Masters Project

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Quantum Technology
Master of Technology(2022-24)

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Domians Explored

System Simulation

Optimization/ML

Complexity theory (BQP)

Conclusion

Tentative Plan

System Simulation

Efficient quantum algorithms for dissipative nonlinear differential equation [J-P. Liu, ... , A. Childs (2021)] Link

- My motivation to read: To know if non-linear system can be captured by Quantum algorithms.
- If yes, then why to use, and under what conditions

Status:

- Paper reviewd [See 'presentation-1.pdf'] Link
- Remark-1: In fault tolerant era, certain special non-linear system can benefit from Quantum algorithm (with certian caveats).
- Remark-2: Some major caveats in the algorithm restricts its use in many non-linear systems

Machine Learning

Towards provably efficient quantum algorithms for large-scale machine-learning models [Pre-print: J. Liu, ..., L. Jiang 2023] Link

- My motivation to read: To know how classical neural network can be trained via Quantum algorithms
- Different approach than the traditional one which relies on (periodic) pattern in the dataset to have Quantum advantage

Status:

- Paper reviewd [See 'presentation-2.pdf'] Link
- Remark-1: Fault-tolerant era algorithm
- Remark-2: Saving for future.

Power/limitations of BQP in the relativized world

Forrelation: A Problem that Optimally Separates Quantum from Classical Computing [Aaronson, Ambianis 2015] Link

- My motivation: To know from if there is a common reason for (in general) all Quantum advantages
- Status: paper reviewed [See presentation-3.pdf] Link

Verifiable Quantum Advantage without 'Structure' [Yamakawa, Zhandry 2022] Link

- My motivation: Imporatance of structure (in problem) for claasical and Quantum advantage
- Status: paper reviewed [See presentation-4.pdf] Link

Tentative plan for the project

- I wish to explore (the last as of now) area of interest: Combinatorial Optimization using Quantum algorithms
- Finally, I will converge to one of the explore area by 20th November
- Tentative finalization of problem statement before 10 Dec)

Thanks for your support and time!