Which tree remains standing? – Combining disturbance and forest condition maps

Natural and anthropogenic forest disturbances have increased in the 21st century. Particularly, natural disturbances are active on a landscape scale and classical ground-based inventory methods with random sampling designs have difficulty to capture landscape-scale dynamics. Thus, remote sensing techniques coupled with machine learning classification algorithms have been frequently used to research large scale forest change in the last decade. These methods have produced many continuous maps to investigate forest change. By now, spatial explicit data is freely available for Germany about where and when did a disturbance occur (Senf and Seidl 2020, https://doi.org/10.5281/zenodo.3924380), which dominant tree species was in that specific location (Blickensdörfer et al. 2024 https://atlas.thuenen.de/layers/geonode:Dominant_Species _Class), what was the cause of the disturbance (Seidl and Senf 2024 https://zenodo.org/records/8202241) and also what was the forest health condition at that time (Lange et al. 2024 https://zenodo.org/records/13123397).

Combining the different maps may lead to promising research questions that cannot be answered by the maps in isolation. Potential research questions of a Master thesis may be:

What is the likelihood that a highly negative reflectance anomaly ("bad" forest condition) is followed by a stand-replacing disturbance?

What is the likelihood that a highly negative reflectance anomaly ("bad" forest condition) is followed by planned (harvest) or unplanned (e.g. wind) canopy opening?

How does the likelihood differ between the four main tree species in Germany (spruce, pine, beech, oak)?

Skills needed or willing to develop: Spatial data analysis (preferably in R), Inference and Spatial Statistics (also depending on the fine-tuning of the research question); basic knowledge of machine learning algorithms

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