Master's thesis project in Space, Earth and Environment

Measuring rAIn over Africa from space

Continuous and accurate measurements of rain are essential for weather forecasting, planning farming and other important societal services. Most developed countries are covered by networks of weather radars giving continuous monitoring of rain. Such networks are lacking for large land areas, including a major part of Africa, and ground-based measurements are restricted to rain gauges at a few locations. Rain can be estimated from satellite observations, but there are several issues to consider. For Africa the use of geo-stationary satellites are of special interest as they give a continuous coverage of the continent. Unluckily, the sensors in geo-stationary orbit are not optimal for measuring rain, the information provided is "fuzzy" and existing data products have relatively poor accuracy. However, there should exist room for significant improvements. In fact, the data extraction should be a suitable task for machine learning (i.e. "AI") but this approach has so far hardly been used.

The objective of this project is to developed a machine learning (ML) algorithm for retrieving rain from geo-stationary (infrared) data. The task will include downloading of geo-stationary data, as well as, reference data from a satellite radar (DPR, part of the Global Precipitation Mission). In contrast to existing algorithms, time series of satellite images shall be used. Various ML techniques can be of interest for extracting features from the images, while the final result shall be derived through Bayesian inference (using ML code developed in house). Further details can be provided for the interested one.

The project can be adopted to fit one or two persons. This project will be part of an ongoing collaboration between Chalmers and Makerere University in Uganda, aiming at improving the monitoring of rain in the region.

Prerequisites: Knowledge and interest in programming and physics.

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