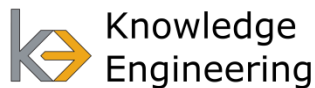


TECHNISCHE
UNIVERSITÄT
DARMSTADT

Creating Noise Pollution Maps Based on User-generated Noise Data

*Axel Schulz, Frederik Janssen,
Jakob Karolus, Felix Mayer, Immanuel Schweizer*

May, 28 2013



Knowledge
Engineering

Telecooperation Lab 

The work is partly funded by a grant of the German Federal Ministry for Education and Research

Technische Universität Darmstadt





Noise Pollution is an increasing problem in urban areas





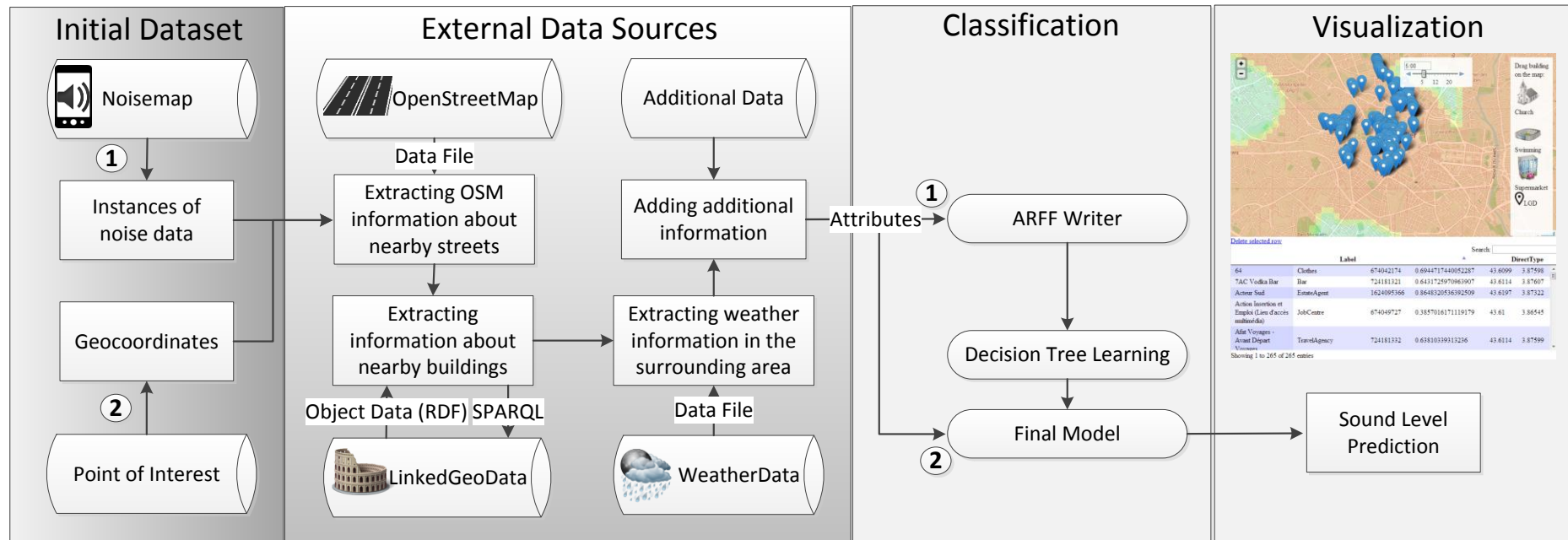
Challenges

- Currently:
 - Noise maps created using a limited amount of sensors, e.g., wireless sensor networks, stationary noise meters, simulation models
 - Disadvantages: high deployment costs, limited coverage, infrequently updated

-> Current approaches not usable for an entire city
- Participatory Sensing as a means to gather large amounts of data
 - Disadvantage: still limited coverage -> data that is still missing has to be generated
- Vision and Contribution
 - Leveraging *participatory sensing* and *machine learning* for creating the first comprehensive system for pollution mapping that is applicable on large scale



Architecture





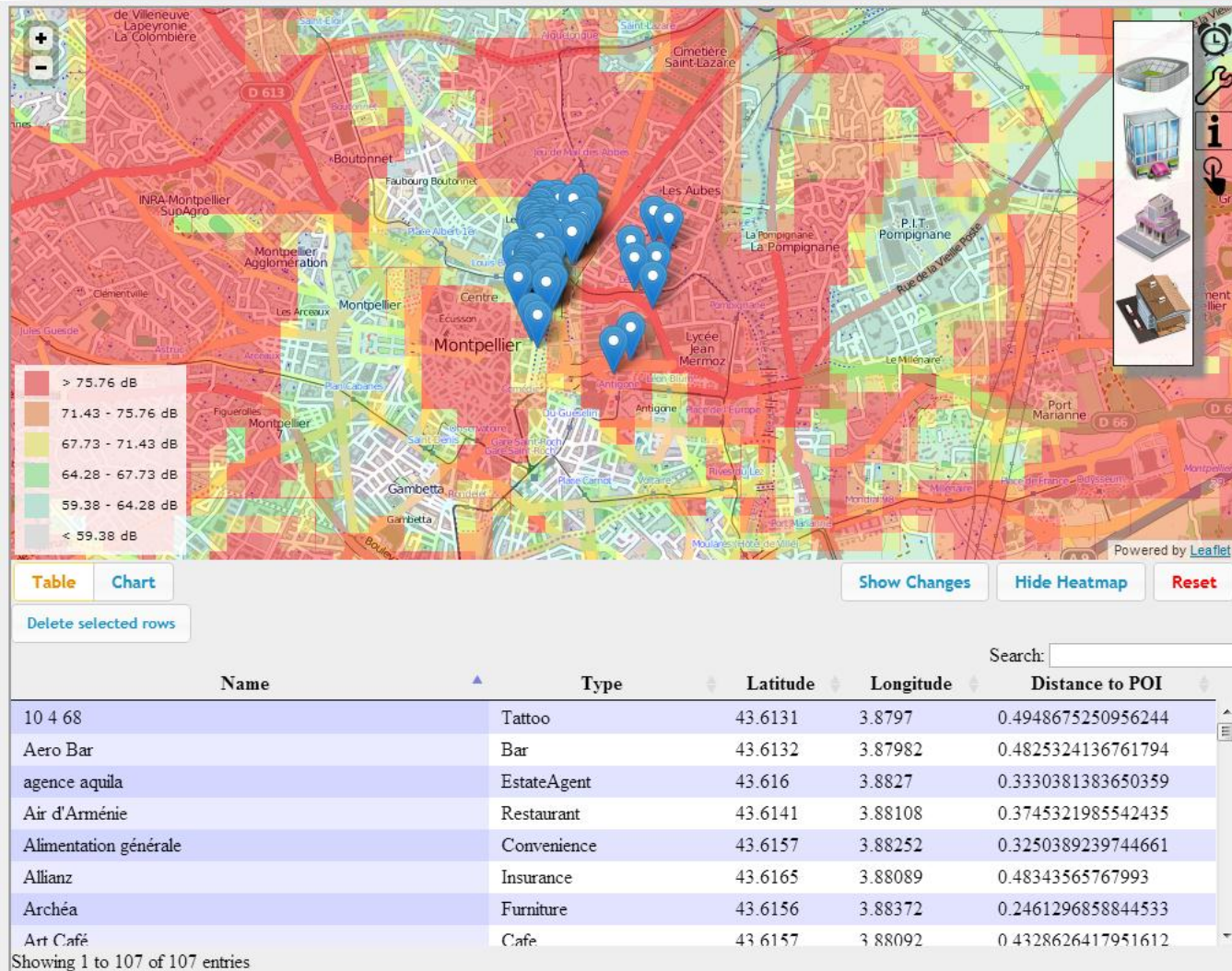
- Dataset
 - Overall we included a total amount of 75,884 measurements taken between the 17th of February and 26th of October 2012 in Rhein-Main Area, Germany
- Evaluation approach
 - Define number of noise levels
 - Train a decision tree classifier
 - Use a 10-fold cross validation to estimate the quality of the model

Classification results for six noise levels

Accuracy	80.9%
Precision	80.8%
Recall	80.9%
F-Measure	80.8%



MINI Screenshot



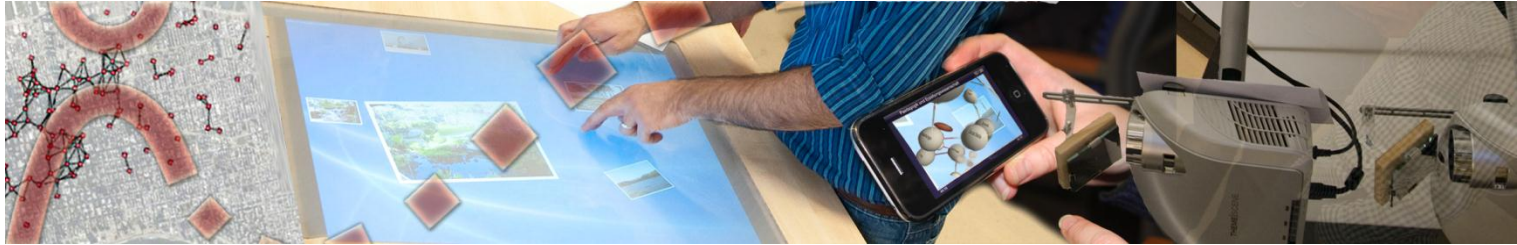


Conclusion and Outlook

- What MINI does
 - First comprehensive system for noise pollution mapping
 - Based on noise data from participatory sensing and background information describing the area where the data was collected
 - High prediction accuracy, easily interpretable, fast classification

- Training and evaluation of a classifier predicting noise levels and iterative optimization relying on comprehensive feature selection methods

- Future Plans
 - Additional knowledge: social media for uncommon events, census data
 - Applying the system to other pollutants



THANK YOU!

Questions?

Can also be addressed to:
aschulz@tk.informatik.tu-darmstadt.de