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AI-driven insights into soil health and soil degradation in Europe in the face of climate and anthropogenic challenges

Mehdi H. Afshar¹, Amirhossein Hassani², Milad Aminzadeh¹, Pasquale Borrelli^{3,4}, Panos Panagos⁵, David A. Robinson⁶, and Nima Shokri¹

¹Institute of Geo-Hydroinformatics, Hamburg University of Technology, Hamburg, Germany

²The Climate and Environmental Research Institute NILU, P.O. Box 100, Kjeller 2027, Norway

³Department Science, Roma Tre University, Roma, Italy

⁴Department of Environmental Sciences, University of Basel, Basel 4056, Switzerland

⁵European Commission, Joint Research Centre (JRC), Ispra, IT-21027, Italy

⁶UK Centre for Ecology & Hydrology, Bangor, UK

A healthy soil supports life on Earth through maintaining ecosystems that provide food, feed and fibre whilst supporting Earth system functions such as waste recycling, climate, flood, and water regulation. The intensification of anthropogenic activities and climate challenges pose serious threats to soil health (Hassani et al., 2021), exacerbating the processes of soil degradation that are putting at risk soil management, biodiversity, and food security.

This study thus aims at enhancing our understanding of the state and changes of soils by combining machine learning methods with a comprehensive series of climate and environmental variables. We employ machine learning methods to analyze the relationships between soil health indicators and a wide range of climatic parameters, and chemical, physical, and biological soil attributes in Europe. Capitalizing on the LUCAS (Land Use/Cover Area frame statistical Survey) topsoil database (2009-2018) and digital soil mapping techniques, our preliminary results highlight the regions across Europe showing consistent decline in soil nutrients and carbon content, signaling potential risks of soil degradation. The proposed framework enables us to understand, document and respond to soil changes in ecosystems under different land management and climate scenarios. This contributes to devising necessary action plans for sustainable soil management and preservation.

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Reference

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