



Visualization of the traffic situation in the „Smart City“ Basel (and Switzerland)

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04.07.2023

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Data Visualization – Project: Visualization of the traffic situation in the “SmartCity” Basel

Master Digital Sciences – Data and Information Science

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Technology
Arts Sciences
TH Köln

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Motivation



Dataset



Libraries

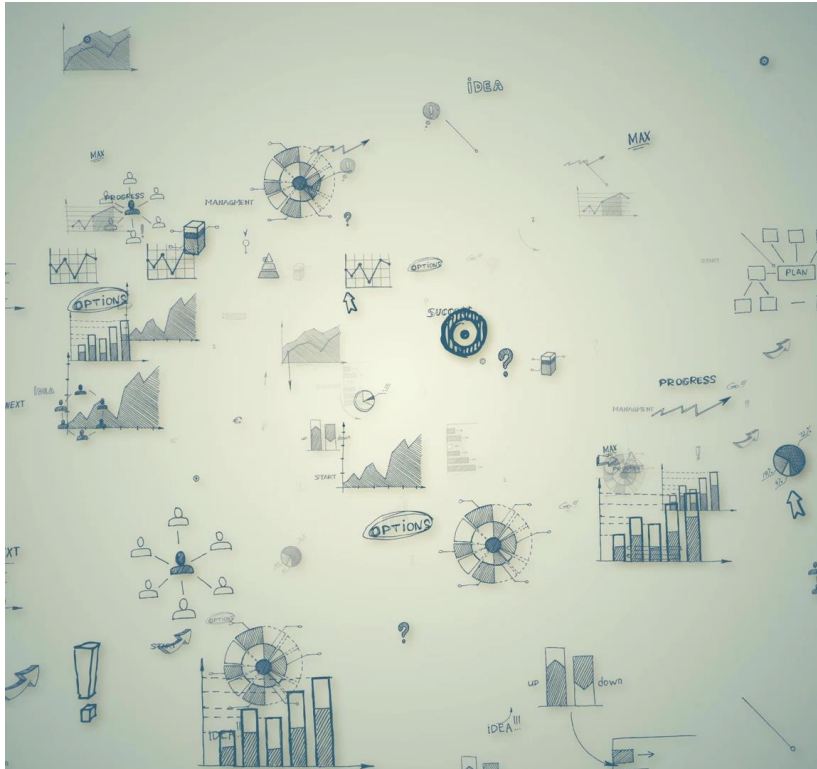


Usecase 1: Traffic Accidents



Usecase 2: Noise pollution

Motivation



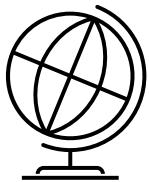
Goal:

Graphically identification of potential pitfalls or bottlenecks in the urban development planning of the „SmartCity“ Basel

Ideas:

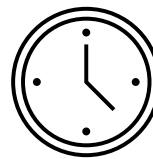
- Identifying hotspots for certain kinds of car accidents
- Investigation of the traffic noise development
- (Identification of parking capacity bottlenecks of Basel)

Datasets – An Overview



Geographic Data

- Points
- Polygons
- Names



Time Series Data

- Range of up to 11 years
- Very fine grained



Traffic Data

- (Traffic) Noise
- Parking capacity
- Traffic accidents
- ...

Datasets – An Overview

The screenshot displays the 'Datenportal Basel-Stadt' interface. It features three dataset cards, each with a title, description, publisher, license, and a set of filters. To the right of each card is a vertical menu with icons for 'Tabelle', 'Karte', 'Analysen', 'Exporte', 'API', and 'Dashboard'.

- Strassenverkehrsunfälle**: Beschreibt anonymisierte, lokalisierte Einzeldaten von Unfällen auf den Strassen von Basel-Stadt. Verfügbar sind Angaben wie die Art und Schwere des Unfalls, dem Unfallzeitpunkt und dem Ort und der Strassenart des Unfalls. Die Daten über die Strassenverkehrsunfälle sind ab dem Jahr 2011 für Basel-Stadt verfügbar. Die Daten eines Kalenderjahres sind...
Herausgeber: Bundesamt für Strassen ASTRA
Lizenz: CC BY 4.0
Filter: Verkehrsunfall, Fussgänger, Schaden, Gefährdung, Velo, Auto, Motorräder, Unfall, Verkehrsunfälle
- Smart Climate Schallpegelmessungen**: Im Rahmen des Projektes «Smart Climate» von Smart Regio Basel (<https://smartregiobasel.ch/de/projekte/smart-climate-plug-and-sense>) werden an verschiedenen Standorten in der Region Basel Schallpegeldaten mit LoRa-Sensoren gemessen. Das Lufthygieneamt beider Basel, das Amt für Umwelt und Energie des Kantons Basel-Stadt, der Basler Wetterdienstleister meteoblue AG, die IWB sowie die Sensirion AG ...
Herausgeber: Amt für Umwelt und Energie
Lizenz: CC BY 3.0 CH
Filter: Schall, Lärm, Pegel, Lautstärke, Belästigung
- Gemeinden**: Zum Kanton Basel-Stadt zählen die Stadt Basel und die Gemeinden Riehen und Bettingen.
Herausgeber: Grundbuch- und Vermessungsamt
Lizenz: CC BY 3.0 CH + OpenStreetMap
Filter: Post, Postleitzahl, Brief, Paket

Datasets provided by Datenportal Basel-Stadt

- Contains 234 datasets about topics like:

- Geography
- Mobility and traffic
- politics
- ...

Datasets – An Overview

Shapefiles provided by Federal Office of Topography swisstopo

swissBOUNDARIES3D - Access to geodata

For small and simple data the user always gets the full geographical extent. The user interface makes it easy to download geodata through a list of links to download the available variants. [Further information.](#)

Available data		Export all links
Data	Actions	
swissboundaries3d_2023-01_2056_5728.gdb.zip	Download	
swissboundaries3d_2023-01_2056_5728.shp.zip	Download	

- Shapefiles can be worked with in different levels:
 - District territories
 - Jurisdictions
 - Canton areas
 - Country areas

Geo-Coordinates provided in LV95 LN02

Libraries

Used for working
with Geodata:



Used for plotting
geodata:



Used for creating
interactive plots:



Used for plotting
and styling figures:



seaborn

matplotlib

Datashader

Usecase: Traffic Accidents

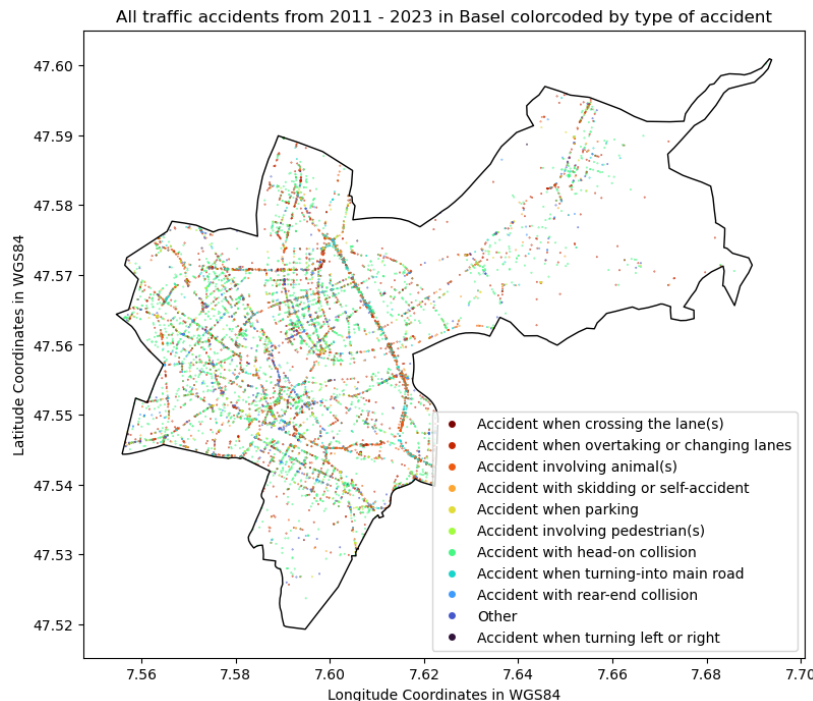


Ideas:

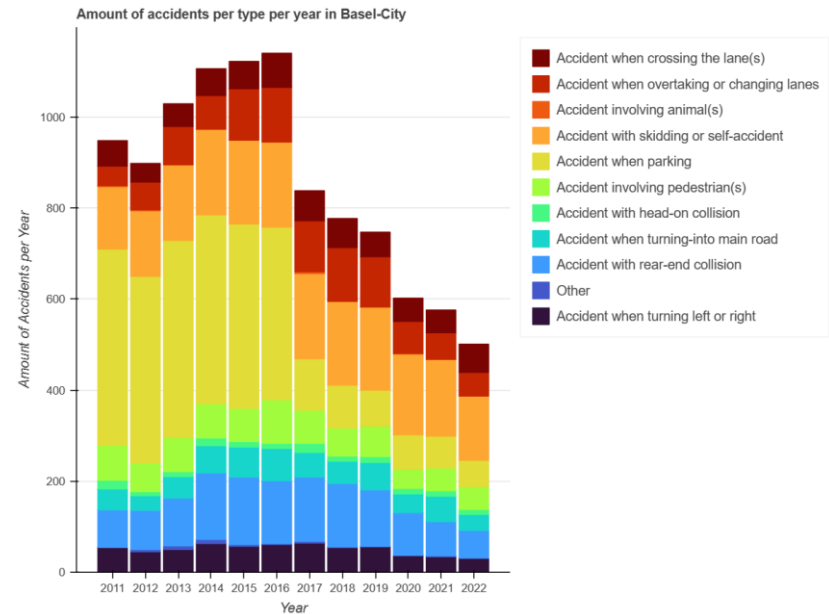
- Identify hotspots for traffic accidents
- Differentiate hotspots regarding the type of accident
- Identify road types with high likelihood for accidents

Overview: Traffic Accidents

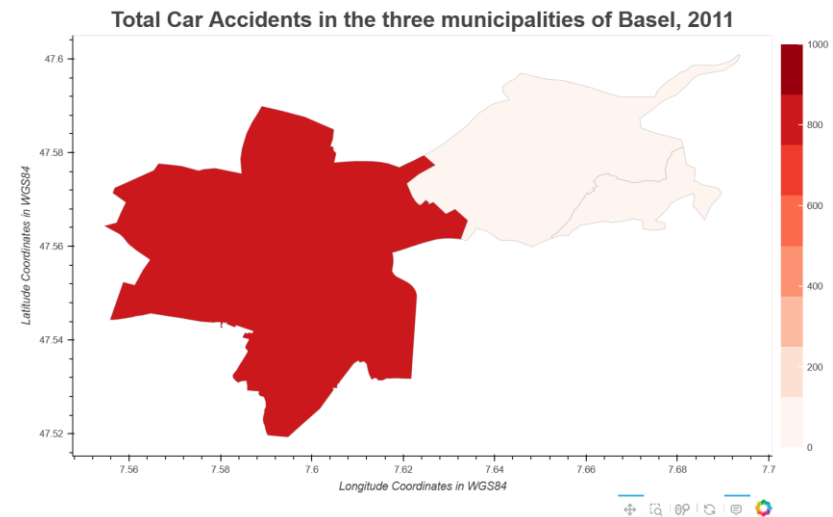
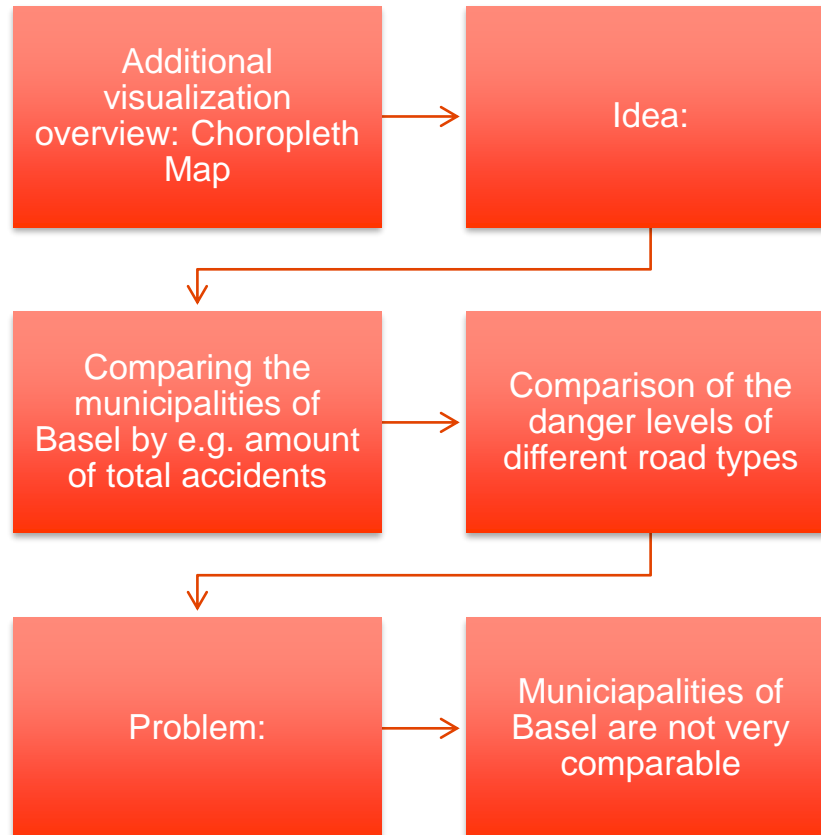
Geographical overview of all accidents in Basel (2011 – 2022)



Numerical overview of all accidents in Basel (2011 – 2022)



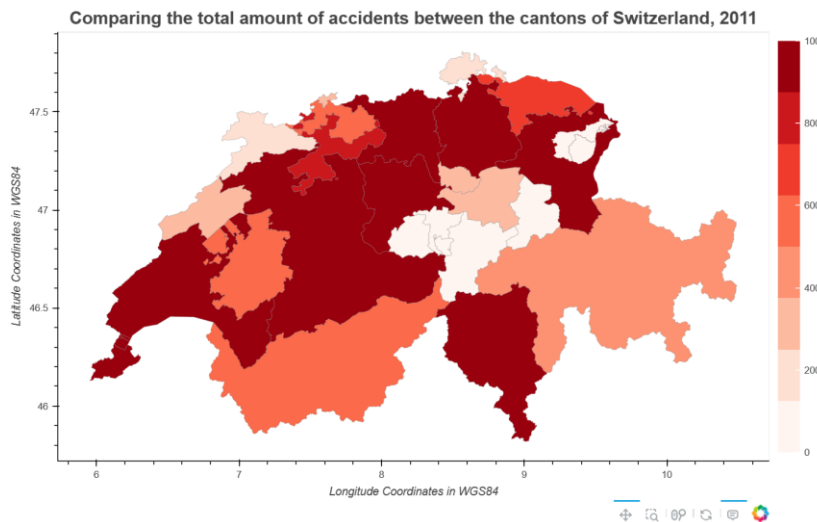
Overview: Traffic Accidents



Overview: Traffic Accidents

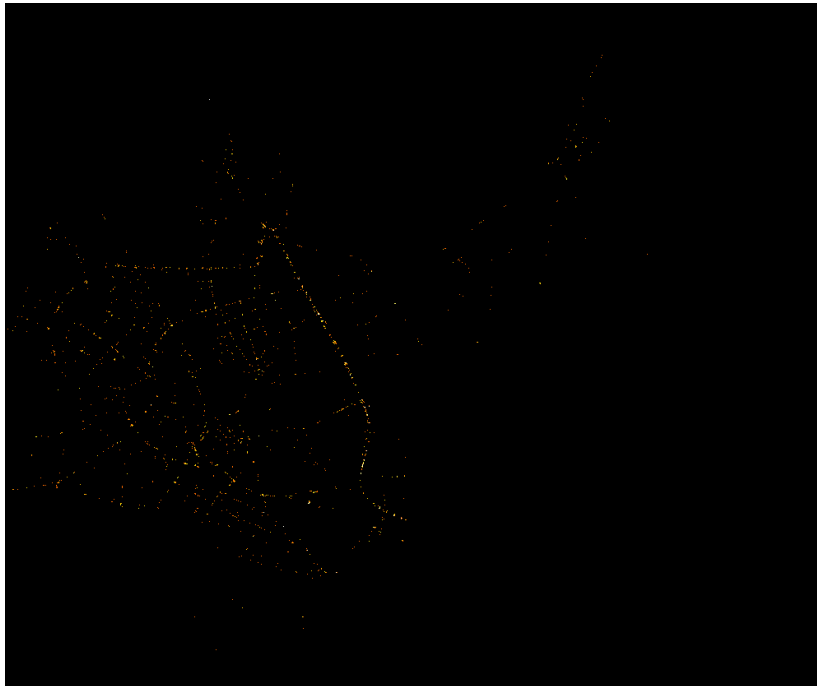
Considerations:

- Sequential Colorcoding enables easy understanding
- ⇒ White colors are associated with low values
- Colorblind friendly colorcoding



Usecase: Traffic Accidents

Datashader Plot



Idea:

- Aggregate Geopoints to identify hotspots

Problem:

- Dataset is way too small

Usecase: Traffic Accidents

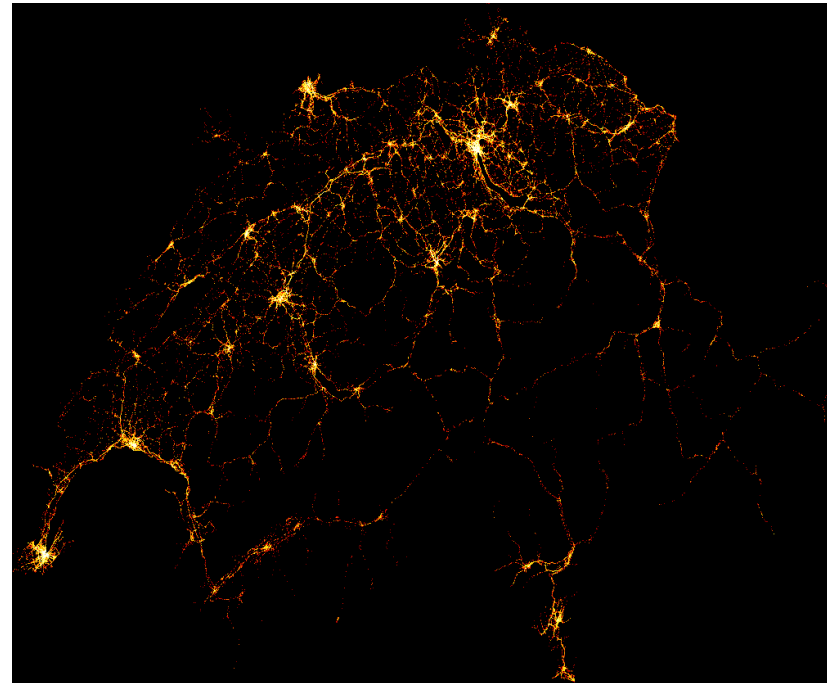
Idea:

- Creating the aggregation plot for the complete switzerland

Outcome:

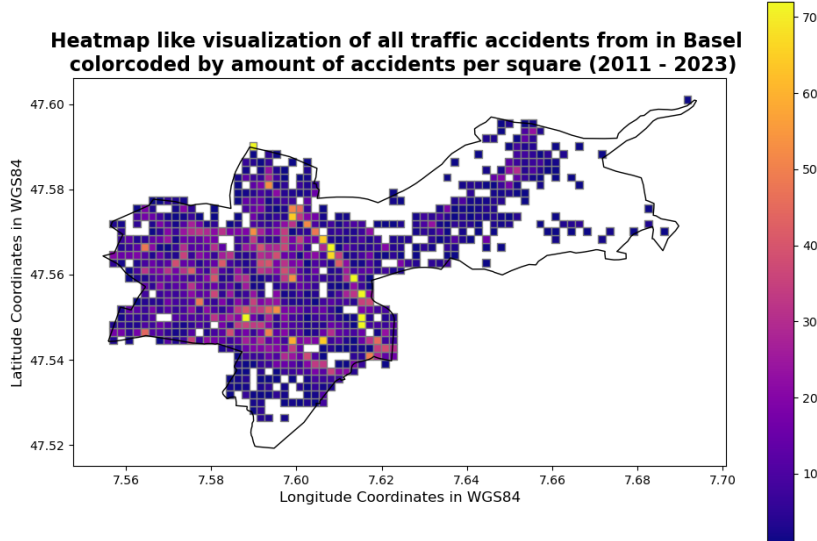
- Hotspots are clearly identifiable
- Still lacking data to differentiate the different kinds of accidents

Aggregation Plot for the complete Switzerland



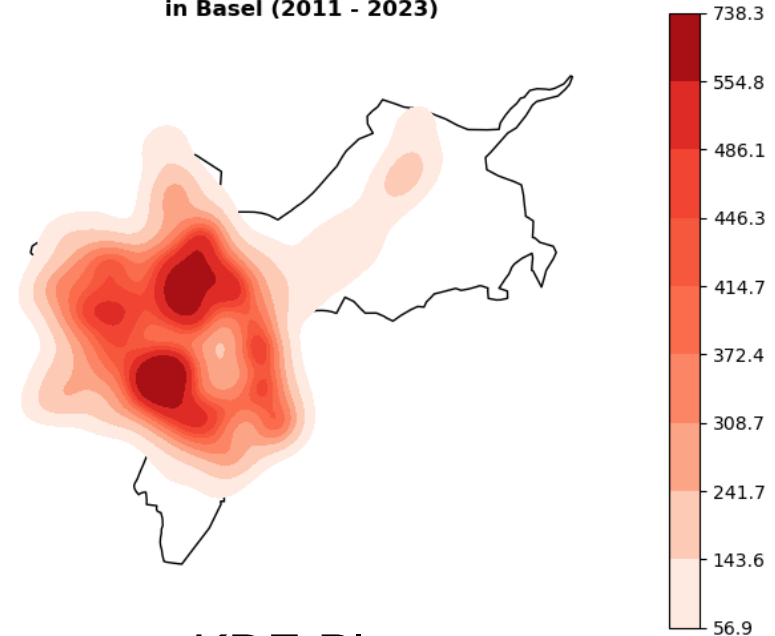
Usecase: Traffic Accidents

Possibilities for identifying accident hotspots:



„Gridding“

Kernel Density Estimation Plot for traffic accidents in Basel (2011 - 2023)



KDE Plot

Usecases: Traffic Noise



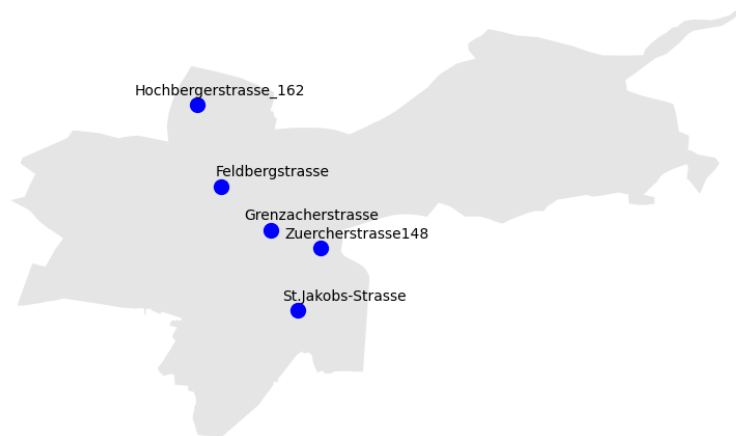
Identifying excessive noise pollution:

Idea:

- Identify hotspots with high noise pollution
- Identify time intervals with high noise pollution

Usecase: Traffic Noise

Location of monitor stations



Basel führt Tempo 30 in der Feldbergstraße ein

15. März 2021

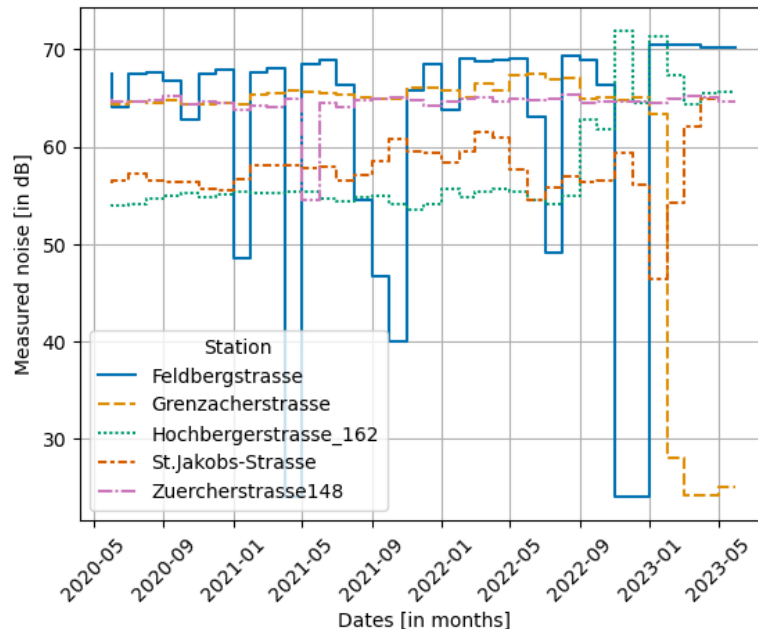


Die Geschwindigkeitsreduzierung soll für bessere Luft und weniger Lärm

Visualization – Traffic Noise

First approach:

Average decibel measurements for the different stations
in Basel



Considerations and used aesthetics

Considerations:

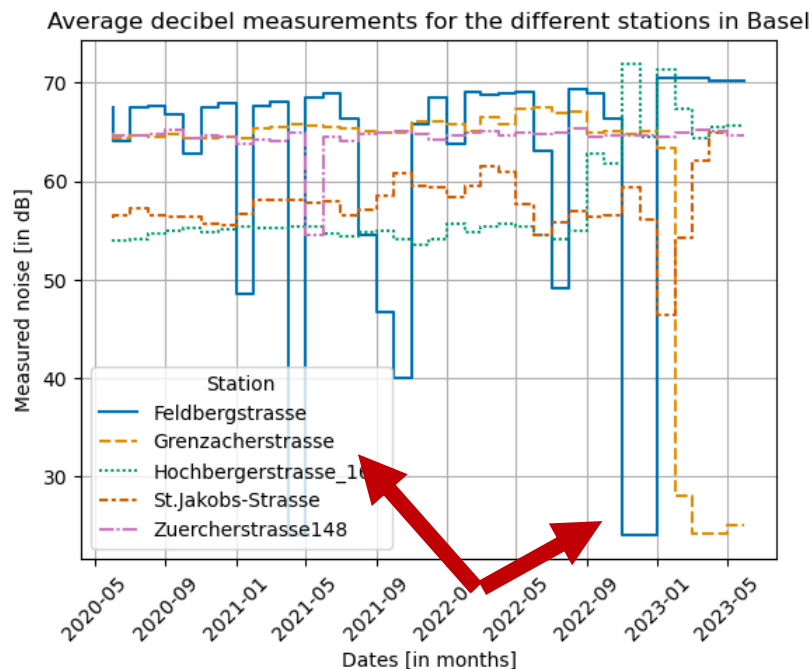
- The visualization displays the monthly averages per station
- Using grids and drawstyle “steps-pre” for better readability

Aesthetics used:

- Colorblind friendly colors
- Different linestyles

Visualization – Traffic Noise

First approach:



Problems: Huge outliers

Possible Reasons:

- Probably Corona Lockdown
- Road Closure
- Inconsistent measurements of the sensor

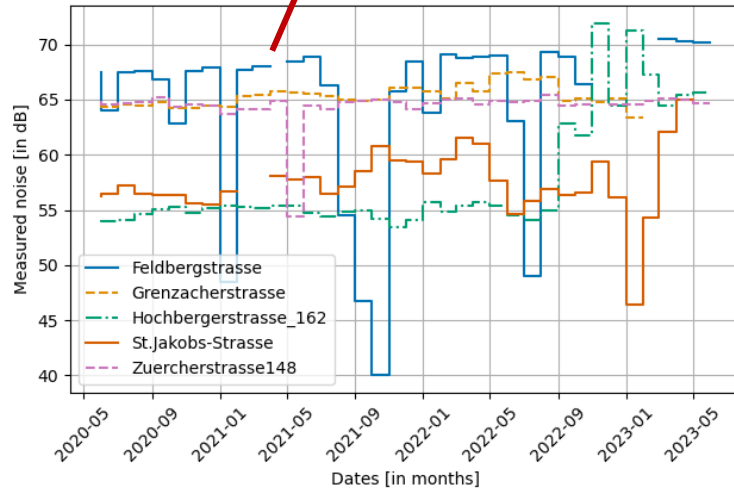
Solution: All values for this time interval were exactly 24.1

	Station	date	Wert
11	Feldbergstrasse	2021-05	24.1
30	Feldbergstrasse	2022-12	24.1
31	Feldbergstrasse	2023-01	24.1

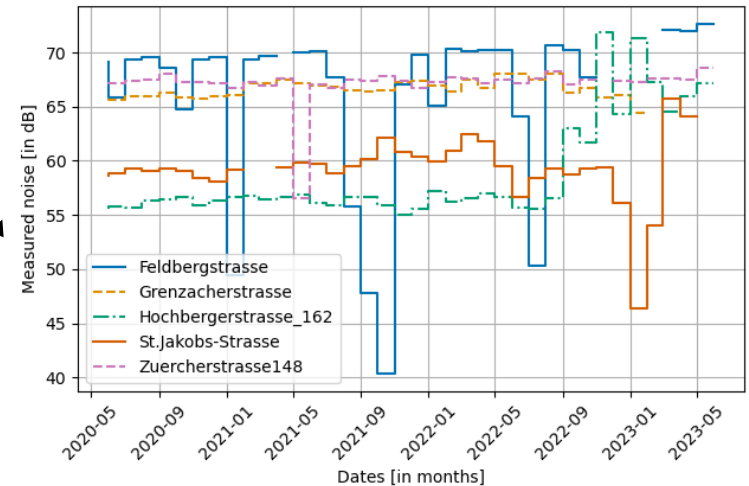
Visualization – Traffic Noise

Seaborn

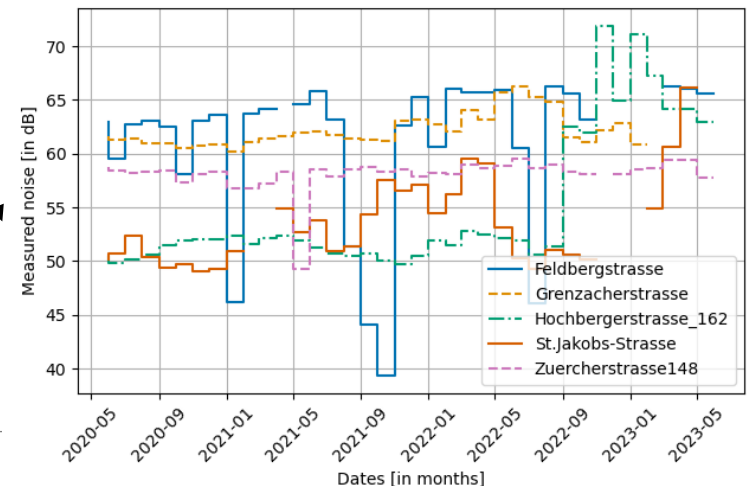
Average decibel measurements for the different monitoring stations in Basel



Average decibel measurements for the different monitoring stations between 6 - 22 o'clock in Basel



Average decibel measurements for the different monitoring stations between 22 - 6 o'clock in Basel



Conclusion



Usage of the right tools / libraries is key



Aggregating different data sources can be quite challenging



Watch out for inconsistencies in the data and how you handle them

Future Work



- Adding more interactive slider functions to make use of time series data
- Usage off additional traffic data
- Combining different data to detect causalities or correlations
- Combining visualizations in a dashboard



Thanks for listening!



Any questions?

Links

Datasets:

- <https://data.bs.ch/explore/?sort=modified>
- <https://data.geo.admin.ch/>
- <https://www.swisstopo.admin.ch/en/geodata/landscape/boundaries3d.html>

Tutorials:

- https://james-brennan.github.io/posts/fast_gridding_geopandas/
- <https://towardsdatascience.com/walkthrough-mapping-basics-with-bokeh-and-geopandas-in-python-43f40aa5b7e9>
- <https://towardsdatascience.com/visualizing-geospatial-data-in-python-e070374fe621>

Other:

- <https://www.baden.fm/nachrichten/basel-fuehrt-tempo-30-in-der-feldbergstrasse-ein-727683/>
- <https://www.schweizerbauer.ch/regionen/nordwestschweiz/basel-stadt-kann-sich-nicht-mehr-als-europas-umweltstadt-bewerben/>
- <https://stock.adobe.com/at/search?k=%22noise%20pollution%22>