



Data-Driven Cycling Analytics: Tools & Experience

Michal Jakob



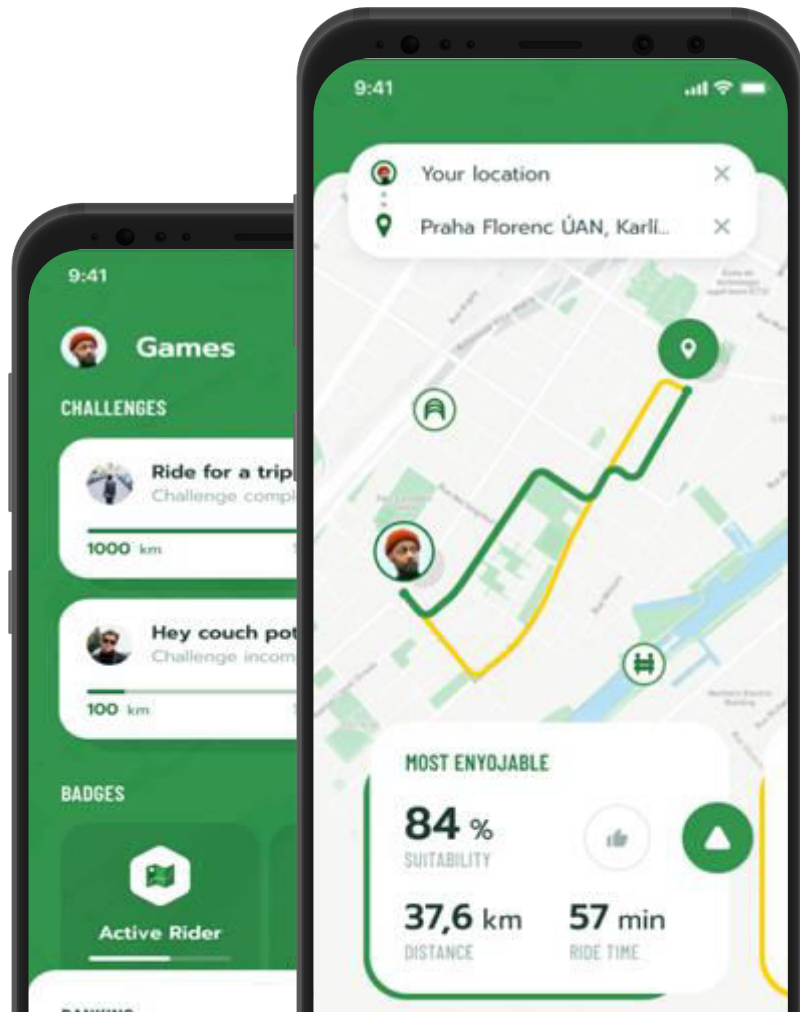
CYCLERS

cyclers.city

About Cyclers (by Umotional)



Cyclers App



Cyclers for Cities platform



Information & Navigation

Motivation & Incentivization

Data Collection & Analytics



Cycling Analytics: **Prague** Example

KOMPLETNÍ PRŮVODCE PRAŽSKÉHO CYKLISTY

doprava
i výlety
na kole

tipy a rady
jak na kole
po Praze

počítá
najaté
kilometry

ZDARMA
ke stažení

nejlepší trasy
několik variant
kombinace
s MHD

GET IT ON
Google Play

Download on the
App Store

Also available in English as "Prague on Bike".

NA KOLE PRAHOU



Prague on Bike



Prague's **official cycling** app



The city's **best rated** mobile app



Over **20,000** users

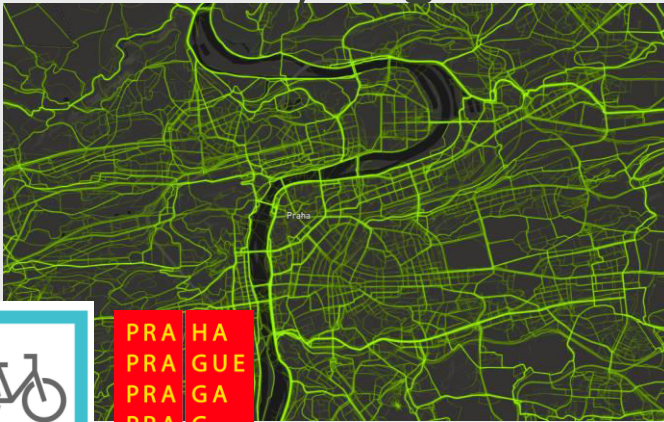


Over **200 thousand rides** recorded

Prague Cycling Volume Map



100K GPS cycling tracks

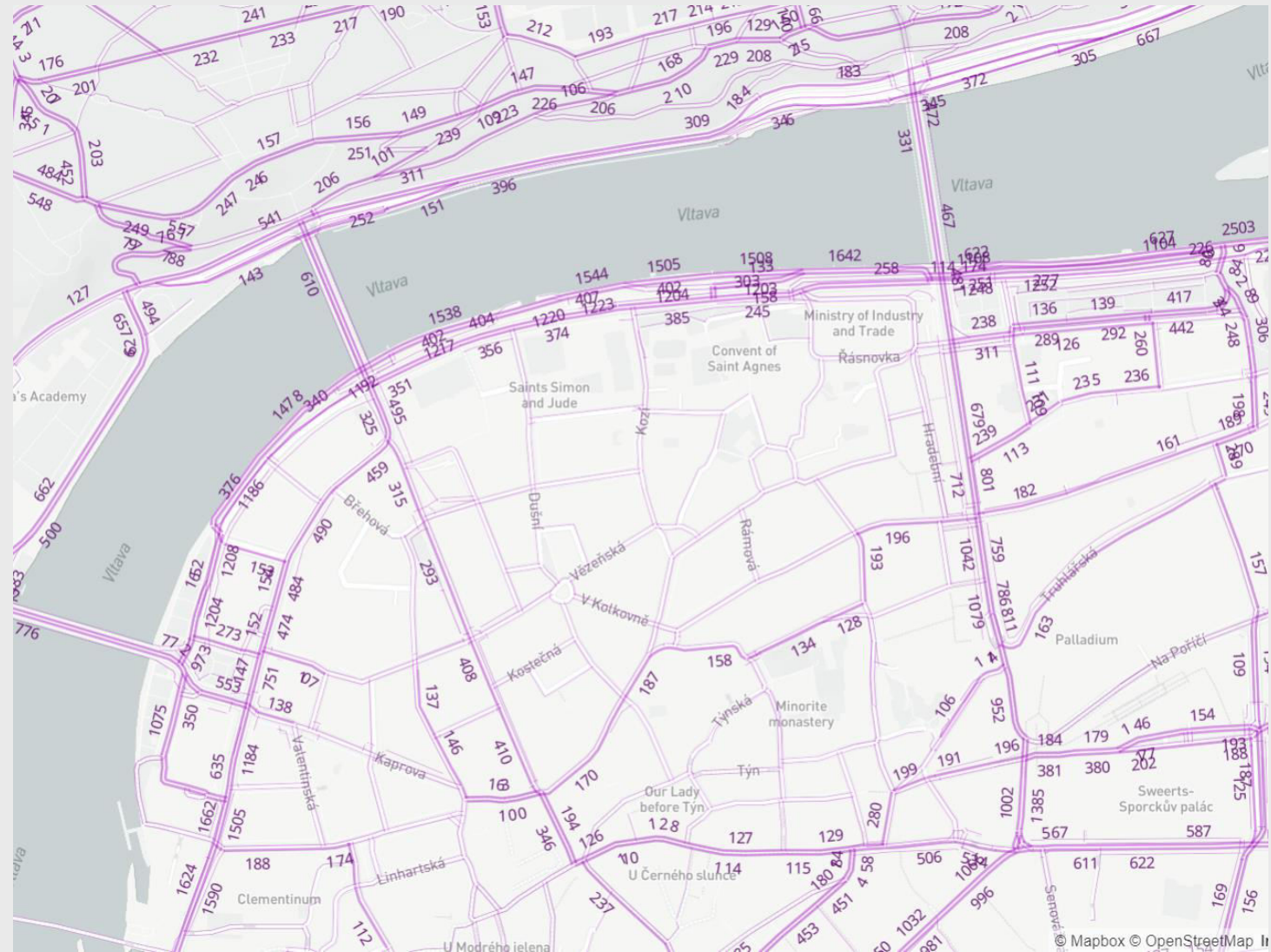
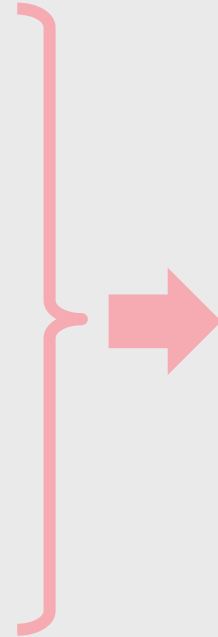


PRA
PRA
PRA
PRA

HA
GUE
GA
G



Prague cycling network

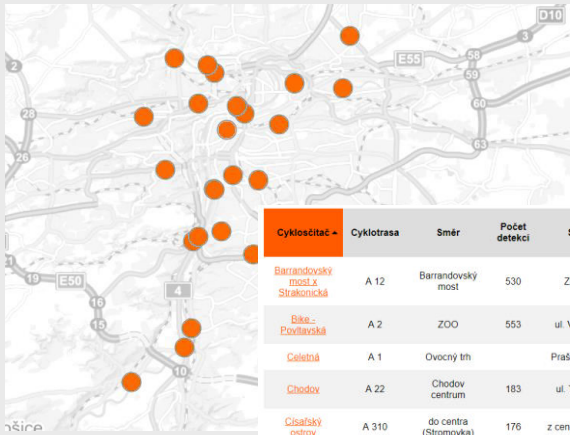


recorded trips per segment

Prague Cycling Volume Map

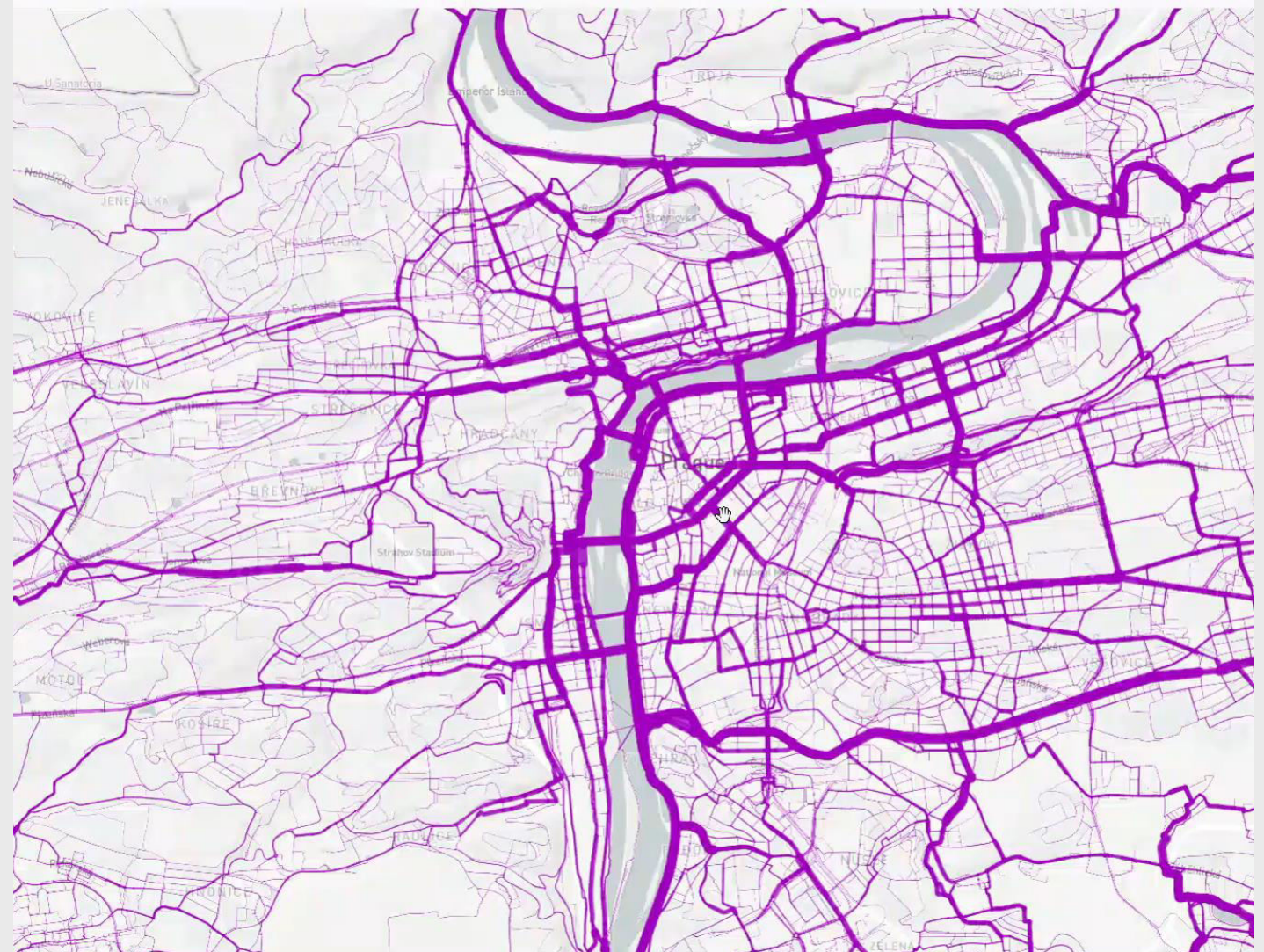


Rides per segment



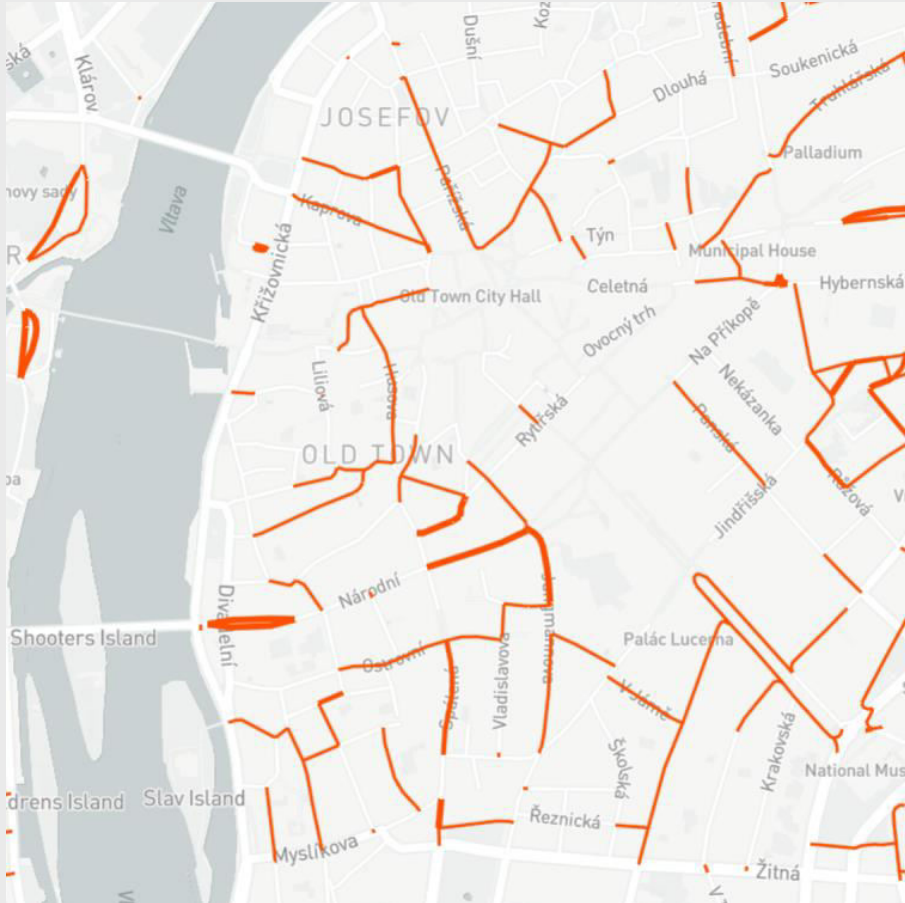
Cykloštic +	Cyklotrasa	Směr	Počet detekci	Směr
Barrandovský most z Strakonická	A 12	Barrandovský most	530	Zlíchov
Bílé Povelavská	A 2	ZOO	553	ul. Vodická
Celebná	A 1	Ovocný trh		Prašná brána
Chodov	A 22	Chodov centrum	183	ul. Turkova
Cisalský ostrov	A 310	do centra (Stromovka)	176	z centra (Trója)

Data from 25 static bike counters



Estimated average daily number of rides

Cycling Contraflow Analysis



Segments with recorded contraflows



Additional analysis and data



Infrastructure upgrades proposed and implemented

Foto: Da
rek

Cycling Data Analytics: Key Ingredients



Cycling
Data



Cycling Analytics
Tools



Data: Sources on Cyclist Movement



User data



- **High-resolution GPS traces**
- Full network coverage
- Limited sample
- Limited access (unless own app)

Fleet data



- **Variable-resolution GPS traces**
- Full network coverage
- Limited sample
- Additional quantities
- Access can be enforced

Infrastructure



- **Traffic counts**
- Complete sample
- Point coverage only
- High accuracy
- Accessible with extra investment

Tools: Overview



Elementary
tools & expertise

Intermediate
tools & expertise

Advanced
tools & expertise



Cycling Analytics: **Basic**

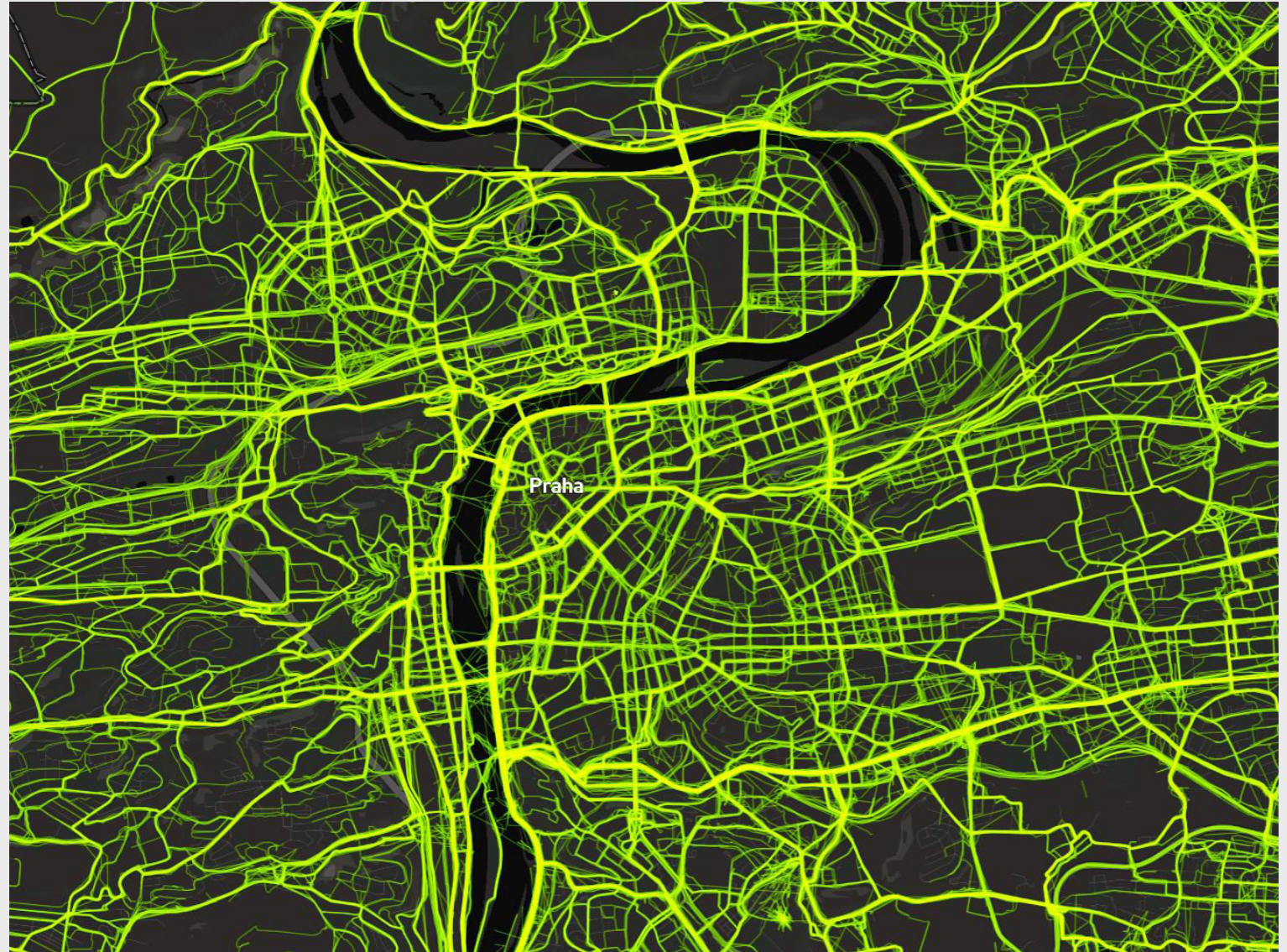
Heatmaps



Traces



Geovisualization
tools

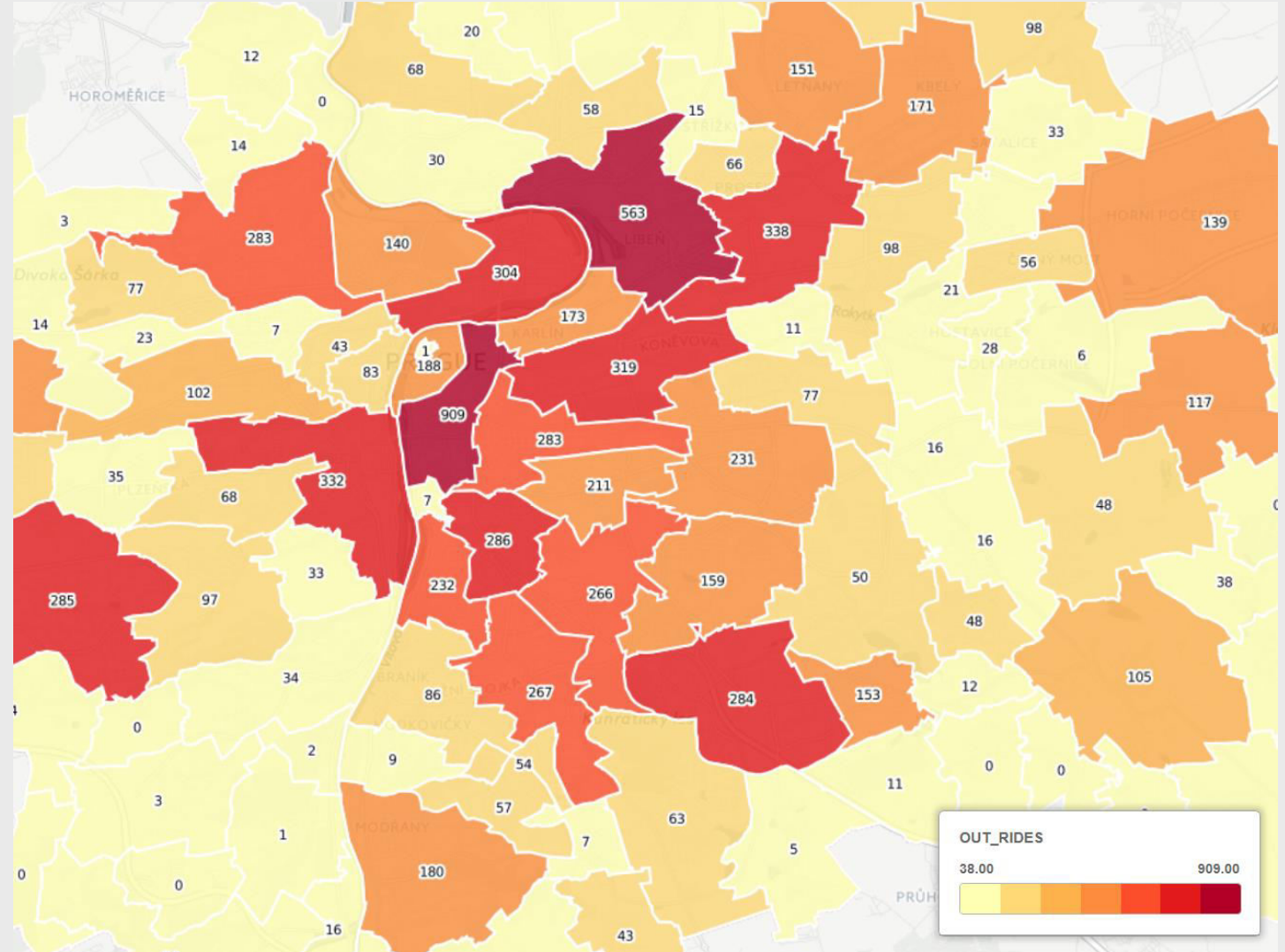


Trip Origin-Destination Analysis

Trips



Geovisualization tools

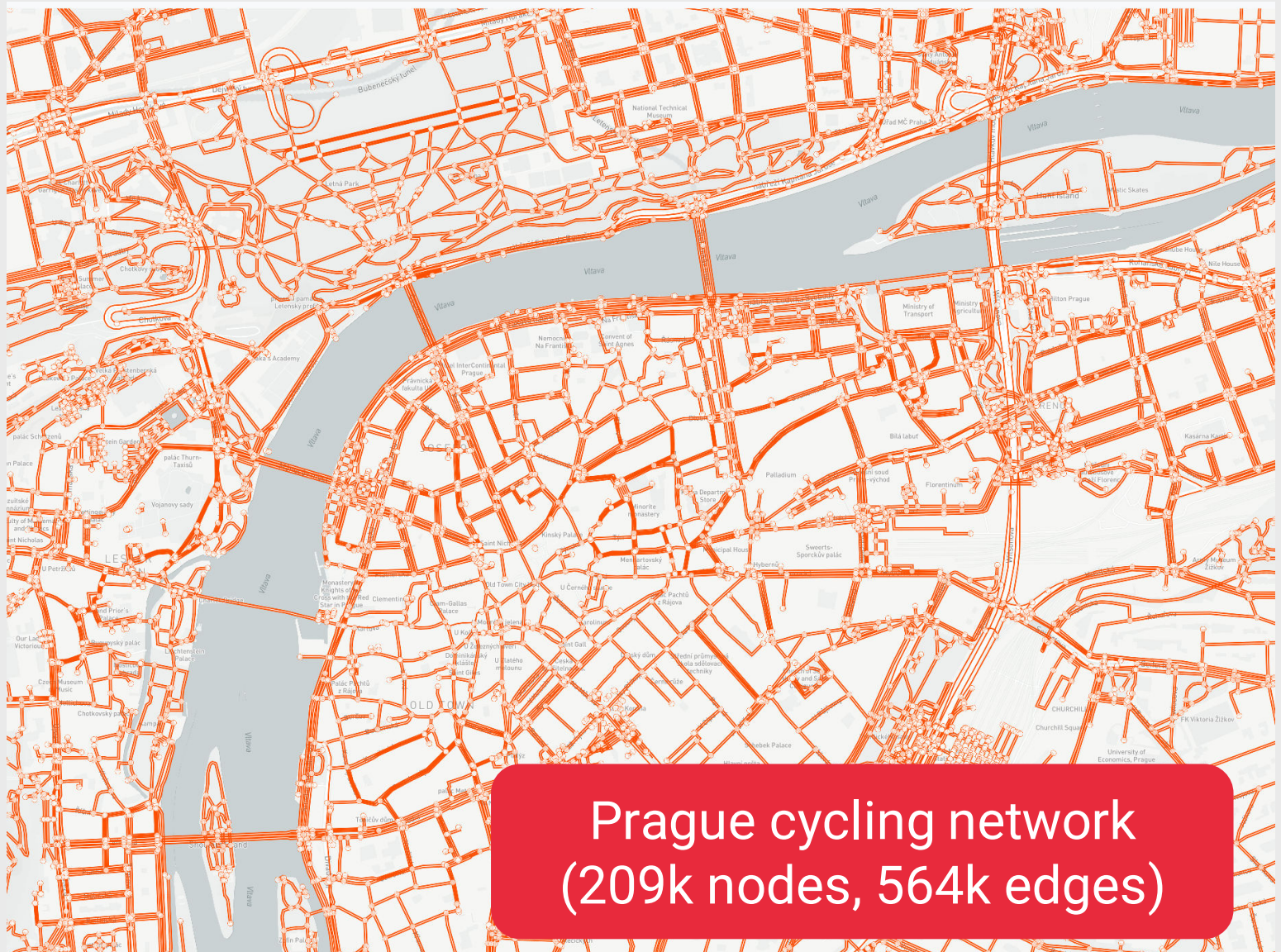




Cycling Analytics: **Intermediate**

Intermediate Analytics: Networks

Maps
Elevation profiles
Cycling infrastructure
...



Prague cycling network
(209k nodes, 564k edges)

Cycling Volume Maps

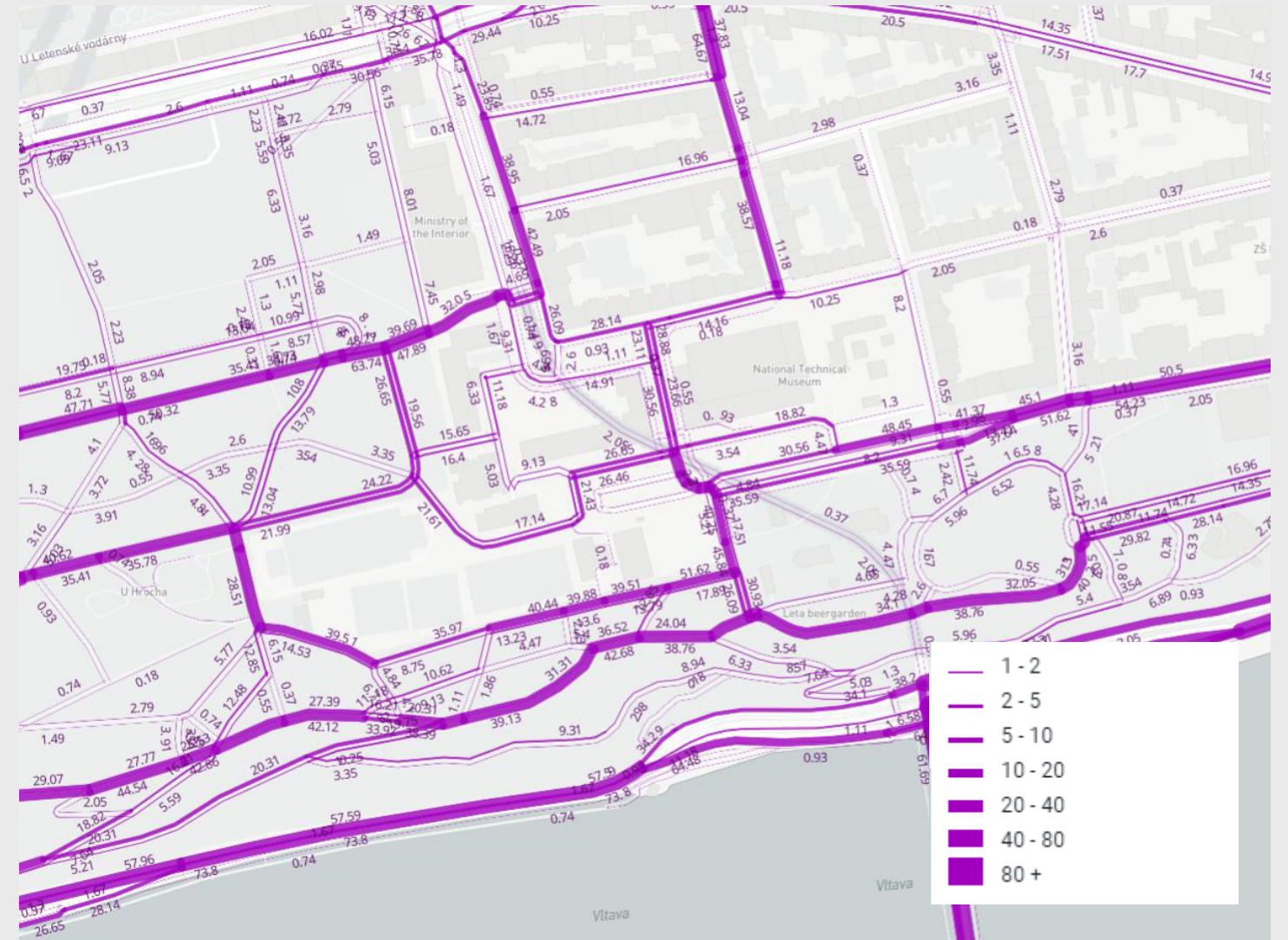
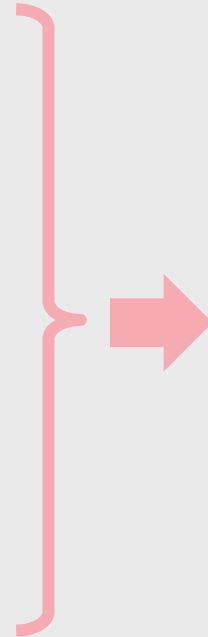
in collaboration with



Traces
Counts
Maps

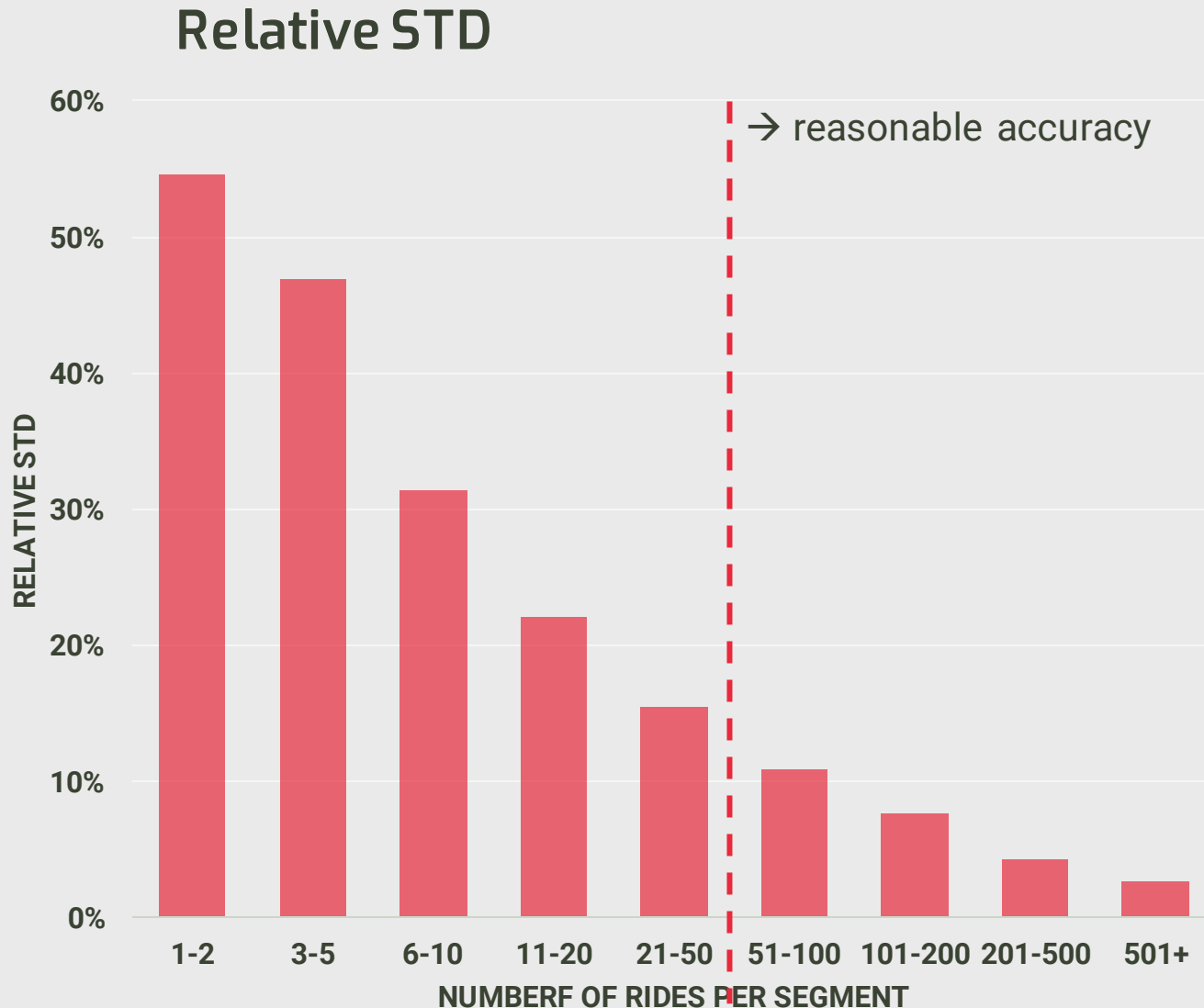


Network building
Network-
matching
Geovisualization
tools



Average daily number of rides per segment

Statistical Evaluation



For 100 thousand
recorded rides

26% of segments

has more than 50
recorded rides in Prague

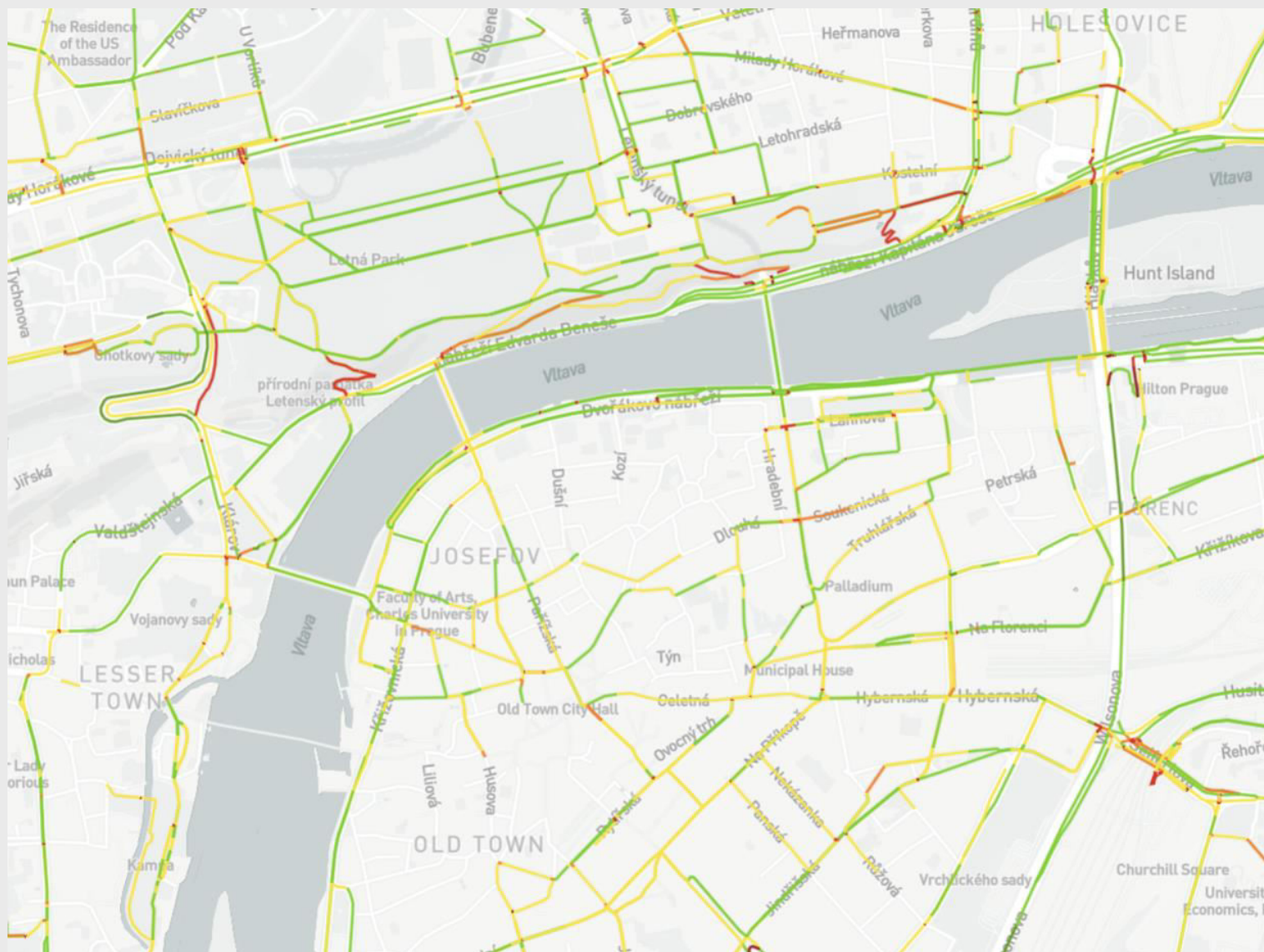
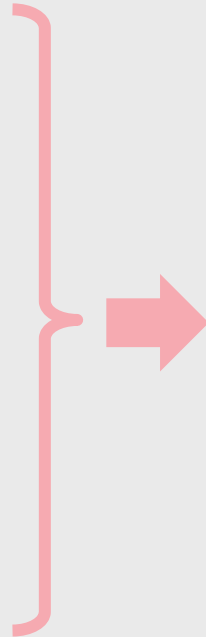
250 rides per sq km

Cycling Speed Maps

Traces
Maps



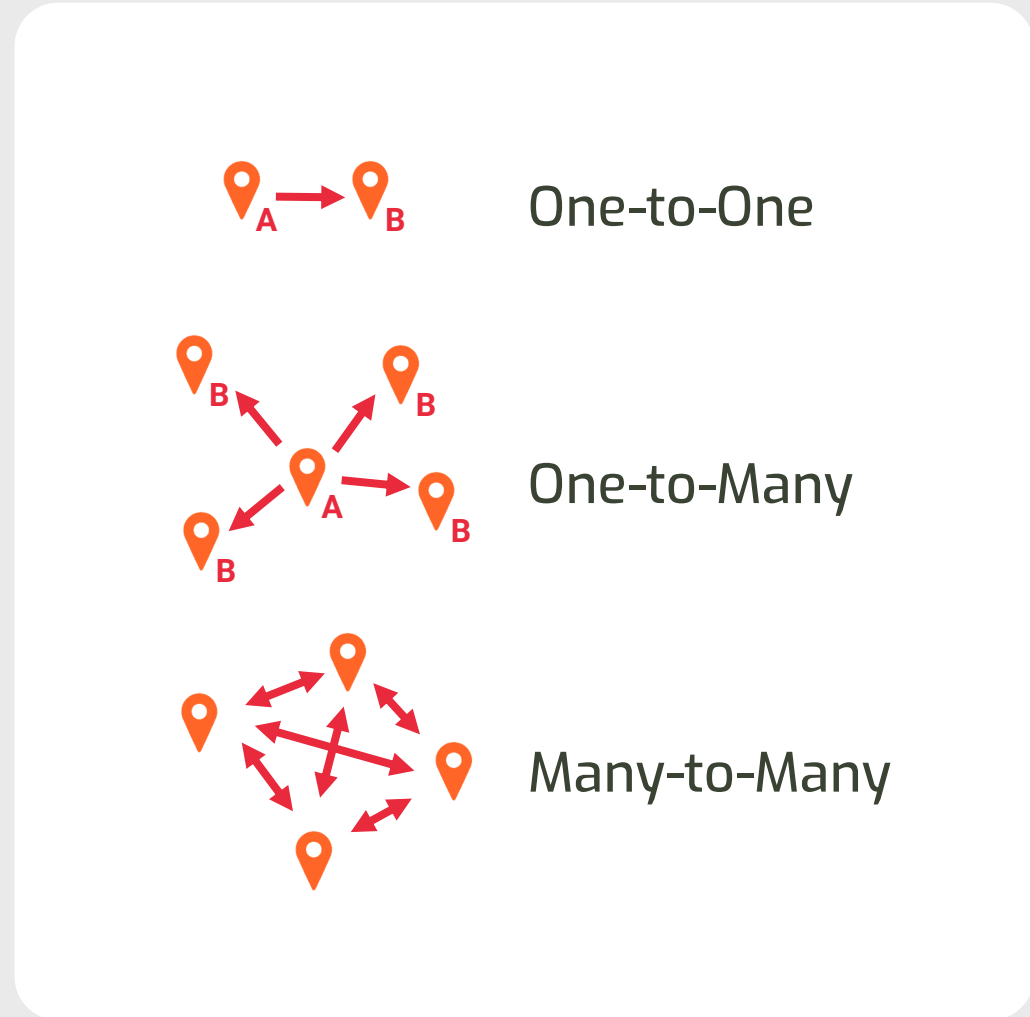
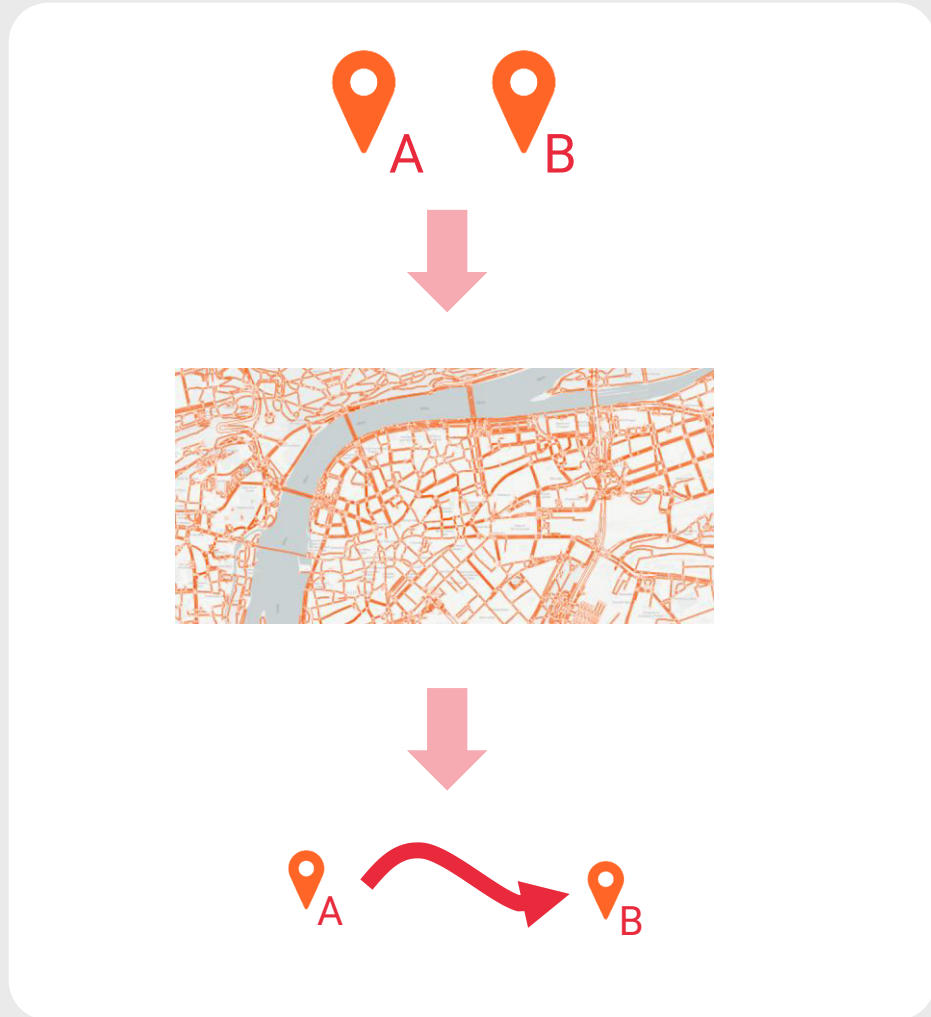
Network building
Network-
matching
Geovisualization
tools





Data Analytics: **Advanced**

Advanced Analytics: Route-Choice Models

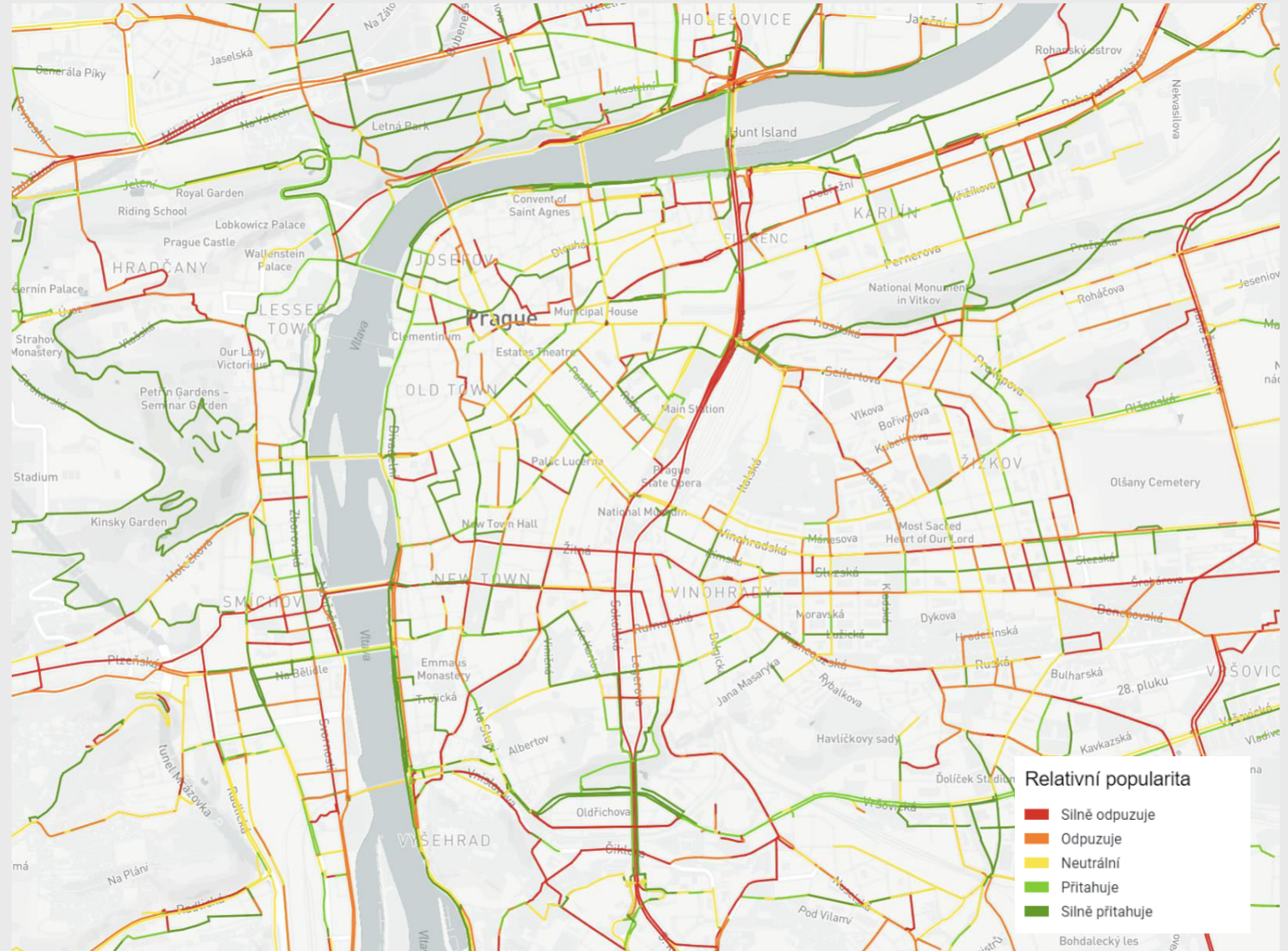
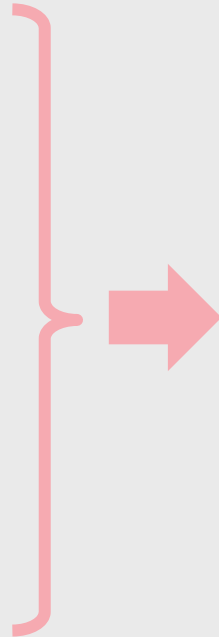


Street Attraction Index

Traces
Counts
Maps



Network building
Network matching
Cycling routing
Geovisualization
tools



Relativní popularita

- Silně odpuzuje
- Odpuzuje
- Neutrální
- Přitahuje
- Silně přitahuje

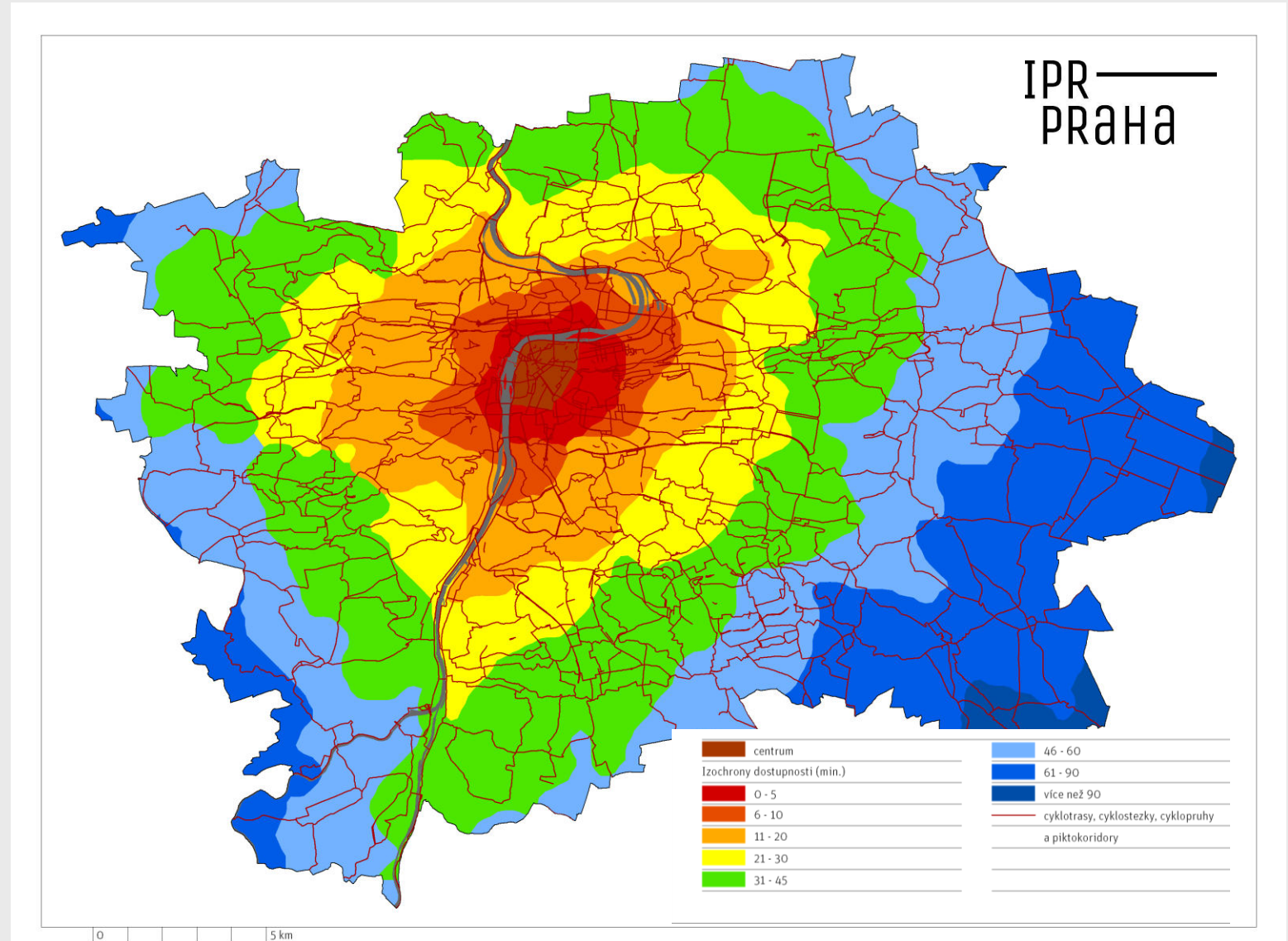
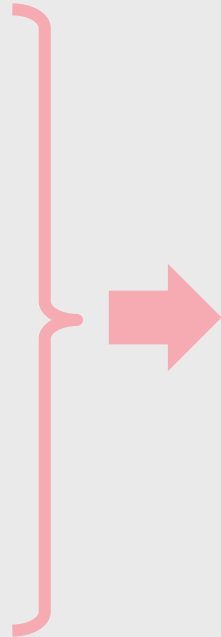
Bohdalecký les

Travel Time Maps

Traces
Counts
Maps



Network building
Network matching
Cycling routing
Geovisualization
tools

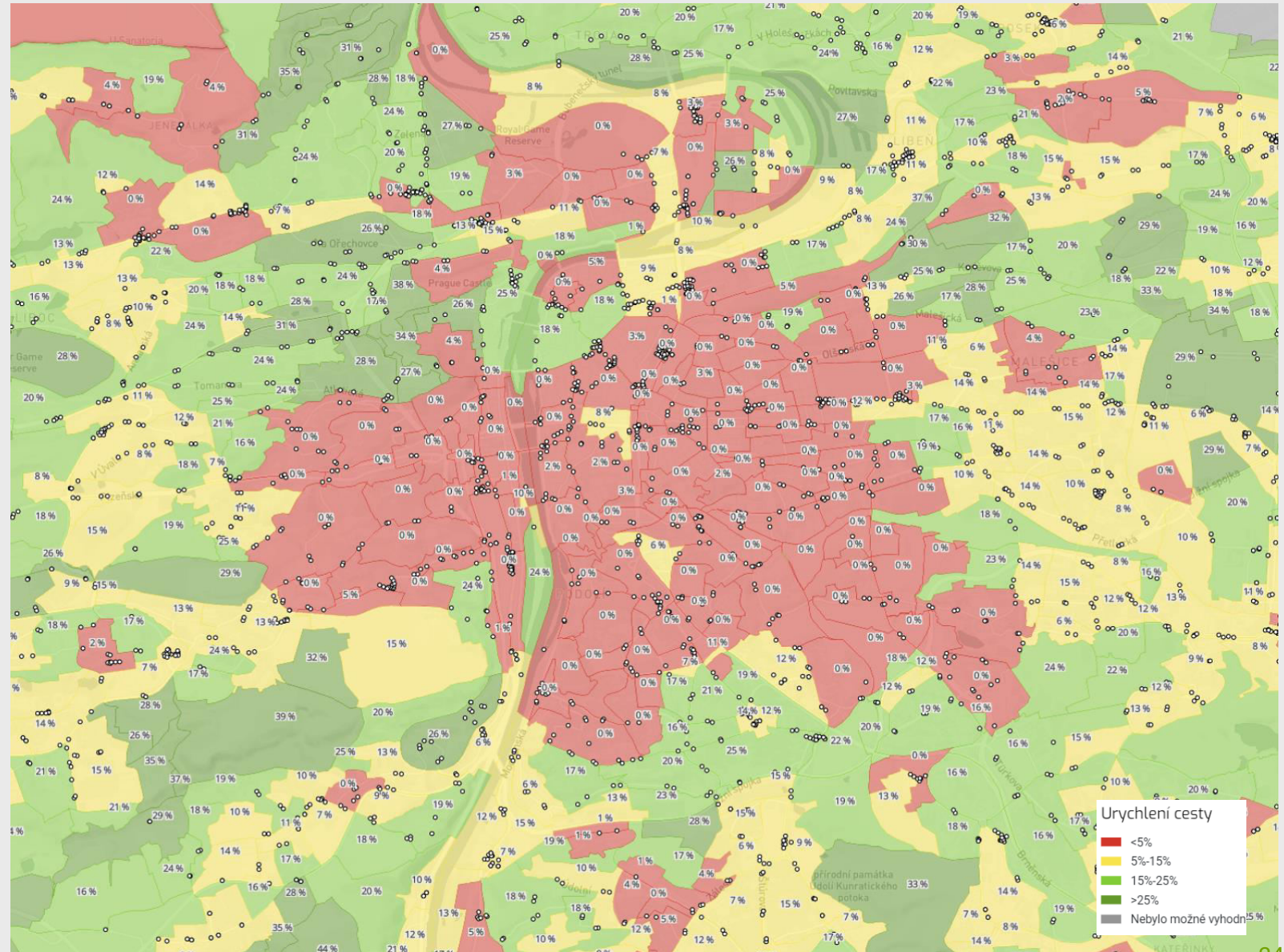
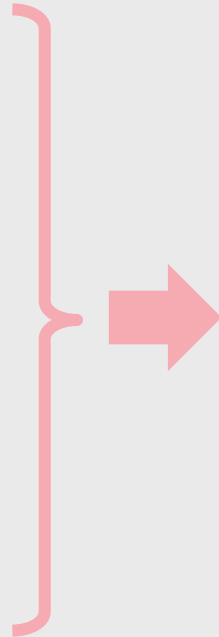


Analysis of B+R Potential (with train / metro / tram)

Traces
Counts
Maps
Timetables
Census



Intermodal
network building
Network matching
B+R routing
Geovisualization
tools





Conclusions

Analytics: Summary



Data



Tools

Basic

- Individual data sets

- **Off-the-shelf generic** data analytics tools

Intermediate

- Multiple data sets
- Cycling networks

- **Off-the-shelf GIS** tools

Advanced

- Multiple data sets
- Cycling network
- Route choice modes

- **Specialized cycling** analytics / modelling / GIS tools

Key Take-Aways

- 1 Cycling analytics is reality and can deliver real changes on the ground.
- 2 Various levels of tools and know-how required for different outputs.
- 3 Less complex analytics can be carried in-house; advanced analytics might require external help.



Thank you!

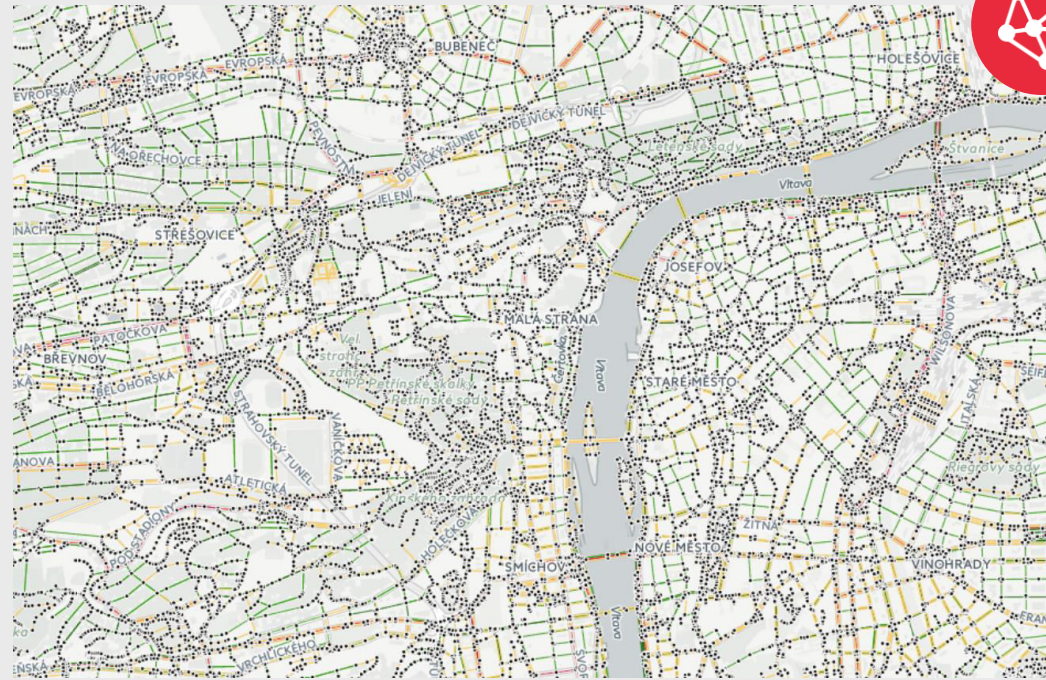
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Meet us:

Stand G5
cyclers.city

Intermediate Cycling Analytics



Various cycling data

Cycling
Networks

Network building
Network matching

Intermediate Analytics: Summary

Data



- **Multiple** data sets
- **Integration** required

Tools



- Advanced, but still **off-the-shelf** GIS tools
- Some **customization** needed

Travel Times to the City Center

in collaboration
with

IPR
PRaha

Traces
(10K+)



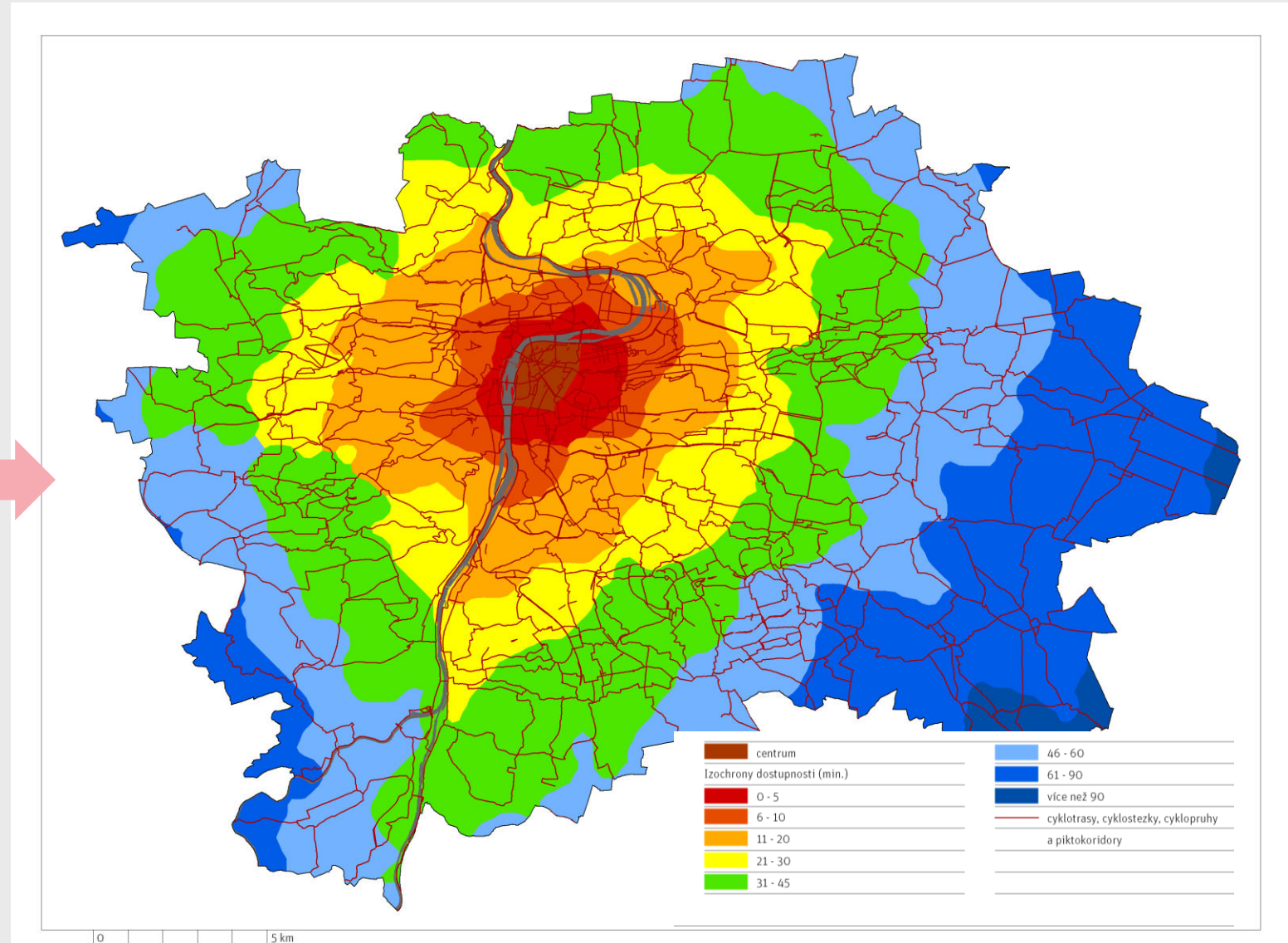
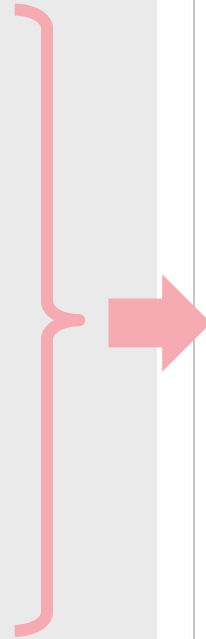
Network
(med detail)



Network
matching



Bicycle
routing



Street Attraction Index

Traces
(100K+)



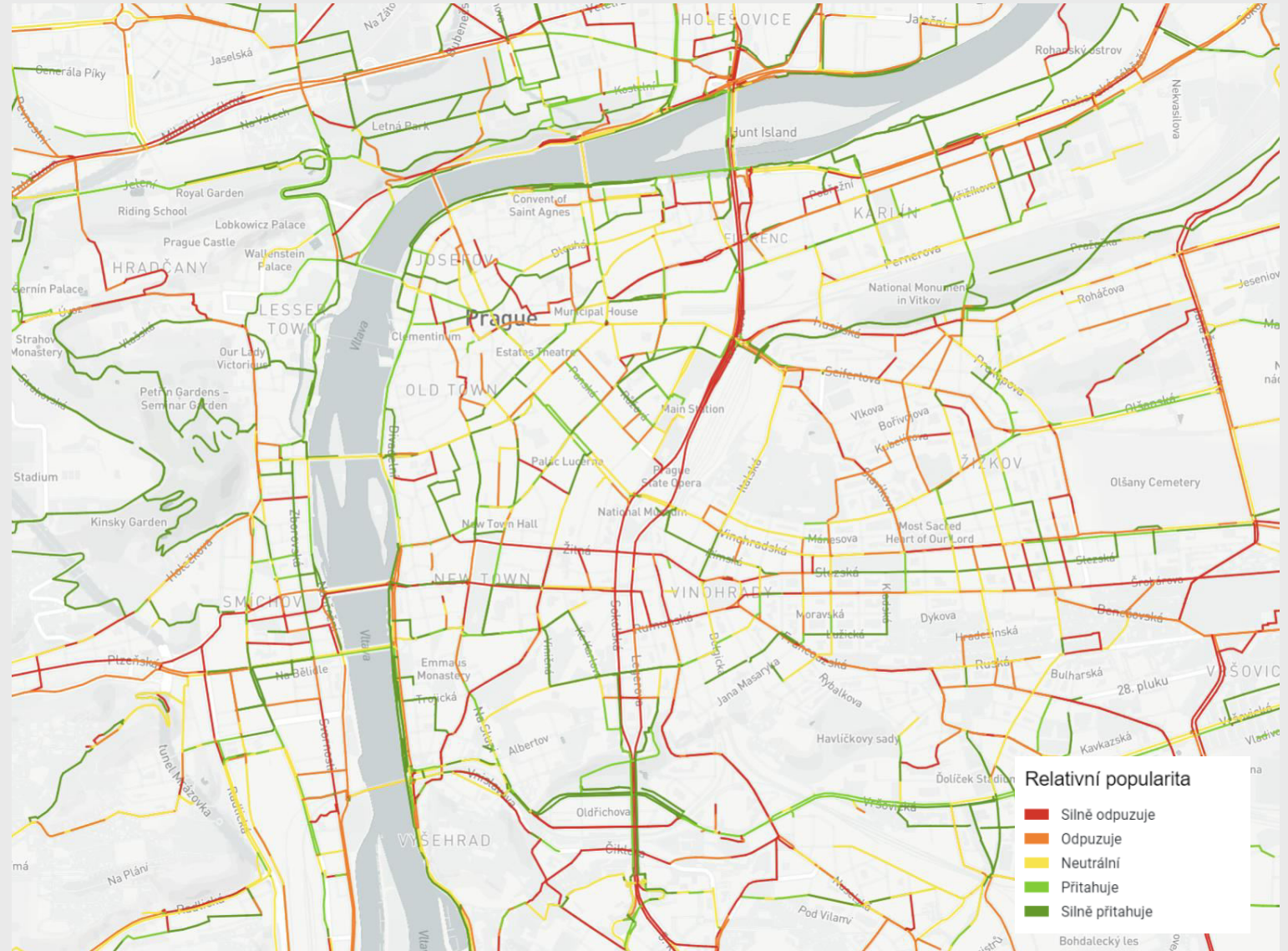
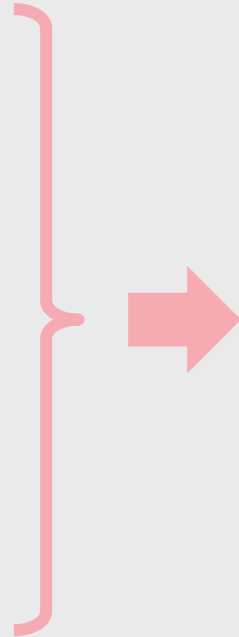
Cycling
Network



Network
matching



Routing



% edges

