

Kartik Srinivas

[Personal Webpage](#)
[LinkedIn](#)
[Scholar](#)

kartiksr@cs.cmu.edu
Ph : +91 8010743389

EDUCATION

2024 - Present	Carnegie Mellon University - School of Computer Science Master's in Machine Learning	Pittsburgh,PA 15232
2020 - 2024	Indian Institute of Technology (IIT), Hyderabad Bachelor's in Computer Science and Engineering (Honors) Minor - Artificial Intelligence Grade - 9.56/10.00 Department Rank: 1/63	Hyderabad,TG 502284

AWARDS

- **Institute Silver Medalist, IIT Hyderabad** : *Highest* grade point average by Bachelor's student in the Engineering Sciences department July 2024
- **Institute Academic Excellence**: Awarded for outstanding academic and Research performance in the Engineering Sciences department Nov 2021-22-23
- **Honors Society, IIT Hyderabad** : The only Honors student selected from the class of 2024. Aug 2023
- **Mitacs Undergraduate Research Fellowship**: To theoretically estimate the effect of Heterogeneity in Federated Learning under Dr.Xiaoxiao Li at the *University of British Columbia, Vancouver* Dec 2022
- **Shastri Indo-Canadian Institute (SICI) Scholarship**: Provided additional funding worth 3000 CAD for continuing my research at *UBC* as a "promising researcher" Dec 2022

SKILLS

Languages and Frameworks

- Proficient Languages: Python,C++, LaTeX
- Proficient Libraries/Frameworks : Pytorch, Numpy, Pandas and Scikit
- Intermediate Languages : C, Java, JavaScript, MatLab, Octave, Julia, Shell Scripting, Fortran
- Intermediate Frameworks: Tensorflow, Flask, React

Mathematics

- Proficient : Probability and Statistics, Linear Algebra, Measure Theory and Stochastic Processes, Calculus and Convex Optimization
- Intermediate: Probabilistic Combinatorics, Number theory, Randomized Algorithms and Approximation Algorithms
- Beginner: Topology

INTERESTS

My primary interests revolve around leveraging algorithmic ideas from Continuous Mathematics (such as Probability Theory, Linear Algebra, Calculus, and Information Theory) to develop efficient solutions in languages like C++ and Python. This passion drives my exploration across diverse fields in Computer Science and Machine Learning, including Computability Theory, Compilers, Statistical Learning Theory, and Robust Machine Learning.

PUBLICATIONS

Overcoming Data and Model Heterogeneities in Decentralized Federated Learning [ICML 2024](#)
Paper Link ([Arxiv](#)) ([PMLR Proceedings](#))

CY Huang, [Kartik Srinivas](#), Xin Zhang, Xiaoxiao Li

EXPERIENCE

Research Intern

May 2023 - Aug 2023

TEA lab - University of British Columbia, Vancouver

Vancouver, BC

- Developed a theoretical analysis for Centralized Heterogeneous Federated Learning using the theory of Neural Tangent Kernels and standard results in statistical learning theory.
- Discovered a new practical ML setting that involved learning in a decentralized, distributed setup in a public-data free and privacy preserving way.
- Developed and implemented an algorithm to handle decentralized learning in a privacy-preserving manner with no access to public data.
- Gave Probably Approximately Correct bounds (PAC) on the worst case performance of the trained models on diverse data distributions of the clients.

Outcome : - The work was continued on return to IIT Hyderabad and accepted to [ICML 2024](#)

Student Research Intern

May 2023 - Aug 2023

Vector Institute for Artificial Intelligence

Remote

- Investigated the effects of rapid retraining and Knowledge Distillation methods to learn over 50 decentralized client models with different architectures
- Participated in Vector talks on AI for healthcare

Research Intern

May 2022 - Aug 2022

Machine Learning and Vision Group - IIT Hyderabad

Hyderabad, TG

- Developed a theoretical worst-case guarantee on the performance of a Domain-Incremental Learning model based on Optimal Transport theory.
- Developed an algorithm that unlearns over a changing distribution of data using techniques from Information theory

Outcome :- This work is leading to a submission at **AAAI 25**

PROJECTS

Nabla: A Language for Automatic Differentiation

Sept 2022 - Mar 2022

Mentors:- Dr. Ramakrishna Upadrasta (INRIA & IITH)

- Led a team of 7 members to create a domain specific language that would be suited for automatic differentiation.
- Implemented a Conflict-free grammar and LALR parser using Lex and Yacc
- Implemented tensor algebraic calculus in C++ that were the base libraries called during compilation of the program written in our language
- Used Graphviz to visualize the computational graph after a topological sort of the tensor operations involved.

Outcome:- Highest Grade (A) in **CS3423(Compilers)** and the language was made **open-source** with documentation and a syntax-highlighting functionality

Accelerating Proximal Stochastic Mirror Descent

Sept 2024 - May 2024

Mentors:- Dr. Saketha Nath Jagarlapudi (MSR & IITH)

- Implemented efficient optimization algorithms and classes using Pytorch to train deep neural networks using Stochastic Mirror descent.
- Implemented Nesterov Acceleration and empirically verified faster convergence rates for certain classes of potential functions.

Outcome:- Highest Grade (A) in **CS5660(Optimization - 2)**

A Collaborative Filtering Recommendation Engine

May 2022 - Aug 2022

Program:- Microsoft Engage Program

- Built a Movie Recommendation Engine that recommends movies and predicts ratings using Collaborative Filtering and Nearest Neighbour Methods
- Implemented a website in Flask that gave a user interface to give ratings for movies and the engine would return similar movies which had high probability of being rated well, the website was hosted using Heroku

Outcome:- I was offered a **Software Engineer Internship** at Microsoft - India, directly after evaluation of this work

ONGOING PROJECTS

Stochastic Approximation for Convergence of Adaptive Algorithms

May 2024 - Aug 2024

Mentors:- Dr M Vidyasagar *FRS* (IITH)

- Developed a new convergence proof of RMSprop and the Heavy ball method removing the bounded gradient assumption, using techniques in Measure theory and Stochastic Processes.
- Presently working on extending the proof to ADAM

TEACHING

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- **CS20230 - Theory of Computation** Fall 2022, Fall 2023
 - Under Dr. Subrahmanyam Kalyanasundaram (IITH)
 - Taught on **Government of India's National Education Portal** (NPTEL)
 - Built assignment questions
 - **AI2100 - Deep Learning** Fall 2023
 - Under Dr. Konda Reddy Mopuri (IITH)
 - Taught in person and built assignments, checked assignments
 - **CS6070 - Tensor Analysis** Fall 2023
 - Under Dr. Rameshwar Pratap (IITH)
 - Taught in person and corrected and designed questions for the assignments
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