Advangeo® - Machine learning for geological process modeling: background, software, application cases

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In geosciences machine learning approaches like Artificial Neural Networks, Random Forests or Support Vector Machines can be used to deal with huge amounts of data gained from field work, analytical investigations and remote sensing. Since 2007, Beak has invested considerable efforts to develop a stable and user-friendly software with comprehensive data pre- and post-processing and model reliability evaluation tools. Today, the developed advangeo® Prediction Software offers full integration of Artificial Neural Network (ANN) into 2D and 3D data processing procedures, making the method available for daily use by non-mathematicians within their standard ESRI ArcGIS software respectively Paradigm GOCAD® software environment. Artificial neural networks are a powerful data-driven modelling approach for the creation of prediction maps based on existing raster and vector data. ANNs analyze complex, non-linear relationships of potential controlling parameters on the probability of any spatially distributed, geo-related event or phenomena. Advangeo® has shown its capabilities in the prediction of a wide variety of phenomena from which selected issues will be illustrated: temporal and spatial prediction of lignite mining waste rock pile stability, geo-hazard maps for slope instabilities and landslides along transport infrastructure as well as the qualitative and quantitative prediction of mineral occurrences.