AI CUP 2021 - Final Report

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1 Introduction

This is my final report about the competition of the Artificial Intelligence course of this year at USI: the **AI CUP 2021**. The competition goal was to implement some algorithms in order to find the shortest tours in a collection of TSP problems. All the algorithms I implemented or tried to implement were learned during the lectures of professor Gambardella and the tutorials taught by the TA Umberto Junior Mele.

2 Implementation

I wrote every line of code and implemented all the algorithms using the $C++$ language.

2.1 Tutorial 4.10

After the first TA session, I have decided to create a file named *ProblemInstance.hpp* in order to perform the following actions:

- Reading the raw data

- Storing the metadata

- Reading and storing all the points

- Creating the distance matrix

Thus, I re-implemented in $C++$ the following functions explained during the tutorial:

- *void print_info*: prints the details of a problem

- *distance_euc*: computes the Euclidean distance between two points

- *create_dist_matrix*: computes the distance matrix

2.2 Tutorial 18.10

After the second TA session, I implemented a file named *SolverTSP.hpp* with the following functions definitions:

- *compute_solution*: solves a problem with the given algorithms

- *check_if_solution_is_valid*: checks the solution's validity

- *_gap*: computes the gap value

After implementing the class, I tried to re-implement in $C++$ both the first and the second constructive algorithms we learned during the lecture: the *nearest neighbors* algorithm and the *best nearest neighbors* algorithm.

2.3   Tutorial 8.11

After the third TA session, I've decided to implement the *2opt* optimization. I spent the remaining time modifying my implementations, resulting in an average gap percentage of 5%.

3   Conclusion

The output is printed out as shown in the $4th$ tutorial. In order to execute the solver, type:

```
// compiling option 1
c++ main.cpp -o main

// compiling option 2
make main

// run the executable file
./main
```