# BIDUR KHANAL

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Bidur-Khanal bidurkhanal5 BidurKhanal ResearchGate: Bidur-Khanal

## EDUCATION

**Ph.D. in Imaging Science** *Aug 2020 - Expected Dec 2024*
*Rochester Institute of Technology* Rochester, NY, USA

**Research Focus**: *Medical Image Analysis using Deep Learning with Limited Labeled Data or Noisy Labels*
**Relevant Courses:** Intro to Medical Imaging; Mathematics for Deep Learning; Image Processing and Computer Vision; Human Visual System; Fourier Methods for Imaging; Probability Noise and System Modeling

**Bachelor's in Electronics and Communication Engineering** *Nov 2013 - Dec 2017*
*Institute of Engineering, Pulchowk Campus, Tribhuvan University* Lalitpur, Nepal
**Relevant Courses:** Data Mining; Artificial Intelligence; Big Data Technologies

## TECHNICAL SKILLS

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|---|---|
| **Programming Languages** | Python(Proficient), MATLAB (Intermediate), C/C++ (Basics) |
| **Python Packages** | Pytorch, Tensorflow, Keras, Matplotlib, Seaborn, Numpy, Scipy, Scikit-Learn, Pandas, OpenCV, Regex, Jupyter |
| **Tools and Frameworks** | Git, Bash, Conda, SLURM, AWS, ITK-SNAP, Neptune, Weight & Biases |

## RESEARCH EXPERIENCE

**Graduate Research Assistant** *July 2022 - Present*
*Biomedical Modeling, Visualization and Image-guided Navigation Lab, RIT* Rochester, NY, USA

- Studied how network architecture, pretraining methods, and dataset characteristics affect the medical image classification robustness amidst noisy labels in several settings ( $1^{st}$ paper submitted to EMBC 2024; $2^{nd}$ paper submitting to MedIA journal).
- Improved the robustness of medical image classification against noisy labels by using self-supervised pretraining (published at DEMI Workshop, MICCAI 2023).
- Developed a multimodal active learning method for 2D brain tumor segmentation and chest x-ray classification (accepted at MIUA 2023).
- Investigated the impact of class-dependent label noise in medical image classification on noise-free classes with subtle visual differences (published at SPIE Medical Imaging 2023).

**Graduate Research Assistant** *Jan 2021 - June 2022*
*Machine and Neuromorphic Perception Lab, RIT* Rochester, NY, USA

- Investigated the impact of heterogeneous label noise on deep learning-based vision tasks in multi-class, multi-task, and multi-label scenarios (published at ISVC 2021).
- Conducted an extensive study of online learning classifiers (streaming LDA, PA classifier, NCM, and AROW) for efficient continual learning.

**Machine Learning Research Assistant** *April 2019 - Aug 2020*
*NepAl Applied Mathematics and Informatics Institute for Research* Lalitpur, Nepal

- Developed deep learning framework for vertebra detection, spinal curvature estimation, and, scoliosis detection from X-ray images (published at MICCAI 2019 AASCE Challenge).
- Created a colorimetric PAD image dataset for pesticide concentration estimation using smartphone cameras, and benchmarked it with various ML models. (published at ACS Omega 2021).

## INDUSTRY WORK EXPERIENCE

**Deep Learning Engineer** *Dec 2019 - Aug 2020*
***Zeg**, 3D AI solution Company (Worked remotely, part-time consulting job)* London, UK

- Implemented several GAN models for adding realism to computer-rendered images.
- Developed deep learning-based framework for key points detection in 2D images for 3D modeling.

**Firmware/Image Processing Engineer** *Feb 2018 - Aug 2018*
*Nepal Digital Systems (startup company)* Lalitpur, Nepal

- Interfaced Raspberry Pi, Picamera, and GSM/GPS module with effective network communication for home automation application.
- Built OpenCV-based computer vision pipeline for edge devices to assess material strain under force.

## PUBLICATIONS

- **Khanal, Bidur**, Shrestha, P., Amgain, S., Khanal, B., Bhattarai, B., and Linte, C. A. (2024b). Investigating the robustness of vision transformers against label noise in medical image classification. *Accepted at EMBC*
- **Khanal, Bidur**, Bhattarai, B., Khanal, B., and Linte, C. (2024a). How does self-supervised pretraining improve robustness against noisy labels across various medical image classification datasets? *Preprint*
- Shrestha, P., Amgain, S., **Khanal, Bidur**, Linte, C. A., and Bhattarai, B. (2024). Medical vision language pretraining: A survey. *Preprint*
- **Khanal, Bidur**, Bhattarai, B., Khanal, B., and Linte, C. A. (2023a). Improving medical image classification in noisy labels using only self-supervised pretraining. In *MICCAI Workshop on Data Engineering in Medical Imaging*, pages 78–90. Springer
- **Khanal, Bidur**, Bhattarai, B., Khanal, B., Stoyanov, D., and Linte, C. A. (2023b). M-vaal: Multimodal variational adversarial active learning for downstream medical image analysis tasks. In *Annual Conference on Medical Image Understanding and Analysis*. Springer
- **Khanal, Bidur**, Hasan, S. K., Khanal, B., and Linte, C. A. (2023c). Investigating the impact of class-dependent label noise in medical image classification. In *SPIE Medical Imaging 2023: Image Processing*
- Sapkota, S., **Khanal, Bidur**, Bhattarai, B., Khanal, B., and Kim, T.-K. (2022). Label geometry aware discriminator for conditional generative networks. *ICPR*
- **Khanal, Bidur**, Pokhrel, P., Khanal, B., and Giri, B. (2021). Machine-learning-assisted analysis of colorimetric assays on paper analytical devices. *ACS omega*
- **Khanal, Bidur** and Kanan, C. (2021). How does heterogeneous label noise impact generalization in neural nets? In *International Symposium on Visual Computing*. Springer
- Wang, L., Xie, C., Lin, Y., Zhou, H.-Y., **Khanal, Bidur**, Khanal, B., et al. (2021). Evaluation and comparison of accurate automated spinal curvature estimation algorithms with spinal anterior-posterior x-ray images: The AASCE 2019 challenge. *Medical Image Analysis*
- **Khanal, Bidur**, Dahal, L., Adhikari, P., and Khanal, B. (2019). Automatic cobb angle detection using vertebra detector and vertebra corners regression. In *International Workshop and Challenge on Computational Methods and Clinical Applications for Spine Imaging*. Springer

## GROWTH, ACHIEVEMENTS AND HONORS

**Tiger Tales Toastmasters, RIT**
· Presentation Mastery pathway (level 2) *Aug 2022 - Present*
· Sergeant at Arms Role: Responsible for managing logistics at Toastmasters meetings. *May 2023 - Present*

**RIT PhD. Merit Scholarship/Assistantship** *Aug 2020 - Present*

**AWARE-AI NSF Research Trainee**, RIT *Jan 2022 - May 2022*

**First Treasurer of Nepal Student Association**, RIT *April 2020 – April 2021*

**Merit-Based Scholarship for Children of Government Employees** *2018*
Provided by: Government of Nepal, Ministry of General Administration (MoGA)

**Merit-Based Partial Tuition Waiver**, Tribhuvan University *Nov 2013 - Dec 2017*

**Appearance in National Television as an Idea Presenter** *2017*
Received the best idea award under Energy and Sustainability Category