Tushar Nayak

tusharnayak@outlook.com tusharn@andrew.cmu.edu /in/nayaktushar
ORCiD (0000-0002-4328-7983) Google Scholar (9xUX7NoAAAAJ) My Website

I'm a masters student at Carnegie Mellon University, studying Biomedical Engineering and interested in the intersection of medical engineering, computer vision and pattern recognition in the context of medical & surgical robotics. I am currently part of Professor Kenji Shimada's CERLab at CMU as a part of the Tele-Surgery project, where I work on the vision subsystem of the tele-operated endovascular surgical platform as part of my masters thesis.

Education

2026 **M.S. Biomedical Engineering - Research**
Carnegie Institute of Technology, Carnegie Mellon University.
PITTSBURGH, PENNSYLVANIA, USA
Coursework: Computer Vision, Visual Recognition & Learning, Learning for 3D Vision, Image-based Computational Modeling & Analysis, Clinical Translations of Deep Learning, Sensing and Sensors, MRI and Neuro-imaging Analysis, Rehabilitation Engineering, Surgery for Engineers

2023 **B.Tech. Biomedical Engineering, Minor in Data Science**
Manipal Institute of Technology, Manipal Academy of Higher Education.
MANIPAL, KARNATAKA, INDIA
Capstone Thesis: Deep Learning Based Multi-Modal Multi-Stage Detection of Oral Cancer
Relevant Coursework: Pattern Recognition, Regression Models, Statistical Inference, Machine Learning, Exploratory Data Analysis, Signals & Systems, Signal Processing, Image Processing, Digital System Design, Integrated Circuit Systems, Signal Processing Lab, Math I, II, III & IV

Click here for detailed information about coursework.

Research Experience

August 2024 – · · · · **Graduate Student Researcher: Tele-Surgery**
Computational Engineering and Robotics Lab, Carnegie Mellon University

Dec 2024 – May 2025 **Graduate Research Assistant: Neuro-Oncology Prediction**
The ∀ Lab & Image Science Lab, Carnegie Mellon University

Apr 2024 – Jul 2024 **Research Intern: Fetal Anomaly Detection System**
Indian Council of Medical Research

June 2024 – Jul 2024 **Project Intern: Malaria Infection Detection**
Department of Biomedical Engineering, Worcester Polytechnic Institute

Aug 2023 – Apr 2024 **Research Associate: Pattern Recognition & Signal Processing**
Heritage Science & Biomedical Engineering, Indian Institute of Technology - Hyderabad

Jan 2022 – May 2023 **Undergraduate Student Researcher: Computer-Aided Diagnosis**
Dr. Niranjana S. Medical Informatics Lab, Manipal Institute of Technology - Manipal

Jan 2023 – Mar 2023 **Techno-Commercial Market Research Intern** at CETAS Healthcare

Jul 2022 – Aug 2022 **Hospital Intern** at Kasturba Hospital, Manipal University *not a research internship*

Click here for details on the methods and results about the research conducted.

Research Publications

Journal Articles

1. **T. Nayak**, N. Gokulkrishnan, K. Chadaga, N. Sampathila, H. Mayrose, and S. KS, "Automated histopathological detection and classification of lung cancer with an image pre-processing pipeline and spatial attention with deep neural networks," *Cogent Engineering*, vol. 11, no. 1, p. 2 357 182, 2024. DOI: 10.1080/23311916.2024.2357182.
2. **T. Nayak**, K. Chadaga, N. Sampathila, *et al.*, "Deep learning based detection of monkeypox virus using skin lesion images," *Medicine in Novel Technology and Devices*, p. 100 243, 2023. DOI: 10.1016/j.soh.2023.100040.
3. **T. Nayak**, K. Chadaga, N. Sampathila, *et al.*, "Detection of monkeypox from skin lesion images using deep learning networks and explainable artificial intelligence," *Applied Mathematics in Science and Engineering*, vol. 31, no. 1, p. 2 225 698, 2023. DOI: 10.1080/27690911.2023.2225698.

4. H. Mayrose, N. Sampathila, G. M. Bairy, **T. Nayak**, S. Belurkar, and K. Saravu, "An explainable artificial intelligence integrated system for automatic detection of dengue from images of blood smears using transfer learning," *IEEE Access*, pp. 1–1, 2024. DOI: 10.1109/ACCESS.2024.3378516.

5. **T. Nayak** and N. Sampathila, "Automated oral squamous cell carcinoma detection from histopathological images using deep neural networks," *Journal of Biomedical Engineering Society of India, Vol. 17*, 2023. URL: https://t.ly/P1Md3.

6. N. Gokulkrishnan, **T. Nayak**, N. Sampathila, L. Dalmia, and R. Laghate, "Binary detection of acute lymphocytic leukemia using blood smear images using deep learning models," *Journal of Biomedical Engineering Society of India, Vol. 17*, 2023. URL: https://t.ly/P1Md3.

Conference Proceedings

1. **T. Nayak**, N. Sampathila, and N. Gokulkrishnan, "Processing and detection of lung and colon cancer from histopathological images using deep residual networks," in *2023 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)*, IEEE, 2023, pp. 1–6. DOI: 10.1109/CONECCT57959.2023.10234757.

2. N. Gokulkrishnan, **T. Nayak**, and N. Sampathila, "Deep learning-based analysis of blood smear images for detection of acute lymphoblastic leukemia," in *2023 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)*, IEEE, 2023, pp. 1–5. DOI: 10.1109/CONECCT57959.2023.10234824.

3. H. Mayrose, N. Sampathila, G. M. Bairy, **T. Nayak**, S. Belurkar, and K. Saravu, "Deep learning approach for detection of dengue fever from the microscopic images of blood smear," in *Journal of Physics: Conference Series*, IOP Publishing, vol. 2571, 2023, p. 012 005. DOI: 10.1088/1742-6596/2571/1/012005.

Skills

Programming	Python, MATLAB, R, C++, C, Visual Basic, .NET, LaTeX, …
Deep Learning	Convolution Neural Networks, Neural Ordinary Differential Equations, Attention Mechanisms & Transformers, Physics-Informed Neural Networks, Recurrent Neural Networks & Long Short Term Memory, Encoder-Decoders, Autoencoders, Explainable AI. *Exploring & Learning Probabilistic Graph Models and Graph Neural Networks.*
Image Processing	Image Filtering, Feature Enhancement & Extraction, Segmentation, Object Detection, Texture Analysis, Morphological Analysis, Compression, Color Processing.
Computer Vision	Feature Detection & Description, Geometric Computer Vision, Camera Geometry, 3D Reconstruction & Stereo Vision, Motion Analysis & Tracking and OPENCV
3D Vision	3D STL Data Processing, Surface Mesh Manipulation, Deformation Models, Image Registration, Volume Rendering, Alignment AND Neural Imaging: SPM, FSL, ITK-SNAP.
Pattern Recognition	Support Vector Machines, Random Forests & Decision Trees, Gaussian Processes, Bayesian Neural Networks, Clustering, Principal Component Analysis, Time-Series Analysis.
Signal Processing	Filter Design, Signal Reconstruction, Noise Reduction, Feature Extraction, Time Series & Spectral Analysis, Statistical Signal Processing.
Biomedical Engg.	Medical Image Analysis, Computer-aided diagnosis, Computer-aided robotic surgery, Tumor Detection-Classification-Evolution Modeling, Pathological Data Processing, Biomedical signal Processing.

Technical and Co-Curricular Activities

Feb 2025 - May 2025	**Teaching Assistant: 17644 Applied Deep Learning,** Carnegie Mellon University
Jul 2022 – May 2023	**Chairperson & Head of Research,** IEEE EMBS Student Chapter Manipal
Jul 2021 – Jun 2022	**Secretary & Webmaster,** IEEE EMBS Student Chapter Manipal
Feb 2022 – Mar 2023	**Head of IT and Webmaster,** IEEE RAS Student Chapter Manipal

Extra-Curricular and Non-Technical Activities

Jan 2015 – · · · ·	**Blogger,** TechnologyFoundHere https://foundhere.technology/
April 2015 – May 2015	**Content Creator,** NODWIN Gaming
Jan 2019 – Mar 2019	**Tech Writer,** TechQuila techquila.co.in/author/tushar/
Feb 2019 – April 2019	**Staff Writer,** The MIT Post themitpost.com/author/tushar/
2006 – · · · ·	**Amateur Keyboardist and Pianist,** Trinity College London (Keyboard).

Awards

- **Biomedical Engineering Department Head's Fellowship**, College of Engineering at Carnagie Mellon University (March 2024)
- **Best Paper - AI Track**, 2nd International Conference on Artificial Intelligence, Computational Electronics and Communication System (March 2023)

References

Prof. Kenji Shimada
Theodore Ahrens Professor of Engineering
Department of Mechanical Engineering
and Robotics Institute & Biomedical Engineering
Carnegie Mellon University
shimada@cmu.edu

Prof. Niranjana Sampathila
Professor and Head of Department
Department of Biomedical Engineering
Manipal Institute of Technology
niranjana.s@manipal.edu

Dr. Clarence Worrell
Senior Data Scientist
School of Computer Science
Carnegie Mellon University
cworrell@andrew.cmu.edu

Dr. Krishnaraj Chadaga
Assistant Professor
Department of Computer Science & Engineering
Manipal Institute of Technology
krishnaraj.chadaga1@manipal.edu