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**Predavanje\***

## **Machine Learning as a Framework for Spatial and SpatioTemporal Prediction**

**dr. Tomislav Hengl**

istraživač i voditelj projekta "Global Soil Information Facilities"  
ISRIC - World Soil Information  
Wageningen, Nizozemska

A framework for spatial and spatiotemporal predictions based on quantile regression forests is described and illustrated with series of sample data sets: spatial prediction of Zinc concretions in soil (with and without covariates), spatial prediction of soil organic carbon in 3D (with watershed distances), and spatiotemporal prediction of daily rainfall. To account for spatial autocorrelation i.e. spatially dependent variation, buffer distances to groups of values in response space are used in addition to remote sensing and DEM-based covariates. This allows for a full extension of quantile regression forests to spatial problems where spatial dependence needs to be included in the model building.

The proposed method is compared to standard geostatistical techniques such as ordinary kriging, regression-kriging (based on a Generalized Linear Model) and spatiotemporal regression-kriging. Advantages of using quantile regression forests are: (1) both geographical and feature spaces are considered simultaneously, (2) more complex distances e.g. based on watershed connectivity can be incorporated into model building, and (3) spatial prediction can be speed-up because minimum human interaction is required and most of processes can be parallelized. Method is also useful for sorting the predictor variables based on importance, for visualizing complex non-linear relationships, and for highlighting possible outliers and blunders in the input data.

A fully automated spatial/spatiotemporal prediction framework based on machine learning is a realistic possibility, especially if the input training points are of high quality and representative of both feature and geographical spaces.

Tomislav Heng diplomirao je na Šumarskom fakultetu u Zagrebu. Magistrirao je s temom "Geoinformation for Sustainable Soil Resource Management" na Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente. Doktorirao je s temom "Pedometric mapping", na Sveučilištu u Wageningenu. Nakon nekoliko godina u JRC-u, zaposlio se kao istraživač i voditelj projekata "Global Soil Information Facilities" u [ISRIC World Soil Information](#) institutu u Wageningenu gdje se bavi prostorno-vremenskim analizama, geostatistikom, digitalnom kartografijom i geoinformatičkim tehnologijama. Autor je knjige "[Practical Guide to Geostatistical Mapping](#)" koja je preuzeta više od 10 000 puta. Autor je 35 radova na WoS-u, a njegov najcitiraniji rad "[A generic framework for spatial prediction of soil variables based on regression-kriging](#)" citiran je ~300 puta. Od 2004. i prve radionice održane na Agronomskom fakultetu u Zagrebu, svoje znanje geostatistike prenosi redovito svake godine na [GEOSTAT](#) radionicama koje volonterski organizira na sveučilištima diljem Europe i svijeta s vrhunskim predavačima.

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