Venice International University
VIU Graduate Seminar
Towards Geo-Data Science: extracting knowledge from heterogeneous geoenvironmental data

May 20-24, 2024

Faculty

- Marj Tonini, University of Lausanne, Switzerland (Coordinator)
- Sebastiano Trevisani, University IUAV of Venice, Italy (Co-coordinator)
- Pietro Omodeo, Ca' Foscari University of Venice, Italy (Co-coordinator)
- Dario Camuffo, National Research Council of Italy, Institute of Atmospheric Sciences and Climate ISAC, Padua, Italy
- Filippo Catani, University of Padua, Italy
- Donata Canu, National Institute of Oceanography and Applied Geophysics OGS, Italy
- Paolo Fabbri, University of Padua, Italy
- Mikhail Kanevski, University of Lausanne, Switzerland
- Francesco Luzzini, Ca' Foscari University of Venice, Italy, and Johns Hopkins University, USA
- Alejandra Morán-Ordóñez, University of Lausanne, Switzerland

Day 1 | Monday, May 20

09:00-09:30 – *Registration*

09:30-09:45 – Introduction to the course (Tonini)

09:45-10:30 – Students' presentations

Keynotes talks - part 1 (chair: Trevisani & Omodeo)

10:30-11:15 – Data driven modelling: fundamental challenges and tools (Kanevski)

11:15-11:30 – *Break*

11:30-12:15 – Thus was closed the cycle. Natural philosophy and the early modern debate on the origin of springs: a historical and experimental inquiry (Luzzini)

12:15-13:00 – When humanities and Earth sciences meet: proxies to reconstruct the relative sea level rise from documentary written sources, visual arts, urban features and archaeology (Camuffo)

13:00-14:00 – *Lunch*

Keynotes talks - part 2 (chair: Tonini & Trevisani)

14:00-14:45 – Geo-, Bio-, and Anthropocene-spheres: A Venetian Perspective into the Environmental Humanities (Omodeo)

14:45-15:30 – Integrated modelling tools for Venice Lagoon ecological resilience (Canu)

15:30- 15:45 – *Break*

15:45-16:30 – AI for Prevention and Sustainable Management of Geo-Hydrological Hazards (Catani)

16:30-17:15 – The influence of natural and anthropogenic factors on landscape patterns and species distributions (Morán-Ordóñez)

Day 2 | Tuesday, May 21

09:20-9:30 – Introduction to day 2 (Trevisani)

09:30-10:15 – Geostatistics, key concepts: spatial continuity, interpolation, random functions, etc. (Trevisani)

10:15-11:00 – Case study keynote (Fabbri)

11:00-11:15 – *Break*

11:15-13:00 – Geostatistics: kriging algorithms, local and spatial uncertainty (Trevisani)

13:00-14:00 – *Lunch*

14:00-15:30 – Student activity: the R environment (geostatistical package GSTAT) and the exploratory data analysis (Trevisani & Tonini)

15:30- 15:45 – *Break*

15:45-17:15 – Student activity: ordinary kriging with GSTAT (Trevisani)

17:15-17:30 – Discussion

Day 3 | Wednesday, May 22

09:20-9:30 – Introduction to day 3 (Tonini)

09:30-10:15 – Geo-Data science: main definitions and general introduction (Tonini)

10:15-11:00 – Predictive learning: main concept and tools in machine learning (Kanevski)

11:00-11:15 – *Break*

11:15-13:00 – Introduction to K-Nearest Neighbors, Multilayer perceptron, and Support Vector Machine (Kanevski)

13:00-14:00 – *Lunch*

14:00-15.00 – Student activity: practical exercise on kNN, SVM, MLP with applications (Kanevski)

15:00 - Field Trip: (In)visible traces: Water management in early modern Venice (Luzzini)

19:00 – Social Dinner in Venice (San Trovaso Restaurant)

Day 4 | Thursday, May 23

09:20-9:30 – Introduction to day 4 (Tonini)

9:30-11:00 – Species distribution models (SDMs); predictions, variables selection and bias (Morán-Ordóñez)

11:00-11:15 – Break

11:15-13:00 – Student activity: fitting distribution models from multi-decadal time slices and evaluate the model (Morán-Ordóñez)

13:00-14:00 – Lunch

14:00-14:45 – Machine learning based approaches for susceptibility assessment of environmental natural hazards (Tonini)

14:45-15:30 – Student activity: Random Forest for wildfires and landslides susceptibility mapping

15:30- 15:45 – Break

15:45-16:15 – Explainability and interpretability Machine Learning (Tonini)

16:15-17:15 – Student activity: susceptibility assessment and variable importance ranking (Tonini)

17:15-17:30 – Discussion

Day 5 | Friday, May 24

09:20-09:30 – Introduction to student activity (Tonini & Trevisani)

09:30-10:15 - Q&A session

10:15-11:00 – Student activity session: catching up on previous activities.

11:00-11:15 – Break

11:15-12:45 – Student activity session: catching up on previous activities.

12:45-13:00 – Discussions

13:00-14:00 – Lunch

14:00-15:30 – Student activity session: work on your own personal project

15:30- 15:45 – Break

15:45-17:15 – Student activity session: work on your own personal project

17:15-17:45 – Closure of the seminar