Quantum Information and Computing

Plan of Action (Summer of Science)

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From May 9 to July 15, 2022

Nature isn't classical, dammit, and if you want to make a simulation of nature, you'd better make it quantum mechanical, and by golly it's a wonderful problem, because it doesn't look so easy.- Richard Feynman

1 Tentative Deadlines

- **Week1(Till May 14): Introduction**
  Linear Algebra
  Postulates of Quantum Mechanics
  The Qubit
  System of Qubits
- **Week2(till May 21): Quantum Gates and Circuits**
  Quantum Gates
  Quantum Circuits
  No-Cloning Theorem and Quantum Teleportation
  SuperDense Coding
- **Week3(till May 28): Density Matrix and Measurement Postulates**
- **Week4(till June 4): Midsems(Break)**
- **Week5(till June 11): Algorithms**
  Deutsch–Jozsa and Bernstein-Vazirani Algorithms
  Grover's Search Algorithm
  asked to contact for handwritten notes
- **Week6(till June 18): QFT and its applications**
  Quantum Fourier Transform

period-finding
Implementing QFT
shor's factorization algorithm
June 15 : Mid-Term Report Submission

- **Week7(till June 25): Quantum noise and quantum operations**
- **Week8(till July 2): Distance Measures and Quantum Error-Correction**
- **Week9(till July 9): Entropy and Quantum information Theory**
  Shannon Entropy
  Shannon's Noiseless Coding Theorem
  Von Neumann entropy
  asked to contact for handwritten notes
  EPR and Bell's Inequalities
- **Week10(till July 14): Quantum cryptography**
  July 15 :Submission of Final Report and Video

2 References

- Quantum Computation and Quantum Information by Nielsen and Chuang
- Qiskit Textbook
- John Preskill's notes
- Vazirani's videos
- John Watrous' notes