Modelling Extreme Weather Events using Data Science, Machine Learning, and Social Sentiments

The information era has led to an explosion of online activity. A large part of that activity is published on social media sites, representing a large amount of publicly available, unprocessed social data that is both opinionated and emotional. These data include text, images, videos and are often denoted as 'unstructured data'. Increasingly studies are using social media as a data source for investigations. Due to its widespread use during events, this concept has been developed for disaster management from a humanitarian perspective, which is being employed by aid agencies.

Extreme weather modelling using 'unstructured data' from social media sources to inform physical modelling and therefore better decision making is something still largely unexplored.

There is currently little real-time in field data available during an extreme weather event (e.g., a cyclone making landfall). There is also no connection and feedback between data (or 'unstructured data') and physical hazard models.

This project aims to analyse data generated from witness observations via social media using machine learning to generate actionable information and merge them with physical models. The ambition is to improve disaster response. Another aspect to explore in this project is the analysis of how people perceive extreme weather events, and whether this can be measured, modelled, or classified. To do this, Twitter is utilised as a data source for extreme weather events modelling, collecting large numbers of tweets associated with different extreme weather events. Reddit and Facebook will be used as extra sources of data. Data Science tools such as Data Assimilation are employed to merge the different sources of information. Sentiment analysis is performed on social data to generate social sentiment variables and curves for these events.

Previous studies of this investigation show that social sentiment can both be predicted by physical attributes, but also act as a predictor for these characteristics. This contributes to bridging the gap of understanding in the social impacts of extreme weather events and uncovers relationships between social extreme weather events sentiment and physical extreme weather events attributes. This work lays the groundwork for more `socially conscious' models - models which consider social drivers, predictors of extreme events, in addition to already widely used physical sensor and satellite data - models which combine these data in a socio-physical extreme weather modelling using Machine Learning and Data Science.

The candidate will be part of the [Data Learning](#) working group at Earth Science and Engineering & Data Science Institute and will interact with other students and researchers working on similar Machine Learning and Data Science models.

In the course of the proposal development and project, new competences (fundamental for career progression) will be acquired by the student into the context of models and technologies for Data Science and Machine Learning.

Contact:

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