Sampad Kumar Kar

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Education

- **Chennai Mathematical Institute** — Chennai, India
  M.Sc. - Computer Science; ***GPA: 8.95****; transcript* — *2022 - 2024*
  Notable Coursework: *Advanced Machine Learning, Reinforcement Learning, Mathematical Statistics, Computer Vision, Natural Language Processing*

- **Chennai Mathematical Institute** — Chennai, India
  B.Sc.(Hons.) - Mathematics and Computer Science; ***GPA: 8.82****; transcript* — *2019 - 2022*
  Notable Coursework: *Calculus, Differential Equations, Probability Theory, Linear Algebra,Theoretical Foundations of ML, Data Mining and ML, Probability and Statistics with R, Linear Programming and Combinatorial Optimisation*

Experience

- **BNY Mellon** — Chennai, India
  Computer Vision Intern — *May 2023 - July 2023*
  - **Project**: Enhancing Short Term Cash Flow Model
  - **Contribution**: Enhanced BNY Mellon's Corporate Treasury framework for STCF forecasting by implementing quantitative methods to identify seasonal days, leading to more accurate predictions across LOBs and currencies. Developed strategies using statistical tests and modeling techniques, demonstrating the superiority of the quantitative framework over the existing qualitative model. Model forwarded to Risk for auditing for the Bank's use. *Report*

- **Trumpf** — Chennai, India
  Computer Vision Intern — *Nov 2022 - Apr 2023*
  - **Project**: Sheet Metal Part Identification
  - **Contribution**: Built a deployable pipeline to identify 'Sheet Metal Parts' and their types and output their corresponding CAD file. Utilized transfer learning on pre-trained ensembles to identify an image as a SMP or not. Employed image hashing and other image processing techniques to classify the identified SMP as one of the 10 pre-defined classes for outputting the corresponding CAD file. *Report*

- **Launchpad.ai** — Remote
  Machine Learning Intern — *July 2022 - Sep 2022*
  - **Project**: Fitness Activity Recognition (in collaboration with Nike)
  - **Contribution**: Worked with the Cohort'23 to develop a generic model to identify and compare videos of trainees with experts. Implemented algorithms using Dynamic Time Warping to compare videos using the coordinates extracted via Mediapipe Blazepose, while making the comparison robust to differences in camera angles. *Report*

- **Cheenta** — Remote
  Mathematics Instructor (part-time) — *Oct 2019 - Apr 2022*
  - **Mathematics Olympiad Instructor**: Taught various courses for Indian National Mathematics Olympiads on various topics like Geometry, Number Theory, Algebra etc.

Notable Projects

- **Clustering - Fast Text based Clustering**: Developed 4 clustering techniques, two of them based on built-in sklearn 'KMeans', and two new techniques coded from scratch to cluster bigger datasets, all using 'Jaccard Similarity' as metric. Optimised these algorithms to be able to cluster bigger datasets for further semi-supervised learnings. *GitHub* (April '22)
- **Computer Vision - Facial Emotion Detector**: Developed a facial expression detector from scratch using Deep Residual Networks and the Kaggle open-source facial expression dataset. Additionally, deployed the model for real-time rendering to capture human facial expressions in real-time via webcam. *GitHub* (Jan '23)

Notable Reports

- **Master's Thesis (LLM) - SSMs: An Efficient Alternative to Attention**: This thesis investigates state space models (SSMs) as alternatives to Transformers for deep sequence modeling. It examines the efficiency and performance of SSM variants, including S4, Mamba, LRUs, and Griffin, through experiments on text, image, and audio generation tasks using tiny language models. *GitHub Report* (May '24)
- **ANN - Comparison of Regularization Techniques in DNNs**: (Reading Project): Comparative research on several popular regularization techniques using real world weather dataset. Also tested this on their own test set, to validate the conclusions based on training and validation errors, to come up with the best regularization paradigm. *Report* (Jan '22)

TA Experience

- **Chennai Mathematical Institute** Chennai, India
  Teaching Assistant *Jan 2023 - Apr 2023*
  - **Data Mining and Machine Learning**: Instructors: Prof. Madhavan Mukund, Prof. Pranabendu Misra, Course Details: This course is an introduction to machine learning techniques including supervised and unsupervised learning, text mining, and additional topics such as probabilistic graphical models and neural networks.

Honors and Awards

- Shriram Scholarship (Full Tution Fee Waiver and Stipend at CMI for Masters) - 2022 - present
- Shriram Scholarship (Full Tution Fee Waiver and Stipend at CMI for Bachelors) - 2019 - 2022
- NTSE Scholar - 2017
- INMO Merit Awardee - 2017
- KVPY Qualifier - 2018
- NSEP, NSEA, RMO Qualifier - 2017-18
- JEE Advanced AIR **4062**, JEE Mains AIR **3042** - 2019

Skills

- **Languages**: Python, R, Matlab C++, Java, Haskell
- **ML Frameworks**: NumPy, Pandas, Scikit, Tensorflow, NLTK, OpenCV, Matplotlib, Seaborn
- **Web Dev**: HTML, CSS, Bootstrap, Javascript, Flask, Jinja2, SQLAlchemy
- **Tools**: Git, PostgreSQL, LaTeX, Excel, SQLite
- **Platforms**: Linux, Windows, Mac
- **Soft Skills**: Leadership, Event Management, Writing, Public Speaking, Time Management