Ramesh K. **Sah**

Ph.D. Student in Computer Science | Machine Learning | Mobile Health | Embedded Systems

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"We are what we repeatedly do. Excellence, therefore, is not an act but a habit."

Summary

I am a Computer Science Ph.D. student at Washington State University researching novel machine learning algorithms and optimization processes using wearable sensor systems. I am interested in practical applications of machine learning and sensor systems to real-world problems.

Transferable Skills

- Efficient at analyzing problems and thinking through for possible solutions
- Quick learner with focus on both research methodology and product innovations
- Excellent work ethics and time management skills

Skills

Programming Languages	Python, C, C++, Bash
Framework & Libraries	PyTorch, TensorFlow, Keras, Scikit-Learn
Software Engineering Tools	Git, vim, LaTeX
Databases	MySQL
Hardware Platform	ARM-Cortex M, ESP8266, ESP32

Experience

Proctor & Gamble, Smart Products

Mason, OH.

Machine Learning Intern — *Jun. 2021 - Aug. 2021*

- Researched Binarized Neural Networks (BNNs) and consolidated the findings by developing a library to train a Binary Convolutional neural network from scratch.
- Developed the inference pipeline to accelerate and deploy binary models for ARM-32, ARM-64 embedded platforms, and Android devices.
- Trained and deployed 1D Binary CNN model for human activity classification using inertial sensor data
- Trained Binary image classification and object detection models using IMAGENet dataset and deployed the trained model on Raspberry PI and Android devices. Binary models did not suffer from performance drop but at the same time showed significant improvements in terms of memory and computation speed.

Rewire Neuro

Remote

Machine Learning Consultant — *Aug. 2021 - Current*

- Helping medical scientists to develop machine learning models to determine the ototoxicity of chemical compounds.

Washington State University

Pullman, WA.

Graduate Research Assistant — *May. 2019 - Aug. 2021*

- Quantified, measured, and detected stress in real-time in alcohol-addicted individuals using machine learning algorithms and sensor systems. We aim to build a mobile health system that can detect stress and provide interventions such as music therapy, games, and inspirational texts to prevent alcohol-dependent people from relapsing.
- Developing an Android app to collect inertial, positional, bio-markers, and image data for a human-in-the-loop activity monitoring system to learn activity and behavioral patterns in an individual. Wrote the firmware for the camera module based on the ESP-32 system-on-chip.
- Investigated the effects of adversarial examples in wearable sensor systems used in health care. We showed how an adversary can craft adversarial examples and fool the underlying machine learning models.
- Investigated the transferability of adversarial examples in wearable sensor systems from four novel different perspectives: 1) transferability between models, 2) transferability between subjects, 3) transferability across sensor body locations, and 4) transferability between datasets.

Washington State University

Pullman, WA.

Graduate Teaching Assistant

Aug. 2018 - May. 2019

- Helped students with their problems and graded homework and exams in several Computer Science courses.
- Gave lectures in a class with 150 students.
- Courses: Introduction to Machine Learning, Data Structures and Algorithms, Software Development, Embedded Systems, and Computer Architecture.

Real Time Solutions Pvt. Ltd.

Patan, Nepal

Firmware Engineer

Dec. 2016 - Aug. 2018

- Wrote efficient and resilient C/C++ code for products ranging from smart home, IoT, Queue Management Systems, weather monitoring systems, and flood/landslide warning systems.
- Used machine learning algorithms in IoT applications such as smoke detectors, vehicle accident monitoring systems, and anti-theft systems to prevent theft of solar panels installed in remote weather monitoring stations.

Real Time Solutions Pvt. Ltd.

Patan, Nepal

Firmware Software Intern

Aug. 2016 - Dec. 2016

- Developed a prototype system to detect earthquakes using an off-the-shelf accelerometer. The system was designed to detect P and S waves and act as an earthquake monitoring and early-warning system.

Education

Washington State University (WSU)

Pullman, WA

Doctor of Philosophy, Computer Science

August 2018 - May 2023 (expected)

- Research and development of machine learning algorithms and sensor system for mobile health.

Kathmandu University (KU)

Dhulikhel, Nepal

Bachelor of Engineering in Electronics and Communication Engineering

March 2012 - September 2016

- Final Year Project: Comparative Analysis of Routing Protocols for Wireless Body Area Networks.
- Cumulative GPA: 3.89 on a 4.00 scale
- Relevant Coursework: C, C++, Electronics, Numerical Analysis, Calculus

Publications

Adar: Adversarial Activity Recognition in Wearables

Westminister, CO, USA

The 38^{th} IEEE/ACM International Conference on Computer Aided Design (ICCAD)

Nov 4-7, 2019

Adversarial Transferability in Wearable Sensor Systems

ArXiv PrePrint

Mar 2020

Mobile Health for Alcohol Recovery and Relapse Prevention

Washington D.C., USA

The 5^{th} IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies

Dec 2020

Stress Classification and Personalization: Getting the most out of the least

Remote

The 17^{th} IEEE-EMBS International Conference on Wearable and Implantable Body Sensor Networks (BSN'21)

Jun 2021

Associations Between Physiological Signals Captured Using Wearable Sensors and Self-reported Outcomes Among Adults in Alcohol Use Disorder Recovery: Development and Usability Study

Journal of Medical Internet Research

Jul 2021

Comparing the Predictability of Sensor Modalities to Detect Stress from Wearable Sensor Data *Virtual*

IEEE Consumer Communications & Networking Conference *Oct 2021*

Honors & Awards

2019 **Recipient of Graduate and Professional Student Association (GPSA) student travel grant,** Washington State University

2018 **Awarded full-time RA/TA scholarship,** Washington State University

2015 **Recipient of ERASMUS Mundus INTACT student exchange scholarship,** Kathmandu University

2016 **Merit Scholarship for Academic Excellence,** Kathmandu University

2012 **First Prize in Society of Electrical and Electronics Engineers (SEEE) Circuit Competition,** Kathmandu University

Open Source Projects

Adar

TensorFlow implementation of the paper, "Adar: Adversarial Activity Recognition in Wearables"