



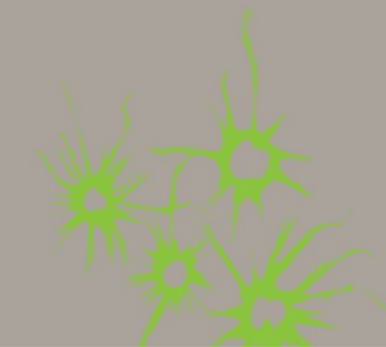
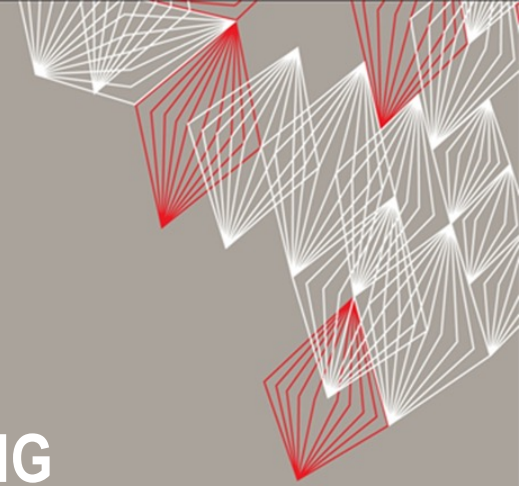
GEOSPATIAL DATA ANALYSIS AND SPATIOTEMPORAL MACHINE LEARNING WITH PYTHON

INTRODUCTION TO THE COURSE

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LEARNING OBJECTIVES

1. Create scientific notebooks to perform interactive analysis of spatio-temporal data.
2. Organize and explore geospatial data.
3. Choose and apply a suitable machine learning method for a given problem and interpret the results.
4. Combine various analytical methods to solve a basic case study.

TOPICS

The learning process is built around the following main topics:

- Principles of Jupyter Notebook and interactive programming
- Principles of data management and geospatial database operation
- Introduction to exploratory (spatial) data analysis
- Introduction to data mining and machine learning methods (clustering, classification, and regression tasks)
- Working with real case studies

COURSE SCHEDULE

- Three weeks of lectures (October 11th - October 28th)
- Two weeks for a case study and one week for evaluation/exam in November
- Materials and announcements will be published in Moodle

Slot	Time (NL)	Time (BD)	Content
1	6.30-9.00	10.30-13.00	Work on exercises / Reading material
2	9.00-10.00	13.00-14.00	Lunch break
3	10.00-11.30	14.00-15.30	Feedback session & Online Live Lecture 1 (OLL1)
4	11.45- 12.45	15.45-16.45	Online Live Lecture 2 (OLL2)

TIMETABLE

- Mix of online lectures and practicals (exercises and guided discussions)
- Plan and use well the self-study slots

Day	Content	Phase
1	Introduction to the course and Geospatial data	Learn & Practice
2	Python review and introduction to Jupyter Notebook	
3	Data management and database	
4	Geospatial database	
5	EDA and ESDA	
6	Introduction to Machine Learning	
7	Clustering and regionalization	
8	DT and RF	
9	ANN	
10	Model validation and HPO	
11	Advanced RS image classification	
12	studies and project kick off	

Spatio-temporal analysis with Python

- The diagram illustrates a workflow for land cover classification using Remote Sensing (RS) images and Geodata solutions.

Top Left: RS image
A satellite image showing a landscape with various land cover types, including fields, forests, and urban areas.

Top Right: Geodata solutions
A Python script snippet and the Python logo, indicating the use of Python for data processing and analysis.

Bottom: Land cover map
A map showing the results of the classification, with different land cover types represented by different colors. The map is divided into 16 distinct regions, each corresponding to a specific land cover type.

Legend:

 - 1-Alfalfa
 - 2-Corn-no till
 - 3-Corn-min till
 - 4-Corn
 - 5-Grass/pasture
 - 6-Grass/tree
 - 7-Grass/pasture-mowed
 - 8-Hay-windrowed
 - 9-Oates
 - 10-Soybeans-no till
 - 11-Soybeans-min till
 - 12-Soybeans-clean till
 - 13-Wheat
 - 14-Woods
 - 15-Bldg-Grass-Tree-Drives
 - 16-Stone-steel tower

ASSESSMENT

The assessment will be based on group projects (70%) and individual oral examinations (30%)

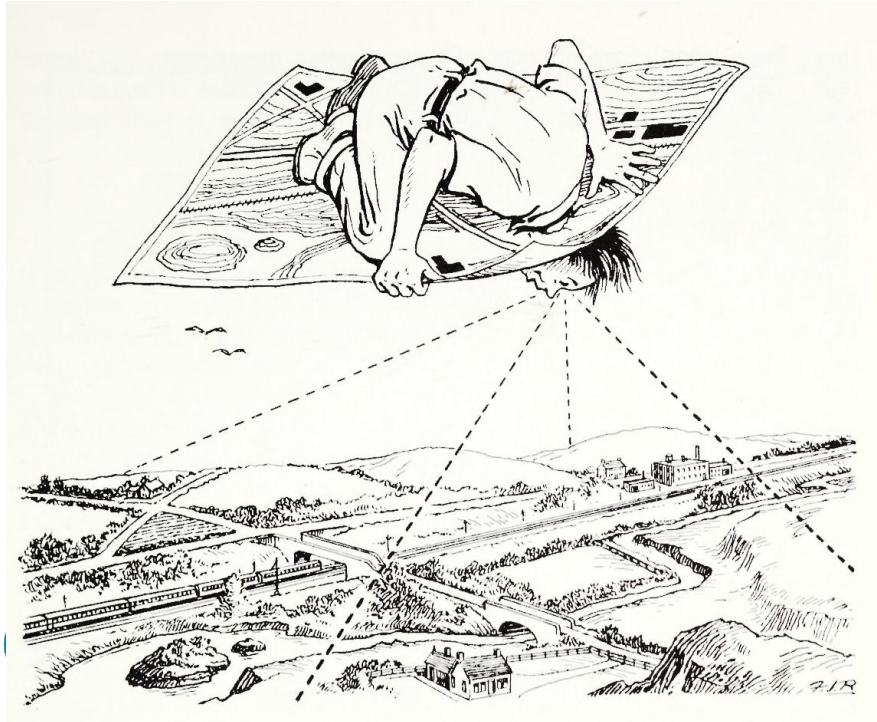
- The project assessment will be done based on 15 mins presentation and preparation of a well-documented Jupyter notebook
- The oral examination will be done after the project presentation (± 10 mins per student)

REFLECTION

- In this course, you will not be able to create a sophisticated workflow/model
- Hence, a critical reflection on the choices made is fundamental
- You can reflect on:
 - Design of your model
 - Use of data
 - The way you evaluate and present the outcomes of your model
 - The way you describe your model
 - ...

REMEMBER

Look beyond the map

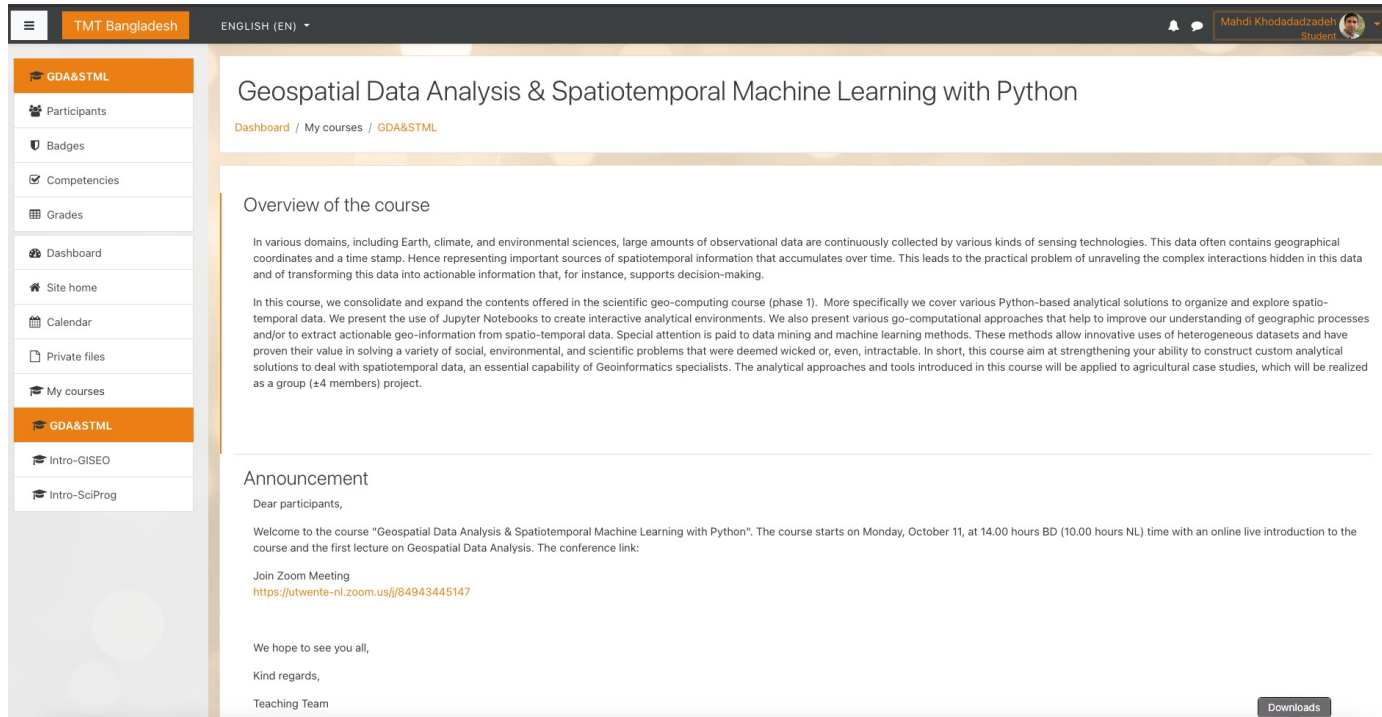


Get organized



MOODLE

Materials will be added on the go ...
check regularly



The screenshot shows a Moodle course interface. At the top, the header includes 'TMT Bangladesh', 'ENGLISH (EN)', and a user profile for 'Mahdi Khodadadzadeh Student'. The left sidebar contains a navigation menu with items like 'GDA&STML', 'Participants', 'Badges', 'Competencies', 'Grades', 'Dashboard', 'Site home', 'Calendar', 'Private files', 'My courses', and 'GDA&STML' (highlighted). The main content area displays the course title 'Geospatial Data Analysis & Spatiotemporal Machine Learning with Python' and a breadcrumb trail 'Dashboard / My courses / GDA&STML'. Below this is an 'Overview of the course' section with a paragraph about data collection and analysis, followed by a paragraph about the course content. An 'Announcement' section follows, starting with 'Dear participants,' and providing details about the course start date (Monday, October 11, 14:00 hours BD) and a Zoom meeting link: <https://utwente-nl.zoom.us/j/84943445147>. The announcement concludes with 'We hope to see you all,' 'Kind regards,' and 'Teaching Team'. A 'Downloads' button is located at the bottom right of the page.

GETTING TO KNOW EACH OTHER

https://docs.google.com/forms/d/e/1FAIpQLSfs4rPRVaZkNGwTq3mjDy0QWYmXyl-HEhUvpOkCWjwPxEH11A/viewform?usp=pp_url