

Thariq Shanavas

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Education

University of Colorado, Boulder

Aug 2025

Ph.D., Physics

Indian Institute of Technology, Bombay

Aug 2019

B.S., Electrical Engineering

Experience

University of Colorado, Boulder (Advisor: Prof. Juliet Gopinath)

PhD Candidate

Aug 2019 – Jul 2025

- Demonstrated the smallest (200 μm) optical gyroscope to date. Leveraged non-linear processes in integrated photonic micro-resonators to achieve an over 10 times increase in SNR over the state of the art. [3, 9]
Patent under a licensing agreement with Mesa Quantum. [1]
- Developed a finite difference solver for Maxwell's equations in highly scattering media, with a reduced time complexity of $O(n^{2.37})$ from $O(n^3)$ for existing methods. This framework was implemented in Python, and used to solve several previously intractable problems in deep-tissue optical microscopy imaging. [4, 5, 10] **Patent Pending.** [2]
- Prototyped the first cascaded forward Brillouin laser in a microresonator platform, with a record-low pump power of 0.76 mW. Built a testing chamber with electronically actuated coupling stages to evaluate photonic integrated circuits with high repeatability. [6, 11]
- Used industry-standard software including Comsol, Lumerical, Zemax and Matlab to simulate and design lenses, laser systems and integrated photonic devices.
- Raised \$425,000 in government and private funding through successful grant proposals on topics of microscopy, imaging, non-linear optics, ultrafast lasers and integrated photonics.

Tyndall National Institute, Ireland (Advisor: Prof. Paul Townsend)

Internship

May 2018 – Jul 2018

- Developed and trained a recurrent neural network reduce the error rate in fiber-optic links by 50%, permitting up to 20 Gbps bitrates over a network designed for 10 Gbps.

High Energy Accelerator Research Organization, Japan (Advisor: Prof. Manobu Tanaka)

Internship

Nov 2017 – Dec 2017

- Prototyped an FPGA-based controller using VHDL for semiconductor-based subatomic particle detectors. Parallel processing of data-streams from multiple detectors increased the system throughput by 25 times.

University of Alberta, Canada (Advisor: Prof. Karthik Shankar)

Internship

May 2017 – Jul 2017

- Developed a theoretical framework for surface plasmon resonances in metamaterial surfaces, effectively modeling absorption and Raman spectra of Titanium Nitride nanotube arrays. [7]

Publications and Patents

Patents

1. **Shanavas T**, Kreuper G, Zhu J, Park W, and Gopinath JT. Nonlinear scanning optical microphotonic gyroscope. U.S. Patent Application No. 63/784,713, filed Apr 2025.
2. **Shanavas T**, McLeod RR, Siemens ME, and Gopinath JT. Apparatus and Methods for Enhanced Simulation of Light Propagation in a Scattering Medium. U.S. Patent Application No. 19/210,929, filed May 2025.

Journal Articles

3. **Shanavas T**, Kreuper G, Zhu J, Park W, and Gopinath JT. Nonlinear symmetry breaking to enhance the Sagnac effect in a microresonator gyroscope. Submitted to APL Photonics 2025
4. Saladrigas CA, Anchordoquy R, **Shanavas T**, Heyrich M, Restrepo D, Siemens ME, Gibson EA, and Gopinath JT. Two-photon fiber STED microscope demonstrated at depth in scattering media. Submitted to Photonics Technology Letters 2025
5. **Shanavas T**, McLeod RR, Siemens ME, and Gopinath JT. Fast finite difference solver for optical microscopy in deep biological tissue. Optics Letters 2024; 49:4417–20
6. **Shanavas T**, Grayson M, Xu B, Zohrabi M, Park W, and Gopinath JT. Cascaded forward Brillouin lasing in a chalcogenide whispering gallery mode microresonator. APL Photonics 2022; 7
7. Farsinezhad S, **Shanavas T**, Mahdi N, Askar AM, Kar P, Sharma H, and Shankar K. Core-shell titanium dioxide-titanium nitride nanotube arrays with near-infrared plasmon resonances. Nanotechnology 2018; 29:154006
8. Grayson M, Xu B, **Shanavas T**, Zohrabi M, Bae K, Gopinath JT, and Park W. Fabrication and characterization of high quality GeSbSe reflowed and etched ring resonators. Optics Express 2022; 30:31107–21

Conference Talks

9. **Shanavas T**, Kreuper G, Zhu J, Park W, and Gopinath JT. Nonlinear symmetry breaking to enhance the Sagnac effect in a microresonator gyroscope. *Frontiers in Optics*. Optica Publishing Group, 2025
10. **Shanavas T**, McLeod RR, Siemens ME, and Gopinath JT. Comparison of Coherent and Incoherent Donut Beams for Deep Tissue STED Microscopy. *Conference on Lasers and Electro-Optics (CLEO)*. Optica Publishing Group, 2023
11. **Shanavas T**, Grayson MB, Zohrabi M, Park W, and Gopinath JT. Cascaded Forward Brillouin Scattering in a Chalcogenide Microsphere. *Conference on Lasers and Electro-Optics (CLEO)*. Optica Publishing Group, 2022