



# Neighbourhood Based Fire Risk Effect Module

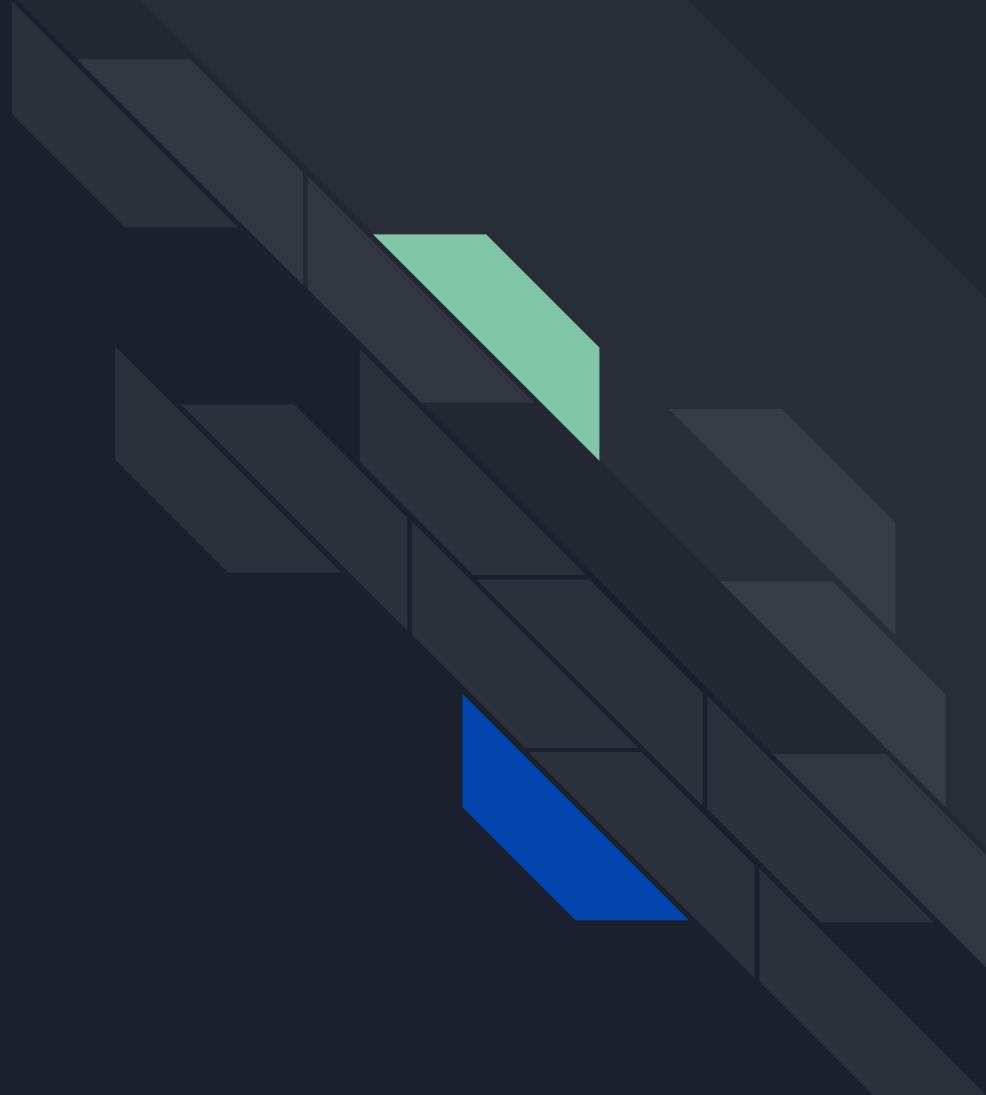
Dashboard for Petrol Stations around  
Amsterdam  
Data System Project - Group D2



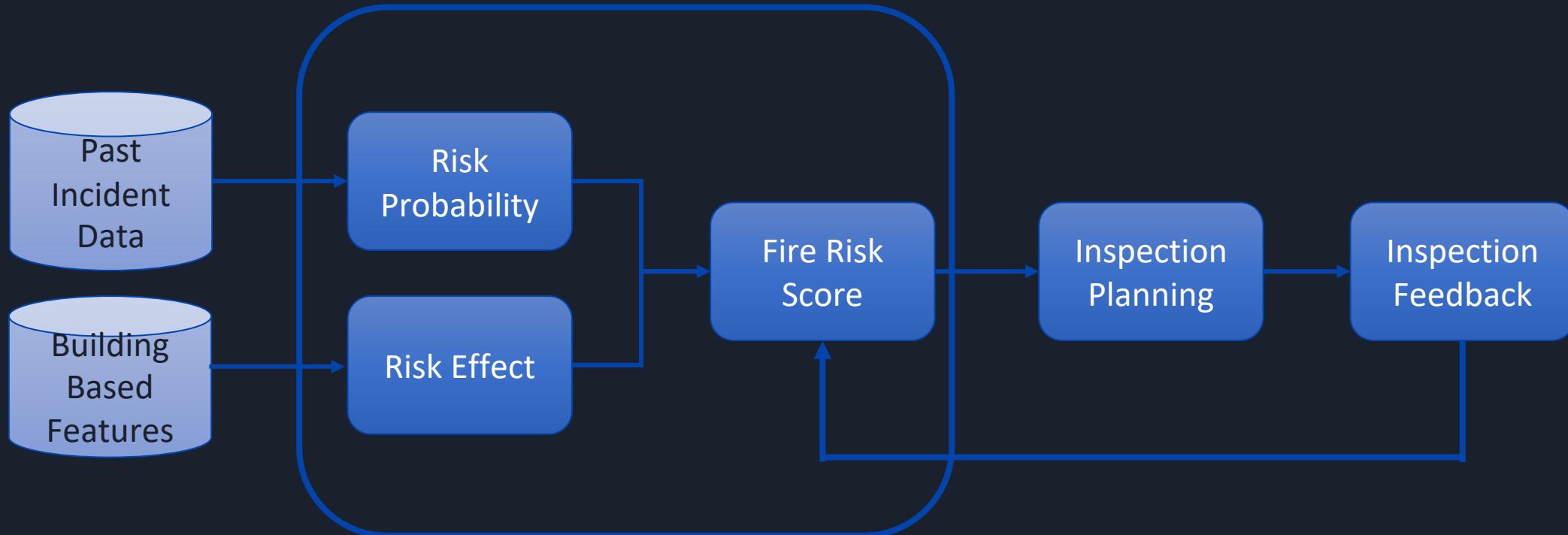
# Agenda

1. Motivation
2. Literature review
3. Features and data collection
4. Clustering models and effect-score calculation
5. Prototype and demonstration
6. User Validation
7. Extension and scalability
8. Q&A

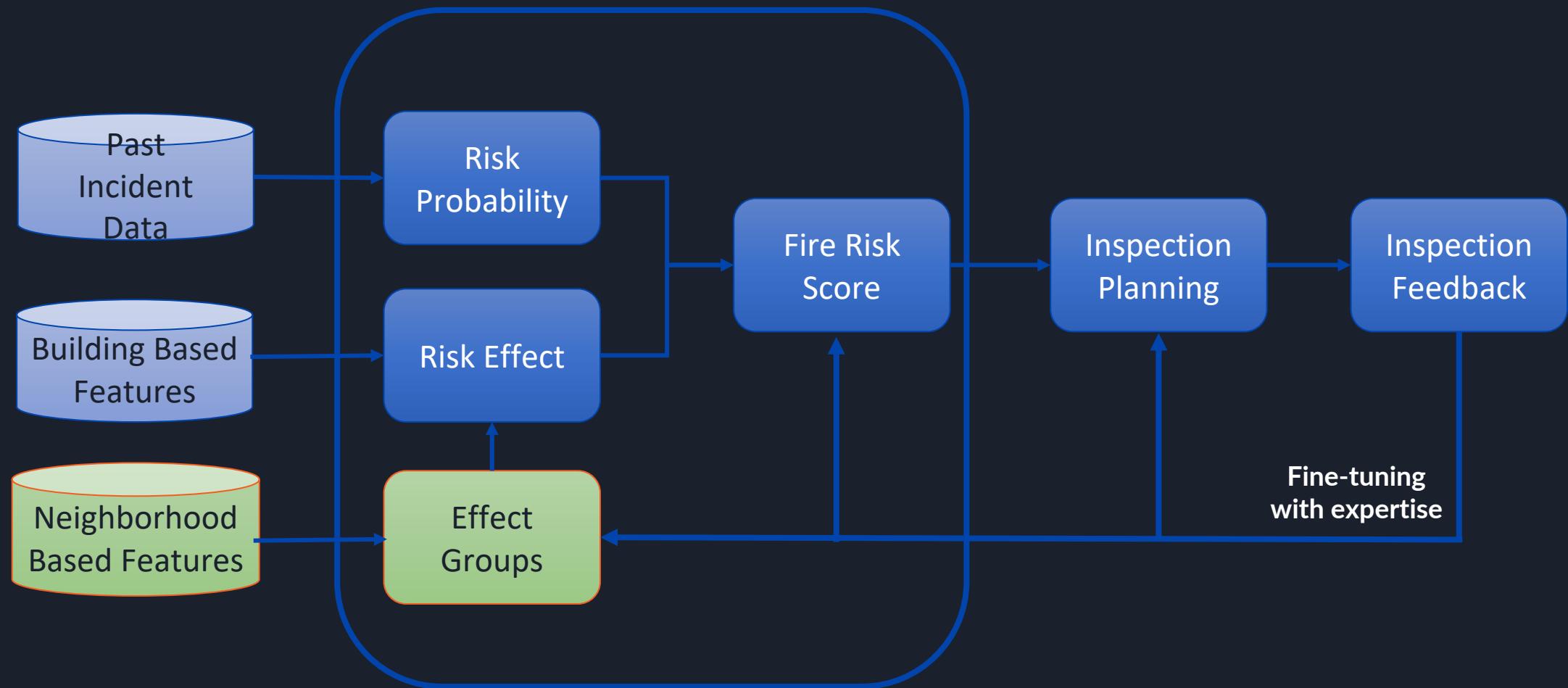
# Motivation



# Current Fire Risk Inspection Framework



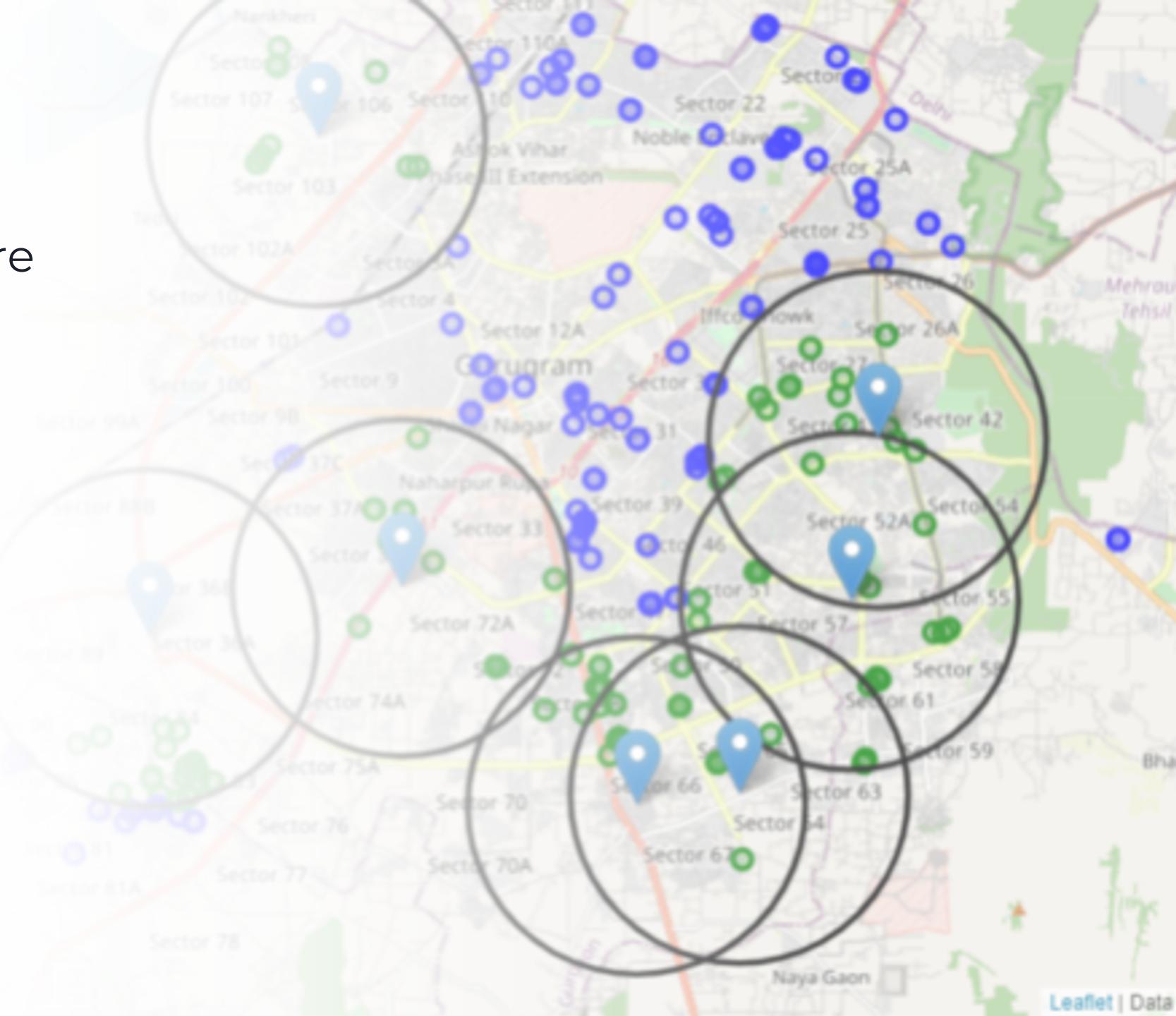
# Proposed Fire Effect Module



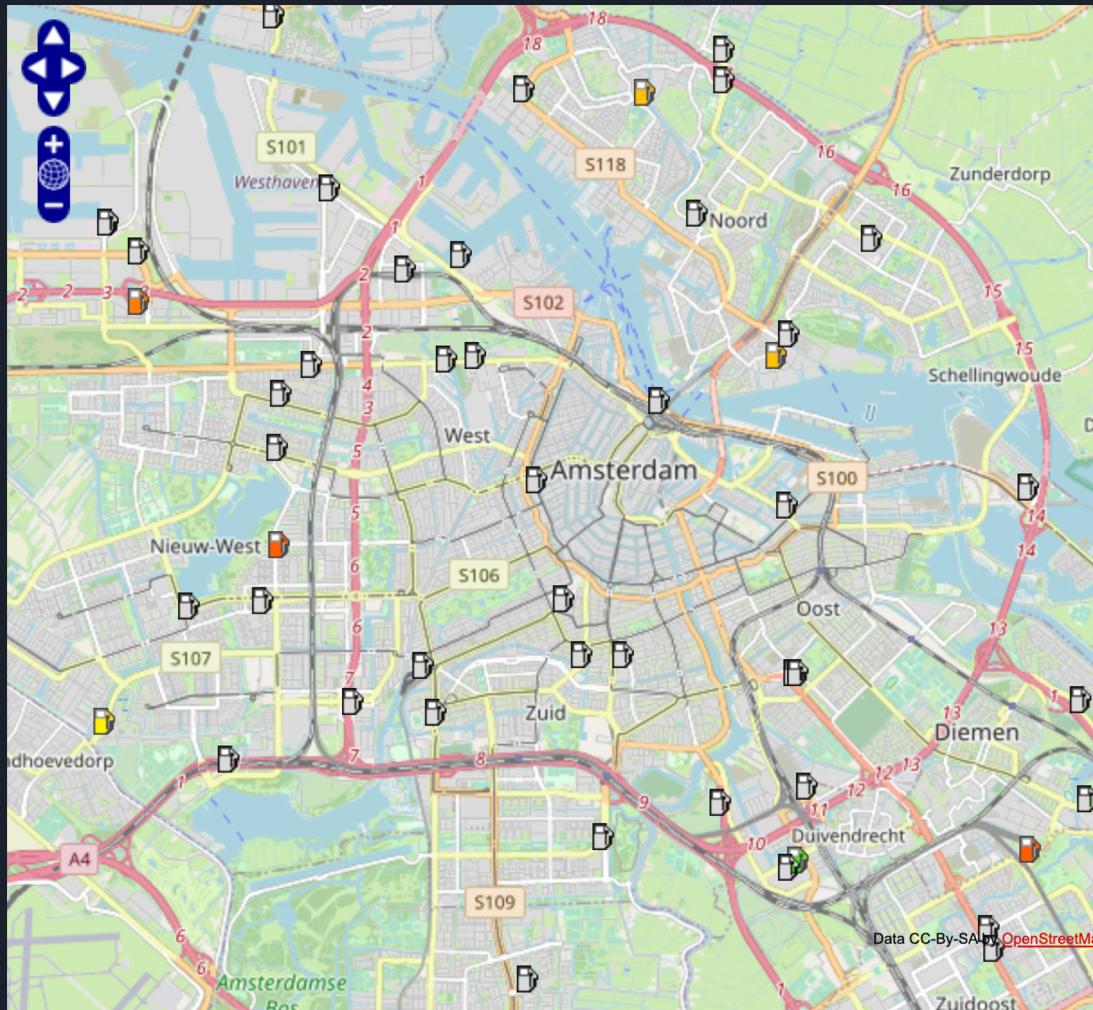
*Goal: grouping based on neighbourhood features and provide insights for inspection planning*

# Neighbourhood based fire risk effect module

- Target venues
    - Low Occurrence
    - High impact
  - Features from neighbourhood
    - Schools
    - Day care centres
    - Public transports
    - etc.
  - Range of impact configurable



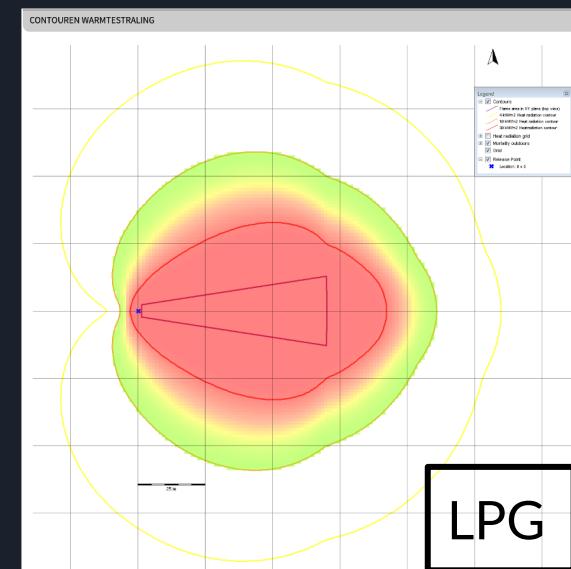
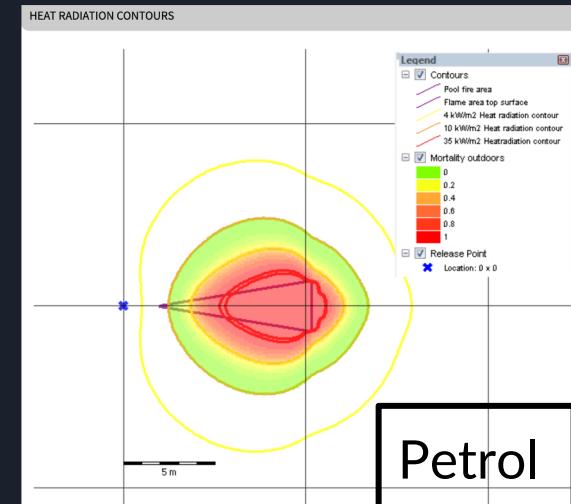
# 45 Petrol Stations near Amsterdam



# Literature Review

# Range of impact - radius

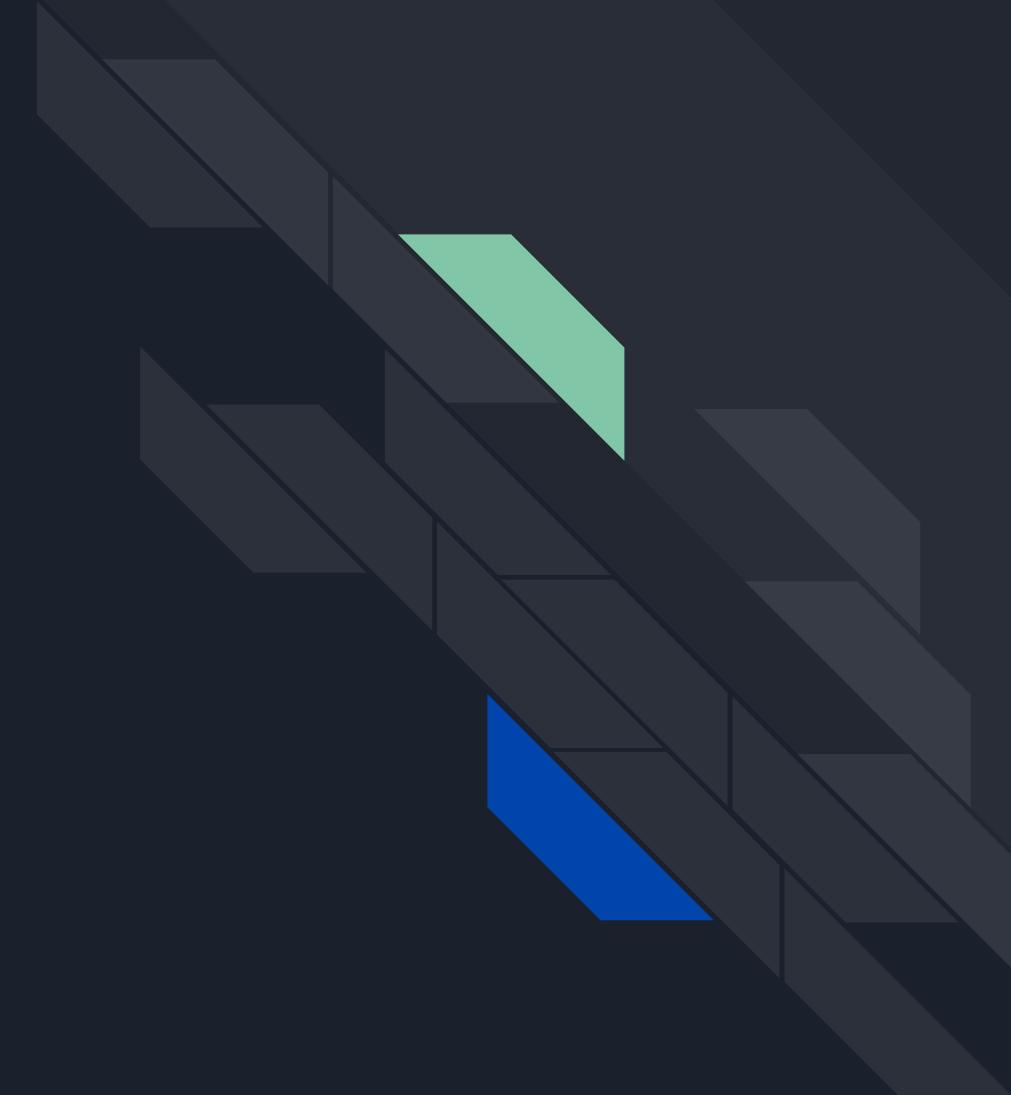
- Depends on various factors:
  - *Fuel type(s) and amount*
  - *Size of leak(s)*
  - *Ambient temperature*
  - *Wind speed and direction*
  - *Surrounding area*
- Default value - 200 metres
- Changeable as user input



Reference

Scenarioboek Externe Veiligheid. 2021. Retrieved 18 Jan. 2022 from <https://www.scenarioboekev.nl/>

# Features and Data Collection



# Features

## Static

- Fuel types
  - Petrol
  - Diesel
  - LPG
  - CNG
- 24/7 store at the station
- Type of neighbourhood area
  - Residential
  - Business
  - Leisure
  - Industrial
- Highways nearby

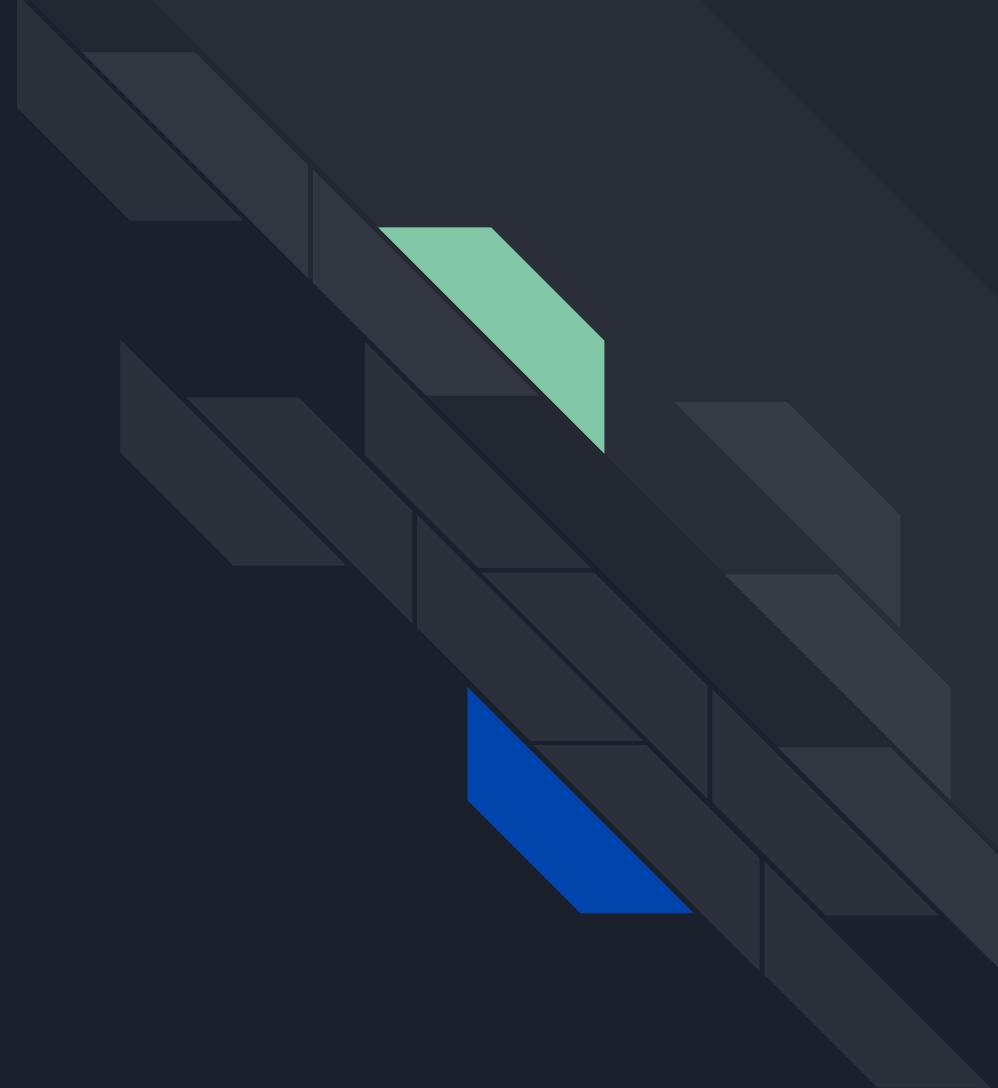


## Dynamic

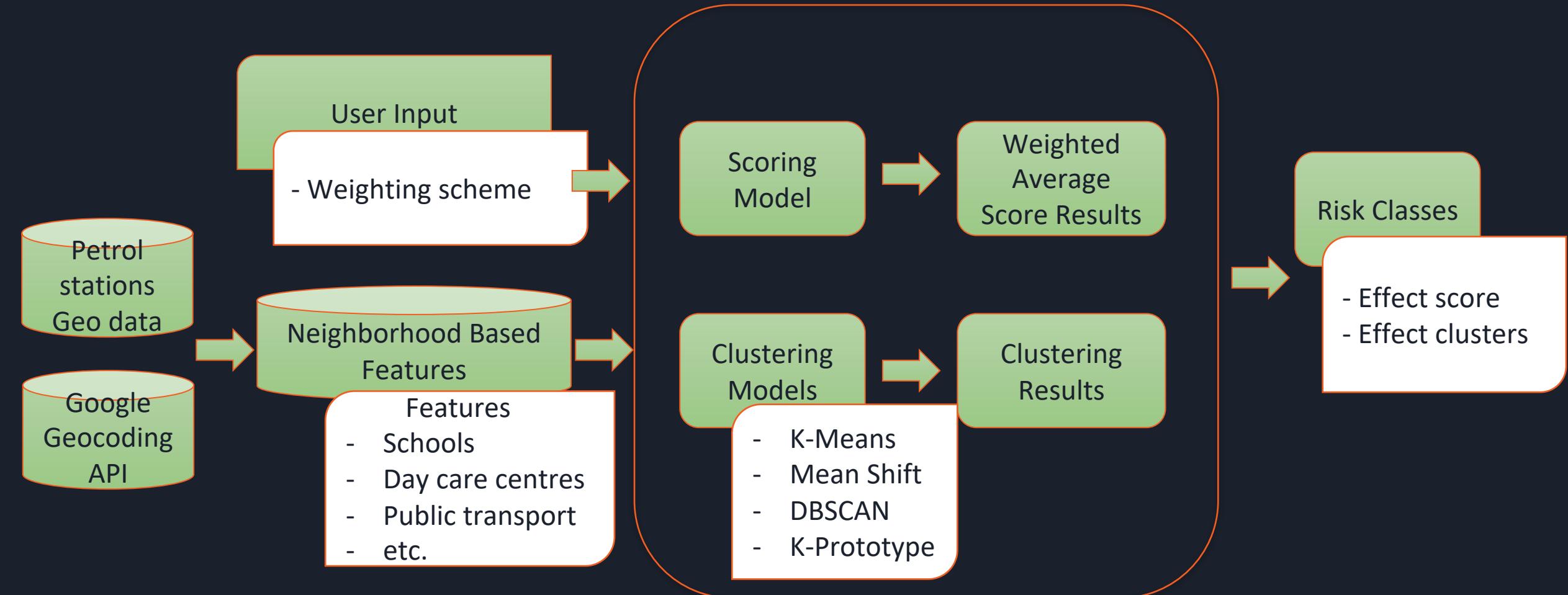
- Hospitals and medical centres
- Schools
- Children day care centres
- Eldery houses
- Public transport stations
- Hotels
- Stores, restaurant, gym, cinemas
- Travel time from the nearest fire station



# Neighbourhood based effect score module



# Neighbourhood based effect score module

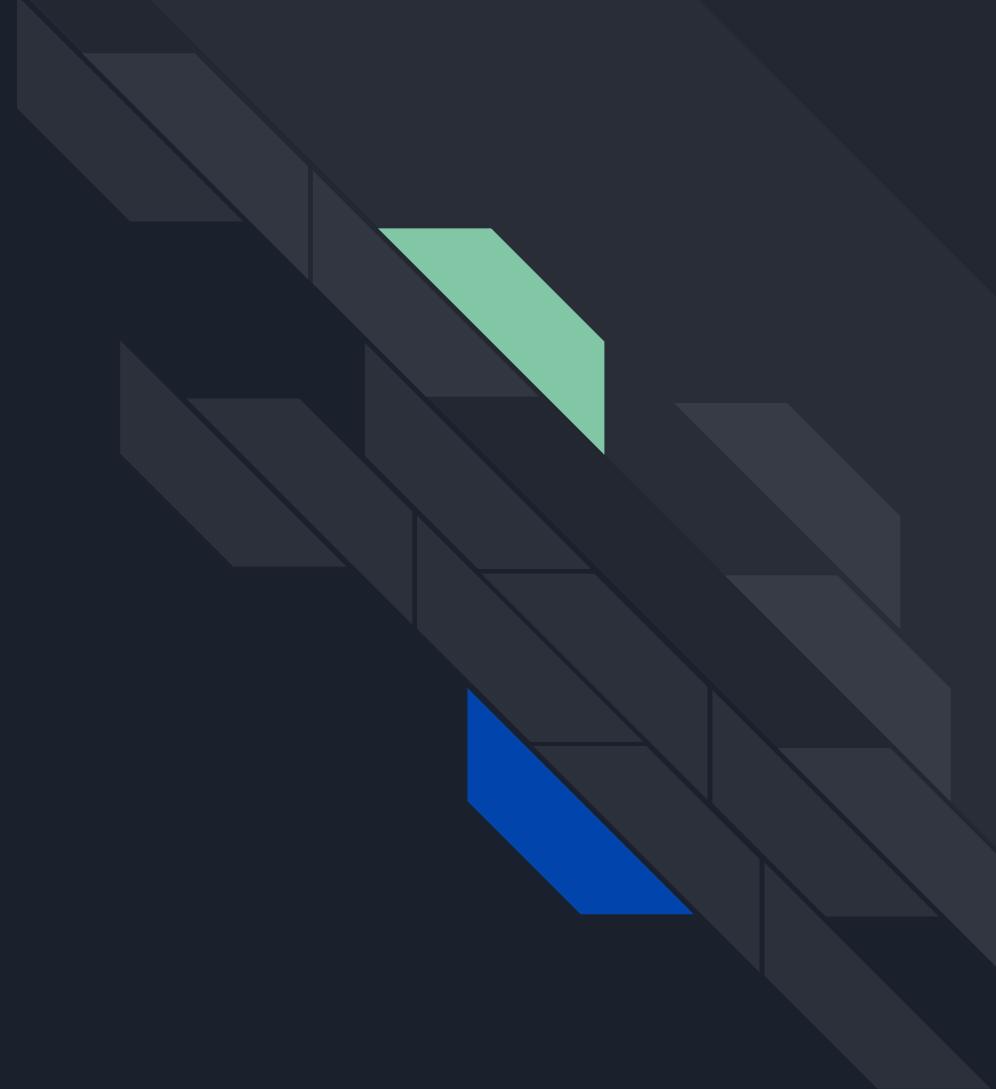




# Clustering Models and Effect-score Calculation

- Clustering Models
  - K-Means
  - Mean Shift
  - DBSCAN
  - K-Prototype
- Clustering Explanation
  - Feature importance by clustering
- Evaluate the clustering models:
  - Silhouette Score
  - Elbow method
- Scoring model
  - Weighted average effect score as indicator of risk level
  - User input: features weights, score range

# Demonstration of the Prototype



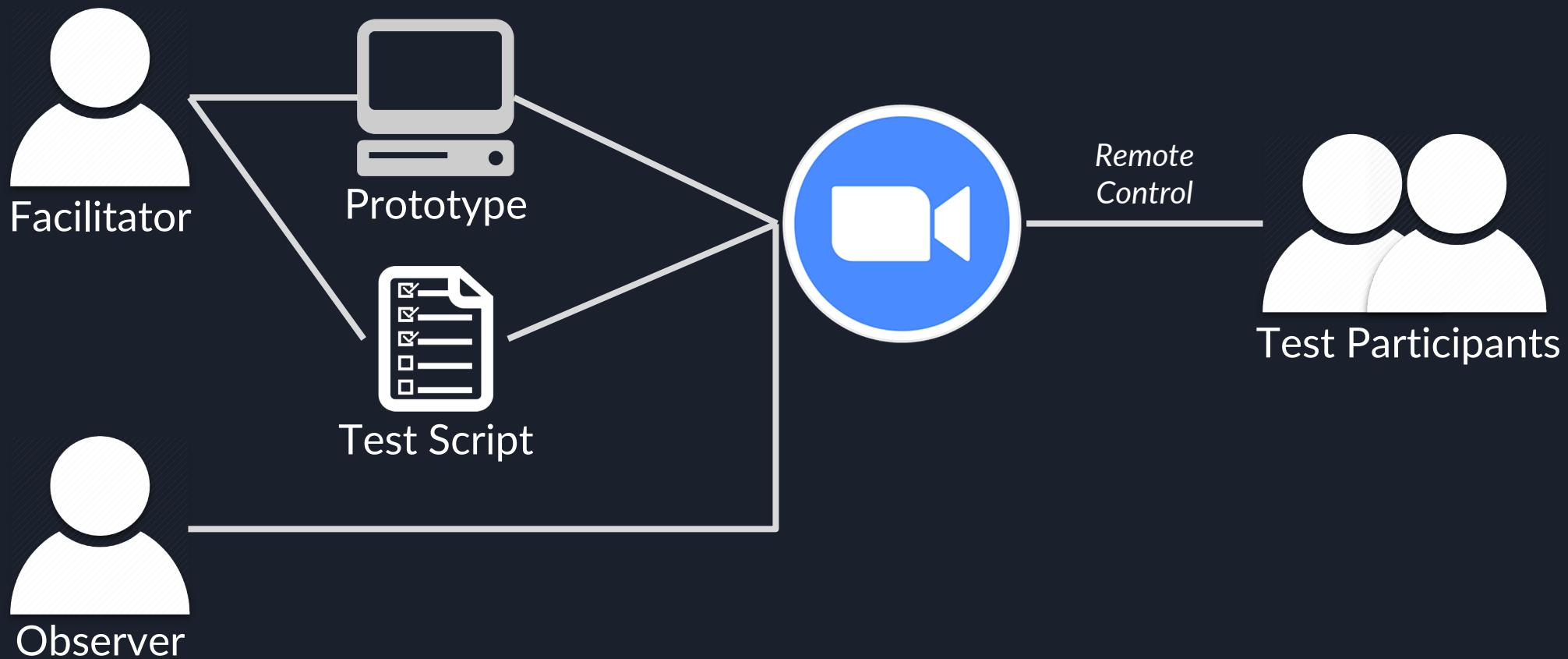
# User Validation



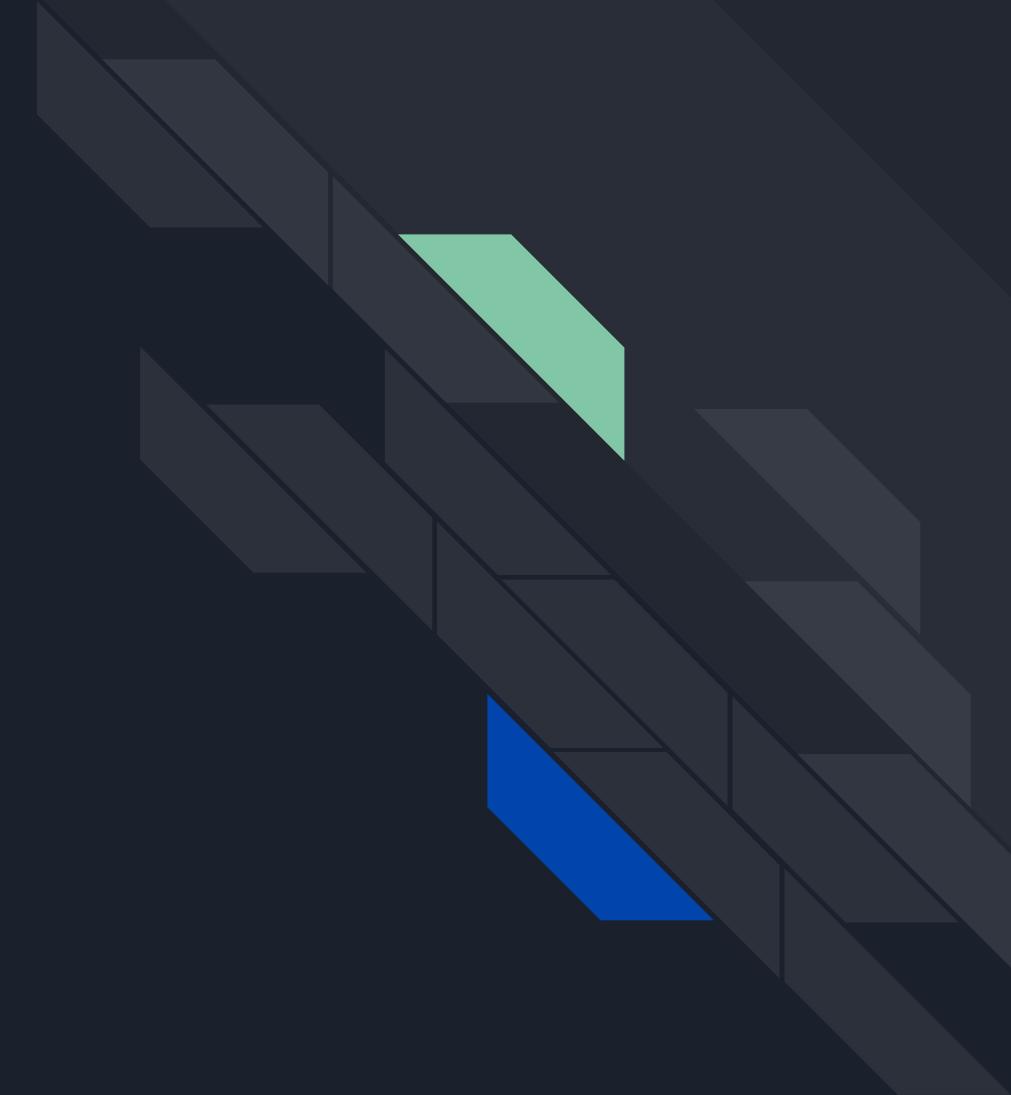
# Usability Test

Group D2

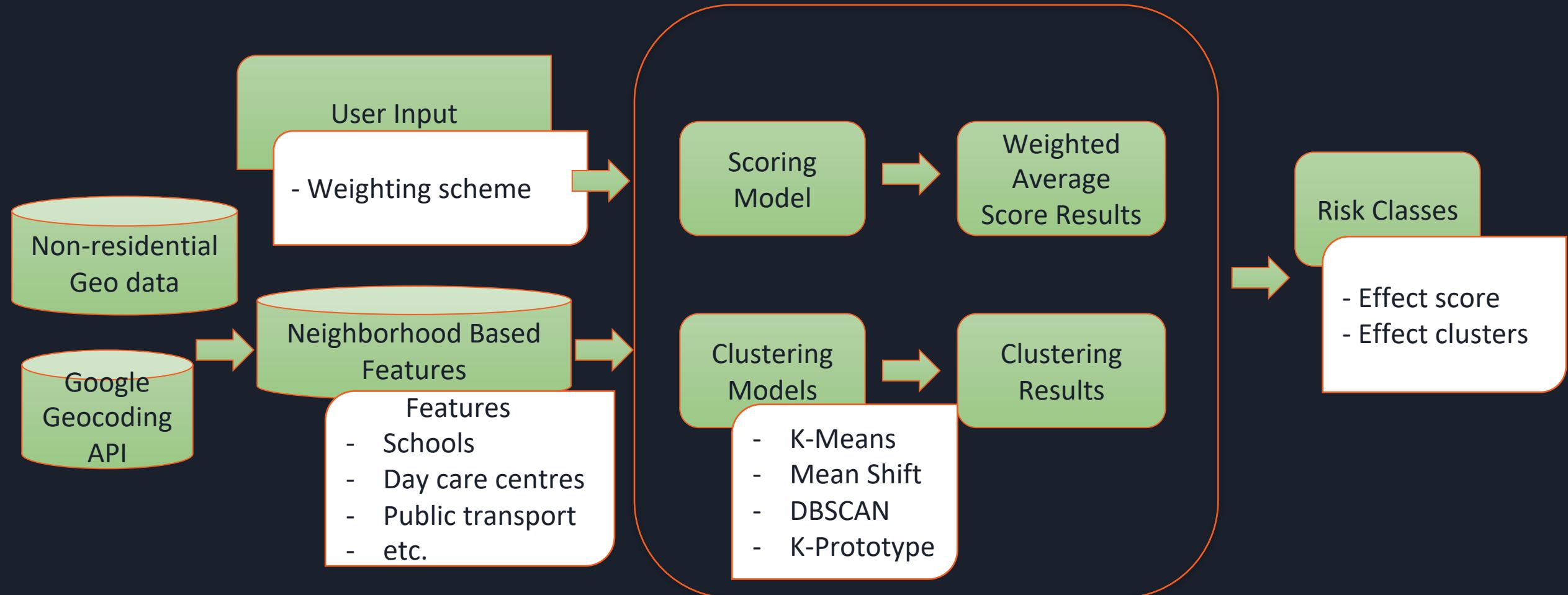
Fire Department /  
Municipality



# Extension and Scalability



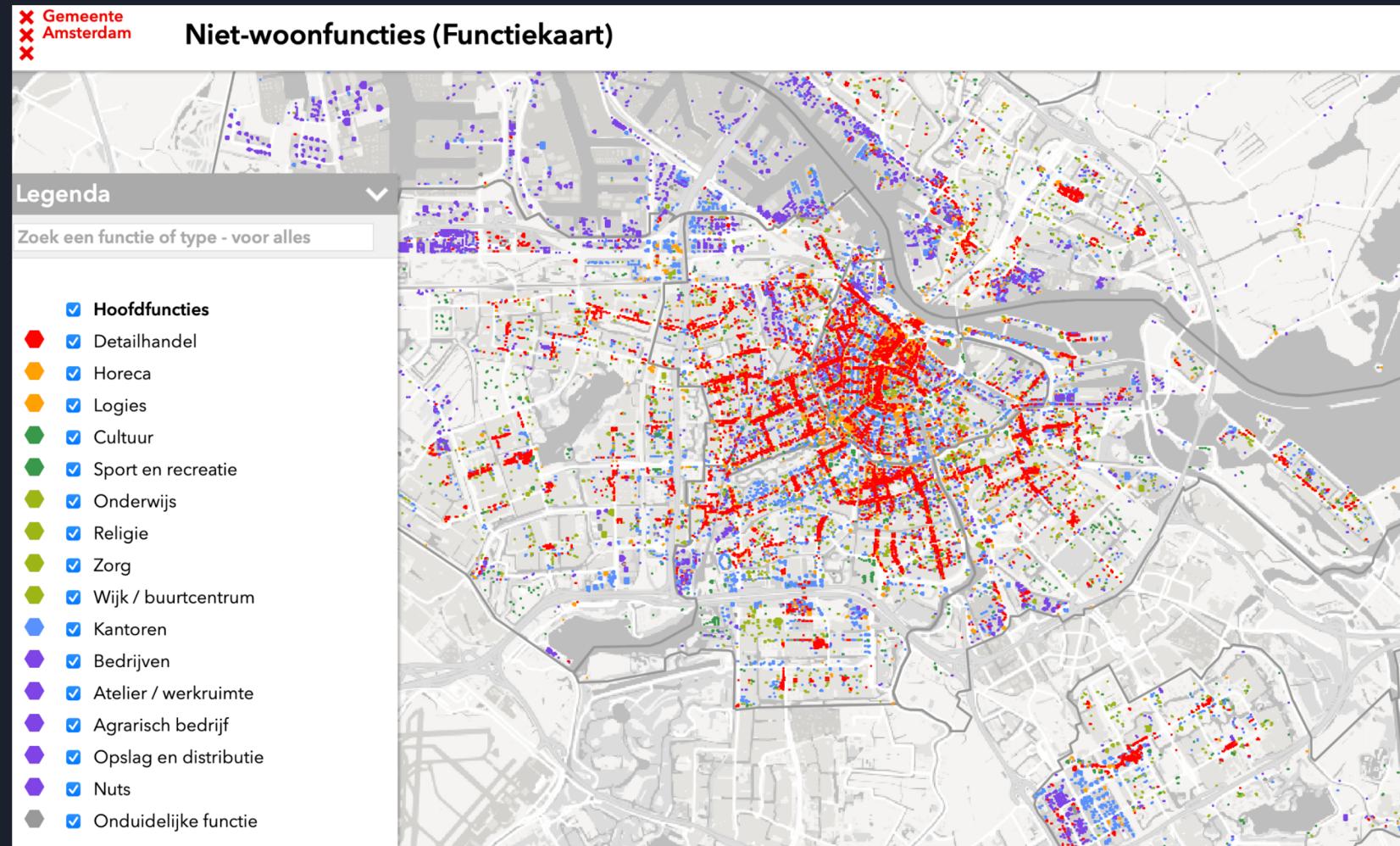
# Neighbourhood based effect score module



# Neighbourhood based Risk Effect model From petrol stations to non-residential buildings

Possible further development  
on the prototype

Public available Data Source:  
o FUNCTIEKAART.csv  
o 32995 non-residential  
data points available

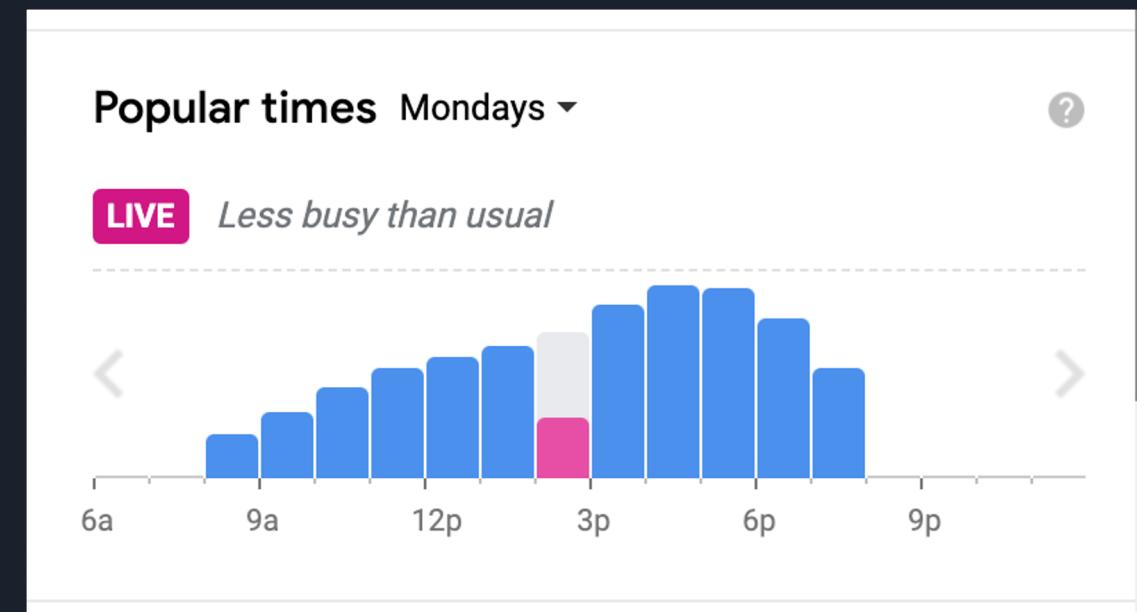


# More features and more details from Google API

Traffic data



Popular times of venues in the neighbourhood



# Q&A