

EGU22-6955

<https://doi.org/10.5194/egusphere-egu22-6955>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Novel approaches to model assessment and interpretation in geospatial machine learning

Alexander Brenning

Friedrich Schiller University Jena, Department of Geography, Jena, Germany (alexander.brenning@uni-jena.de)

As the interpretability and explainability of artificial intelligence decisions has been gaining attention, novel approaches are needed to develop diagnostic tools that account for the unique challenges of geospatial and environmental data, including spatial dependence and high dimensionality, which are addressed in this contribution. Building upon the geostatistical tradition of distance-based measures, spatial prediction error profiles (SPEPs) and spatial variable importance profiles (SVIPs) are introduced as novel model-agnostic assessment and interpretation tools that explore the behavior of models at different prediction horizons. Moreover, to address the challenges of interpreting the joint effects of strongly correlated or high-dimensional features, often found in environmental modeling and remote sensing, a model-agnostic approach is developed that distills aggregated relationships from complex models. The utility of these techniques is demonstrated in two case studies representing a regionalization task in an environmental-science context, and a classification task from multitemporal remote sensing of land use. In these case studies, SPEPs and SVIPs successfully highlight differences and surprising similarities of geostatistical methods, linear models, random forest, and hybrid algorithms. With 64 correlated features in the remote-sensing case study, the transformation-based interpretation approach successfully summarizes high-dimensional relationships in a small number of diagrams.

The novel diagnostic tools enrich the toolkit of geospatial data science, and may improve machine-learning model interpretation, selection, and design.