



**PROJECT REPORT**  
**COMPARISON ANALYSIS OF GENETIC ALGORITHM AND**  
**FIREFLY ALGORITHM INTEGRATION WITH K-MEANS IN**  
**TRAVELING SALESMAN PROBLEM**

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**2024**

## ABSTRACT

Nowadays route optimization has become a common problem in our daily life. Usually, the problem focuses on maximizing or minimizing the objective function by changing variables that in a way make sense. The goal of a Traveling Salesman Problem (TSP) is to find the best and optimal route among multiple locations that must be visited only once. One of these approaches is Genetic Algorithm (GA), in previous research they made significant progress in solving the problem, overall it proves to be the best at performing optimization tasks. Additionally, in some scenarios, the Firefly Algorithm (FA) also demonstrates some interesting results. The results showed that GA performed efficiently with smaller clusters (1–5), achieving a travel distance of 407.871 due to its broader search space. However, FA demonstrated its strength with larger clusters (15–25), achieving a travel distance of 418.665 by thoroughly exploring the solution space despite higher computational costs. Although excessive clustering can also lead to inefficiencies in both algorithms.

**Keywords:** Traveling Salesman Problem (TSP), route optimization, Genetic Algorithm, Firefly Algorithm, K-Means clustering, optimization, algorithm performance evaluation.