**Distributed Genetic Algorithm for Solving Non-Convex Optimization Problems**

Non-convex optimization problems tackle an area of mathematics with many real-world applications in fields like signal processing, machine learning, and control systems. Due to the presence of many local optima, these problems become difficult to solve. One class of techniques used to solve constrained and unconstrained optimization problems are genetic algorithms. Genetic Algorithms (GA) model phenomena observed in biology and metaheuristic techniques by generating better and better “candidate solutions” that aspire towards stronger fitness function values. The generation of these candidate solutions can take time and their scalability is limited due to computation on single processors and high computational load.

This project aims to build a distributed genetic algorithm (DGA) for solving a non-convex optimization problem, specifically the Rastrigin function. We will run the DGA on a platform such as Amazon Web Services or Azure and build a cluster of virtual machines that work together to solve the optimization problem. We can use Kubernetes or Docker to manage the VMs and to distribute the workload. Whether we will utilize a shared database or some other process so the VMs have access to shared information is to be figured out.

We will then benchmark the result of the DGA against other methods like Particle Swarm Optimization to see how the performance compares. Because the parameters of a GA play a big role in its performance, we will try different hyperparameter settings such as varied population size, crossover rate, and number of generations to see how it fairs.

The aim of this project is make a unique variation of a GA, a Distributed Genetic Algorithm(DGA) that utilizes cloud-based infrastructure and shared communication over VMs to solve hard, non-convex, optimization problems easier and more efficiently.