**Bike-Routing for Berlin:
Understanding the base framework for
weighted planning**

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Problem Setting

- Biking infrastructure is needed to make traffic more safe
- In Germany, main biking infrastructure is adding green sidelines for bikes
- My goal: doing the groundwork for a bike routing planner for Berlin
- Premise: Using streets with biking infrastructure = safer and better
- A bike routing planner has already been done by bbbike.de

Data

- Infravelo project data https://www.infravelo.de/karte/
- Important variables: project names, location (street name or description), type of infrastructure in place (biking or road)
- API available, but data is basically handwritten (unclean and unregular)
- Infravelo only gives adresses / streetnames, no geo locations for their projects

- Openstreetmap data acquired through API for Berlin
- Important variables: geo location, streetname, road quality
- Great quality, but geo data (completely new to me)

https://www.berlin.de/sen/uvk/en/mobility-and-transport/transport-planning/cycling/

Infravelo Project Map for comparison

- A lot of projects are planned! (purple)

- Only finished projects (green) are considererd here

- https://www.infravelo.de/karte/ Have a look, it's interactive
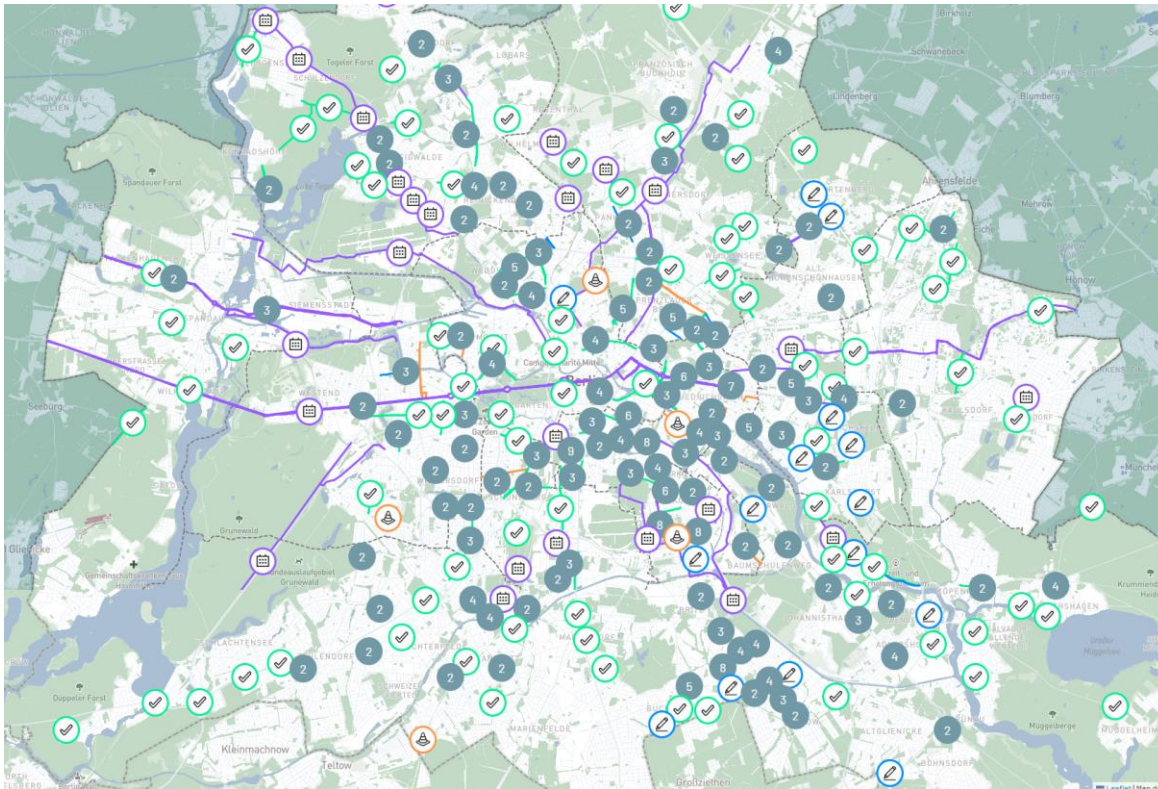
Understanding how streets are defined in openstreetmap data

```
df.loc[2,"geometry"]
```

`'LINESTRING (13.3189287 52.4813095, 13.318873 52.4793006, 13.3188632 52.4792413)'`
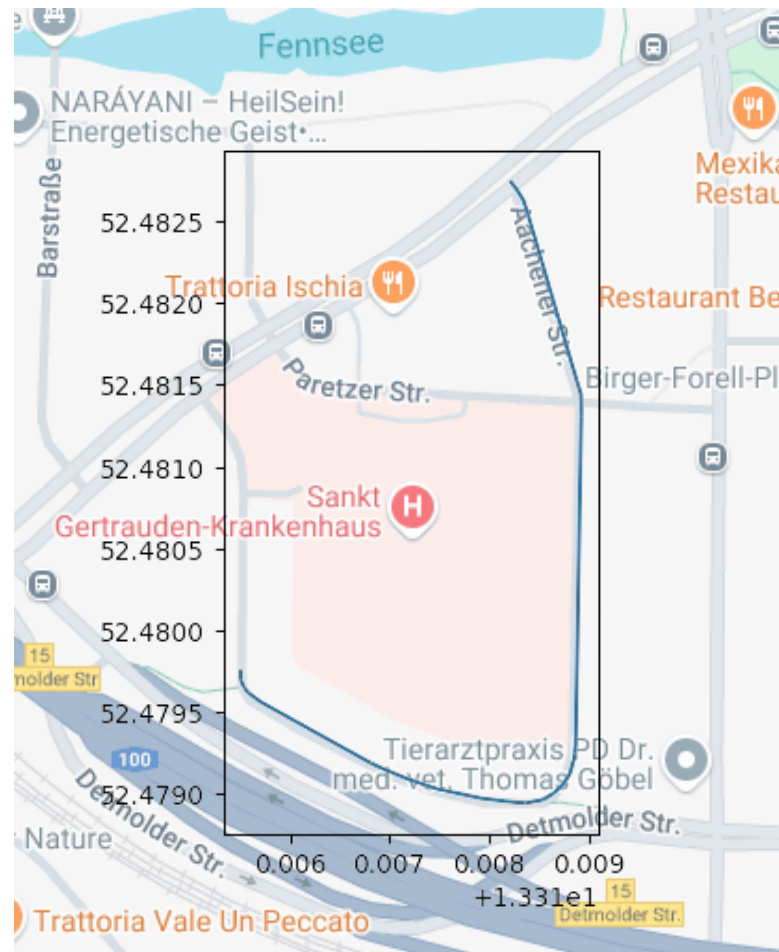
Methods

1. Pulling the infravelo project and map data
2. Cleaning the infravelo project data
3. Feature engineering to have clear information that is relevant for a map (for example type of project – road or bike parking)
4. Getting parking geolocations for (valid) street addresses
5. Matching the streetnames given for bikeroads with roads on openstreetmap to get coordinates
6. Adding Bike Parking addresses with geolocations to the map
7. Visualize it!
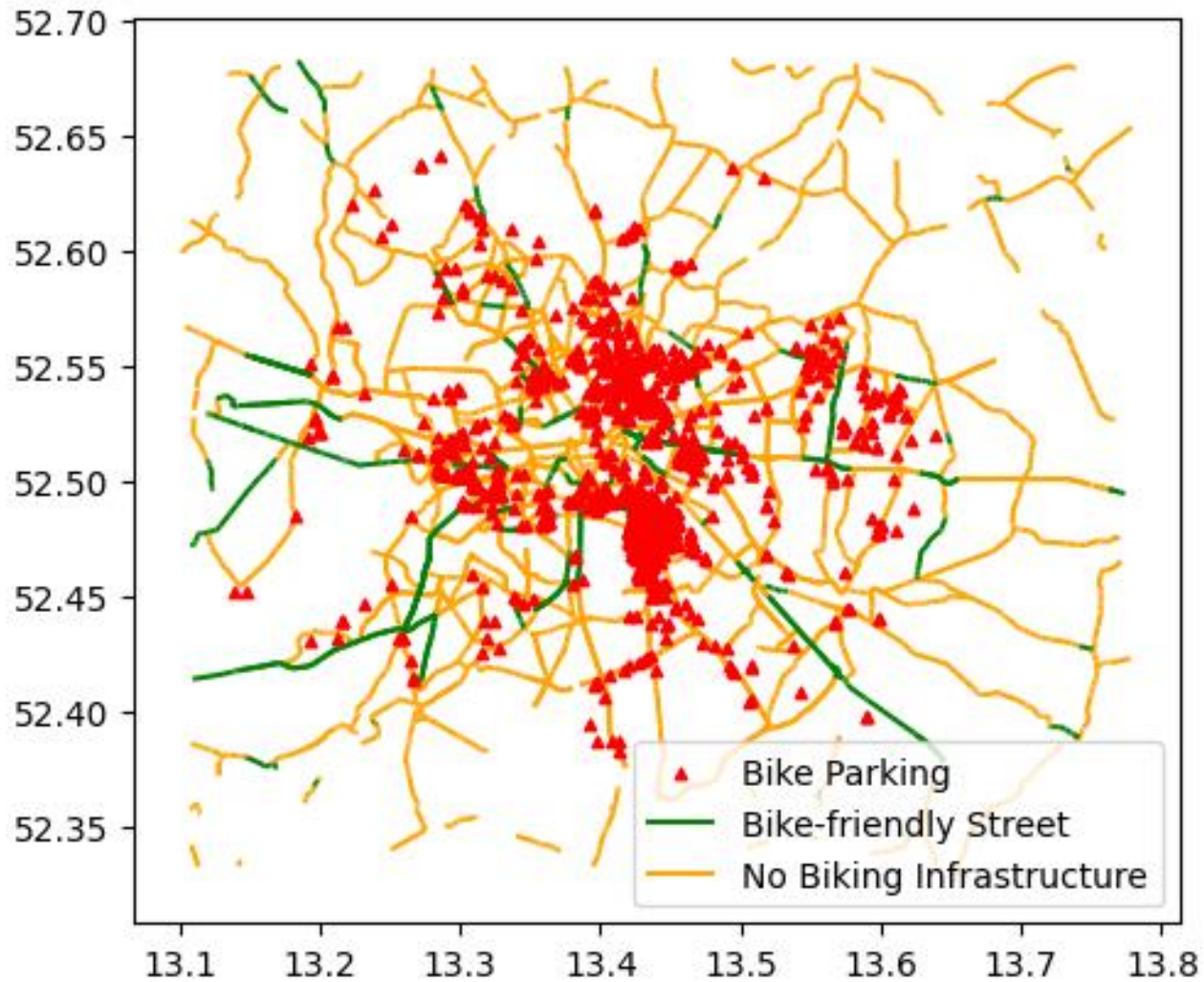8. Prototype for weighing streets when planning a route

Results 1: Bike roads for primary and secondary streets
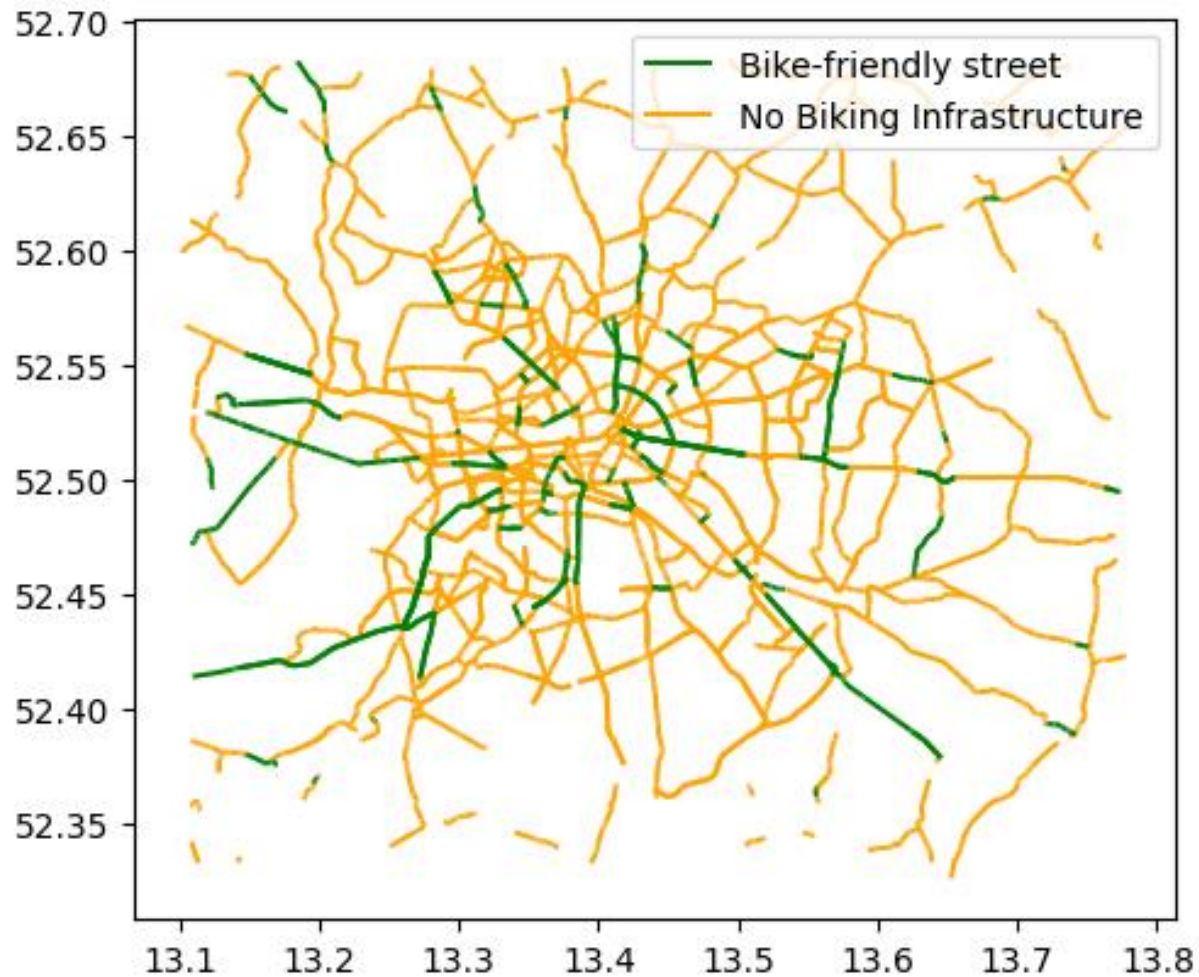
Results 2: Bike roads for tertiary and residential streets
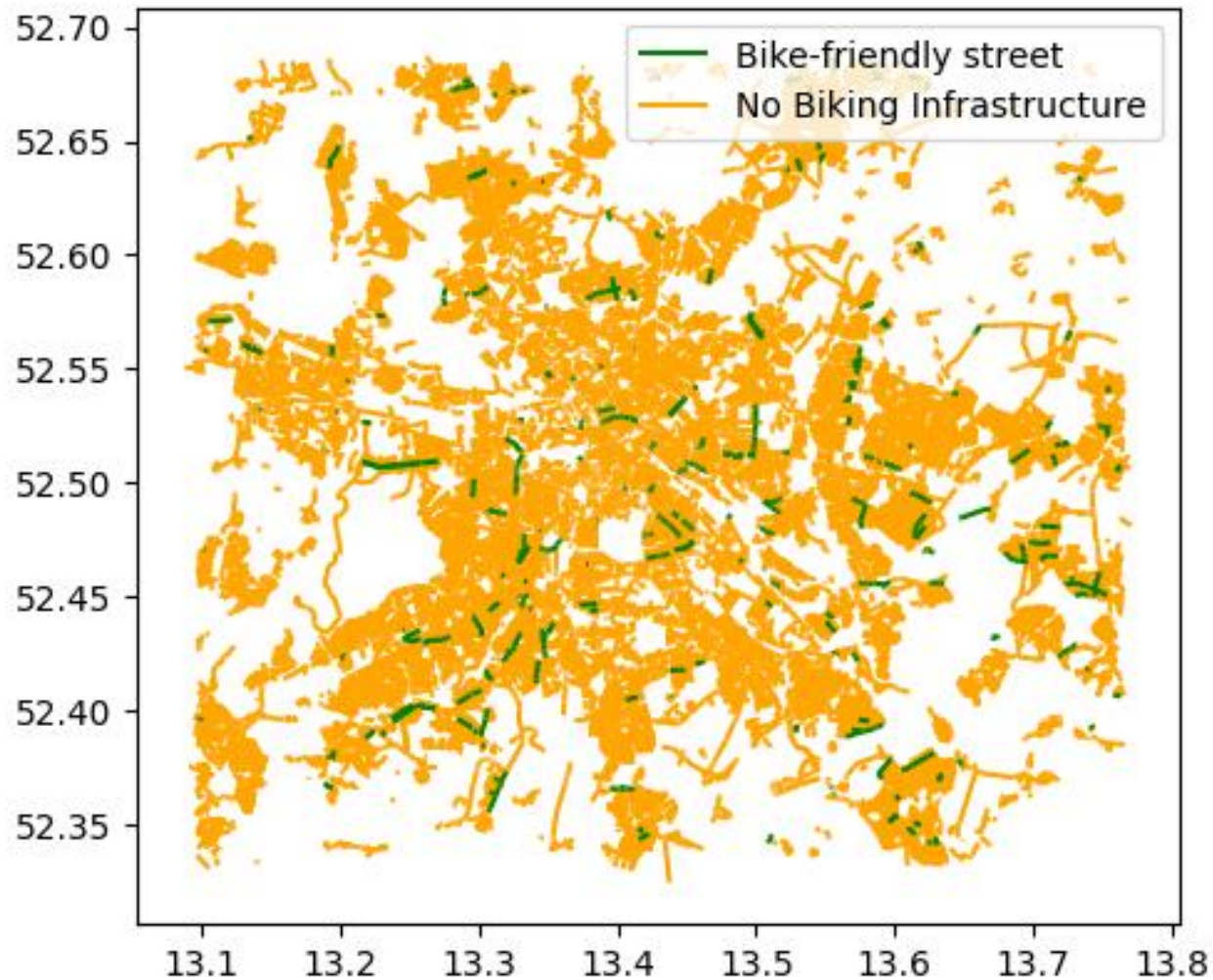
Result 3: Parking possibilities

Weighting prototype

- Idea: Safety of road for bikes is determined by street quality, allowed car speed, number of lanes and whether there is biking infrastructure

- Problem: missing info

- Solution: using the mice algorithm to fill missing data

- Base approach for weighting: normalize each factor and sum it up

- Final weight should be a multiplicator to distance

- The worse the safety, the bigger the multiplicator

- Weights are between ~ 0.6 and ~2.9 for Berlin

	lanes	maxspeed	smoothness	bikeroad	weight
14	4.0	30.0	2.0	0.0	1.965079
15	4.0	30.0	2.0	0.0	1.965079
16	1.0	20.0	5.0	0.0	1.782540
17	2.0	70.0	3.0	0.0	2.219048
18	1.0	20.0	5.0	0.0	1.782540

|	lanes	maxspeed	smoothness	bikeroad	weight
145	1.0	50.0	2.0	1.0	0.687302
146	2.0	50.0	4.0	1.0	1.139683
147	1.0	50.0	2.0	1.0	0.687302
148	3.0	50.0	3.0	1.0	1.163492
149	2.0	50.0	3.0	1.0	0.996825

Result 4: Plotting weighted streets
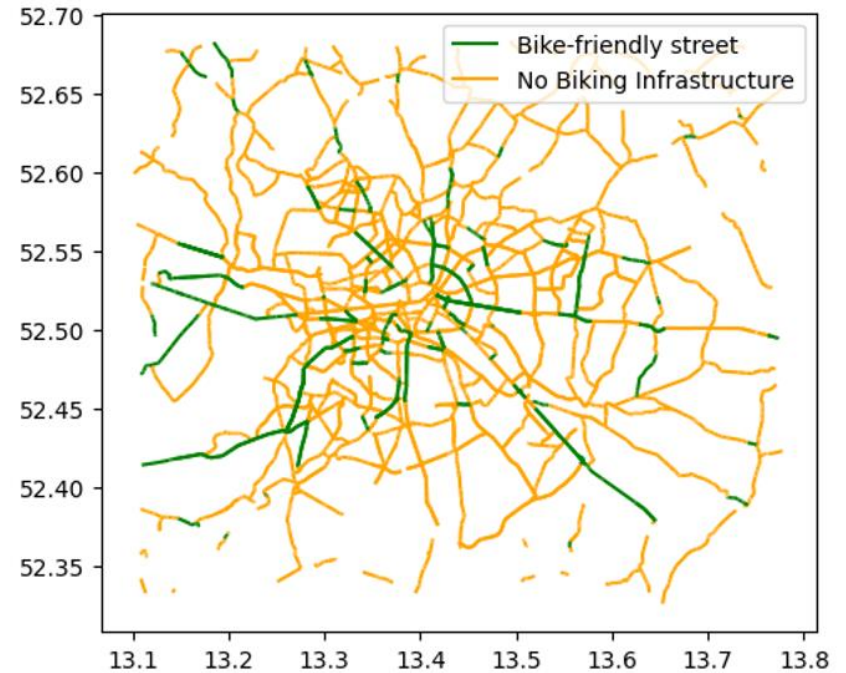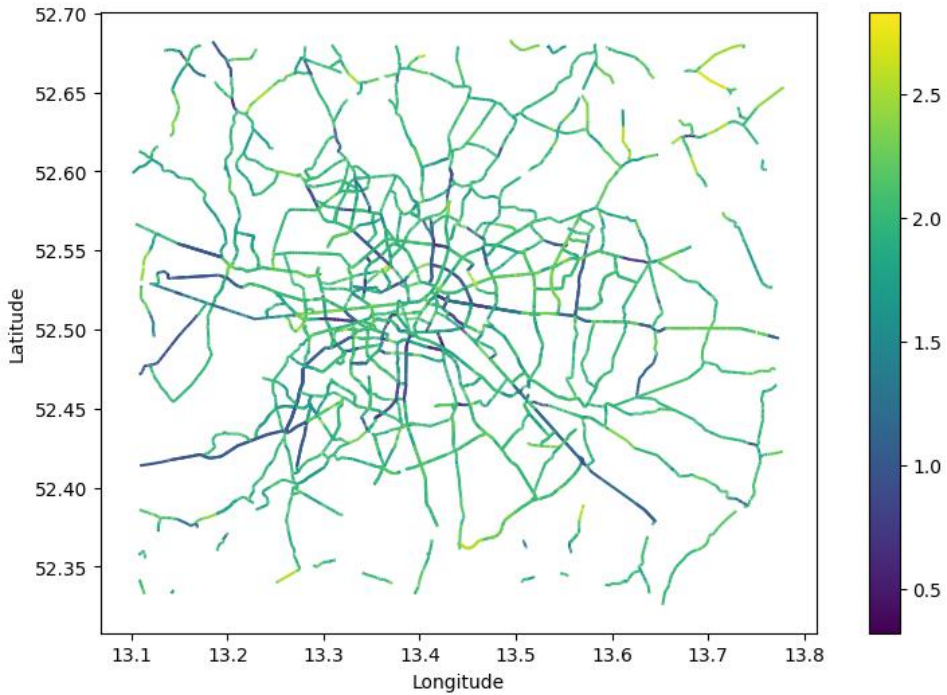
Problem 1: handwritten project data

- Types of streetnames:
  „Frankfurter Weg" (great)
  „Frankfurter Weg 98" (also great)
  „Rosa Luxemburg Gymnasium" (building name)
  „Frankfurter Weg / Tobiasstraße" (street crossing)

- Matching building names or crossings with coordinates is a very hard task

- Getting correct geo locations for given adresses is tricky (per default streets got represented by a point coordinate)

- Infravelo's project data doesn't provide geo locations

Problem 2: Streets with actual biking infrastructure are too optimistically drawn
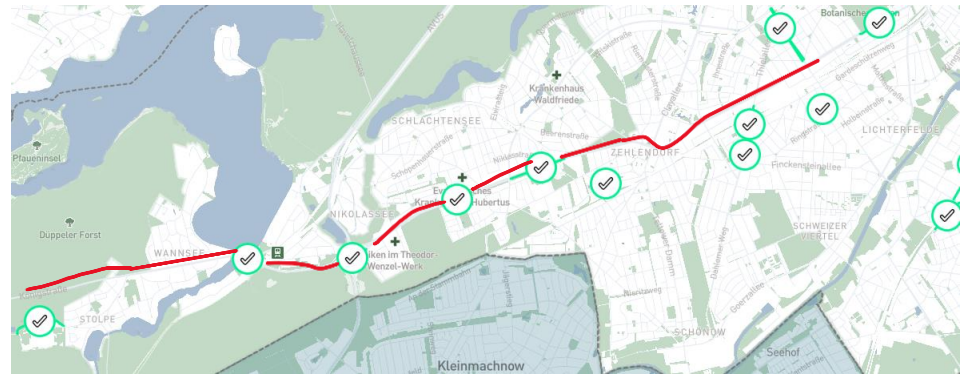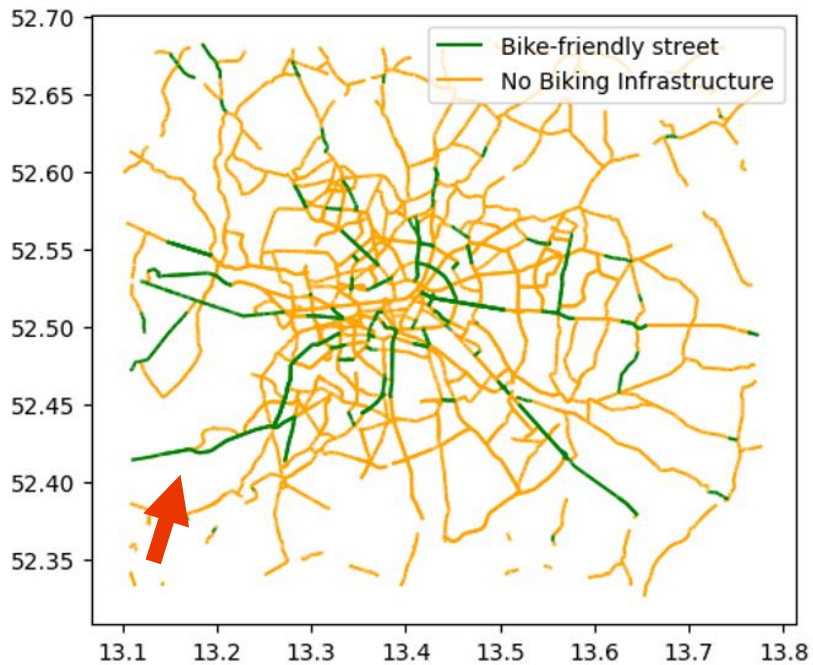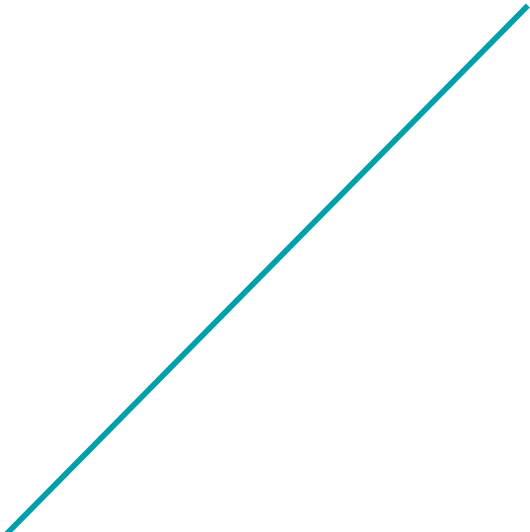
Discussion

- There is still little biking infrastructure in Berlin when it comes to roads
- More projects are to come to make Berlin more safe for bikers
- Compared to the netherlands, it would be nice to have some political effort to make traffic more bike-friendly instead of adding more lines for cars
- The Netherlands are a great rolemodel!
- Weighting algorithms are tricky and need good graph theory knowledge
- Testing is required to know whether the weighting is okay

Check out the Github:
https://github.com/CarolineGraebelBHT/Projekt_Urban_Technologies

Sources

- https://www.infravelo.de

- https://wiki.openstreetmap.org/

- https://pybit.es/articles/build-a-route-planner-for-maps-using-python/