Sanskar Amgain

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Education

Bachelors in Computer Engineering — Lalitpur, Nepal
Pulchowk Campus, Institute of Engineering — *November 2018 – April 2023*

- Achieved Rank 57 in the entrance examination of 2018, out of approximately 15000 students
- Gradudated in *First Division* with **78.26%**
- **Relevant courses:** Object Oriented Programming, Engineering Mathematics, Theory of Computation, Discrete Structure, Data Structure & Algorithm, Microprocessor, Applied Mathematics, Numerical Methods, Software Engineering, Computer Organization & Architecture, Computer Graphics, Probability & Statistics, Database Management System, Artificial Intelligence, Operating System, Computer Networks, Digital Signal Analysis & Processing, Big Data, Data Science
- Undergraduate thesis: Distributed Resource Sharing Framework, supervised by Dr. Babu Ram Dawadi

English Proficiency Test (IELTS): 7.5, (Reading 9.0, Listening 8.5, Speaking 7.0, Writing 6.0)

Research Experience

Multimodal Learning Lab — June 2023 - Present
Research Assistant — Supervisor: ***Dr. Binod Bhattarai*** — *Lalitpur, Nepal*

- Contributing actively to research projects focused on **Medical Imaging**, **Federated Learning**, and **Multi-modal Learning**.
- Developed a novel local similarity regularization method to **enhance robustness in federated noisy label learning**, particularly in environments with significant label noise (*Currently Under Review*).
- Assisted team in developing novel **federated multimodal learning** algorithms with missing modalities in healthcare application.
- Employed rigorous research methodologies to analyze data, draw meaningful conclusions, and contribute to advancing knowledge in these domains.

NepAl Applied Mathematics and Informatics Institute (NAAMII) — August 2022 - April 2023
Research Intern — Supervisor: ***Dr. Bishesh Khanal*** — *Lalitpur, Nepal*

- Conducted comprehensive reviews of academic papers in Nepali Natural Language Processing (NLP)
- Performed in-depth exploratory data analysis (EDA) on Nepali NLP datasets, studying their features and limitations

Preprints & Publications

- **Amgain, S***, Shrestha, P*., Shrestha, Khanal, B., Y. R., Gyawali, P., & Bhattarai, B. (2024). Local K-Similarity Constraint for Federated Learning with Label Noise. *Under Review*
- Poudel, P., Shrestha, P*., **Amgain, S***., Shrestha, Y. R., Gyawali, P., & Bhattarai, B. (2024). CAR-MFL: Cross-Modal Augmentation by Retrieval for Multimodal Federated Learning with Missing Modalities. *International Conference On Medical Image Computing & Computer Assisted Intervention* (MICCAI), 2024 (Link)
- Khanal, B., Shrestha, P.*, **Amgain, S.***, Khanal, B., Bhattarai, B., & Linte, C. A. (2024). Investigating the Robustness of Vision Transformers against Label Noise in Medical Image Classification. *International Conference of the IEEE Engineering in Medicine and Biology Society* (EMBC), 2024. (Link)
- **Amgain, S.***, Shrestha, P.*, Bano, S., Torres, I. D. V., Cunniffe, M., Hernandez, V., ... & Bhattarai, B. (2024). Investigation of Federated Learning Algorithms for Retinal Optical Coherence Tomography Image Classification with Statistical Heterogeneity. *International Conference on Information Processing in Computer-Assisted Interventions* (IPCAI), 2024 (Link)

- Shrestha, P.*, **Amgain, S.***, Khanal, B., Linte, C. A., & Bhattarai, B. (2023). Medical Vision Language Pretraining: A survey. arXiv preprint arXiv:2312.06224. (Link)

Teaching Experience

AI4Growth *Teaching Assistant* January, 2024

- Conducted an in-depth lab session on the principles and application of gradient descent, explaining its role in optimizing machine learning models
- Guided students in the implementing *Sentiment Classification in BERT* as their final project in PyTorch

Fourth Annual Nepal AI School *Teaching Assistant* May, 2024

- Provided hands-on guidance and technical assistance in lab session on *Active Learning*, *Self-supervised Learning*, and *Federated Learning*

Industry Experience

Base Gene Therapeutics Limited October 2023 - November 2024
Machine Learning Engineer *United Kingdom*

- Analyzed nucleotide sequence data to derive meaningful insight about the disease-causing variant from nucleotide sequence
- Filtered out relevant variants using external associated gene list like *Panelapp*

Technical Skills

Languages : Python, C/C++, CUDA, Javascript, Golang

Machine Learning : Computer Vision, Multimodal Learning, Federated Learning, Distributed Optimization

Frameworks : PyTorch, Tensorflow, Numpy, Matplotlib

Dev Tools : Slurm, Visual Studio Code, Git, Docker, Debugger, Vim

Projects

Guthi-Distributed Computing Framework Source Code
*Undergraduate thesis, Supervisor — **Dr. Babu Ram Dawadi***

- Creation of distributed computing library in Go with support for Distributed Filesystem
- Implementation of Robust Persistent Peer to Peer Connection between nodes for communication with support for failure handling

Cockroach Tag Detection using YOLOv5 *Python, PyTorch*

- Successfully finetuned YOLOv5 to accurately detect and identify tags placed on the backs of cockroaches, for analyzing the association of cockroaches in different environmental conditions.
- Conducted detailed annotation of images to identify and label tags on cockroaches, ensuring high-quality training data for the detection model.

Pneumonia Detection *Python, PyTorch* Source Code

- Performed multi-class classification using VGG-19 network on Chest X-Ray images to identify whether the X-ray is normal or affected by Pneumonia (Bacterial and Viral)
- Utilized **Class Activation Map (CAM)** analysis to identify and interpret specific regions of interest targeted by the model during predictions.

Old Image Restoration *Python, PyTorch, Wandb, Git* Source Code

- Implemented a Generative Adversarial Networks (GAN) architecture for removing scratches from images achieving SSIM score of **0.69**
- Implemented **UNet** architecture as a Generator to transform old images to clean images and **PatchGAN** as a Discriminator

Casualty Extraction *Python, Transformers, NLTK* Source Code

- Developed and maintained a comprehensive repository for extracting casualty information from unstructured Nepali text data.
- Extracted the latest news from the RSS feed and leveraged NLP to identify and extract details about casualties, such as the number of people injured or deceased, from various text sources like news articles and reports.

AWARDS AND ACHIEVEMENTS

GritFeat AI Health Hackathon - 1st Runner Up 2023

Received stipend each semester for securing top 24 position in class 2018-2023

Merit-based full tuition waiver in undergrad based on entrance exam ranking 2018-2023

Volunteer Experiences

2nd Data Engineering in Medical Imaging (DEMI), MICCAI *Reviewer* 2024

IT Club, Pulchowk Campus *Founding Committe Member* 2022