

Pranjal Choudhury

Ph.D. Candidate in Physics

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👤 Pranjal Choudhury

RESEARCH INTERESTS

- Super-resolution Microscopy (SMLM/STORM) • Computational Imaging • Deep Learning in Optics
- Optics Instrumentation • Adaptive Optics.

EDUCATION

Indian Institute of Technology Guwahati

2020 – Present

Ph.D. in Physics (CGPA: 10.00/10.00)

Thesis: Improved Localisation and Reconstruction in a Single Molecule Localisation Microscope to Enable Super-Resolution Imaging with Lowered Resource Pre-requisites.

Advisor: Prof. Bosanta Ranjan Boruah

Tezpur University

2014 – 2019

Integrated M.Sc. in Physics (CGPA: 8.73/10.00)

Thesis: Quantum Phenomena in Flatland.

- *Awarded Institute Gold Medal*

RESEARCH EXPERIENCE

Visiting Ph.D. Researcher | Imperial College London

May – July 2024

Global Development Hub Fellowship | Supervisor: Prof. Paul M.W. French

- Collaborated on development of a robust hardware-based autofocus system for focus stabilization in Single Molecule Localization Microscopy (SMLM).

PhD Research Student | IIT Guwahati

2020 – Present

- **Deep Learning:** Developed a CNN-based approach for accurate PSF detection in high-density emitter environments. Developed a deep learning based wavefront reconstruction method for Shack-Hartmann type wavefront sensors.
- **Software Development:** Built custom Python-based SMLM image reconstruction software and integrated it as a Micro-Manager plugin for real-time visualization.
- **Instrumentation:** Collaboratively built a low cost SMLM setup, including laser alignment and spatial light modulator (SLM) integration.
- **Hardware Software Interfacing:** Developed an image based lateral drift correction algorithm for Fluorescence microscopes, achieving nanometer level stability.

PEER-REVIEWED JOURNAL PUBLICATIONS

1. **P.Choudhury**, et al. "Real-Time Lateral Drift Stabilization in Single Molecule Localization Microscopy Using Live Image Re-Registration." (*under revision*) *Journal of Microscopy*. (2026).
2. **N. Kumar**, et al. "Deep Learning-Driven Wavefront Sensing for Grating-Array-Based Wavefront Sensor." *IEEE Sensors Journal*. (2025). DOI

3. **P. Choudhury**, et al. "Neural network-assisted localization of clustered point spread functions in single-molecule localization microscopy." *Journal of Microscopy* (2024). DOI
4. **A. Kumar**, et al. "Tuning the excitation laser power in a stochastic optical reconstruction microscope for Alexa Fluor 647 dye in Vectashield mounting media." *Review of Scientific Instruments* (2024). DOI
5. **P. Choudhury**, et al. "Adaptive image thresholding and localization of point spread functions with enhanced precision for single molecule localization based super-resolution microscopy" *Optics and Lasers in Engineering* (2024). DOI
6. **P. Choudhury**, et al. "Localization and Image Reconstruction in a STORM Based Super-resolution Microscope." *Image Processing Online* (2024). DOI

SELECTED CONFERENCE PRESENTATIONS

- **Talk:** "Astigmatic Vortex Beam-Based Autofocus System for Super Resolution Microscopy" **Optica-SPIE ECBO 2025, Munich Germany** (2025).
- **Poster:** "Structure Estimation in Single Molecule Localization Microscopy Using Parametric and Deep Learning Methods" **Optica Fio-LS 2025, Denver USA** (2025).
- **Poster:** "Implementation of Real-Time Image Reconstruction and Visualization in Single Molecule Localization Microscopy" **Optica-SPIE ECBO 2025, Munich Germany** (2025).
- **Poster:** "Image reconstruction in a STORM based super resolution microscope" **PHOTONICS 2023, IISC Bangalore, India** (2023)

AWARDS & HONORS

- **Optica Student Leadership Award** 2025
- **Global Development Hub Fellowship**, Imperial College London 2024
- **Institute Gold Medal**, Tezpur University 2019
- **National Exams:** CSIR-JRF/NET, GATE, and JEST 2020
- **INSPIRE Scholarship**, Dept. of Science & Technology, Govt. of India 2014 – 2019

TECHNICAL SKILLS

Programming	Python, MATLAB, C++, Java.
Hardware	Optical Microscopy, SMLM/STORM, Fluorescence Imaging, Wavefront Sensing.
Software	Micro-Manager, ImageJ/Fiji, Napari, Zemax, LabVIEW
Data Science	PyTorch, TensorFlow, Computer Vision (OpenCV).

TEACHING & LEADERSHIP

- **Teaching Assistant:** Engineering Optics, Computational Physics, Advanced Physics Lab (IITG).
- **Leadership:** Student Member of SPIE & Optica; Member of Research Scholar's Forum, IITG.
- **Mentorship:** Mentored undergraduate and postgraduate students as well as summer interns for their research projects.

REFERENCES

Prof. Bosanta Ranjan Boruah
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Prof. Paul M.W. French
 Department of Physics, Imperial College London
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