ML4Fires: A Digital Twin Component for Wildfire Danger Analysis via Global Burned Areas Prediction on Climate Projection Data

Authors

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In recent years, the escalation of Extreme Weather Events (EWEs), including storms and wildfires, due to Climate Change has become a pressing concern. This exacerbation is characterised by increased intensity, frequency as well as the duration of such events.

Machine Learning (ML) presents a promising avenue for tackling the challenges associated with predicting global wildfire burned areas. It offers sophisticated modelling techniques capable of estimating EWEs in a cost-effective manner. ML-based algorithms not only assist in detection and prediction but also provide robust data-driven tools for scientists, policymakers, and the general public. Yet, the implementation of such solutions requires a comprehensive infrastructure including data acquisition systems, preprocessing modules, computing platforms, and visualisation tools.

A relevant aspect which the InterTwin project - funded by the EU - focuses on is the development of a Digital Twin for EWE analysis. This Digital Twin harnesses artificial neural networks to model the non-linear relationships between various climate, geomorphological and human factors and the occurrence of EWEs, thereby enabling insights from historical data and projections for future events.

In particular, within the interTwin project, our work is emphasising on modelling and predicting global wildfire burned areas, together with tropical cyclones detection and tracking. Our work aims to establish a resilient system for timely prediction and EWE assessment and analysis on projections scenarios.

The Digital Twin on wildfires prediction integrates data and ML models to provide a proactive approach to the fire danger assessment. These efforts underscore the importance of leveraging cutting-edge technologies to address the challenges posed by Climate Change-induced EWEs, ultimately fostering informed actions and resilient communities.