Inteligência Artificial

Checkpoint - Projeto 1

Alexandre Silva
Beatriz Remondes
Bruno Fortes

Wedding Seat Planner

The goal of this project is to develop an optimization system to generate an optimal wedding seating plan using Simulated Annealing. The seating arrangement must maximize guest satisfaction while considering constraints such as:

- Guests who prefer to sit together (e.g., friends, family).
- Guests who should be seated apart (e.g., conflicts, ex-partners).
- Table capacity constraints (each table can only hold a certain number of guests).

Objectives:

- Develop a data structure to represent guests, tables, and their relationships.
- Implement an evaluation function that scores seating plans based on guest preferences.
- Apply Simulated Annealing to iteratively improve the seating arrangement.
- Compare different configurations of the algorithm to assess solution quality.
- Provide a visualization of the final seating arrangement.

Sources

We are basing our work on the following sources:

- https://medium.com/analytics-vidhya/building-a-wedding-seating-plan-using-probabilistic-methods-simulated-annealing-8f31d8987026#1ef0
- Lewis, R., & Carroll, F. (2016). Creating Seating Plans: A Practical Application. Cardiff School of Mathematics, Cardiff University & Faculty of Computing, Engineering and Science, University of South Wales.

Formulation as an optimization problem

1. **Solution Representation:**
A list of lists where each index represents a table, and each inner list contains the guests assigned to that table

2. **Neighbor Function:**
   - **Swap Guests** - Randomly select two guests from different tables and swap their positions.
   - M**ove Guests** -Move a guest from one table to another if the destination table has space.

3. **Hard Constraints:**
   - **Table Capacity:** No table can exceed its maximum capacity.
   - **All Guests Assigned:** Every guest must be seated at exactly one table.
   - **Forbidden Pairs:** Specific pairs of guests must not be seated at the same table.

4. **Evaluation Function:** Maximizes guest preferences while penalizing invalid configurations.

Data Structures

- **Class Guest**
  - List of guests
- **Class Table**
  - List of tables
- **Class SeatingPlan**
  - list of Table objects, and Each Table object, contains a list of Guest

Algortihms

- Simulated annealing
- Hill Climbing
- Greedy

Implementation

Language: Python