

# Project proposal

The project from Rijkswaterstaat is about improving the average response time of road inspectors. The main goal is to build a model for which the average response time is less than 18 minutes. This 18 minutes is important because this is the minimum requirement of the model. This can be achieved by optimizing the locations of road inspectors that are spread over the network. Something to take into account is the social impact, because the response time is average and some locations can be very far away from the closest road inspector and this cannot happen. This is the case the model needs to be changed even though the average is sufficient. Based on the information above a main research and multiple sub research questions are formulated.

## Research questions

Main question: At which locations do the road inspectors need to be placed in order to optimize the response times?

Sub research questions:

1. What methodologies can be employed to address the primary research question effectively?
2. Are there geographical areas with a history of higher incident occurrence rates, and how should they be prioritized?
3. How do various incident types impact social costs, and what implications do they have for resource allocation?
4. What is the optimal number of road inspectors required to meet response time objectives?
5. To what extent do date and time factors affect the deployment of road inspectors?
6. Should road inspectors be positioned in fixed locations, or is a mobile approach more effective?
7. How does weather conditions influence the deployment strategy of road inspectors?
8. What considerations should be made for holidays and their impact on road incidents and inspector deployments?
9. What ethical considerations should guide the deployment and operations of road inspectors?

## Data

- Csv file with incidents provides the location and the duration of incidents.
- Road network map shows the research area and provides the characteristics for each road.
- The weather data can help to study the differences in accident occurrence rates and severity based on various weather conditions.
- The holiday data like Christmas holiday starts on the 23rd of December until the end of year to check the festival's influence.

## Tech Stack

The tech stack is split up into three categories. In the first category is the tech that is used in the first phase of the project. The second category are the methods that are tested to see if they can get an average response time of less than 18 minutes and this is part of the sub research questions. The last category is the programming that is needed for the methods and that includes the location of the repository.

Data preparation:

- Data Cleaning
- Visualization tools
- Python

Methods used:

- Path finding
- Clustering (k-means)

Programming;

- GitHub
- Optimization algorithm
- Create subsections to reduce calculation time of notebook

## Project backlog

In order to get a better idea of the different tasks that need to be completed for this project and the time it will take, a project backlog is provided here. For each of the different smaller tasks an estimation of the time necessary to complete it is given as well. Note that these times are a rough estimation and are subject to change because many of these tasks are new to us. If during the project new tasks come up or the estimated completion times change this project backlog will be updated.

Activity	Time (days)
Collecting the data used in the project	$\frac{1}{2}$
Getting a clear understanding of the data	1
Cleaning the data	1
Creating a path finding model from the road inspectors to the incident location	10
Find the path travel time and average speed	2
Making an optimization model using clustering method	15
Making an optimization model using path finding method	15

Try different scenarios; for example changes in: weather, number of inspectors, average speeds	3
Validate the model with the other part of the dataset	4

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