Thariq Shanavas

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Summary

PhD Physicist with over six years of experience in building optical sensors and laser systems. Proficient with industry-standard simulation software, as well as developing tailored solutions for unique challenges.

Education

University of Colorado, Boulder
Ph.D., Physics 2025
Indian Institute of Technology, Bombay
Bachelor's degree, Electrical Engineering 2019

Experience

University of Colorado, Boulder (Advisor: Prof. Juliet Gopinath)
PhD Candidate Aug 2019 – Aug 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 previous best report. [3, 9] **Patent Pending.** [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 commercial software. This framework was implemented in Python, and used to solve several previously intractable problems in deep-tissue optical microscopy. [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 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, 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.

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. Preprint on arXiv, 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