

Project Seminar: Organization and overview

SS 2023

Timm Oertel, Jorge Weston

Friedrich–Alexander Universität Erlangen–Nürnberg, Department of Data Science

- Scope: 2SWS, 5ECTS
- Content:
 - Data collection.
 - Modeling and model analysis.
 - Development and implementation of solution methods for solving a practical routing problem.
- Methodology:
 - The project will be developed in teams of 4 students.
 - Each team will take the role of a consulting company and will aim to present the best solution for the project.
 - During the semester there will be 3 meetings to present the progress.
 - Each team will present a final written report.

Kick-off Meeting

The kick-off meeting will take place on April 18 (Tuesday) at 16.00 in room Übung 1 (01.250).

Within the Project Seminar

Each team represents a consulting company, that wants to offer a solution to a problem of a fictional company (owned by the lecturers).

Within the Team

The team needs to appoint a **Representative**, who will be the direct contact between the team and the lecturers.

The distribution of tasks will be decided internally, and should be done in a way that the workload is evenly distributed.

3 meetings during the semester

1st meeting: Theory and Data (≈ 20 min):

- Mathematical Problem.
- Models to consider and Implementation.
- How approach the data collection?

2nd meeting: Data Collection and Test Cases (≈ 20 min):

- How the data was obtained?.
- Graphic representation of the data.
- Results and complexity of the implementations with small test cases.
- (For Master's teams) Algorithmic ideas on how to approach the problem.

3rd meeting: Results and Conclusions (≈ 40 min):

- Presentation of the results.
- Performance analysis.
- Difficulties/complications and how it could be improved.
- (For Master's teams) What about scalability?.

Dates

| 1st Meeting | 2nd Meeting | 3rd Meeting |
|-------------------------------|-------------------------------|-------------------------------|
| <u>23.05.2023 15:00–17:30</u> | <u>13.06.2023 15:00–17:30</u> | <u>04.07.2023 15:00–19:00</u> |

Location

| 1st Meeting | 2nd Meeting | 3rd Meeting |
|---|---|---|
| <u>Praktikum 2 / 00.327¹</u> | <u>Praktikum 2 / 00.327¹</u> | <u>Praktikum 2 / 00.327¹</u> |

¹Cauerstrasse 11

Form and scope

- The report should have a length of 10 - 12 pages and should contain the following:
 - Short introduction.
 - Mathematical models.
 - Implementation.
 - Processing of the data and results.
 - Short conclusion with an outlook.
 - List of references.
- Each member has to clearly highlight his or her contributions.
- Preliminary deadline: End of August.

Grades

- The overall grade is based on equal parts of the presentation and the report.
- Teamwork will be part of the evaluation.
- The final evaluation will be individual.

It is important to remark that the evaluation of the project depends not only in the quality of the solution/algorithm but also in how it is presented (sold) by the consulting team.

During this semester we will focus on a routing problem, particularly the **travelling salesman problem** (TSP) in its basic form and with some of its variation.

TSP

In a general way, the TSP consists on finding the shortest route between an origin point and points of interest, such that each point of interest is visited exactly once and at the end the route return to the origin point.

Some variations

- **Inclusion of Time Windows:** In this case, the points of interest can only be visited in a given time interval. Therefore, travel times and time spent at each point should be considered.
- **Pick-up/Delivery:** For this, it is necessary to take into consideration the maximum capacity that can be transported and if in each node a delivery (or pick-up) happens.
- **Transport Mode Selection:** In this case, the decision of how the route will be travel, e.g., by bike, walking, public transportation or by car, should be considered. This will affect the travel times and the possible routes between points.

Some Considerations

- The problem will be set in the city of Erlangen, where a part (or eventually all the city) should be analyzed.
- The data collection will be an important part of the project.
- It is highly recommended to have coding experience and knowledge in optimization.
- The required tasks will depend on whether the team is made up of Bachelor's or Master's students.
- For the registration, there will be only space for 5 teams (20 participants). **And the registrations that inform the composition of the complete team will have preference.**

- There will be a consultation time that will be decided at the start of the Seminar.
- As soon as a team is completed (with a proper name), the Representative should upload the information to StudOn (**Do not use the forum**, a proper element will be created for this).

Project Seminar: Organization and overview

SS 2023

Timm Oertel, Jorge Weston

Friedrich–Alexander Universität Erlangen–Nürnberg, Department of Data Science