Rahaf Youssef
Title: *Characterizing Noise in Quantum Computing*

Abstract: Quantum computers are computational devices that employ quantum-mechanical phenomena in solving problems that are classically intractable. Future applications of quantum computers include prime factorization of large numbers, implementing more efficient search algorithms, among various applications. Most quantum algorithms utilize superposition of states in solving a given problem. Therefore, the decay of the superposition of states is a limitation to performing complex quantum algorithms. Quantum decoherence is usually characterized by measuring two constants: T_1 (thermal relaxation time) and T_2 (dephasing time). Here we present an overview of measuring and simulating T_1 and T_2 for qubits and qudits using IBM quantum computers and other simulation tools."

Evan Strong
Title: *2D Topological Defects in Liquid Crystals*

Abstract: Topological defects in liquid crystals heavily distort the topological landscape, which affects material and optical properties. Liquid crystals are most widely used in electronic displays, and defects play an essential role in designing effective products. This research develops a minimization algorithm using modified vector fields and a Frank-Oseen free energy to simulate the relaxation of nematic defects with integer and half-integer charge within their liquid crystal medium. The vector-field procedure is efficient when compared to more computationally heavy models involving tensors, yet encodes identical information to these intensive models. Through careful implementation of projective spaces, the algorithm treats nematic non-orientability and successfully models half-integer charge defect anisotropy, dipole annihilation, and colloidal suspensions. Modeled far-field orientational deviations surrounding defects agree closely with previous theoretical and empirical results. Future research avenues include defect repulsion and dynamics with keen attention to non-orientability, as well as confined and mixed-boundary colloidal systems.