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

Research Experience

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

- Contributing actively to research projects focused on **Federated Learning**, **Medical Imaging**, and **Multi-modal Learning**.
- 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

- 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. MICCAI 2024
- 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. EMBC 2024.
- **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. IPCAI 2024
- Shrestha, P.*, **Amgain, S.***, Khanal, B., Linte, C. A., & Bhattarai, B. (2023). Medical Vision Language Pretraining: A survey. arXiv preprint arXiv:2312.06224.

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 June 2023 - Present
Machine Learning Engineer *United Kingdom*

- Analyzed nucleotide sequence data to derive meaningful insight about the disease-causing variant from nucleotide sequence

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

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.

Tag Detection using YOLOv5 *Python, PyTorch*

- Successfully finetuned YOLOv5 to accurately detect and identify tags placed on the backs of cockroaches, improving the precision and reliability of the detection system.
- Conducted detailed annotation of images to identify and label tags on cockroaches, ensuring high-quality training data for the detection model.

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

- Developed a GAN architecture for removing scratches from images
- 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.

Symbolic Differentiation Source Code

- Implementation of symbolic differentiation using C++ with support for the various sinusoidal and exponential functions
- Preprocessed C++ header file to generate another function in runtime for calculation of derivative

Guthi-Distributed Computing Framework *Go, C++* Source Code

- 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
- Implemented a Shared Memory Architecture for communication between C++ and Go runtime

Volunteer Experiences

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

IT Club, Pulchowk Campus *Founding Committe Member* 2022