BIDUR KHANAL

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 Bidur-Khanal   bidurkhanal5   BidurKhanal ResearchGate: Bidur-Khanal

RESEARCH INTEREST

General: Medical Image Analysis, Computer Vision, Deep Learning, Machine Learning, Artificial Intelligence
Specific: Robust Machine Learning for Medical Image Analysis.

EDUCATION

Ph.D. in Imaging Science *Aug 2020 - Present*
Rochester Institute of Technology Rochester, NY, USA
Thesis: *Medical Image Analysis with Deep Learning on Limited or Noisy Labeled Data*

Bachelor's in Electronics and Communication Engineering *Nov 2013 - Dec 2017*
Institute of Engineering, Pulchowk Campus, Tribhuvan University Lalitpur, Nepal

RESEARCH EXPERIENCE

Graduate Research Assistant *July 2022 - Present*
Rochester Institute of Technology; BiMVisIGN Lab Rochester, NY, USA

- Studied how network architecture, pretraining methods, and dataset characteristics affect the medical image classification robustness amidst noisy labels in several settings. (1st paper accepted at EMBC 2024; 2nd 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*
Rochester Institute of Technology; Machine and Neuromorphic Perception Lab 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

Camera Software Quality Intern *May 20, 2024 - Aug 23, 2024*
NVIDIA Corporation Santa Clara, CA, USA

- Automate the sensor-camera image quality testing using deep learning.
- Build software tool for automated data collection and analysis for camera software and hardware.

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.

TEACHING EXPERIENCE

Teaching Lab Assistant   *Dec 10 - Dec 20, 2019*
Second Nepal Winter School in AI   Pokhara, Nepal

- Prepared lab assignments for Pytorch tutorial on deep learning.
- Supervised lab activities: Teaching and assigning lab works in Python to beginner students.

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

- **Khanal, Bidur**, Pant, S., Pokharel, K., and Gaire, S. (2018). Mental state prediction by deployment of trained svm model on eeg brain signal. In *2018 IEEE 3rd International Conference on Computing, Communication and Security (ICCCS)*. IEEE

PROFESSIONAL SERVICE

Reviewer, International Conference on Medical Image Computing and Computer Assisted Intervention 2024.

Reviewer, International Conference on Medical Image Computing and Computer Assisted Intervention 2023.

Reviewer, Data Engineering in Medical Imaging, MICCAI 2023.

Reviewer, AAAI Conference on Artificial Intelligence 2023.

Technical Program Committee, Workshop on Data Engineering in Medical Imaging, MICCAI 2023.

ACADEMIC HONOR OR AWARD

Award, IEEE EMBC NextGen Scholar   *2024*

Award, Graduate Student Research and Creativity Reimbursement   *2023*
Rochester Institute of Technology, NY, USA

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

Scholarship, Merit-Based Engineering Scholarship in Bachelor's Degree   *2018*
Provided by MoGA Nepal for Children of Government Employees

Scholarship, Received stipend each semester for securing top 24 position in class.   *2013 - 2017*
Electronics and Communication Engineering, IOE, Pulchowk, Tribhuvan University, Nepal

LEADERSHIP AND PERSONAL GROWTH

Tiger Tales Toastmasters
Rochester Institute of Technology, NY, USA
· **Active Member,** Presentation Mastery pathway   *Aug 2022 - Present*
· **Sergeant at Arms Role,** Responsible for logistics at Toastmasters meetings.   *May 2023 - Dec 2023*
· **Treasurer,** Responsible for managing logistics at Toastmasters meetings.   *Jan 2024 - May 2024*

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

Idea Presentation, Himalayan Television, Nepal   *2017*
Presented for the best idea award in the Energy and Sustainability category.

TECHNICAL SKILLS

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