Term project Spatial Statistics & Machine Learning

1. General

Objective: apply and adapt machine learning and/or spatial statistics techniques to a real-world problem in a group.

Methods: finding and cleaning spatial data, selecting the technique(s) and variables, implementing the method/ model, and visualizing and interpretating the results.

Criteria, you should:

- Use at least one spatial dataset;
- Use at least one spatial statistics or machine learning technique;
- Which is implemented by coding in Python or R; and
- Visualize your output in at least
    - one graph (plot)
    - and one map

The workload should be fitting two weeks (half-time) work for three students. The first idea is pitched in a practical as a project pitch (see section 2). Furthermore, the following output is expected:

- a scientific paper of 1500 words (section 0),
- a poster (section 4), and
- scripts (section 0).

2. Project pitch

During this practical, each group presents the topic that they propose to study during the term project. After each presentation, there is the option to ask questions and provide feedback on the objectives and feasibility of the proposal. After all the topics have been presented, there will be an opportunity to discuss the topic in more detail with the staff and possibly redirect the project.

2.1 Procedure

- The duration of the pitch should be 4 minutes, followed by some minutes of questions and feedback.
- The presentation should be in Microsoft PowerPoint format (.pptx), or in Adobe pdf (.pdf).
- One student should give the presentation.
- There will be two parallel sessions with pitches, see course guide. We will distribute the groups over these sessions.

2.2 Content

The pitch should clarify the proposal of what you want to study. It contains at least:

- Short intro/background
- Aim and preferably a research question
- Data and rough idea of the method
- Expected result/deliverable (what do you plan to plot/map?)

3. Research paper

3.1 Guidelines

- You should write a scientific short paper, following the standard structure: introduction, study area, data and methods, results, discussion (these two may be combined), and conclusion. As a reference guide for scientific writing, we added the guide on scientific writing (Geo-guide-for-scientific-writing-apr2015.pdf) to the course materials on Blackboard.
- The length of the paper should be no more than 1500 words, excluding tables, figures, references and appendices. This requires a concise writing style and good use of figures to support the line of reasoning.
- Add the script of your analysis or a link to your Github code (accessible!) in the appendices. Scripts should be organized well and contain comments to explain functionality.
- The most important components of the paper are the
    - Introduction, to frame the research and to zoom in on the specific and measurable aim and/or research question. Make sure you refer to the relevant scientific literature to limit the scope of your problem.
    - Methods, to give the steps of the analysis and the type of validation that was carried out. Justify the choices you made.
    - Results, to take the reader from the initial data to analysis results and possible data reduction. Make sure that the result section has a storyline and is not a sequential and unconnected description of various figures.
    - Discussion, to interpret you results in the context of existing literature. You may have a combined results and discussion section.
- The weights of each chapter for the final grade of the paper are:
    - Introduction = 5
    - Study area = 1
    - Data and methods = 5
    - Results = 5
    - Discussion = 2
    - Conclusion = 2

3.2 Peer feedback session

In the peer feedback session, you will receive peer feedback on the paper you are writing for the term project and provide peer feedback on the work of others. This is not an assessment and it will not be used for grading. It is meant to learn from reviewing other projects: it helps the authors in being precise and it helps the reviewer by recognizing structure in the paper and the sections.

The peer feedback session will consist of three parts:

1. Plenary session with all groups (10 minutes).
2. Review papers in a pairwise manner.
3. Breakout sessions with the groups supervised by the teaching staff. We will discuss any remaining open questions, focusing on techniques, validation and visualization.

Feedback in part two should comprise four aspects, following the habits of peer review of scientific papers:

1. Summary of what you think the paper covered. This is not necessarily the same as what the authors intended.
2. Objectives: do they follow logically from the introduction and are all methods and results logically linked to these objectives. Make suggestions for more specific and measurable alternatives.

3. Points for improvements and great achievements (tips & tops).
4. Detailed feedback on grammar and spelling in the main document.

4. Poster

4.1 Guidelines

- The poster should display your main question, findings and conclusions of your term project.
- This means that it does not need to contain all your results! "Kill your darlings."
- The design of the poster should be guided by the document 'A guide for making posters and infographic January2022.pdf' available on Teams.
- The evaluation of the poster follows the rubric on BB, which is based on the general poster rubric of the Faculty of Geosciences.

4.2 Poster session

You will present the research in a poster presentation. Note the deadline for poster submission on Blackboard is strict, because we need time to print the posters.

For the presentation, keep the following points in mind.

- Each project group is split in two subgroups of one or two persons. One subgroup stays with the poster to present. The other subgroup walks around to visit all the other posters.
- After 75 minutes, the groups are changed.
- The presentation should pitch the main research finding and should take around one minute.
- You are expected to actively engage with the poster presenter: ask questions, discuss limitations and further opportunities, new questions that arise.

5. Submission and final grade

Based on the feedback that you got from the peer feedback session and the poster presentation, you should revise your paper. The final version of the paper should be submitted on Blackboard. For the computation of the final grade and all deadlines, see the course guide and the modules in BB where you hand in the poster and paper.