Seyoon Ragavan

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EDUCATION

Princeton University, Princeton NJ — September 2017-May 2021
Bachelor of Arts in Mathematics, Highest Honours — GPA: Dept: 3.98, Overall: 3.96
Certificates in Applications of Computing, Applied Mathematics, and Cognitive Science

Undergraduate coursework

Economics and Computing	Quantum Computing	Quantum Mechanics	Abstract Algebra
Extremal Combinatorics	Number Theory	Partial Differential Equations	Real Analysis

Graduate coursework

Complexity Theory	Advanced Algorithm Design	Information Theory	Graph Algorithms
Learning Theory	Machine Learning	Natural Language Processing	Deep Learning

ACADEMIC ACHIEVEMENTS

George B. Covington Prize in Mathematics, Princeton University (top prize for overall excellence in mathematics) 2021
Phi Beta Kappa, elected to the Princeton chapter 2021
Sigma Xi, elected to the Princeton chapter 2021
Peter Greenberg Memorial Prize, Princeton University (for junior accomplishments in mathematics) 2020
Putnam Competition, Honorable Mention (top 100 participants across colleges in the USA) 2017-2019
Shapiro Prize for Academic Excellence, Princeton University (top 2% undergraduate students) 2019
Manfred Pyka Memorial Prize in Physics, Princeton University 2018
International Mathematical Olympiad, represented Australia four times: 1 gold and 3 bronze medals 2013-2016

RESEARCH PROJECTS

Query Complexity of Max-Cut in the Value Oracle Model, *Senior Thesis* 2020-2022

- Extended recent linear algebraic techniques to establish lower bounds for approximating max-cut in a non-standard computational model where the algorithm does not have direct access to the graph.
- Completed and wrote up Orestis Plevrakis' proof that a (1-epsilon)-approximation for max-cut can be achieved in this model with O(n polylog(n)) queries and proved using information theoretic techniques that this is essentially optimal.
- Senior thesis advised by Prof. Matt Weinberg, read by Prof. Noga Alon.

Spectral Theory of Triangles, *in proceedings of Journal of Spectral Theory* 2020-2021

- Showed that the ratio between the top two Dirichlet-Laplacian eigenvalues of a triangle is maximised by the equilateral triangle, thus proving the Ashbaugh-Benguria-Payne-Pólya-Weinberger inequality in the case of triangles.
- Conducted experiments in Python and Mathematica to identify the effective regions of different estimates.
- Joint work with Ryan Arbon, Mohammed Mannan, and Michael Psenka, advised by Prof. Javier Gómez-Serrano.

Morphology-Aware Meta-Embeddings for Tamil, *in proceedings of NAACL Student Research Workshop 2021* 2020-2021

- Developed and released novel morphologically enhanced word embeddings for Tamil.
- Developed and released the first-ever word analogy dataset for Tamil, consisting of 4499 word tetrads.
- Joint work with Arjun Sai Krishnan, advised by Prof. Danqi Chen.

Connecting Adversarial Robustness and Gradient Interpretability, *Junior Independent Work* 2019-2021

- Conducted large-scale experiments to evaluate previously proposed theoretical explanations of the relationship between interpretability and adversarial robustness using the manifold hypothesis, advised by Prof. Sanjeev Arora.
- Proposed and evaluated an alternative explanation using Fourier analysis of images, advised by Prof. Jason D. Lee.

Lottery Ticket Hypothesis and Neural Network Pruning, *course project* 2020

- Conducted experiments to evaluate the expressivity and data-dependency of deep neural networks obtained from different pruning methods.
- Provided new empirical and theoretical explanations for the relatively poor performance of pruning at initialisation.
- Joint work with Arjun Mani, Michael Psenka, and Sabarish Sainathan.

PUBLICATIONS

Orestis Plevrakis, Seyoon Ragavan, and S. Matthew Weinberg. 2022. On the cut-query complexity of approximating max-cut. Preprint. DOI: http://dx.doi.org/10.48550/arXiv.2211.04506.

Ryan Arbon, Mohammed Mannan, Michael Psenka, and Seyoon Ragavan. 2022. A proof of the triangular Ashbaugh–Benguria–Payne–Pólya–Weinberger inequality. Journal of Spectral Theory 12, 2 (2022), 515–533. DOI: http://dx.doi.org/10.4171/jst/409.

Arjun Sai Krishnan and Seyoon Ragavan. 2021. Morphology-Aware Meta-Embeddings for Tamil. Proceedings of the 2021 Conference of the North American Chapter of the Association for Computational Linguistics: Student Research Workshop (June 2021). DOI: http://dx.doi.org/10.18653/v1/2021.naacl-srw.13.

EXPERIENCE

Citadel Securities, *Quantitative Research Analyst* August 2021-January 2023

- Developed tools leveraging the firm's distributed computing infrastructure to monitor the performance of the firm's systematic trading strategies and identify key areas for potential improvement.

Citadel Securities, *Quantitative Research Analyst Intern* Summer 2020

- Conducted an alpha research project, leveraging a large dataset to predict and test statistical market patterns.
- Applied causal inference techniques to automate feature selection for predictive models.

Princeton University, *Research Intern, Theoretical Machine Learning* Summer 2019

- Investigated interpretability and adversarial robustness of deep learning models, advised by Prof. Sanjeev Arora.

Afari (student-founded social media startup), *Software Intern* Summer 2018

- Designed security, incentive, and censorship mechanisms for the network with the goal of keeping the network decentralized.
- Developed the web app on the full stack using Node.js backend, React frontend.

TEACHING AND MENTORING

TA for Economics and Computing at Princeton University 2019
Trainer and grader for Australia's International Mathematical Olympiad team 2017, 2020-present
Peer Academic Advisor (for 30 first-years and sophomores) 2019-2021

INTERESTS AND SKILLS

Languages: English, Tamil
Technical: Python, NumPy, pandas, scikit-learn, xarray, PyTorch, Slurm, AWS, C++, Java
Music: Mridangam (South Indian classical drum), drum kit, voice