

Karan Vombatkere

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EDUCATION

Boston University

Ph.D. Computer Science

- *Algorithmic Data Mining, Computational Social Science*, (GPA: 3.86)

Boston, MA

Aug 2021 - present

University of Rochester

M.S. Data Science

- *Computational & Statistical Methods*, (GPA: 3.83)

Rochester, NY

May 2018

B.S. Electrical & Computer Engineering

May 2017

B.A. Physics

- *Highest Distinction, Magna Cum Laude*, (GPA: 3.92)

RESEARCH AND WORK EXPERIENCE

Boston University, Boston, MA

PhD Researcher

Aug 2021 - present

Advisor: Dr. Evimaria Terzi

Approximation algorithms for team formation

- Design efficient approximation methods for the team formation problem, with provable guarantees.

Max Planck Institute-SWS, Saarbrücken, Germany

Research Intern

May 2022 - Aug 2022

Advisor: Dr. Krishna Gummadi

Personalization in social media feeds

- Framework to audit personalization on TikTok's short format video content recommendations.

IBM, Cambridge, MA

Data Scientist

Sep 2018 - Jun 2021

Supervisor: Dr. Mark Freeman

Optimizing bid pricing using ML

- Developed a novel method for bid price optimization in Python for a B2B competitive pricing setting. Implemented a custom gradient ascent algorithm to solve the constrained revenue maximization, and integrated SQL functionality into the train-test pipeline to improve run time by over 100%.
- Built a REST API framework to handle real-time pricing requests in under 2 seconds. Successfully released pricing engine as a microservice for *Verizon Communications*.

Pre-authorization for surgical procedures

- Developed a rules engine in Python and extracted contextual language features from patient clinical data. Deployed natural language model framework on AWS for *CVS Health*.

Data engineering for dashboards

- Wrote SparkSQL code for large datasets, to enhance dashboard capabilities for *Apple Media Products*.

Brand Networks, Rochester, NY

Master's Capstone Practicum

Jan 2018 - May 2018

Mentor: Dr. Ajay Anand

- Researched Facebook ad-campaign success drivers and identified optimal campaign configurations using SQL scripts. Developed classification models in Python to predict campaign-optimizing key performance indicators and presented a metric-driven, ad-campaign configuration process to the company.

Audio Information Research Lab, University of Rochester

Research Fellow (Sponsored by Xerox)

May 2016 - Aug 2016

Mentor: Prof. Zhiyao Duan

- Developed an automatic lyric display system and GUI for live music performances in Java. Used a real-time implementation of the dynamic time warping algorithm to align annotated and live temporal sequences, based on their harmonic similarity.

TEACHING EXPERIENCE

Boston University

- CS 565: Algorithmic Data Mining, *Head Teaching Assistant*
- BU CS Summer Challenge Course, *Instructor*

Spring 2023

Summer 2023

University of Rochester

- ECE 231: Applied Electromagnetism, *Head Teaching Assistant*
- ECE 111: Analysis & Design of Electrical Circuits, *Teaching Assistant*
- ECE 112: Logic Circuit Design, *Teaching Assistant*





Fall 2016, Fall 2017

Fall 2015







Spring 2018

- MTH 161: Differential Calculus, *Teaching Assistant* Fall 2014 - Fall 2015
- MTH 162: Integral Calculus, Series & Sequences, *Teaching Assistant* Spring 2016 - Spring 2017
- PHY 113: Mechanics, *Teaching Assistant* Fall 2017, Spring 2018
- PHY 122: Electricity & Magnetism, *Lab Teaching Assistant* Fall 2016, Spring 2017
- AST 105, AST 106: Introductory Astronomy, *Teaching Assistant* Fall 2014, Spring 2015

SELECTED PUBLICATIONS

- Vombatkere, Mousavi, Zannettou, Roesner, & Gummadi. (2024). **TikTok and the Art of Personalization: Investigating Exploration & Exploitation on Social Media Feeds**. Accepted: WebConf 2024. *[preprint]*
- Vombatkere, Terzi, & Gionis. (2023). **Forming Coordinated Teams that Balance Task Coverage and Expert Workload**. Submitted: Springer Data Mining and Knowledge Discovery. *[preprint]*
- Vombatkere, Terzi. (2023). **Balancing Task Coverage and Expert Workload in Team Formation**. In Proceedings of the 2023 SIAM International Conference on Data Mining (SDM). 
- Kritharakis, Luo, Unnikrishnan, & Vombatkere. (2022). **Detecting Trading Trends in Streaming Financial Data using Apache Flink**. In Proceedings of the 16th ACM International Conference on Distributed and Event-Based Systems (pp. 145-150). 
- Vombatkere, Lyu, & Luo. (2021). **How Political is the Spread of COVID-19 in the United States?**. In International Conference on Social Computing, Behavioral-Cultural Modeling and Prediction and Behavior Representation in Modeling and Simulation (pp. 13-22). Springer, Cham. 
- Vombatkere, Li, & Duan. (2017) **Automatic Lyrics Display System for Live Music Performances**. In IEEE Signal Processing Magazine. 

TECHNICAL PROJECTS

- Coresets for Clustering & Streaming**  2021
Python implementation of Coreset algorithms for clustering and streaming.
- Settlers of Catan AI Framework**  2020
Catan boardgame built in Python with AI framework.
- Ultimate TicTacToe AI**  2018
Ultimate Tic Tac Toe framework (nine 3x3 boards) built in Java implementing adversarial search using MiniMax with Alpha-Beta pruning. Developed a heuristic AI, which beat a control player in 99/100 games.
- WWII Enigma Simulator**  2017
A complete implementation of the Enigma machine in Python. Object-oriented framework with full encryption and decryption functionality. Implemented known-plaintext attack methodology to crack the Enigma cipher.
- Augmented Audio Reality Binaural Headphones**  2017
Designed and built binaural headphones with real-time recording and filtering capability and < 12 ms latency.
- Non-linear Dynamics of Damped & Driven Pendulum**  2016
Researched the non-linear dynamics of the damped and driven pendulum. Developed a theoretical framework and computationally solved the problem using Mathematica to find regions of chaotic and non-chaotic motion.

ACADEMIC HONORS AND AWARDS

- University of Rochester Merit Scholarships** *[Genesee Scholarship, Dean's Scholarship]*
Awarded 100% scholarship for undergraduate tenure, and 75% scholarship for MS degree.
- Tau Beta Pi Engineering Honor Society** *[National Tau Beta Pi Scholarship]*
Awarded National Tau Beta Pi Scholarship for 2016-17 academic year.
- Citation for Achievement in College Leadership**
Awarded for demonstrating outstanding undergraduate teaching and research commitment.
- Donald M. Barnard Engineering Prize**
Awarded annually to one senior for high personal achievement in Electrical & Computer Engineering.
- Phi Beta Kappa Honor Society**

TECHNICAL SKILLS

- Proficient:** Python, SQL, Java, L^AT_EX, **git**
Familiar: Linux, MATLAB, C, TensorFlow

EXTRACURRICULARS [UNIVERSITY OF ROCHESTER]

- Club Tennis Team**, *Competed at USTA TOC National Championships, Florida, 2018* 2013 - 2018
- Men's Rowing Team**, *Competed as a rower in coxed fours and eights* 2014 - 2015
- Sigma Phi Epsilon Fraternity**, *Housing Manager, 2016* 2015 - 2017