**Quantum Implementation of a Quantum-Cognitive Model of Decision-Making**

1Yu Jun Shen, 2Raghavendra Pothukuchi, 2Bhattacharjee Abhishek

1Science Research and Technology Scholar, Yale University, New Haven 06520

2Department of Computer Science, Yale University, New Haven 06520

Models of human decision-making have conventionally drawn inspiration from classical physics, such as the Drift Diffusion Model (DDM) based on Brownian motion. DDM has been used to model decision making in tasks like the Two Alternative Forced Choice (TAFC). However, models based on classical physics cannot account for some advanced aspects of observed behavior. Our goal in this work is to develop the frameworks to deploy decision-making models based on quantum computing, focusing on the quantum potential wells model. In this approach, choices are modelled as potential wells and evidence favoring a choice is accumulated from quantum particles. One bottleneck in the calculation is finding the eigenstates and energies in order to estimate where the quantum particle lands. In our work, we deployed a Variational Quantum Eigensolver (VQE) algorithm in Qiskit which minimizes the cost of a parameterized quantum “ansatz” circuit within a classical optimizer feedback loop. The circuit, once reconfigured with the optimized parameters, outputs the desired eigenstates. VQE is a hybrid classical-quantum algorithm suitable for use on current quantum hardware. We investigated the impacts of various ansatz styles, the classical optimizer choice and measurement mappings between qubits and the potential well. Convergence is observed for multiple lowest energy states in the potential well Hamiltonian using the Qiskit model.