Maitreyi Swaroop — Curriculum Vitae

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EDUCATION

Indian Institute of Technology, Kharagpur, India — July 2019 — Present
BSc. (Hons) + MSc. in Mathematics & Computing — Overall GPA: 9.40/10.00
Micro Specialization in Artificial Intelligence and Applications — Department Rank: 3 (class size 63)

Indian School Certificate (ISC), India — 2019
The Shri Ram School, Gurgaon, India — Board Marks: 98.25%
Subjects: Physics, Chemistry, Mathematics, Economics — School Valedictorian from Science Stream

PROJECTS

Research Internship — *Supervisor: Prof. Dhanya Sridhar*
Mila - Quebec AI Institute, Montreal, Canada — May 2023 — Present

- **Title: Learning Macro Variables with Auto-encoders** *(NeurIPS 2023 Workshop on Causal Representation Learning).*
- We proposed **DeepCFL**: a self-supervised method that learns macro variables and their relations, and both satisfies and extends the desiderata of Causal Feature Learning.
- I conducted experiments in Python using `pytorch` on an associated dataset of handwritten English and Kannada digits which suggest that DeepCFL effectively learns simple macro variables and a simple mechanism relating them, in particular with discrete macro variables.

Masters Thesis Project — *Supervisor: Prof. Partha Pratim Chakrabarti*
Indian Institute of Technology, Kharagpur, India — May 2023—Present

- A comparative study of learning and non-learning based methods to solve the TSP. We are also exploring hybrid methods of approximation algorithms and RL-methods to solve the problem.
- We are benchmarking existing methods on datasets of different distributions and sizes, which will be used as training data for the problem of algorithm selection using graph machine learning.

Research Internship — *Supervisor: Dr. Manuel Gomez Rodriguez*
Max Planck Institute for Software Systems, Germany — May 2022—July 2022

- Project in the domain of **Human Centric Machine Learning**
- We formulated a novel threshold test which takes into account the intersection of traits to determine discrimination in case of decisions taken on individuals. We modelled the data generation process to be a Dirichlet-Process Mixture model and conducted inference using MCMC methods. I implemented our model using the R library `dirichletprocess`.

EXPERIENCES + ADDITIONAL PROJECTS

IIT Delhi Theoretical Computer Science Winter School — December 2022
Indian Institute of Technology Delhi, India

- I was one of the 50 students selected from across India to attend the Winter School. Among the topics covered were Complexity Theory, Matching Theory, Cryptography, and Quantum Computing.

Solving Illustrative Examples for Data Science Textbook — December 2020- May 2021
(Remote) IISc. Bangalore

- I assisted Prof. Ramesh Hariharan and Prof. Rajesh Sunderesan of IISc. Bangalore in solving problems for their Data Science course textbook. In particular, I worked on the problem of determining the orbital parameters of Earth and Mars using Tycho Brahe's data (which had also been used by Kepler for the same purpose).

Course Project (Group): Blog Post on Unnoticeable Backdoor Attacks on GNNs — October 2023
I.I.T. Kharagpur

- A blog post summarising the paper *Unnoticeable Backdoor Attacks on Graph Neural Networks* by Dai et. al.

Course Project (Group): VGL-GAN: Video Game Level Generation using DCGAN — November 2022
I.I.T. Kharagpur

- We generated human-playable levels for Super Mario Bros. using Deep Convolutional Generative Networks (DCGANs) and latent space exploration techniques.

Course Project (Individual): C++ code for parsing and differentiating mathematical expressions — 2021
I.I.T. Kharagpur

- I wrote C++ code to parse a mathematical expression in one variable (x) input as a string and differentiate it with respect to x. The expression may be of the form: `(sin(x^3) + cos(log (2x)))/(x^2)`. My recursive method was implemented completely from scratch using only the basic header files for handling input/output and strings.

Relevant College Coursework:

Ongoing

- Graph Theory & Algorithms
- Machine Learning: Foundations & Applications (Theory+Lab)
- Graph Machine Learning: Foundations & Applications

Completed

- AI: Foundations & Applications
- Graphical & Generative Models for ML
- Linear Algebra for AI & ML
- Genetic Algorithms
- Design & Analysis of Algorithms
- Programming & Data Structures
- Discrete Mathematics
- Switching & Finite Automata
- Operations Research
- Stochastic Processes & Simulation
- Probability & Statistics
- Transform Calculus
- Functional Analysis
- Modern Algebra
- Measure Theory & Integration
- Real Analysis
- Linear Algebra
- Mathematics I&II

SKILLS

- **Programming:** C, C++, Python, R, MATLAB, Mathematica, Haskell
- **ML Frameworks:** PyTorch, TensorFlow

Extra-Curricular Interests

Leadership and Representation

- **Governor, Quiz Club, IIT Kharagpur** (Present) I manage the annual budget for the society, organise and oversee all quizzing related activities. I have taken part in the 2019 and 2023 Inter-IIT Quiz Cups, where our contingent won the Inter-IIT Cultural Cup. I also hosted the 2023 Women's Day Quiz.
- **Elected as the Head Girl of The Shri Ram School** (12th grade) I drove the agenda for student council meetings, raised and resolved issues involving the student body, conducted assemblies and addressed eminent guests at school.
- **Elected as the Secretary for Sports** (11th grade), I organized and refereed intra-school, inter-house matches, and helped organize the annual sports day.

Music

I have attained Grade 4 level in Practical Piano and Grade 5 in Theory of Music (awarded by the Trinity College, London). As a member of the college music societies for Eastern and Western Music, I have performed live for events such as the College Foundation Day and the 2022 Alumni Association Meet.

Sports

As an athlete my main event is the 800m run for which I have taken part in the ASISC National Athletics meet. I have won Gold and Silver Medals at the regional level (for the North-West region). In my first year at IIT KGP, I broke the record for 2.2km race (at the annual 2.2k run).

Debating

I am a member of the college Debating Society. I anchored and adjudicated the 2020 Annual Vigilance Awareness Week Debate.