Thariq Shanavas

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Employment History

2019 – *Present* — **University of Colorado, Boulder** (PhD Candidate) - Prototyping miniaturized lasers, gyroscopes and microscopes using non-linear optics.

May 2018 – July 2018 — **Tyndall National Institute, Ireland** (Internship - Computer Science) Demonstrated 20 Gbps data rates over a fiber-optic network designed for 10 Gbps using machine learning to reduce error rate.

Nov 2017 – Dec 2017 — **KEK, High Energy Accelerator Research Organization, Japan** (Internship - Electrical Engineering) Wrote an FPGA framework for processing and digitizing data from a fast semiconductor-based subatomic particle detector.

May 2017 – July 2017 — **University of Alberta, Canada** (Internship - Physics) Theoretically explained the anomalous optical properties of a metamaterial surface, with repeated structures smaller than the limit of diffraction.

Education

Expected Spring 2025 — **Ph.D., University of Colorado, Boulder** Physics

Fall 2023 — **M.S., University of Colorado, Boulder** Physics

Spring 2019 — **B.S., Indian Institute of Technology, Mumbai** Electrical Engineering

Research Publications

Highlighted Research

1. (**Patent Pending**) A finite difference solver for Maxwell's equations in highly scattering media, with $O(n^{2.37})$ complexity in contrast to $O(n^3)$ for existing methods. This solver is being used internally for developing miniaturized deep-tissue optical microscopes for studying live mice brains.[1]
2. First report of a cascaded forwarded Brillouin laser in a microresonator platform, with a record low pump power of 1 mW. This device may serve as a narrow-linewidth laser source for sensors and integrated photonic devices. [3]
3. Explanation of surface plasmon resonance in a metamaterial surface. This metamaterial may be used as a catalytic surface for photochemical reactions such as splitting water into Hydrogen and Oxygen. [4]
4. (**In-progress**) Building a miniature optical gyroscope with sensitivity far-exceeding MEMS devices.

Journal Articles

1. **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.
2. M. Grayson, B. Xu, **T. Shanavas**, *et al.*, "Fabrication and characterization of high quality gesbse reflowed and etched ring resonators," *Optics Express*, vol. 30, no. 17, pp. 31 107–31 121, 2022.

3. **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.
4. S. Farsinezhad, **T. Shanavas**, N. Mahdi, *et al.*, "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**, R. R. McLeod, M. E. Siemens, and J. T. Gopinath, "Comparison of coherent and incoherent donut beams for deep tissue sted microscopy," in *2023 Conference on Lasers and Electro-Optics (CLEO)*, Optica Publishing Group, 2023.
2. B. Xu, M. Grayson, **T. Shanavas**, J. T. Gopinath, and W. Park, "Dispersion control of high-quality ge23sb7s70 reflowed wedge resonators," in *2023 Conference on Lasers and Electro-Optics (CLEO)*, Optica Publishing Group, 2023.
3. **T. Shanavas**, M. B. Grayson, M. Zohrabi, W. Park, and J. T. Gopinath, "Cascaded forward brillouin scattering in a chalcogenide microsphere," in *2022 Conference on Lasers and Electro-Optics (CLEO)*, Optica Publishing Group, 2022.

Skills

Languages	English
Programming	Python, Matlab, Bash scripting, Linux system administration
Experimental	Proficiency with lab equipment (e.g., Oscilloscopes, Spectrum analyzers) Lithography and cleanroom techniques Data analysis
Engineering	Circuit design and analysis, soldering Failure analysis/debugging Computational and theoretical modeling FPGA and microcontroller programming
Optics	Optical design principles Laser design and safety training Optical fiber handling Design and characterization of on-chip integrated photonic devices

References

Available on Request