T.C.

MARMARA UNIVERSITY

FACULTY of ENGINEERING

COMPUTER ENGINEERING DEPARTMENT

CSE4197 Engineering Project I Proposal

Title of the Project

*"Nature Inspired Algorithm Optimization for Base Station
Location Allocation Problem "*

Group Members

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1. Aim of the Project

The aim of this project is to optimize the communication infrastructure when a telecommunications company intends to provide communication services in a vast geographical area, including voice, data, and internet access. With each passing day, wireless industry achieves phenomenal growth in terms of cellular network technology. However, one of the most important problems in mobile network planning is the base stations placement. It consists in determining the antenna parameters such as power transmission, tilts, azimuth and antenna height taking into account coverage and installation costs. This project combines the use of the "Slime Mould Algorithm" and base station planning to achieve this goal.

It is based on the necessity for telecommunications companies to continuously improve their communication infrastructure to meet growing demand, enhance service quality, and control costs. Nature-inspired algorithms like the "Slime Mould Algorithm" offer an effective solution to address this challenge.

The objective of this project is to enhance the efficiency of the communication infrastructure by leveraging a nature-inspired approach. This aims to increase the competitive edge of the telecommunications company and provide better services to customers.

2. Methodology

In this project, we are planning to utilize the "Slime Mould Algorithm" to optimize the telecommunication infrastructure of the base stations. "The SMA algorithm was invented due to the fluctuating behavior of slime mold in nature. It has several new features with a unique mathematical model that uses adaptive weights to simulate the biological wave. It provides an optimal pathway for connecting food with high exploration and exploitation ability." [2]. However, the other nature-inspired algorithms will be considered in order to enhance the performance and versatility in the optimization of the problem.

The first step involves identifying the needs of the geographical region and determining the infrastructure requirements, such as the placement of base stations, to efficiently deliver these needs to the required points at a low cost. Additionally, determining the number of base stations based on the population density of the region is also a part of this stage. The results obtained are then applied to the real-world communication infrastructure.

The project continues with ongoing monitoring and improvement steps to ensure the most efficient delivery of communication services.

3. Software/Hardware Requirements

Programming Language: C or Python

4. Draft Time Plan

In the first phase, we will conduct a thorough literature review and create a detailed PSD file. By the end of the semester, we will present our findings and also work on developing an ADD document.
In the second phase, we will start implementing our project. This will include preparing the thesis report and presenting our project's progress and findings through a poster presentation.

5. References

- Gharehchopogh, F.S., Ucan, A., Ibrikci, T. *et al.* Slime Mould Algorithm: A Comprehensive Survey of Its Variants and Applications. *Arch Computat Methods Eng* 30, 2683–2723 (2023). https://doi.org/10.1007/s11831-023-09883-3