NAKUL POUDEL

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EDUCATION

Ph.D. in Imaging Science *Aug 2023 - Present*
Rochester Institute of Technology *Rochester, NY, USA*
Advisor: Dr. Cristian A. Linte
Research Topic: *Deep learning for 3D reconstruction, registration, and robust analysis of medical images and surgical data*
Courses: Image Processing and Discrete Fourier Methods, Multivariate Statistics for Imaging Science, Advanced Robust Machine Learning for Interdisciplinary Imaging Science Applications, Machine Learning for Difficult Data, Human Visual System, Introduction to Medical Imaging, Probability Noise and System Modeling

Bachelor in Computer Engineering *Nov 2017 - Jul 2022*
Sagarmatha Engineering College, Tribhuvan University *Sanepa, Lalitpur, Nepal*

RESEARCH EXPERIENCE

Biomedical Modeling, Visualization and Image-guided Navigation Lab *Jul, 2024 - Present*
Research Assistant *RIT, Rochester, NY*

- Benchmarked deep learning models for liver point cloud completion and assessed their effectiveness in reconstructing 3D liver surfaces from partial observations.
- Leveraged the completed 3D liver surfaces for registration between preoperative and intraoperative liver point clouds, resulting in improved registration performance.
- Currently assessing the performance of large vision-language models (VLMs) for various surgical tasks, including surgical tool recognition, tool localization, action recognition, and surgical phase identification, towards developing general-purpose surgical VLMs capable of holistic surgical scene understanding.

Digital Imaging and Remote Sensing Lab *Aug, 2023 - Jul, 2024*
Research Assistant *RIT, Rochester, NY*

- Evaluated how well ground-based monocular depth estimation methods transfer to UAV overhead (nadir) imagery.
- Assessed model performance on real drone captures using LiDAR-derived depth/elevation as ground truth for validation.

TEACHING EXPERIENCE

Graduate Teaching Assistant *Aug 2025 – Dec 2025*
IMGS 617: Image Processing and Discrete Fourier Methods *RIT, Rochester, NY*

- Supported course instruction by grading homework and projects, assisting with course material preparation, and mentoring students during office hours.

Graduate Teaching Assistant *Jan 2024 – Apr 2024*
IMGS 389: Machine Learning for Image Analysis *RIT, Rochester, NY*

- Graded assignments and examinations; conducted weekly office hours to support student learning.

Graduate Teaching Assistant *Aug 2023 – Dec 2023*
IMGS 111: Imaging Science Fundamentals *RIT, Rochester, NY*

- Assisted with laboratory sessions, graded coursework, and provided academic support to students.

TECHNICAL SKILLS

Programming Languages	Python(Proficient), C/C++, MATLAB
Python Packages	Pytorch, Tensorflow, Matplotlib, Seaborn, Numpy, Scipy, Scikit-Learn, Pandas, OpenCV, Jupyter
Tools and Frameworks	Git, Bash, Conda, Slurm, LaTeX

PUBLICATIONS

- **Nakul Poudel**, Zixin Yang, Kelly Merrell, Richard Simon, and Cristian A Linte. Evaluation of intraoperative patient-specific methods for point cloud completion for minimally invasive liver interventions. In *Medical Imaging 2025: Image-Guided Procedures, Robotic Interventions, and Modeling*, volume 13408, pages 376–384. SPIE, 2025
- **Nakul Poudel**, Zixin Yang, Kelly Merrell, Richard Simon, and Cristian A Linte. Toward patient-specific partial point cloud to surface completion for pre to intra-operative registration in image-guided liver interventions. In *Annual Conference on Medical Image Understanding and Analysis*, pages 302–316. Springer, 2025
- **Nakul Poudel**, Zixin Yang, Richard Simon, and Cristian A Linte. Assessing learning-based reconstructed liver surfaces from partial point clouds for improving pre-to intra-operative 3d to 3d registration. *Healthcare Technology Letters*, 12(1):e70041, 2025
- **Nakul Poudel**, Richard Simon, and Cristian A Linte. Evaluating large vision-language models for surgical tool detection. *IEEE EMBC (under review)*, 2026

ACHIEVEMENTS AND HONORS

RIT PhD. Merit Scholarship/ Assistantship *Aug 2023 - Present*

Erasmus+ Funded Traineeship, Universidad Politécnica de Cartagena, Spain *Mar 2022 - Jul 2022*

First Runner-up, Hack for Good Online Hackathon *Jun 2020*

Merit-Based Scholarship for Academic Excellence, Sagarmatha Engineering College *2019-2022*

PROFESSIONAL SERVICE

Reviewer, International Journal of Computer Assisted Radiology and Surgery (IJCARS), 2026

Reviewer, International Conference on Information Processing in Computer-Assisted Interventions (IPCAI), 2026

Reviewer, Medical Image Understanding and Analysis (MIUA), 2025

PROJECTS

Automated Framework for Surgical Tool Segmentation – Developed an end-to-end automated segmentation pipeline integrating the SAM3 foundation model with a vision–language model to enable visual prompt-free, data-agnostic, instance-level surgical instrument segmentation in endoscopic imagery. *2026*

Vision–Language Model Benchmarking for Surgical Instrument Detection – Conducted a systematic evaluation of large vision–language models (e.g., Qwen, LLaVA, InternVL) for surgical instrument detection in laparoscopic images under zero-shot and LoRA fine-tuned settings, with ongoing work toward developing a general-purpose VLM capable of modeling overall surgical workflow understanding. *2026*

Registration Framework to Overcome Partial Intraoperative Visibility – Developed a 3D–3D registration framework incorporating learning-based reconstruction of complete liver surfaces from partial intraoperative point clouds to improve pre- to intra-operative alignment accuracy. Addressed non-canonical liver poses arising from variations in camera field of view and differences in imaging modalities. *2025*

Nepali Handwritten Text Recognition – Developed a machine learning model for recognizing and classifying handwritten Nepali characters using image preprocessing and neural network-based feature extraction. *2021*

Online Queue Management System During COVID-19 – Designed and implemented a web-based system to manage customer queues remotely, reducing physical crowding and improving service efficiency during pandemic restrictions. *2020*

LEADERSHIP EXPERIENCE

Treasurer, Nepalese Student Association, Rochester Institute of Technology *Apr 2024 – Present*

Co-founder/ Member, Computer Engineering Society in Sagarmatha (COESIS) *Apr 2019 - Dec 2021*

TALKS AND PRESENTATIONS

Poster Presentation, "Evaluation of Intraoperative Patient-Specific Methods for Point Cloud Completion in Minimally Invasive Liver Interventions," SPIE Medical Imaging, San Diego, CA, USA *Feb 2025*

Oral Presentation, "Toward Patient-Specific Partial Point Cloud-to-Surface Completion for Pre- to Intra-Operative Registration in Image-Guided Liver Interventions," Medical Image Understanding and Analysis (MIUA), University of Leeds, Leeds, UK *Jun 2025*

Oral Presentation, "Assessing Learning-Based Reconstructed Liver Surfaces from Partial Point Clouds for Improving Pre- to Intra-Operative 3D–3D Registration," AECAI Workshop, MICCAI 2025, Daejeon, South Korea *Jun 2025*