Parsa Rangriz

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INTERESTS

- Probability Theory
- Stochastic Analysis
- High-Dimensional Probability
- Random Matrices
- Statistical Physics
- Spin Glasses

EDUCATION

University of Waterloo, Ontario, Canada — Sep 2023 - Apr 2025 (Expected)
Master of Mathematics in Statistics (Thesis-Based) — GPA: 91.33/100
(Supervisor: **Prof. Aukosh Jagannath**)

Sharif University of Technology, Tehran, Iran — Sep 2018 - Feb 2023
Bachelor of Science in Physics — GPA: 18.34/20
Minor in Mathematics

RESEARCH EXPERIENCES

University of Waterloo, Ontario, Canada
Graduate Research Student — Sep 2023 - Current
Supervisor: **Prof. Aukosh Jagannath**
Master's Thesis: Scaling Limits of the Teacher Student Network via SGD

- My ongoing thesis focuses on the functional central limit theorem of online stochastic gradient descent (SGD) for multi-index models, specifically the teacher-student network. Using the martingale problem approach, with random initialization, I proved that the dynamics of online SGD for the teacher-student network become diffusive near the fixed point, exhibiting the Ornstein-Uhlenbeck (OU) process. The remaining question is that, depending on the initialization, the OU process could either be mean-reverting or mean-repellent.

EPFL, Lausanne, Switzerland
Summer Research Intern — July 2022 - Sep 2022
Supervisor: **Prof. Lenka Zdeborova**
Project: Assortative Partitions on Directed Dense Graphs

- Assortative partitions on directed dense random graphs was studied using the replica-symmetric approach to analyze phase transitions, and to interpret partitions in the high-dimensional limit which involved a message-passing algorithm known as belief propagation.

Sharif University of Technology, Tehran, Iran
Undergraduate Research Student — June 2021 - Sep 2021
Supervisor: **Prof. Amir Daneshgar**
Project: Belief Propagation for Graph Partitioning

- The belief propagatiom algorithm was studied for the graph bi-partitioning problem, where I rebuilt a message-passing algorithm - known as belief propagation (BP) - and studied the heuristic high-dimensional solution for the partitioning problem via BP based on previous developments.

Sharif University of Technology, Tehran, Iran
Undergraduate Research Student — Feb 2021 - June 2021
Supervisor: **Prof. Abolhassan Vaezi**
Project: Phase Transitions in the Transverse-Field Ising Model

- The phase diagrams of the correlation function and the entanglement entropy of the one-dimensional transverse-field Ising model were studied and different thermodynamical phases were identified using machine learning classification and neural networks.

Honors and Awards

Graduate Research Studentship (GRS), UWaterloo, 2023-2024
Received a scholarship of 22,973 CAD for the entire 20-month master's program.

International Master's Award of Excellence (IMAE), UWaterloo, 2023-2024
Received an award of 16,500 CAD for the entire 20-month master's program.

Master of Mathematics Entrance Scholarship, UWaterloo, 2023
Selected as one of top eight new graduate students to receive a 1,000 CAD award.

Summer@EPFL Fellowship, 2022
Ranked top 1.5% among 4,000 applicants and awarded a 4,800 CHF fellowship.

Silver Medal in the 30th Iran National Physics Olympiad, 2018
Awarded a silver medal (top 0.01%) among 10,000 high school student competitors.

Summer Schools

CRM-PIMS Summer School in Probability 2024
Centre de Recherches Mathematiques, Universite de Montreal, QC, Canada

Teaching Experiences

University of Waterloo, Ontario, Canada
Teaching Assistant

- STAT 433: Stochastic Processes 2 (Fall 2024)
- STAT 330: Mathematical Statistics (Spring 2024, Fall 2023)
- STAT 231: Probability (Spring 2024)
- STAT 333: Stochastic Processes 1 (Winter 2024)
- STAT 230: Statistics (Spring 2024)
- STAT 202: Introductory Statistics for Scientists (Fall 2023)

Sharif University of Technology, Tehran, Iran
Teaching Assistant

- Advanced Statistical Mechanics (Fall 2022, Fall 2021, Spring 2021)
- Statistical Mechanics 2 (Spring 2021)
- Statistical Mechanics 1 (Fall 2020)

Selected Courses

University of Waterloo, Ontario, Canada (2023-2024)

- STAT 946: Topics in Statistics (Math Foundations of Deep Learning)
- STAT 902: Theory of Probability 2 (Stochastic Calculus)
- STAT 891: Topics in Probability (Random Matrix Theory and HDP)
- STAT 908: Statistical Inference
- STAT 901: Theory of Probability 1 (Probability Theory)

Sharif University of Technology, Tehran, Iran (2018-2023)

- Advanced Theory of Statistics
- Information-Theoretic Methods in High Dimensional Statistics
- Graphical Models, Variational Inferences, and Entropy Maximization
- Advanced Statistical Physics
- Machine Learning in Physics

Skills

Programming Skills and Tools

- Experienced in C and Python
- Familiar with Scikit-learn, Keras, and TensorFlow libraries.
- Experienced in Wolfram Mathematia and LaTeX.