Thursday, 24 October 2013, 16:00–17:00, Géopolis 2208

Seminar in Computational GIScience

http://igd.unil.ch/geocomp/seminar

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Machine learning algorithms to predict and map indoor radon concentration in Switzerland

60% of the annual effective dose from ionizing radiation to the public in Switzerland is attributable to radon. Since radon exposure depends on the geographical location, predictive maps of indoor radon concentrations (IRC) are important tools to support the decision making of public health authorities. However, the design of reliable maps is challenging since the entry of radon from the soil into buildings is a complex process that is determined by several variables such as geology, architectural characteristics, meteorological variables and anthropogenic influences. This project aims to develop reliable predictive models to map IRC in Switzerland by including a maximum of available information from IRC related variables. We considered the following potential predictors: house type, foundation type, year of construction, house coordinates, altitude, outdoor temperature and dosimeter type. In Switzerland, 230 000 measurements have been carried out in 150 000 houses since the early 1980s. We used this data to develop methods to predict IRC at locations where no measurements have been carried out. In order to predict IRC and to estimate the local probability of exceeding a given IRC, we used three machine learning methods: kernel density estimation, random forest and Bayesian Additive Regression Trees (BART). We found random forests to be the fastest algorithm with the best predictability. However, each of the algorithms has its particular benefit. Kernel density estimation is a convenient tool to perform probability mapping of IRC. In addition to good predictability, BART provides an uncertainty estimate of this prediction since the algorithm is based on posterior sampling. All methods gave good results on Swiss IRC. Machine learning can considerably improve the mapping and prediction of IRC.

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