Rana Shahroz

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Education

Vanderbilt University — School of Engineering **August 2020 – June 2024**
Bachelor of Science in Computer Science and Mathematics. Dean's List. GPA : 3.96/4.00. *Nashville, TN*

Selected Relevant Coursework

- Image Processing*
- Intermediate Software Design
- Algorithms *
- Special Topics in Deep Learning : Deep Generative Modelling (PhD)*
- Foundations of Machine Learning *
- Quantum Computing *
- Non-linear Optimization
- Probability and Statistics

Selected Experience

Institute for Software Integrated Systems **June 2022 - September 2022**
Software Engineering Intern *Nashville, TN*

- Working on enabling Simulation Based Evaluation of Large Scale Systems by integrating heterogeneous Simulations.
- Wrote CI/CD Pipelines for automated testing of CPSWT(Cyberphysical System Wind Tunner) using Docker, Gradle, Java and Python(Selenium) as well as changed the legacy code into a JUnit and CPPUnit tests.
- Worked with Java, C++, Pyton and WebGME to implement heterogeneous federation of time synchronized federates/simulations.

Mathematical Intelligence and Neural Technologies Lab **March 2022 - Present**
Undergraduate Research Assistant *Nashville, TN*

- Advised by Dr. Soheil Kolouri, for conducting research on topics involving Computer Vision and Generative Modeling.
- Working with GPU clusters, Point Clouds in Open3D and implementing novel algorithms in C/C++ with CUDA, and Python.

Vanderbilt Undergraduate Research Journal **January 2022 - Present**
Head Reviewer, Computer Science Department *Nashville, TN*

- Responsible for reviewing more than 500 submissions to the Vanderbilt Undergraduate Research Journal for the Computer Science Department, and providing useful feedback on the submitted research papers.

Institute for Software Integrated Systems **November 2021 - February 2022**
Software Engineering Intern *Nashville, TN*

- Developed and launched an auto grader service for CS 5260, a graduate class in Artificial Intelligence, that allows for an accessible interface for submitting an assignment and receiving the grades back.
- Utilized Jenkins to support continuous integration and deployed the application on AWS using Amazon Elastic Compute Cloud for 24/7 service.

Vanderbilt University **August 2021 – Present**
Teaching Assistant *Nashville, TN*

- Worked with Professor Roth in setting up and teaching the Data Structures and Algorithms in C++ at Vanderbilt.
- Promoted in August 2022, to work with Professor Graham Hemingway to teach his Intermediate Software Design(C++)
- Weekly duties include grading home works, quizzes and exams and holding office hours to provide the students necessary tools to design software of quality. Per semester, help out almost 200+ students.

Artificial Intelligence and Visual Analogical Systems Lab **April 2021 – March 2022**
Vanderbilt University School of Engineering Research Fellow *Nashville, TN*

- Researched deep learning architectures that can extract latent features in images even with background noise, under Dr. Maithilee Kunda and worked with Google Colab, Python, Pytorch and Tensorflow to implement different papers.
- Collaborated with lab to develop architectures from an intersection of Convolutional Neural Networks(CNN), Recurrent Neural Networks(RNN), Generative Adversarial Networks(GANs) and Reinforcement Learning(RL) to solve the problem.

Selected Technical Projects

Image Classification Library | *Python, Pytorch* **2022**

- Implemented various different Image Classifications Architectures (about 30) in Pytorch and Python to allow rapid comparisons for researchers in Computer Vision. This Project is under progress. Also converting some of the code to C++ and Libtorch.

Gaussian Blurring Filter | *C/C++, CUDA* **2022**

- Implemented a Gaussian Filter for smooth blurring of a picture in C and Cuda.

Wine Recommendation System | *Python, Pytorch, Hugging Face* **2022**

- Developed a Transformer Based Search-Engine for wines using Hugging Face transformers.

Amazon Clone | *JavaScript, ReactJS* **2022**

- Developed a clone for Amazon with full functionality such as authorization and payments.

Selected Research Projects

Sliced Optimal Transport | *Python, C, C++, CUDA, Pytorch, Open3D* **Advisor : Dr. Soheil Kolouri**

- Worked on implementing Sliced Optimal Transport Algorithms for Shape Registration Experiments.

Implicit Neural Representation as Compression Algorithm | *Python, Pytorch* **Advisor : Dr. Soheil Kolouri**

- Worked on representing images as neural networks using Fourier Mapping and Sine Activation and implementing novel algorithms to compress such models.

Gated Behaviour of Dropout in Continual Learning | *Python, Pytorch* **Advisor : Dr. Sohel Kolouri**

- Studying and exploiting the gated mechanism of dropout to improve the effects from catastrophic forgetting.

Drug Discovery for Diseases | *Python, Pytorch* **Advisor : Dr. Tyler Derr**

- Working on Graph Neural Networks based Generative Recommender Models to discover Drugs for Diseases.

Selected Publications / Preprints

Sliced Optimal Partial Transport. *Yikun Bai, Rana Muhammad Shahroz Khan, Soheil Kolouri*
Work under progress.

Meta-learning for INR based Compression Algorithm for Images. *Rana Muhammad Shahroz Khan, Soheil Kolouri*
Work under progress.

Technical Skills

Languages: C++, C, Python, Go, Racket, Prolog, JavaScript, SQL
Technologies/Frameworks: Pytorch, Tensorflow 2.0, Open3D, Node.js, CUDA, GitHub, Git, Hugging Face, Docker.

Selected Awards/Achievements

Dean's List **Fall 2020, Spring 2021, Fall 2021, Spring 2022**
Made it to Dean's List for all my semesters at Vanderbilt.

Top 50 Mathematician **August 2019**
Qualified for the top 50 (ranked 11th out of 500,000) and attended the IMO training camp.

Vanderbilt University's Appellate Review Board (ARB)
Appointed to University's Appellate Review Board by the Dean and handle Appellate process at Vanderbilt University.