

ANIRUDDHA SUNDARARAJAN

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EDUCATION

ETH Zürich

MSc Robotics, Systems and Control

Sep. 2023 - Jul. 2025 (expected)

Grade: **5.41/6**

Indian Institute of Technology Madras

Dual Degree (B.Tech Engineering Physics & M.Tech Data Science)

Jul. 2018 - Jul. 2023

CGPA: **9.33/10**

SKILLS

Programming: Python, C++, C

Analysis: MATLAB, Mathematica

Frameworks: Scikit-learn, TensorFlow, PyTorch, PySpark, Amazon EC2, Google Cloud, Bash, Git, LaTeX, ROS2

Languages: Tamil, English

EXPERIENCE

Dual Degree Thesis | Research project with Prof. Balaraman Ravindran

Aug. 2022 - Jun. 2023

- Option-Indexed Hierarchical RL:* We learn an affinity function between options and the items present in the environment. This allows us to effectively reuse a large library of pre-trained options (lifelong learning setting) in zero-shot generalization at test time by restricting goal-directed learning to only those options relevant to the task at hand.
- Ideated and implemented a co-occurrence-based representation for options to match them to tasks efficiently.
- Our work (collaboration with Google Research, India) was accepted as an extended abstract in the Autonomous Agents and Multiagent Systems Conference 2023 under Learning and Adaptation.

Amazon | Applied Scientist Intern

Feb. 2022 - Jul. 2022

- Worked in the Accounts Payable team of Amazon, responsible for making timely payments from Amazon to vendors.
- Developed a novel unsupervised multivariate anomaly detection technique using flexible negative sampling.
- Built a cancellation propensity model based on Gradient Boosted Trees to predict the probability of an invoice being canceled and prevent erroneous payments.
- Received a full-time job offer based on my performance in the internship.

Texas Instruments | Digital and Signal Processing Intern

May. 2021 - Jul. 2021

- Performed system modeling and signal level simulation of a 10 Mbps automotive ethernet in MATLAB.
- Proposed an architecture spec for PHY layer of the ethernet that met the IEEE 802.3cg standard for 10BaseT1S.
- Received a full-time job offer based on my performance in the internship.

IITM Young Research Fellow | Research project with Prof. Avhishek Chatterjee

Sep. 2020 - Jul. 2021

- Received the prestigious IITM Young Research Fellowship to work on a year-long funded research project.
- Achieving near-capacity performance in queue-channel systems with waiting-time dependent errors:* Designed error control coding schemes that make bits/qubits robust to noise in queue-channel systems with waiting-time dependent errors.
- Used Python and Mathematica to perform simulations of the channel, implement my convolution-based encoder and Maximum a Posteriori decoder from scratch, and validate the scheme's performance in terms of bit error rates.
- Learned various research skills like reading, writing, and presenting academic work through the YRF's research readiness program.

COURSE PROJECTS

Convex Optimization | Paper Reproduction

Jul. 2022 - Nov. 2022

- Reproduced experimental results from the research paper "How Does Batch Normalization Help Optimization?" by Santurkar et al., which proposed the landscape smoothing effect of the BatchNorm technique as a novel explanation for its effectiveness.
- Designed an academic poster and presented it to the Electrical Engineering Department of IIT Madras.

Machine Learning | Using summaries to improve review sentiment classification

📅 Jan. 2021 - May. 2021

- Developed a novel hierarchical classification-based approach to perform review sentiment classification. The first-stage BiGRU-based classifier leveraged short summaries of the review text, which capture the essential sentiment features, to predict if the review is positive (score 3-5) or negative (score 1-2).
- Subsequent BiGRU models perform finer classification based on the first classifier's prediction using the full review text.
- Tested the architecture on the Sports and Outdoors dataset from Amazon 5 cores repository. Achieved performance close to the then state-of-the-art (**51%** balanced accuracy and **44%** macro F1 score) despite having far fewer trainable parameters.

Linear Algebra | Paper Reproduction

📅 Jul. 2020 - Nov. 2020

- Reproduced numerical results from the research paper "Estimation of the bilinear form $y^*f(A)x$ for Hermitian matrices" [↗](#) by Fika et al.
- Estimated bilinear forms of $f(A)$ without explicitly calculating $f(A)$ by extrapolating the moments $y^*f(A)x$. Verified the accuracy of the estimations using MATLAB simulations.

Nand to Tetris | Building a modern computer from first principles

📅 May. 2019 - Aug. 2019

- **Part I:** Built the hardware part of a fully functioning general-purpose modern computer starting from logic gates.
- **Part II:** Built a modern software hierarchy that can translate and execute object-based, high-level languages on a bare-bone computer hardware platform. Implemented a virtual machine and a compiler for a Java-like programming language (Jack).

TEACHING

Physics Lab | Teaching Assistant

📅 Aug. 2022 - Jun. 2023

- Worked as a teaching assistant for the Physics Preparatory Lab course, which is offered to help first-year students from under-represented groups or with physical disabilities prepare for their studies at IIT Madras.

Programming Club | Coordinator

📅 Mar. 2019 - Jun. 2020

- Worked as a coordinator in the C++ Programming Club of IIT Madras.
- Conducted educative sessions in data structures and algorithms for students from all disciplines. Authored questions for the institute-wide programming contests run by the club on online platforms.

RELEVANT COURSEWORK

Math: Linear Algebra, Probability, Statistics & Stochastic Processes, Multivariable Calculus

Computer Science: Discrete Mathematics, Category Theory, Programming & Data Structures

Data Science: Machine Learning, Deep Learning, Reinforcement Learning, Data Analytics, Large Language Models (ongoing)

Electrical Engineering: Information Theory, Communication systems, Digital Signal Processing, Convex Optimization

Engineering Physics: Quantum Computation & Information, Statistical Physics, Classical Dynamics

Robotics: Linear Systems Theory, Dynamic Programming & Optimal Control, Vision Algorithms for Robotics, Probabilistic AI

ONLINE COURSES

- 2022 Introduction to Operations Research [↗](#)
- 2022 Design and Analysis of Algorithms [↗](#)
- 2020 Deep Learning Specialization (5 courses) [↗](#)
- 2020 CS-191x Quantum Mechanics and Quantum Computation [↗](#)
- 2019 Build a Modern Computer from First Principles: From Nand to Tetris Part I [↗](#)
- 2019 Build a Modern Computer from First Principles: From Nand to Tetris Part II [↗](#)
- 2019 Programming, Data Structures and Algorithms Using Python [↗](#)
- 2018 DAT208x: Introduction to Python for Data Science [↗](#)