Parsa Rangriz

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EDUCATION

Sharif University of Technology, Tehran, Iran
B.Sc in Physics — *Sep 2018 - Jan 2023 (Expected)*
Minor in Mathematics — *CGPA: 3.89/4 (18.50/20)*

RESEARCH INTERESTS

Quantum Information and Computing, Statistical Physics in Optimization Theory, Quantum Thermodynamics, Information Theory and Graphical Models

RESEARCH EXPERIENCE

- **Research Assistant, Sharif University of Technology, Iran**
  Under the supervision of Prof. Amir Daneshgar, on a new method of constructing regular random graphs, named π-lift to prove these generated graphs are more connected than the other methods such as Kim-Vu by studying the min-cut problem using message passing algorithm. (Oct 2021-present)
- **Research Assistant, Institute for Research in Fundamental Sciences, Iran**
  Under the supervision of Dr. Salman Beigi, on the inflation technique, trying to classify classical and quantum correlation in causal triangular networks to find a new bounds for such graphs and formulate relaxations of the causal compatibility problem in terms of linear and semi-definite programming. (Oct 2021-present)
- **Remote Research Intern, The University of Manchester, UK**
  Under the supervision of Dr. Ahsan Nazir and Dr. Adam Stokes, on the thermodynamics of non-conjugate systems as an alternative way of understanding the decomposition of a quantum system into interacting parts based on quantum coarse-grained entropy (July 2021-present)
- **Research Assistant, Sharif University of Technology, Iran**
  Under the supervision of Dr. Abolfazl Ramezanpour and Dr. Saman Moghimi, on loop correction for cavity approach to sphere packing in Hamming space (June 2021-present)
- **Member, Sharif's Quantum Information Journal Club, Iran**
  Regular sessions under the supervision of Prof. Vahid Karimipour. In these sessions we study some newest papers in quantum information and quantum computing. (May 2021-present)

SELECTED COURSE PROJECTS

- A project paper on "**Belief Propagation on Graph Partitioning**" for my Topics in Optimization course. Computing the ground state energy of the Ising model in zero-temperature limit to solve the minimum cut problem. Then using the Belief propagation algorithm (Cavity method) for Erods-Renyi and random d-regular graphs for studying the graph partitioning. 2021
- A project paper on "**Phase Transition of Quantum Ising Model**" for my Machine Learning in Physics course. Studying and finding the phase transition of the transverse-eld quantum Ising model using Machine Learning and Deep Learning methods to classify different phases. 2021
- A term paper on "**Variational Inference in Error-Correcting Codes**" for my Special Topics in Communication Systems course. Trying to understand the Belief Propagation algorithm for evaluating marginal distributions and applying then in decoding problems. Focusing on the mathematical properties of these concepts to tune the process and understanding the deep levels of these algorithms and approximations. Also, generalizing this algorithm in the quantum regime.
- A term paper on "**An Introduction to Quantum Thermodynamics**" for my Advanced Quantum Mechanics course. Reviewing the main concepts of quantum thermodynamics based on open quantum systems and quantum information theory. Also generalizing laws of thermodynamics and cycles.

AWARDS & HONORS

Ranked 5th in the 26th Iran University Physics Olympiad
This annual competition is held by National Organization of Educational Testing (Sanejsh) between the top 100 senior undergraduate students and master applicants

Silver Medal in the 30th Iran Physics Olympiad
Iran Physics Olympiad is the final stage of the International Physics Olympiad (IPhO) preparation competitions during the summer in Iran which is held by Young Scholars Club.

Member of Iran National Elites Foundation
Iran National Elites Foundation is a statewide organization and composed of members with significant scientific and executive background.

SELECTED COURSES & GRADES

- Sepcial Topics in Quantum Information Theory (Physics PhD): In progress
- Special Topics in Communication Systems (Electrical Engineering M.Sc.): In progress
- Quantum Information Theory (Physics PhD): 19.5/20
- Quantum Computation (Physics PhD): 20/20
- Topics in Optimization (Mathematics M.Sc.): 20/20
- Advanced Quantum Mechanics (Physics M.Sc.): 18.6/20
- Advanced Statistical Mechanics (Physics M.Sc.): 18.8/20
- Machine Learning in Physics (Physics M.Sc.): 17.6/20
- Mathematical Statistics (Mathematics B.Sc.): In progress
- Solid State Physics (Physics B.Sc.): 19.5/20

TEACHING ASSISTANT EXPERIENCE

- Advanced Statistical Mechanics (Physics M.Sc.): Prof. Vahid Karimipour
- Advanced Statistical Mechanics (Physics M.Sc.): Dr. Ali Rezakhani
- Statistical Mechanics(Physics B.Sc.): Prof. Vahid Karimipour
- Thermodynamics (Physics B.Sc.): Prof. Vahid Karimipour
- General Physics III (Physics B.Sc.): Dr. Omid Akhavan
- Fundamentals of C Programming (Computer Engineering B.Sc.): Dr. Marjan Nikbin

ATTENDED SCHOOLS

- **ETH Zurich**: Quantum Thermodynamics Summer School 2021
- **University of Sao Paulo**: Mini-Coruse Quantum Information-Thermodynamics 2021

SELECTED TALKS & PRESENTATIONS

- A talk on "**Statistical Physics for Optimization Theory**" at Sharif's Statistical Physics Seminars. 2021
- A presentation on Andreas Winter's paper about "**Programmability of Covariant Quantum Channels**" at Sharif's Quantum Information Journal Club. 2021
- A presentation on Franco Nori's paper about "**Eigenstate Extraction with Neural-Network Tomography**" at Sharif's Quantum Information Journal Club. 2021

OTHER ACTIVITIES & EXPERIENCES

- **Scientifc Director, Sharif Physics Students Scientific Association, Iran**
  A nonprofit organization at the Department of Physics of Sharif University of Technology which is established in 2013 and holds conferences, workshops, and scientific talks by national and international professors, moderates student activities such as study circles and scientific magazines. (2020-2021)
- **Head, Quanta - Sharif Physics Study Circles, Iran**
  Quanta - Sharif Physics Study Circles is a student club that holds and manages some scientific study circles in the physics and math fields. (2020-2021)

TECHNICAL SKILLS

Programming Languages : Python, C
Tools : Wolfram Mathematica, HTML, LaTeX
General : Machine Learning (Sci-Kit Learn), Deep Learning (TensorFlow)