Soumik Ghosh

172 Cedarvale Crescent
Waterloo, Ontario, N2L 4T2
Canada

soumikghosh@uchicago.edu ✉
+1-416-827-3023 ☎
https://soumikghosh23.github.io ⊕

Education

2020 -	**University of Chicago**
	Program : Ph.D. in Computer Science
	Supervisor : Prof. William Fefferman

2018 - 2020	**University of Waterloo**
	Program : M.Math in Computer Science (Quantum Information)
	Percentage : 95.2/100
	Thesis : 'A study of one-turn quantum refereed games'
	Supervisor : Prof. John Watrous
	Readers : Prof. John Watrous, Prof. Richard Cleve, Prof. David Gosset

2014 - 2018	**Jadavpur University**
	Program : Bachelor of Engineering (B.E.) in Electronics Engineering
	CGPA : 9.5/10 (Passed First Class with Honours)

Research Interests

I have broad interests in **quantum computing**. Specific topics that I am interested in include **quantum complexity theory, quantum algorithms, quantum information theory, quantum proof systems, quantum cryptography**, and **the theory of entanglement**. I am also interested in **algorithms, complexity theory**, and **theoretical computer science** more generally.

Manuscripts

Publications

1. **Ghosh, Soumik**, and Watrous, John. **Complexity limitations on one-turn quantum refereed games.** [PDF]

2. **Ghosh, Soumik**, Adhikary, Arnab, and Paul, Goutam. **Revisiting Integer Factorization Using Closed Timelike Curves.** In: **Quantum Information Processing (Springer)**, article 30, vol. 18, issue 1, January 2019. [PDF]

3. **Ghosh, Soumik**, Adhikary, Arnab, and Paul, Goutam. **Quantum signaling to the past using P-CTCs.** In: **Quantum Information and Computation (Rinton Press)**, pages 965-974, volume 18, vol. 11 and 12, September 2018. [PDF]

4. Adhikary, Arnab, and **Ghosh, Soumik**. **Scheme for implementing dichotomic quantum measurements through non-ideal Stern-Gerlach setup.** In: **Quantum Studies: Mathematics and Foundations (Springer)**, pages 107-120, volume 6, issue 1, June 2018. [PDF]

Conference

- Poster by **Ghosh, Soumik**, at the **Canadian Graduate Quantum Conference**, June 2019. **Title**: Quantum games with competing provers. **Authors**: Soumik Ghosh, John Watrous. [PDF]

Research Projects

Master's Research

2018 - 2020	**Study of one turn quantum refereed games.** **Supervisor**: Professor John Watrous, Institute for Quantum Computing **Description**: Utilizing tools from complexity theory, game theory, and information theory to analyze the complexity limitations on quantum proof systems with two competing quantum provers, one polynomial-time quantum verifier, and one round of interaction between the provers and the verifier.
2018 -	**Study of shallow depth quantum circuits.** **Collaborator**: Dr. Matthew Coudron, University of Maryland, College Park **Mentor**: Dr. David Gosset, Institute for Quantum Computing **Description**: Looking into an oracle separation between constant depth quantum circuits with polynomial time classical post-processing and log depth quantum circuits with polynomial time classical post-processing. Also looking into interesting classes of problems that can be solved with a shallow depth quantum circuit but not with shallow depth classical circuits.

Undergraduate Research

May - July 2017	**Simulation of quantum algorithms.** **Supervisor**: Professor Itay Hen, University of Southern California **Description**: Studied quantum algorithms, including quantum random walk algorithms and adiabatic quantum algorithms. Focused on simulating and comparing different algorithms for traversing the glued trees graph, including the continuous time quantum random walk variant, the adiabatic variant, and the discrete time variant.
2016 - 2018	**Quantum computing with Closed Timelike Curves (CTCs).** **Supervisor**: Professor Goutam Paul, Indian Statistical Institute **Description**: Constructed hypothetical quantum protocols for non-orthogonal quantum signaling with post-selected Closed Timelike Curves. Studied causality violations of the protocol and put forward two consistency relations to prevent them.
2016 - 2018	**Study of the non-ideal Stern Gerlach experiment.** **Supervisor**: Professor Dipankar Home, Bose Institute **Description**: Studied the mathematics of the Stern-Gerlach experiment under non-ideal condition. Identified a correspondence between biasedness and unsharpness of measurement and key parameters of the non-ideal Stern Gerlach setup.

Undergraduate Thesis

2018 | **Study of quantum machine learning.**
Supervisor: Professor Pratyusha Rakshit, Jadavpur University
Description: Studied and summarized two areas of quantum machine learning, namely quantum reinforcement learning and quantum associative memory.

Achievements

2020 | Awarded the Daniels Fellowship for being one of the strongest Ph.D. students of the incoming cohort at the University of Chicago (valued at 15,000 USD for one year, in addition to the normal graduate stipend).

2019 | One of only five international students in the entire University of Waterloo to be awarded the prestigious Ontario Graduate Scholarship for academic and research excellence (valued at $15,000$ CAD per year).

2019 | Only international Master's student in the entire Mathematics faculty in the University of Waterloo to be awarded the prestigious President's Graduate Scholarship for academic and research excellence (valued at $10,000$ CAD per year).

2017 | Awarded the prestigious Viterbi-India fellowship for research at USC Viterbi for the summer of 2017 (one of 19 out of more than 350 applicants).

2017 | Awarded the prestigious DAAD-WISE fellowship for research in Germany in 2017 at Technische Universität Dortmund.

Teaching Assistantships

Fall 2018 | Course: MATH 643
Instructor: Professor Naomi Nishimura, University of Waterloo
Description : Online course on the **theory of computation**, designed for students pursuing an online Master's degree from the University of Waterloo.

Fall 2019 | Course: MATH 641
Instructor: Professor Naomi Nishimura, University of Waterloo
Description : Online course on the **algorithm design and analysis**, designed for students pursuing an online Master's degree from the University of Waterloo.

Technical Skills

Languages | C, C++, Mathematica
Research tools | Matlab, Mathematica, Maple

Test Scores

September 2017 | **Graduate Record Examination (GRE)**
Score: 339/ 340, Quant - 170/170, Verbal - 169/170, AWA - 5/6

Service

Professional Service

June 2019	Chaired the quantum computing session at the Canadian Graduate Quantum Conference, 2019.
2019 - 2020	Part of the team organizing the Canadian Graduate Quantum Conference, 2020.

Extracurricular Service

July 2019 -	Member of 'bigyan.org' - an online portal to popularize science in the Bengali language.
2019 -	Member and team leader of the Institute for Quantum Computing (IQC), Graduate Student Association.
October 2019 -	Collaborating with Aquanty, an environmental startup, to develop deep learning techniques for hydrological forecasting.

References

- **Dr. John Watrous**
  - Professor
  - Institute for Quantum Computing, University of Waterloo
  - Email: watrous@uwaterloo.ca

- **Dr. David Gosset**
  - Associate Professor
  - Institute for Quantum Computing, University of Waterloo
  - Email: dgosset@uwaterloo.ca

- **Dr. William Fefferman**
  - Assistant Professor
  - University of Chicago
  - Email: wjf@uchicago.edu