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

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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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