# **Research in Geoinformatics and Geovisualization**



g2lab Lab for Geoinformatics and Geovisualization

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http://g2lab.net

#### Mission

Research at the **g2lab** is about

visualizing spatio-temporal data to enable the understanding of complex problems and decision making

Touch Table

- applying task-oriented approaches to generate effective and efficient visualizations
- modeling and communicating uncertainties to make decisions more certain

Cartographic algorithms Usability Uncertainties

This poster shows selected research and PhD projects of g2lab.

### **Application oriented projects**

## **Public participation:** PaKOMM



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#### The project's overall research issue is whether current multiuser and multimedia techniques may enhance the efficacy and efficiency of participatory planning procedures. In particular, the systematic combination of visualization types is examined for three participation settings (offsite, on-site, online) and the target devices used.

Partners: FTZ Digital Reality of Hamburg University of Applied Sciences and City Science Lab (HCU) **Funding**: Hamburg Ministry of Science, Research and Equality (BWFG).

#### **Fundamental research**

## **Point generalization** TOVIP

Reducing geometric and thematic clutter and improving the interpretability of static, multi-scale or multi-temporal visualizations of VGI points is a task of major relevance. Conventional generalization methods disperse spatial patterns, reducing the usability in visual presentation and exploration, especially when the interpretation of high-level patterns (e.g. hot spots, extreme values) is of interest.

**Funding**: German Research Foundation (DFG)







## **Climate change:** Sea Level Map

A team of g2lab scientists visualized the scientific results for sea level rise using an interactive web map. The map depicts various climate scenarios of the Intergovernmental Panel on Climate Change and shows, in addition to the flooded area, the number of people affected in northern Germany.

**Co-operation**: Norddeutscher Rundfunk (NDR)

## **Change Detection** Machine Learning & **Multi-source Data**

This PhD project aims to fill the gap between tasks of object based detection with two- and threedimensional data. Using deep learning algorithms, the respective advantages of both two- and threedimensional data are to be combined while compensating for the disadvantages.

PhD project: M.Sc. Güren Dinga







## **Building Information Modelling** Zero O, Speicherstadt

So far there have been no investigations into the CO2-neutral operation of historic buildings. Together with numerous partners, HafenCity University is researching how Block H of Hamburg's warehouse district can be supplied and operated in a CO2-neutral manner by 2040. The g2lab takes over the administration of the building information models (Building Information Models).

**Partners**: BIMlab of HCU, and many others **Funding**: Federal Ministry of Economy and Energy





**Historical Maps** Automated georeferencing

This PhD project aims to develop an automatic method to georeference historical topographic maps. Georeferencing allows easier access and analysis of the troves of historical maps in state archives. Computer vision methods are adapted to the special use case of maps. Specifically, map images are encoded with feature descriptors and correlated with volunteered geographic information by content-based image retrieval.

PhD project: M.Sc. Jonas Luft **Funding**: sharing.city.college, City of Hamburg.



**Cartographic Generalization** Machine Learning & Vector data

This Ph.D. project aims at developing an end-to-end deep learning model for map generalization based on vector data input. The first step is to develop and test encoding schemes that allow deep learning models to directly learn from vector data. In the next step, the focus is on defining loss functions to learn how to adequately modify (i.e. generalize) geometries. The aim of the last step is to develop an end-to-end deep learning model that is able to orchestrate the generalization of a whole map scene consisting of several geometry types and objects.

PhD project: M.Sc. Martin Knura