Master thesis research topic Informatics, HydroLogic Research, www.hydrologic.nl

Title: **Human disaster observatory – reanalysis of hurricanes Harvey and Irma to enable forecast location, extent and seriousness of future natural hazards**

Current weather extremes pose tremendous challenges to governments all over the world. In late August 2017, excessive monsoon rainfall and floods made 41 million people leave their homes and flee to higher grounds in India, Bangladesh and Nepal. Around the same time, the subsequent tropical storms Harvey and Irma caused damage for billions of USD in the Caribbean, the Gulf of Mexico and the US. Thousands of people have died in these recent events.

Climate change will cause these types of hazards to occur more often. Due to warming of the land and the sea, the atmosphere becomes moistier, resulting in more heavy rainfall. Moreover, changes in the jet stream meandering in the upper layers of the atmosphere cause low pressure areas to become more stable and move more slowly than in the past, resulting in heavier downpour - long-lasting extreme rainfall.

The idea of this MSc thesis research topic is to combine weather information with social media data to identify and forecast locations where humans are in despair because of extreme weather such as hurricanes. For starters, the topic can be kept general, but the objective is to zoom in on human flood observation and create a means of monitoring and mapping of an extreme event and its seriousness.

Messages in natural language will be the most important source of data for this research. To overcome multilingual issues, the initial focus will be on English, typically using messages from the US and Commonwealth members such as Canada, India, South Africa, Australia and some Caribbean countries.

Weather model data will be used to identify areas where extreme precipitation is forecasted and monitoring should be intensified. Within these areas events will have to be detected using e.g. Twitter messages sent from the areas as well as other media such as news sites and blogs. The aim is to develop, test and parametrise event-detection algorithms, to perform feature mapping and geographical representation of messages and events using geo-tags and topical locations (heat maps). Moreover, we are interested in sensing emotions e.g. to determine the severity of the events. Typical challenges are abstraction and classification of features and validation of message locations. Data for the tropical storms Harvey and Irma are available to use for case studies.

This topic is suitable for MSc students who have interests in data analytics, feature abstraction and classification from social media, mapping and machine learning. Some affinity for natural phenomena like hurricanes is also important.

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