

Abstract Submitted  
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**Searches of Discrete Fitness Landscapes**<sup>1</sup> SAM SMITH, GONZALO ORDONEZ, Butler University — The fitness of a value queried by a search is the extent to which it matches the search’s criteria; the fitness space is the discrete space of all possible values and their respective fitnesses. Searching a fitness space is analogous to searching for the ground state in a lattice, with the fitness as the site-dependent energy. We sought to understand and compare the different computational methods of searching such spaces. We focused on classical and quantum random walks on the N-cube graph with a site-dependent potential. We began by altering the coin operator to bias the walk to the fittest point, which was simpler for the classical case than the quantum. We explored using Grover’s method to discretize different diffusion equations, the Schrödinger and the Smoluchowski (advection-diffusion), finding the quantum now simpler than the classical. We determined that the use of the Smoluchowski equation was inappropriate because of the discrete nature of the space and had the particle search the space by comparing each neighbor’s energy to the average energy of all neighbors. Comparing this method to the Schrödinger equation, we found the hitting time to be faster for the classical but a greater probability of success for the quantum.

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