



SGA 2023

Mineral Resources in a Changing World



SC1: Geoscientific data analysis and mineral prospectivity mapping using open-source geospatial applications (GisSOM and QGIS)

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Pre-conference short course 27-28 August 2023, ETH Zürich

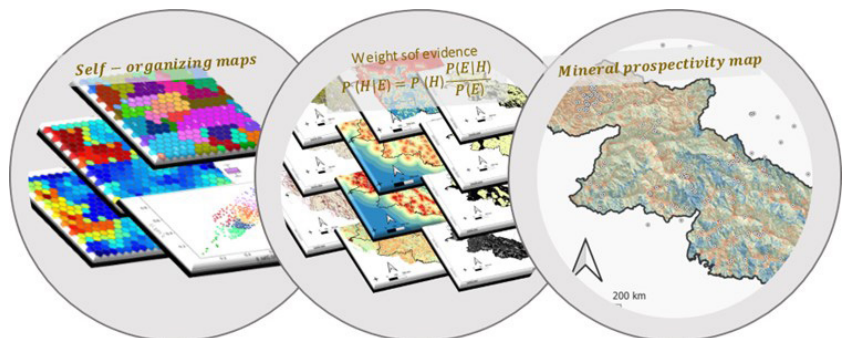
The course consists of two separate parts that aim at familiarizing participants with (1) unsupervised clustering of multivariate geoscientific datasets using self-organizing maps and (2) Mineral prospectivity mapping using the weights of evidence method.

The Part 1 session on data analysis using self-organizing maps (SOM) introduces the GisSOM software, which applies the SOM and k-means methods in performing exploration and clustering of multivariate data. SOM is efficient in identifying patterns in multivariate data and helps to understand the information content of the dataset by reducing the complexity of the dataset. GisSOM is designed considering especially spatial data but can be applied to non-spatial data as well. Being an unsupervised machine learning method, SOM can be implemented independent of the availability of labelled data (i.e., training or ground truth data).

The Part 2 session on mineral prospectivity analysis using the weights of evidence method will introduce the principles of GIS-based mineral prospectivity analysis for exploration targeting of mineral deposit. In this session we will demonstrate end-to-end mineral prospectivity mapping using the data-driven weights of evidence (WofE) method in the open-source GIS platform – QGIS using the WofE plugin. All the steps involved in the modelling workflow will be demonstrated using a real-world case study and hands-on exercises will be designed for the participants to follow along.

Both parts are independent of one another, but mutually supportive. Participants can attend either one or both days, each of which will be structured as follows:

- Introduction to methodology
- Presentation of geoscientific applications and previous work
- Demonstrations and hands-on exercises for use cases using different datasets
- Discussions



Bijal Chudasama, PhD, Researcher, has educational background in geology, geoinformatics and applications of machine learning methods to different geological research domains. Her research area is exploration targeting of mineral deposits using GIS-based mineral prospectivity analysis, that involves a complex workflow of mineral systems modelling, geoscientific data processing, spatial data analysis, pattern recognition and integration of regional-to-deposit-scale geophysical, geochemical earth observation and geological datasets using statistical and machine learning methods. She is also involved in development of open-source tools for geoscience research and demonstrating the scientific applicability of new tools and methods in practical use case studies.



Johanna Torppa, PhD, Senior Researcher, has educational research background in physics and astronomy and more than ten years of experience in geoscientific research. During 2000-2019, she has worked in both astronomical and geoscience research projects at the University of Helsinki, Geodetic Survey of Finland, Space Systems Finland and the Geological Survey of Finland (GTK). Since 2019 she has been working at GTK as an expert in data analysis and multivariate data integration of different types of geological, geophysical and geochemical data. Her aim is to develop new methods for geoscientific data analysis as well as to make these methods available to the geoscience research community in form of easy-to-use software tools.