Rishabh Adiga

Indian Institute of Technology Madras
radiga0987.github.io | User ID/ Mail - rishabh.adiga@gmail.com | github.com/Radiga0987

Education

Indian Institute of Technology Madras; CGPA - 9.63/10 **2019 – 2023**
B.Tech in Electrical Engineering (In top 5 out of 143 students), Minor in Artificial Intelligence *Chennai, India*

Deeksha CFL PU College; 95.8% (99.5% in PCMCs) **2017 – 2019**
Department Of Pre-University Education, Karnataka *Bangalore, India*

PSBB Learning Leadership Academy; CGPA - 10/10 **2006 – 2017**
Central Board of Secondary Education *Bangalore, India*

Research & Professional Experience

Semantic segmentation in Histopathological images at IIITB **June 2021 – Dec 2021**
Deep Learning Research Internship under Dr. T K Srikanth and Dr. Ramesh Kestur *Bangalore, Karnataka*

- Research and development of a deep learning model implemented using a novel version of UNet architecture to detect necrosis by semantic segmentation at International Institute of Information Technology Bangalore.
- The new model surpassed the previously existing Conditional random field (CRF) model by 13.724% in the AUPRC metric (other metrics had a significant increase too).
- Creation of a high-quality ground truth dataset was a secondary task through data manipulation and augmentation techniques along with performance analysis. The work done in this project is in the final stage of review. It is set to be ***published in Elsevier's "Data in Brief" Journal*** soon, and I am a ***co-author*** of this paper.

Speech Technology and Handwriting Recognition using ML **April 2022 – May 2022**
Assignment under Dr. Hema Murthy (IITM) *Chennai, Tamil Nadu*

- Developed a Speech-to-Text system for digits by using digit utterances. Dynamic Time Warping (DTW) and Hidden Markov Model (HMM) was trained for this purpose and achieved accuracies of 93.33% and 98.3%, respectively.
- Also developed a handwritten Telugu character recognition system using DTW, HMM, and ANN. Achieved accuracies of 94%, 97%, and 98%, respectively.
- After experimenting and researching, the number of symbols used for the HMM model was set based on the number of phonemes (44) in the English language for the digit utterances and the number of different patterns across all the letters.

Search Engine using NLP **Feb 2022 – May 2022**
Project under Dr. Sutanu Chakraborti (IITM) *Chennai, Tamil Nadu*

- Developed a search engine from scratch with text processing methods such as sentence segmentation, tokenization, stemming/lemmatization, and stopword removal. Initially used Vector Space Model but moved on to BM-25 like model as a better alternative to TF-IDF vectorization. Tested using Cranfield dataset.
- Latent Semantic Analysis utilized to handle synonymy and polysemy and a separate module for spell check. Achieved mean average precision (mAP) of 0.768 and Normalized Discounted Cumulative Gain (nDCG) of 0.642.

Wells Fargo Internship **May 2022 – July 2022**
Software Developer managed by Mr. Sunil Agarwal *Bangalore, Karnataka*

- Implemented a production quality Trade Order Matching Engine modularized into UI, server, matching engine and database with 97% code coverage.
- Worked primarily on the back end of the engine and created a novel data structure (based on Red-Black trees) that enables matching of orders (and other operations such as insertion and amends) to be performed in O(1) time.

Google Research Week **Jan 2023**
Selected for discussions with esteemed researchers on seminal papers in AI (Primarily in CV and NLP) *Bangalore, Karnataka*

Selected Projects

Image classification | *Python* | *Prof. Hema Murthy* **Feb 2022**

- Developed Image Classifiers using several methods, all coded from scratch, such as Gaussian Mixture Model (74% acc), Support Vector Machine (77% acc), K-Nearest Neighbors (70% acc), and Artificial Neural Network (78% acc). Performed dimensionality reduction using PCA and LDA techniques.

Othello AI Bot | *C++* | *Prof. Deepak Khemani* **Oct 2021**

- Coded an Artificially Intelligent program that plays the game of Othello with other bots.
- Tested and optimized the minimax algorithm, alpha-beta pruning, and SSS* algorithm to have low decision times and high win rates.

Travelling Salesman Problem | *Python* | *Prof. Deepak Khemani* **Sept 2021**

- Given 5 minutes, the project aimed to find the shortest tour visiting all cities in a given list with non-Euclidean distances provided, which is an NP-Hard problem.
- Researched various heuristics and methods such as Greedy heuristics, Farthest insertion, Clark and Wright Savings heuristics, 2-Opt, and many others to implement the project.

Matrix Multiplication Accelerator | *Verilog, Python* | *Prof. Nitin Chandrachoodan* **Sept 2021 – Nov 2021**

- Created a functional 32-bit RISC-V architecture CPU capable of performing all instructions in RV32I set with handshaking support.
- Implemented an accelerator that performs fast matrix operations, particularly matrix multiplication, using SIMD.

Tic Tac Toe over LAN | *C, Socket programming* | *Prof. Ayon Chakraborty* **March 2022**

- Designed and implemented a two-player tic-tac-toe game using the traditional client-server architecture. Contains support for playing multiple games simultaneously using threads along with exception handling.

Self Projects | *Python, PyTorch, C++*

- Some of the projects I worked on were the visualization of shortest path finding algorithms, implemented and trained generative adversarial networks for digits, simulation of a tube-light in python, space fighter game using PyCharm and a research project on the impact of machine learning on climate change and economics.

Achievements

2021 **Bajaj TORQ Engineering Quiz** Awarded 2nd place in this engineering contest held between the top IITs

2019 **Indian National Physics Olympiad (INPhO)** Represented my state for this prestigious Olympiad

2019 **IIT-JEE Mains** 99.90034 percentile out of 930k students from all over India (rank of 1315)

2019 **COMEDK Exam (B.Tech entrance exam)** 1st rank in state and 4th rank in the country (58k students)

2019 **KCET (B.Tech entrance exam)** 13th rank in this exam consisting of physics, chemistry, and math (194k students)

2018 **National Standard Examination in Physics (NSEP)** National Finalist and was awarded a certificate of merit for being placed in the top 1% of the country

2016 **Piano, Trinity College London** Completed grade 1 in theory and practical examination for piano

2014 **National Cyber Olympiad (NCO)** Awarded certificate of merit for an all India rank of 367 and State rank of 43

2010-2015 **Chess and Skating** Won several trophies and medals in district and region-level competitions

Relevant Coursework

Computer Science: Pattern Recognition and Machine Learning, Artificial Intelligence, Natural Language Processing, Reinforcement Learning*, Multi-Armed Bandits*, Non Linear Optimization*, Convolutional Neural Networks for Visual Recognition, Introduction to Computer Networks, Introduction to Programming, Applied Programming Lab, Data Structures and Algorithms, Computer Organisation, Microprocessor Theory, Operating Systems*, Several courses online in ML (* Ongoing/Expected in the following semester)

Mathematics: Multivariate Calculus, Series and Matrices, Graph Theory, Probability, Information Theory*, Differential Equations, Stochastic Processes and Control, Principles of Measurement

Skills

Programming Languages: Python, C, C++, Java, Matlab, Mathematica, Bash, Verilog, HTML5, CSS
Assembly: RISC-V, x86
Technologies/Frameworks: PyTorch, TensorFlow, Apache Kafka, Spring Boot, Git, MySQL, JUnit, React JS
Languages: English, Kannada, Hindi, French, Japanese

Positions of Responsibility

Centre For Innovation (CFI) **July 2021 – May 2022**
Project Member in the accelerator for ray tracing group (Software team) *Indian Institute of Technology Madras*

Saarang Cultural Festival **Dec 2019 – Jan 2020**
Music club volunteer *Indian Institute of Technology Madras*

National Cultural Appreciation (NCA) **August 2019 – May 2020**
Dramatics community member *Indian Institute of Technology Madras*

Computer Science **July 2018 – March 2019**
Class representative *Deeksha CFL PU College*