Thariq Shanavas

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Education

July 2025 **Ph.D. Physics, University of Colorado, Boulder**
June 2019 **B.S. Electrical Engineering, Indian Institute of Technology, Mumbai**

Skills

Simulation and Design: Comsol, Lumerical, Nonlinear optics simulations
Experimental: Lithography and fabrication, Integrated photonics, Lasers, Optical circuit design, Electronics (Circuit/PCB design, soldering, troubleshooting), FPGA and Microcontrollers
Programming: Python, Matlab, Linux shell scripting, Networking, Instrument automation

Employment History

University of Colorado, Boulder (Advisor: Prof. Juliet Gopinath)
PhD Candidate Aug 2019 – July 2025

- **(Patent Pending)** Demonstrated the smallest (200 μm) and most performant chip-scale optical gyroscope to date. Leveraged non-linear processes in micro-resonators to achieve a 1000x improvement in signal-to-noise ratio over the previous best chip-scale gyroscope. [2]
- **(Patent Pending)** Developed a finite difference solver for Maxwell's equations in highly scattering media, with $O(n^{2.37})$ complexity vs. $O(n^3)$ for existing methods. This framework was used to solve several previously intractable problems in deep-tissue optical microscopy. [1], [3]
- Prototyped the first cascaded forward Brillouin laser in a microresonator platform, with a record-low pump power of 1 mW. [5]
- Secured $425,000 in government and private funding through successful grant proposals, directly supporting R&D expenses.

Tyndall National Institute, Ireland (Advisor: Prof. Paul Townsend)
Internship May – July 2018

- Demonstrated 20 Gbps data rates over a fiber-optic network designed for 10 Gbps using machine learning to reduce error rates.

High Energy Accelerator Research Organization, Japan (Advisor: Prof. Manobu Tanaka)
Internship Nov – Dec 2017

- Developed an FPGA framework for processing and digitizing data from a fast semiconductor-based subatomic particle detector.

University of Alberta, Canada (Advisor: Prof. Karthik Shankar)
Internship May – July 2017

- Developed a theoretical framework for surface plasmon resonances in metamaterial surfaces. [6]

Publications and Patents

Journal Articles and Patents

1. C. A. Saladrigas, R. Anchordoquy, **T. Shanavas**, M. Heyrich, D. Restrepo, M. E. Siemens, E. A. Gibson, and J. T. Gopinath, "Two-photon fiber sted microscope demonstrated at depth in scattering media," *Submitted to Photonics Technology Letters*, 2025.
2. **T. Shanavas**, G. Kreuper, J. Zhu, W. Park, and J. T. Gopinath, "Nonlinear symmetry breaking to enhance the sagnac effect in a microresonator gyroscope," *Submitted to APL Photonics*, 2025, U.S. Provisional Patent Application No. 63/784,713, filed April 7, 2025.
3. **T. Shanavas**, R. R. McLeod, M. E. Siemens, and J. T. Gopinath, "Fast finite difference solver for optical microscopy in deep biological tissue," *Optics Letters*, vol. 49, no. 15, pp. 4417–4420, 2024, U.S. Patent Application No. 19/210,929, filed May 16, 2025.
4. M. Grayson, B. Xu, **T. Shanavas**, M. Zohrabi, K. Bae, J. T. Gopinath, and W. Park, "Fabrication and characterization of high quality gesbse reflowed and etched ring resonators," *Optics Express*, vol. 30, no. 17, pp. 31 107–31 121, 2022.
5. **T. Shanavas**, M. Grayson, B. Xu, M. Zohrabi, W. Park, and J. T. Gopinath, "Cascaded forward brillouin lasing in a chalcogenide whispering gallery mode microresonator," *APL Photonics*, vol. 7, no. 11, 2022.
6. S. Farsinezhad, **T. Shanavas**, N. Mahdi, A. M. Askar, P. Kar, H. Sharma, and K. Shankar, "Core–shell titanium dioxide–titanium nitride nanotube arrays with near-infrared plasmon resonances," *Nanotechnology*, vol. 29, no. 15, p. 154 006, 2018.

Conference Proceedings

1. **T. Shanavas**, G. Kreuper, J. Zhu, W. Park, and J. T. Gopinath, "Nonlinear symmetry breaking to enhance the sagnac effect in a microresonator gyroscope," in *Frontiers in Optics*, Optica Publishing Group, 2025.
2. **T. Shanavas**, R. R. McLeod, M. E. Siemens, and J. T. Gopinath, "Comparison of coherent and incoherent donut beams for deep tissue sted microscopy," in *Conference on Lasers and Electro-Optics (CLEO)*, Optica Publishing Group, 2023.
3. B. Xu, M. Grayson, **T. Shanavas**, J. T. Gopinath, and W. Park, "Dispersion control of high-quality ge23sb7s70 reflowed wedge resonators," in *Conference on Lasers and Electro-Optics (CLEO)*, Optica Publishing Group, 2023.
4. **T. Shanavas**, M. B. Grayson, M. Zohrabi, W. Park, and J. T. Gopinath, "Cascaded forward brillouin scattering in a chalcogenide microsphere," in *Conference on Lasers and Electro-Optics (CLEO)*, Optica Publishing Group, 2022.

References

Available on Request