Rebati Raman Gaire

Computer Vision Engineer · Software Engineer

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Education

University of Nebraska-Lincoln

Lincoln, NE

MS in Computer Science, 3.9 — *Jan 2023 - Dec 2024*

- Thesis topic: On-device Incremental Learning with Informative Sample Selection
- Courses: Design and Analysis of Algorithm, Design and Analysis of Efficient Algorithm (Advanced), Introduction to Deep Learning, Advanced Software Engineering, Computer Architecture, Hardware-Software Acceleration for Machine Learning

Tribhuvan University, IOE, Pulchowk Campus

Lalitpur, Nepal

BE in Computer Engineering, 73% — *Nov 2016 - Apr 2021*

- Thesis topic: Multi-stage Generative Adversarial Networks (GANs) for Real Image Super Resolution
- Courses: Computer Programming in C, Object Oriented Programming with C++, Theory of Computation, Data Structure and Algorithm, Discrete Mathematics, Calculus-I, Calculus-II, Probability and Statistics, Object Oriented Analysis and Design, Artificial Intelligence, Database Management System, Distributed System, Computer Networks and Security, Digital Signal Analysis and Processing, Simulation and Modeling, Internet and Intranet, Information System

Work Experience

Graduate Research Assistant

Lincoln, NE

School of Computing, UNL — *Jan 2023 - Present*

- Implemented cutting-edge compression techniques for model quantization, knowledge distillation, and weight sharing in neural networks, significantly reducing compute parameters and energy consumption while upholding competitive performance standards. **[Paper]**
- Conceptualized, implemented, and presented pioneering research on compressing deep learning models with integrated active learning, achieving a notable 3.62% accuracy improvement over baseline using only 60% of training samples. **[Paper][Github]**

Software Engineer - Computer Vision

London, UK

Redev Technology — *Apr 2021 – Dec 2022*

- Orchestrated the implementation of contemporary Active Learning pipelines, integrating cutting-edge algorithms such as Coreset, Learning Loss, and Vision transformer, resulting in a remarkable reduction of up to 30% in annotation costs for computer vision tasks.
- Spearheaded the development of a comprehensive deep learning system covering all stages from data collection, annotation, processing, training to evaluation, facilitating smart city initiatives by enabling robust detection of persons and vehicles, smoke and fire across diverse environmental conditions, including varying geography, occlusion, lighting, and weather scenarios.

Computer Vision Researcher

Kathmandu, Nepal

NAAMII Nepal — *Apr 2021 – Dec 2022*

- Introduced a novel self-supervised multi-task learning framework for medical image semantic segmentation, demonstrating a notable performance boost of up to 2.5% in popular models like UNet and U2Net. **[Paper][Github]**
- Successfully collaborated with multiple researchers on pioneering research in advanced deep federated learning techniques for cross-domain surgical image segmentation **[Paper][Github]**
- Showcased adeptness in teamwork by closely partnering with supervisors to generate innovative research concepts, providing valuable insights, and contributing to the development of grant proposals to secure funding for research initiatives.

AWS AI/ML Interestship

Lalitpur, Nepal

Genese Cloud Academy — *Jun 2020 - Sep 2020*

- Gained proficiency in utilizing diverse AWS services including EC2, S3, Lambda, Sagemaker, Lex, Rekognition, and Polly.
- Successfully executed machine learning assignments and projects utilizing AWS services.

Skills

Areas of Interests: Conducting applied research in Machine Learning and Deep Learning for diverse computer vision applications, crafting optimized software solutions for AI-driven applications and their efficient deployment.
Programming Languages: Python, JavaScript, C/C++, SQL, Matlab
Web Frameworks: Django, Flask, ReactJS, NodeJS
ML Libraries: Pytorch, Tensorflow, Keras, Scikit-Learn, OpenCV, Pandas, NumPy, SciPy, NLTK
Other Tools: Linux, Git, Docker, Tensorflow Serving, AWS, LateX, Matplotlib, Seaborn

Publications

1. **R. R. Gaire**, S. Tabrizchi, A Roohi, "EnCoDe: Enhancing Compressed Deep Learning Models through Feature Distillation and Informative Sample Selection", ICMLA 2023.
2. S. Tabrizchi, **R. R. Gaire**, S Angizi, A Roohi, "SenTer: A Reconfigurable Processing-in-Sensor Architecture Enabling Efficient Ternary MLP", GLSVLSI 2023. https://doi.org/10.1145/3583781.3590225
3. M Eisenmann, ..., **R. R. Gaire**, and others, "Why is the winner the best?", CVPR 2023. https://doi.org/10.48550/arXiv.2303.17719
4. B. Bhattarai[+], R. Subedi[*], **R. R. Gaire**[*], E. Vazquez, D. Stoyanov, "Histogram of Oriented Gradients Meet Deep Learning: A Novel Multi-task Deep Network for Medical Image Semantic Segmentation", Medical Image Analysis Journal. https://doi.org/10.1016/j.media.2023.102747
5. R. Subedi, **R. R. Gaire**, B. Bhattarai[+], D. Stoyanov, "A Client-server Deep Federated Learning for Cross-domain Surgical Image Segmentation", DEMI MICCAI 2023. https://doi.org/10.48550/arXiv.2306.08720
6. S Bano, ..., **R. R. Gaire**, and others, "FetReg2021: A Challenge on Placental Vessel Segmentation and Registration in Fetoscopy", Medical Image Analysis Journal. https://doi.org/10.48550/arXiv.2206.12512
7. **R. R. Gaire**[*], R. Subedi[*], A. Sharma, S. Subedi, , S. K. Ghimire[+], S. Shakya, "GAN-Based Two-Step Pipeline For Real-World Image Super-Resolution", ICT with Intelligent Applications, SIST series, vol 248. Springer, Singapore. https://doi.org/10.1007/978-981-16-4177-0_75

Notable Projects

GAN-based Real Image Super Resolution

- Led a project that enhances the resolution of real-world low-resolution images by a scale factor of 4 using a multi-stage GANs, outperforming other state-of-the-art works both quantitatively and perceptually **[Paper][Github]**
- Developed a full-stack web app to serve the obtained model using ReactJS, NodeJS and Tensorflow Serving with Docker **[Github]**

MSc Thesis Document Automation

- Established a centralized PostgreSQL database for MSc programs, students and faculties at DOECE, IOE, Pulchowk Campus.
- Engineered a Django-based web application to automate MSc thesis document generation and management, resulting in substantial time savings for current MSc program coordinators **[Github]**

Honors & Awards

1. 7 plus publications in top conferences and journals with 53 plus citations. [**Google Scholar**]
2. Most Improved Master's Student Award from the School of Computing at UNL. **[Certificate]**
3. Achieved first place in the EndoVis Fetreg challenge at MICCAI 2021. **[Certificate]**
4. Secured a coveted spot at the prestigious PRAIRIE / MIAI AI Summer School (PAISS) 2021. **[Certificate]**
5. Semester-wise TU stipend for excellent academic performance.
6. Ranked 14^{th}/12,000 plus appearing students in IOE, TU's Nationwide BE Entrance Exam, securing a merit scholarship for undergraduate studies.

Training & Certifications

1. PRAIRIE / MIAI Artificial Intelligence Summer School (PAISS), 2021.
2. Project Mentor at 4th National Workshop on Machine Leaning and Data Science, Nepal, 2021
3. AWS AI/ML Interestship organized by Genese Cloud Academy
4. Advanced Machine Learning Specialization, Coursera
5. Computer Vision Nanodegree, Udacity
6. Applied Data Science with Python Specialization offered by the University of Michigan, Coursera
7. Deep Learning Specialization offered by deeplearning.ai, Coursera
8. Tensorflow Developer Professional Certificate offered by deeplearning.ai, Coursera
9. Machine Learning Course offered by Stanford University, Coursera
10. Linear Algebra by Prof. Gilbert Strang, MITOpenCourseWare
11. Multivariable Calculus by Prof. Denis Auroux, MITOpenCourseWare

Extracurricular Activity

Forth National Workshop on Machine Learning and Data Science

Nepal

Project Mentor

October 2021

- Taught fundamentals of programming, machine learning, deep learning, and guided undergraduate and post-graduate students to computer vision projects

LOCUS 2020, National Technical Exhibition

Nepal

Software Instructor

June 2020

- Volunteered as a software Instructor to teach programming concepts to junior students

IOE, Pulchowk Football Club

Nepal

Football Player

2017 - 2021

- Played for college senior team and won some major inter-college football tournaments in Nepal