Title: Detecting and Assessing Pollution Events from Wildfires Using Remote Sensing and Meteorological Data: A Data Science Approach

Summary: Wildfires contribute significantly to air pollution by releasing particulate matter (PM) and toxic gases into the atmosphere, with climate change projected to increase wildfire activity and the spread of smoke, heightening health risks. The work that will be developed will be supported by a data-driven framework to monitor and assess air pollution from wildfires, a pressing health and environmental issue that affects the global population. The work will analyse current atmospheric models outputs coupled with remote sensing indicators, like Fire Radiative Power (FRP) and Fire Radiative Energy (FRE), combined with meteorological data and machine learning to improve pollution event detection. It aims to look upon transboundary impacts of wildfire emissions, evaluate remote sensing technologies (e.g. MODIS, SEVIRI, Sentinel) in wildfire monitoring, and examine data science methods for environmental monitoring. For the data and methodology section, it will describe the integration of meteorological and remote sensing data, with machine learning models, such as Random Forest, XGBoost, and Neural Networks, used to classify pollution events and track spatial-temporal patterns of smoke. Model validation will be performed by comparing results with historical extreme wildfire events to verify accuracy. Then the model will be evaluated by its predictive performance and have some insights into wildfire smoke dispersion patterns, identifying key factors contributing to pollution events. To conclude the work, the highlights of the study will be shown, demonstrating how remote sensing and meteorological data can improve air quality monitoring and support policy planning. Future work will be proposed to enhance real-time monitoring capabilities, integrate additional data sources, and apply findings within broader environmental and health frameworks. This research has the potential to inform strategic interventions, further strengthening decision-making tools for managing wildfire-driven pollution.

Keywords: Air Pollution, Wildfires, Meteorological Data, Remote Sensing, Machine Learning

The provided summary was composed with the help of the thesis' supervisors.

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