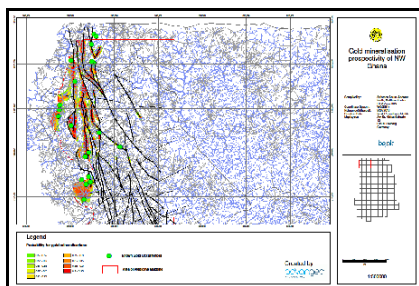# Advangeo® – using artificial neural networks for predictive mapping

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Artificial neural networks (ANN) are a powerful tool for interpretation of geo-scientific data. They are able to analyze complex, non-linear relationships between spatially distributed, geo-related events or phenomena's and a wide variety of data. ANN`s are able to model not only probabilities of the appearance of an event (e.g. probabilities of landslides in a certain area) but also quantities (e.g. grades of contaminations in soils). The approach is based on the ability of ANNs to learn from "examples" (e.g. known sites of landslides) and the subsequent transfer of this "knowledge" into a larger area with similar conditions (e.g. a mountainous region). In the past, the application of the technology was difficult due to its low awareness level and difficulties to integrate it into 2D and 3D data processing algorithms.

In this situation, the software advangeo® was created to provide a "normal" GIS user with a powerful tool to use ANNs for prediction mapping within their standard ESRI ArcGIS environment. Advangeo® provides useful data-processing and data-analysis tools that are adjusted to the solution of special problems: geo-hazards and mineral deposits. Among others there are algorithms for preparation of vector data, vector/raster data transformation, analysis of raster data and data processing reliability analysis.

In the past two years, advangeo® has shown its capabilities in modeling and prediction of a wide variety of geological, environmental and geo-economic issues: landslides, soil erosion processes, mineral occurrences, soil contaminations, ground water chemistry and pollution, geological mapping, coal fires, forest pests, and estimation of manganese nodule resources at the Pacific sea floor.

In Africa, the application of the prediction software helps to add value to existing data especially in the fields of investment attraction and guidance, land use planning, geohazards analysis and prevention, agriculture and many others. In the frame of the AEGOS (African-European Georesources Observation System) project, advangeo® has been used to demonstrate the project's potential to generate high value user oriented products. Advangeo-based use cases range from the prediction of erosion gullies in South Africa to exploration targeting for Gold occurrences in NW-Ghana. The modeling was based completely on available data, such as the geological and soil maps, the digital elevation model and its derivations, land use data, airborne geophysical data, and satellite images.

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