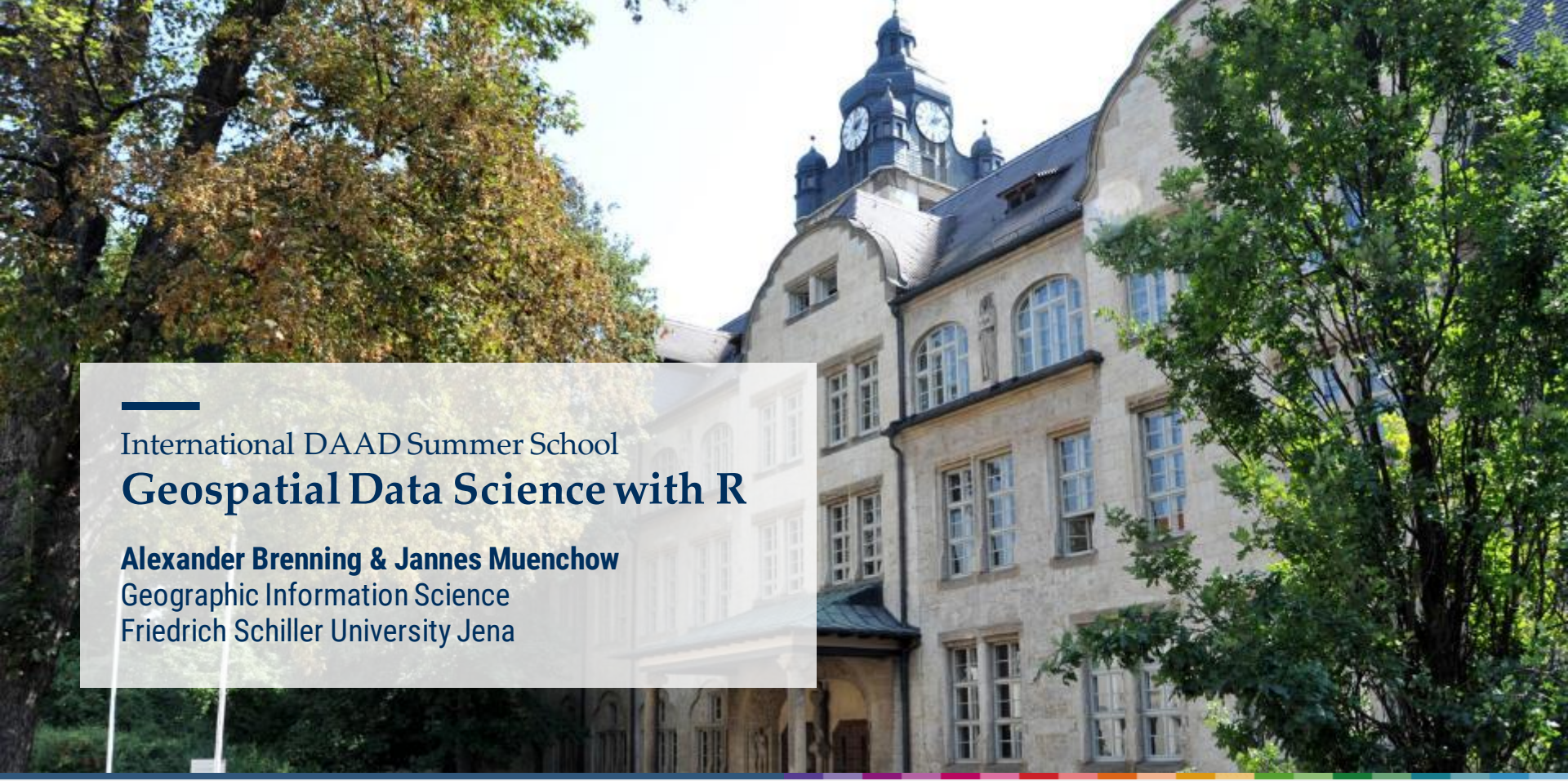


International DAAD Summer School

Geospatial Data Science with R

Alexander Brenning & Jannes Muenchow
Geographic Information Science
Friedrich Schiller University Jena

Objectives

- Learn advanced open-source geocomputing using R
- Get to know statistical and machine learning methods for geospatial modelling… and their pitfalls
- Apply these methods in selected case studies
- Discuss modelling challenges you encounter
- Grow your network of like-minded young researchers
- Get to know the geography of Jena and its surroundings

Welcome to Jena!

Jena

- 111.000 inhabitants
- University town (20% of pop.)
- Research centers (Max Planck Institutes, DLR, …)
- Optical, biotech, IT and other high-tech industries
- Most affluent town in former East Germany

Friedrich Schiller University

- Founded in 1558
- Named after national poet Friedrich Schiller, who was a professor in Jena
- Traditional comprehensive university
- Famous professors include Carl Zeiss, Hegel, Karl Marx, Ernst Haeckel
- 18000 students (13% international)

Geography & GIScience in Jena

Academic programs (intake ~260 students annually)
Geography (BSc, MSc, PhD, secondary school teachers)
Geoinformatics (MSc, PhD)

Thematic focus areas
Environmental modelling and geospatial data science
Biogeochemical cycles
Landscape history and paleo climate
Radar remote sensing
Regional economic development and transformation
Sustainability

Local research partners
Max Planck Institute for Biogeochemistry
DLR Institute for Data Science

The GIScience Group

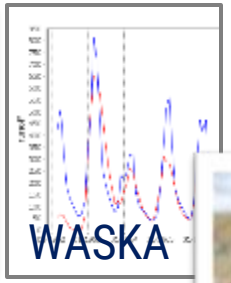
Prof. Dr. Alexander Brenning

Dr. Jannes Münchow

Environmental Statistics & GeoComputation

Environmental Modelling Software and Data Management

Dr. Sven Kralisch



Dr. Manfred Fink

Ecohydrological Modelling

Monitoring of Earth Surface Processes

Dr. Helene (Petschko) Goetz

Dr. Sophie Biskop

Jason Goetz

FRIEDRICH-SCHILLER-UNIVERSITÄT JENA

Summer School Organizers

Academic Program
- Prof. Dr. Alexander Brenning
- Dr. Jannes Muenchow

Administration
- Bettina Böhm
- Dr. Jannes Muenchow

IT Support
- R issues: Dr. Jannes Muenchow
- WiFi & general IT issues: Andreas Schäf (sys admin)

Sponsor

DAAD Deutscher Akademischer Austauschdienst
German Academic Exchange Service

Bettina Böhm

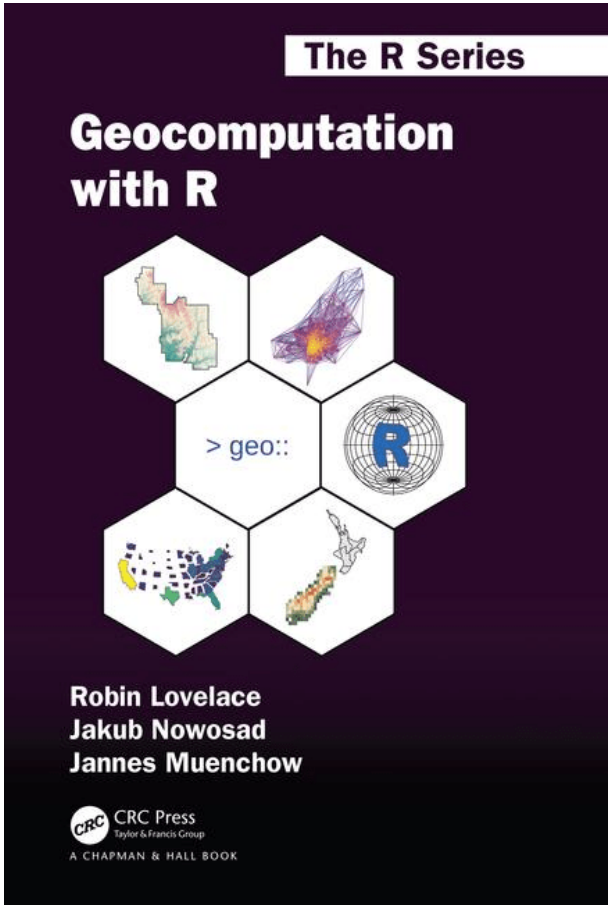
Summer School Program Overview

Monday: Geospatial Data in R

Introduction(s)

Geospatial Data and Geocomputing in R
- Dr. Jannes Muenchow, Univ. Jena

Visualizing Geospatial Data in R
- Dr. Tim Appelhans



https://geocompr.robinlovelace.net/

Tuesday: R & GIS / Introduction to Modelling

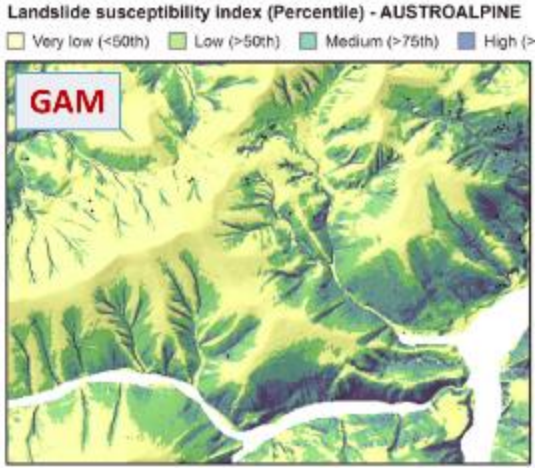
R as a GIS
- Dr. Jannes Muenchow, Univ. Jena

Research Data Management
- Dr. Roman Gerlach, Univ. Jena

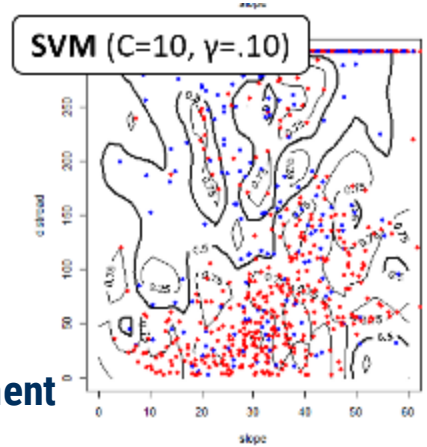
Parallel Sessions:

Environmental Modelling and Remote Sensing
- Jun.-Prof. Dr. Hanna Meyer, Univ. Münster

Modelling Natural Hazards
- Dr. Helene Goetz, Univ. Jena



Wednesday: Statistical and Machine Learning

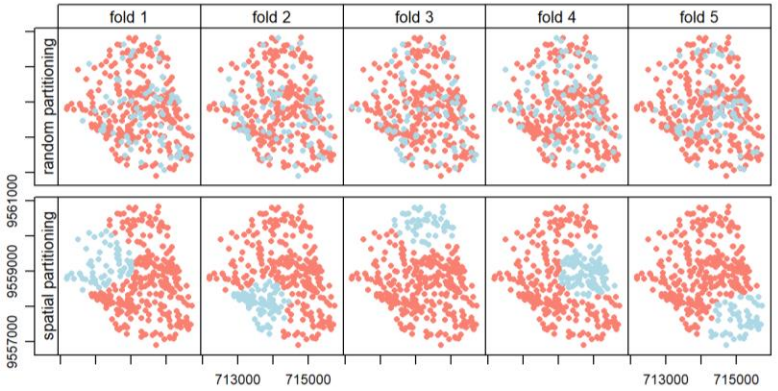


Assignment of Modeling Tasks and Teams

- Groups of 3-4 students, topics e.g. predictive modelling of landslides, feature selection in remote sensing data, analysis of vegetation communities etc.
- Propose your own topic, use your own data?

Statistical and Machine Learning Techniques:Overview & Performance Assessment

- Prof. Dr. Alexander Brenning & P. Schratz, Univ. Jena



Parallel Sessions:

Ordination Techniques

- Dr. Jannes Muenchow, Univ. Jena

Hyperspectral Data Analysis

- P. Schratz, Univ. Jena

Wed. or Thu. evening:
Hike to Fuchsturm beergarden
(weather permitting)

Thursday: Data Science and Modelling Challenges

Group work on assigned tasks

Student Poster Presentation

- Did you bring a poster? Still need to print it?

Group Discussions on Methodological Challenges

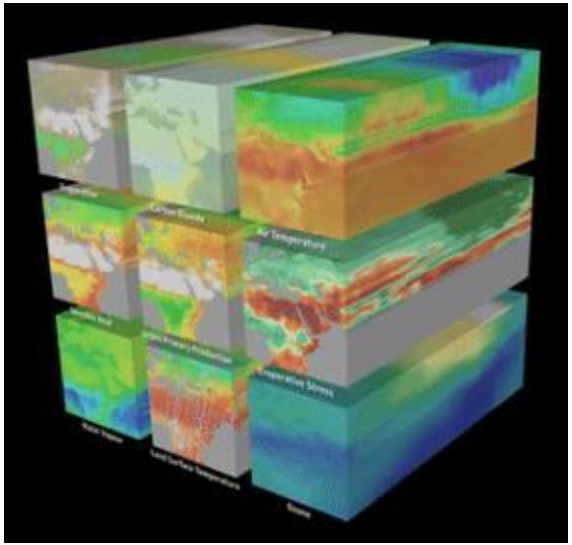
- ~3-5 groups
- Topics related to group work or to your MSc/PhD research
- Typical issues include…
  - Sampling design
  - High dimensionality and feature selection
  - Making your research reproducible
  - Dealing with missing data
  - …

Friday: Spatio-Temporal Patterns and Trends

Earth System Data Cube
- Fabian Gans, Max Planck Institute for Biogeochemistry, Jena

Multiple Testing Problem in Spatial Trend Analysis
- José Cortés, PhD student, Univ. Jena

Closing Discussion



M. Mahecha / MPI-BGC / ESA

Evening: Barbecue in Paradise Park (weather permitting)

Saturday: Field Trip to Kyffhäuser Mountains

Things we'll discover

- Sinkholes
- Cave in gypsum(!) rock
- Leaning church tower
- Kyffhäuser monument
- Awesome views!

Logistics (Questions? → Bettina Böhm)

- Departure time: 8:00am from bus station
- Return time: 6:00pm (-ish)
- Prepare for cool temperatures in the cave
- Use sun screen
- Check for ticks in the evening


Gerhard Otto / Deutsche Fotothek

Heart-shaped sinkhole as seen from a UAV

© Helene Goetz

Other Things You Can do in Your Free Time

- Visit **Buchenwald concentration camp memorial** near Weimar (half day)
- Enjoy great views from the **visitor platform of the JenTower** high-rise office building (30 minutes, ~3 € fee)
- Hike (or run) in the **hills around Jena** (don't get lost, use OpenStreetMap)
- Visit the **Zeiss planetarium** (~90 minute movies in German only)
- Visit the **historic city center of Erfurt** (half day; 30-minute train ride)

This summer school was generously sponsored by:

DAAD Deutscher Akademischer Austauschdienst
German Academic Exchange Service

Enjoy the
Summer School!