

COMPUTATIONAL INTELLIGENCE FOR OPTIMIZATION 24/25 PROJECT STATEMENT

Project Statement

The goal of this project is to apply Genetic Algorithms to solve an optimization problem.

Sports League Optimization

In a fantasy sports league, the objective is to assign **players to teams** in a way that ensures a balanced distribution of talent while staying within salary caps.

Each player is defined by the following attributes:

- Skill rating: Represents the player's ability.
- Cost: The player's salary.
- Position: One of four roles: Goalkeeper (GK), Defender (DEF), Midfielder (MID), or Forward (FWD).

A solution is a complete league configuration, specifying the team assignment for each player. These are the constraints that must be verified in every solution of the search space (no object is considered a solution if it doesn't comply with these):

- Each team must consist of: 1 Goalkeeper, 2 Defenders, 2 Midfielders and 2 Forwards.
- Each player is assigned to exactly one team.

Impossible Configurations: Teams that do not follow this exact structure (e.g., a team with 2 goalkeepers, or a team where the same defender is assigned twice) are not part of the search space and are not considered solutions. It is forbidden to generate such an arrangement during evolution.

Besides that, each team should not exceed a 750€ million total budget. If it does, it is not a valid solution and the fitness value should reflect that.

The objective is to create a balanced league that complies with the constraints. A balanced league is a league where the average skill rating of the players is roughly the same among the teams. This can be measured by the standard deviation of the average skill rating of the teams.

The dataset consists of players with their names, position, skill rating and salary (in million €). These players should be distributed across 5 teams of 7 players each.

Code Requirements

For your project to be successful you must implement:

- the fitness function
- at least 3 mutation operators
- at least 2 crossover operators
- at least 2 selection mechanisms

Additionally, you may also choose to compare Genetic Algorithms (GA) with other optimization techniques, such as hill climbing, simulated annealing etc. While this is entirely optional and not required for the project, it could add value to your final analysis.