fabrication, and characterization), University of British Columbia (UBC).

* **Anual Lumerical and Cadence Photonics Summit.**

Cadence Photonics Summit 2018 and 2019.

* **Certified LabView Associate Developer.**

Three days, 24 hours training National Instruments event LabVIEW Boot Camp.

* **120 hours of training on Telecommunication Network and Systems (GSM 900 & 1800).**

90 days internship in Telecommunication Company of Iran.

skills

COMPUTER SKILLS

* **Optics and Photonics Simulation Software:** Lumerical, Silvaco, RSoft (Component), Synapsys (OptSim Circuit, OptoDesigner).
* **Analog/Digital Design:** Cadence, ADS, L-Edit (Tanner), HFSS, Proteus, FPGA (Quartus).
* **Programming Languages:** Matlab, C, C++, Python, Labview, Basic, and R.
* **Optimization Methods:** Artificial Neural Networks.
* **Other software:** Solidworks, MS Office, Photoshop, AutoCAD 2D, and 3D.

PERSONAL SKILLS

* Languages: English (Full Professional Proficiency), Persian (Native/Bilingual Proficiency).

course work

|  |  |
| --- | --- |
| Fiber Optic Communication | Advanced Semiconductor Device Physics |
| Advanced Solid-State Devices | Integrated Circuits Fabrication I and II |
| Optoelectronic Devices | Photonics I and II |
| Analog Circuit Design I and II | Electronics I, II, III, and VLSI |
| Signal and Systems Analysis | Communication I and II |
| Numerical Methods in Electromagnetics | Advanced Biophotonics |
| MOS Analog Circuit Design | Digital System Design I and II |
| Communication Circuits Design and Synthesis | Plasmonics I and II |
| Solar Cells and Photovoltaic systems | Wide Bandgap Semiconductor Materials |
| Silicon Photonics Design, Fabrication, and Data Analysis |

Publications

Journals

[1] S. Ghandiparsi, A. F. Elrefaie, A. S. Mayet, T. Landolsi, C. B. Perez, H. Cansizoglu, et al., "High-Speed High-Efficiency Photon-Trapping Broadband Silicon PIN Photodiodes for short reach Optical Interconnects in Data Centers," Journal of Lightwave Technology, 2019.

[2] H. Cansizoglu, A. S. Mayet, S. Ghandiparsi, Y. Gao, C. Bartolo-Perez, H. H. Mamtaz, et al., "Dramatically Enhanced Efficiency in Ultra-Fast Silicon MSM Photodiodes Via Light Trapping Structures," IEEE Photonics Technology Letters, vol. 31, pp. 1619-1622, 2019.

[3] J. Gou, H. Cansizoglu, C. Bartolo-Perez, S. Ghandiparsi, A. S. Mayet, H. Rabiee-Golgir, et al., "Rigorous coupled-wave analysis of absorption enhancement in vertically illuminated silicon photodiodes with photon-trapping hole arrays," Nanophotonics, vol. 8, pp. 1747-1756, 2019.

[4] H. Cansizoglu, C. Bartolo-Perez, Y. Gao, E. P. Devine, S. Ghandiparsi, K. G. Polat, et al., "Surface-illuminated photon-trapping high-speed Ge-on-Si photodiodes with improved efficiency up to 1700 nm," Photonics Research, vol. 6, pp. 734-742, 2018.

[5] A. S. Mayet, H. Cansizoglu, Y. Gao, S. Ghandiparsi, A. Kaya, C. Bartolo-Perez, et al., "Surface passivation of silicon photonic devices with high surface-to-volume-ratio nanostructures," JOSA B, vol. 35, pp. 1059-1065, 2018.

[6] B. Alhalaili, D. M. Dryden, R. Vidu, S. Ghandiparsi, H. Cansizoglu, Y. Gao, et al., "High-aspect ratio micro-and nanostructures enabled by photo-electrochemical etching for sensing and energy harvesting applications," Applied Nanoscience, vol. 8, pp. 1171-1177, 2018.

[7] Y. Gao, H. Cansizoglu, K. G. Polat, S. Ghandiparsi, A. Kaya, H. H. Mamtaz, et al., "Photon-trapping microstructures enable high-speed high-efficiency silicon photodiodes," Nature Photonics, vol. 11, p. 301, 2017.

[8] Y. Gao, H. Cansizoglu, S. Ghandiparsi, C. Bartolo-Perez, E. P. Devine, T. Yamada, et al., "High speed surface illuminated Si photodiode using microstructured holes for absorption enhancements at 900–1000 nm wavelength," ACS Photonics, vol. 4, pp. 2053-2060, 2017.

[9] H. Cansizoglu, E. P. Devine, Y. Gao, S. Ghandiparsi, T. Yamada, A. F. Elrefaie, et al., "A New Paradigm in High-Speed and High-Efficiency Silicon Photodiodes for Communication—Part I: Enhancing Photon–Material Interactions via Low-Dimensional Structures," IEEE Transactions on Electron Devices, vol. 65, pp. 372-381, 2017.

[10] S. Golmohammadi and S. Ghandi-Parsi, "Analysis of pulse propagation through multilayer plasmonic waveguides in the quasi-bound mode region," Journal of Optical Technology, vol. 83, pp. 525-531, 2016.

Conferences

[1] S. Ghandiparsi, A. F. Elrefaie, A. S. Mayet, C. Bartolo-Perez, H. Cansizoglu, Y. Gao, et al., "Up to 1700nm broadband high-efficiency surface-illuminated Ge/Si photodiode with microhole array," in Integrated Photonics Research, Silicon and Nanophotonics, 2019, p. IT3A. 3.

[2] H. Rabiee-Golgir, S. Ghandiparsi, E. P. Devine, A. S. Mayet, C. Bartolo-Perez, P. S. Wijewarnasuriya, et al., "Ultra-thin super absorbing photon trapping materials for high-performance infrared detection," in Infrared Technology and Applications XLV, 2019, p. 110020T.

[3] C. B. Perez, S. Ghandiparsi, A. S. Mayet, H. Cansizoglu, Y. Gao, E. Ponizovskaya-Devine, et al., "TuD1. 3-Photodetectors with Photon-trapping Surface Nanostructures for Short Range LIDAR Systems," in 2019 IEEE Photonics Society Summer Topical Meeting Series (SUM), 2019, pp. 1-2.

[4] E. Ponizovskaya-Devine, H. R. Godir, S. Ghandiparsi, A. Mayet, C. Perez, and M. S. Islam, "MP4-Si-compatible Mid-infrared Photodetectors Based on 2D Materials," in 2019 IEEE Photonics Society Summer Topical Meeting Series (SUM), 2019, pp. 1-2.

[5] S. Ghandiparsi, A. F. Elrefaie, H. Cansizoglu, Y. Gao, C. Bartolo-Perez, H. H. Mamtaz, et al., "High-Speed High-Efficiency Broadband Silicon Photodiodes for Short-Reach Optical Interconnects in Data Centers," in Optical Fiber Communication Conference, 2018, p. W1I. 7.

[6] H. Cansizoglu, Y. Gao, S. Ghandiparsi, C. B. Perez, H. H. Mamtaz, M. F. Cansizoglu, et al., "Black holes enabled light bending and trapping in ultrafast silicon photodetectors," in Micro-and Nanotechnology Sensors, Systems, and Applications X, 2018, p. 106390I.

[7] H. Cansizoglu, Y. Gao, C. B. Perez, S. Ghandiparsi, K. G. Polat, H. H. Mamtaz, et al., "Toward all-silicon optical receivers: photon trapping and manipulation using nanostructures (Conference Presentation)," in Low-Dimensional Materials and Devices 2018, 2018, p. 107250B.

[8] C. Bartolo-Perez, H. Cansizoglu, Y. Gao, S. Ghandiparsi, A. S. Mayet, E. P. Devine, et al., "Enhanced Photon Detection Efficiency of Silicon Single Photon Avalanche Photodetectors Enabled by Photon Trapping Structures," in 2018 IEEE Photonics Society Summer Topical Meeting Series (SUM), 2018, pp. 143-144.

[9] H. Cansizoglu, Y. Gao, C. B. Perez, S. Ghandiparsi, E. Ponizovskaya, T. Yamada, et al., "High efficiency flexible silicon photodetectors and photovoltaics (Conference Presentation)," in Low-Dimensional Materials and Devices 2018, 2018, p. 107250F.

[10] E. P. Devine, H. Cansizoglu, Y. Gao, S. Ghandiparsi, C. Perez, H. H. Mamtaz, et al., "Quantum efficiency enhancement of mid infrared photodetectors with photon trapping micro-structures," in 2018 IEEE Photonics Society Summer Topical Meeting Series (SUM), 2018, pp. 97-98.

[11] Y. Gao, H. Cansizoglu, S. Ghandiparsi, C. Bartolo-Perez, E. P. Devine, A. Elrefaie, et al., "Fabrication of effective photon trapping and light manipulating micro/nano structures," in Low-Dimensional Materials and Devices 2017, 2017, p. 103490T.

[12] H. Cansizoglu, Y. Gao, S. Ghandiparsi, A. Kaya, C. B. Perez, A. Mayet, et al., "Improved bandwidth and quantum efficiency in silicon photodiodes using photon-manipulating micro/nanostructures operating in the range of 700-1060 nm," in Low-Dimensional Materials and Devices 2017, 2017, p. 103490U.

[12] H. Cansizoglu, Y. Gao, C. B. Perez, S. Ghandiparsi, E. P. Devine, M. F. Cansizoglu, et al., "Photon-trapping micro/nanostructures for high linearity in ultra-fast photodiodes," in Low-Dimensional Materials and Devices 2017, 2017, p. 103491C.

[13] C. Bartolo-Perez, Y. Gao, H. Cansizoglu, S. Ghandiparsi, A. Kaya, A. Mayet, et al., "Highly efficient silicon solar cells designed with photon trapping micro/nano structures," in Low-Dimensional Materials and Devices 2017, 2017, p. 103491D.

[14] E. P. Devine, H. Cansizoglu, Y. Gao, K. G. Polat, S. Ghandiparsi, A. Kaya, et al., "Optimization of light trapping micro-hole structure for high-speed high-efficiency silicon photodiodes," in 2017 IEEE Photonics Conference (IPC), 2017, pp. 587-588.

[15] H. Cansizoglu, Y. Gao, A. Kaya, S. Ghandiparsi, K. G. Polat, Y. Wang, et al., "Efficient Si photovoltaic devices with integrated micro/nano holes," in Low-Dimensional Materials and Devices 2016, 2016, p. 99240V.

[16] A. S. Mayet, H. Cansizoglu, Y. Gao, A. Kaya, S. Ghandiparsi, T. Yamada, et al., "Inhibiting device degradation induced by surface damages during top-down fabrication of semiconductor devices with micro/nano-scale pillars and holes," in Low-Dimensional Materials and Devices 2016, 2016, p. 99240C.

Presentations

* JENA-DAVIS (JEDIS) Summer School on Biophotonics in Clinical Research *Aug. 25-30, 2019*

“Broadband high-efficiency surface photodiode integrated with photon trapping structures for eye-safe low power light-sensing.”

* Integrated Photonics Research, Silicon and Nanophotonics, 2019. *Mar. 11-15, 2019*

“Up to 1700nm broadband high-efficiency surface-illuminated Ge/Si photodiode with microhole array”.

* SPIE Defense + Commercial Sensing, 2019. *Apr. 14-18, 2019*

 “Ultra-thin super absorbing photon trapping materials for high-performance infrared detection.”

* Fiber Communication Conference, 2018. *Mar. 11-15, 2018*

“High-Speed High-Efficiency Broadband Silicon Photodiodes for Short-Reach Optical Interconnects in Data Centers.”

* International Conference on Nanoscience, Nanotechnology & Advanced Materials (IC2NAM), Tehran, Iran. *May 23-25, 2012*

“Optical Properties of Plasmonic Waveguides Containing Noble Metal Nanoparticles.”

* Iran Nanotechnology Initiative Consul Meeting, Tehran, Iran. *Dec. 26th, 2011*

“Analysis of the properties of plasmonic waveguides with the goal of modifying their optical properties using noble metal nanoparticles.”

Service & Professional Membership

* Electrical and Computer Engineering Graduate student Association (ECE-GSA) board member *2019-2020*
* UC Davis Optic Club Officer *Since 2019*
* Institute of Electrical and Electronics Engineering (IEEE) *Since 2016*
* Optical Society of America (OSA) *Since 2015*
* Iran Nanotechnology Initiative Council *Since 2009*
* Iran Nanotechnology Society *Since 2008*
* Iranian Association of Electrical and Electronics Engineering *2007-2012*

references

|  |  |  |
| --- | --- | --- |
| M. Saif Islam (PhD Advisor)Professor and ChairElectrical and Computer EngineeringUniversity of California-Davis(530) 754-6732sislam@ucdavis.edu | Jerry M. Woodall(PhD Committee Chair)Distinguished ProfessorElectrical and Computer EngineeringUniversity of California-Davis(530) 752-9581jwoodall@ucdavis.edu | Shih-Yuan (SY) Wang(Supervisor and Co-PI)CTO & Co-FounderW&Wsens Devices, Inc.(650) 965-3211sywang@me.com |