



Karan Vombatkere

Computer Science Ph.D. Applicant

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RESEARCH INTERESTS

Algorithmic Game Theory, Data Mining, Statistical ML, Reinforcement Learning

EDUCATION

University of Rochester

Aug 2013 - May 2018

M.S. Data Science

May 2018

- GPA: 3.83/4.00, *Focus in Computational & Statistical Methods*

B.S. Electrical & Computer Engineering

May 2017

B.A. Physics

May 2017

- GPA: 3.92/4.00, *Highest Distinction, Magna Cum Laude*

RESEARCH AND WORK EXPERIENCE

IBM, Cambridge, MA

Sep 2018 - present

Data Scientist

Supervisor: Dr. Mark Freeman

Machine Learning for Optimal Bid Pricing

- As the primary code owner, developed a novel method for bid price optimization using Logistic Model Trees in Python for a business-to-business competitive pricing setting. The method uses a hierarchical decision-tree model to segment customers based on historical non-pricing data, and then models segment-specific price sensitivities using a logistic regression framework to predict optimal line-item pricing.
- Developed a gradient ascent algorithm to solve the constrained revenue maximization problem, and integrated automated 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. Successfully deployed pricing engine as a microservice on IBM Cloud for a large telecommunications company.

Automating Pre-Authorization for Surgical Procedures

- Developed a rules engine in Python to integrate with IBM Watson Annotator for Clinical Data. Wrote code to extract natural language concepts and contextual language features from patient clinical data.
- Tested and deployed NLP model framework on AWS for a large healthcare provider.

Brand Networks, Rochester, NY

Jan 2018 - May 2018

Master's Capstone Practicum

Supervisor: Dr. Ajay Anand

- Worked with 2017 Facebook ad-campaign data to help predict drivers of campaign success and identify optimal ad-campaign configurations, using SQL scripts to generate campaign performance distributions.
- 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

May 2016 - Aug 2016

Research Fellow (Sponsored by Xerox)

Supervisor: Prof. Zhiyao Duan

- Developed an automatic lyric display system for live music performances in Java, using a real-time implementation of the dynamic time warping algorithm to align annotated and live temporal sequences, based on their harmonic similarity.
- Designed a GUI to display lyrics in real time, and successfully tested the system on several soundtracks using a multi-threaded framework for live audio recording and processing.

Tata Institute of Fundamental Research, Mumbai

Jul 2014 - Aug 2014

Research Intern

Supervisor: Dr. Ravi Venkatramani

- Investigated conformation changes and molecular dynamics in the photoisomerization cycle of Bacteriorhodopsin using NAMD simulation software, and presented findings to research group.

TEACHING EXPERIENCE

University of Rochester Department of Electrical & Computer Engineering

- ECE 231: Applied Electromagnetism, Head TA
- ECE 111, ECE 112: Electrical Circuits & Logic Circuit Design, TA

University of Rochester Department of Mathematics

- MTH 161, MTH 162: Differential & Integral Calculus, TA

University of Rochester Department of Physics & Astronomy

- PHY 113: Mechanics, TA
- PHY 122: Electricity & Magnetism, Lab TA
- AST 105, AST 106: Introductory Astronomy, Head TA

TECHNICAL PROJECTS

Settlers of Catan AI Framework

2020

Settlers of Catan Framework built in Python. AI Framework built in TensorFlow using Reinforcement Learning

Ultimate TicTacToe AI

2018

Ultimate Tic Tac Toe framework (9 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.

Tennis Player Performance Prediction

2017

Predicted professional tennis player performance with 80% accuracy using aggregated statistical features from historical match data and a deep learning implementation in Python.

Binaural Headphones Design [ECE Senior Design Project]

2017

Built binaural recording headphones with real-time recording, playback and filtering capabilities

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 to find regions of chaotic and non-chaotic motion.

Brownian Motion Stock Price Evolution

2016

Developed a statistical framework in Python to predict stock price evolution using Geometric Brownian Motion.

PAPERS

Karan Vombatkere, Hanjia Lyu, Jiebo Luo. **How Political is the Spread of COVID-19 in the United States? An Analysis using Transportation and Weather Data.** *Submitted to AAAI 2021, ArXiv*  

Karan Vombatkere, Bochen Li, Zhiyao Duan. **Automatic Lyrics Display System for Live Music Performances.** *IEEE Signal Processing Magazine, January 2017, SigPort*  

ACADEMIC HONORS AND AWARDS

University of Rochester Merit Scholarships [Dean's Scholarship, Genesee Scholarship]

Awarded 100% (\$220,000) scholarship for undergraduate tenure, and 75% (\$42,000) scholarship for MS degree.

Tau Beta Pi Engineering Honor Society [National Tau Beta Pi Scholarship]

Awarded \$2,000 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 and Scholarship

Phi Beta Kappa Honor Society

TECHNICAL SKILLS

Programming Languages: Python, Java, C/C++, SQL, MATLAB

Tools: NumPy, Pandas, TensorFlow, PyTorch, L^AT_EX

EXTRACURRICULAR HIGHLIGHTS [UNIVERSITY OF ROCHESTER]

Club Tennis Team, *Competed at USTA TOC National Championship, Florida, 2018*

Aug '13 - May '18

Men's Rowing Team, *Competed as a rower in coxed fours and eights*

Sep '14 - Sep '15

Sigma Phi Epsilon Fraternity, *Housing Manager, 2016*

Jan '15 - May '17