Automatic Anomaly Detection (Irrigation and crop growth status)

There are dozens of anomalies in a field that farmers cannot detect until the later stages of an anomaly by then significant damage has been done to the crop in these cases there is a need for early anomaly detection systems which can monitor the crop growth cycles and provide the early warnings if there is an anomaly. In general, the anomaly may be due to variability in physical and chemical soil properties, the presence of pathogens like nematodes, or an insect propagation. It can also result from faults in fertilizer application and water irrigation system design. Monitoring plant growth status and irrigation needs require extensive high-quality checks and monitoring from remote sensing data. Usually, the process of monitoring agriculture farmlands using satellite imagery requires a lot of time and patience since to detect changes in field conditions, one should continuously compare the images and mull through the data for differences, which can be quite subtle.

Therefore, it is valuable and pivotal to explore the approaches using Earth Observation data (EO) for automatic anomaly detection in particular for (irrigation and crop growth status). Such detection is of high importance for reducing uncontrolled growth in many regions, where water availability is a limiting factor in crop production, and irrigation must be carefully planned.

The Challenge

There are two main problems needed to solve in this challenge.

1- The first challenge is to develop an algorithm that combines different sources of EO data (Sentinel, Landsat-8, and MODIS), which can be used for automatic anomaly detection.
2- The second challenge is to develop a model that generates and sending anomaly notifications to the end-user (farmer) and can track the cause of anomalies like water stress (irrigation) or notification related to crop growth status.

Data

Sentinel 2, Landsat and Modis

Sentinel-1

References

IBAM, E. O., AFOLABI, M., JOHN, I. & OLALEKAN, I. 2018. Design and Implementation of Farm Monitoring and Security System. International Journal of Computer Applications, 181, 10-15.

MERONI, M., FASBENDER, D., REMBOLD, F., ATZBERGER, C. & KLISCH, A. 2019. Near real-time vegetation anomaly detection with MODIS NDVI: Timeliness vs. accuracy and effect of anomaly computation options. Remote Sensing of Environment, 221, 508-521.

REMBOLD, F., MERONI, M., URBANO, F., CSAK, G., KERDILES, H., PEREZ-HOYOS, A., LEMOINE, G., LEO, O. & NEGRE, T. 2019. ASAP: A new global early warning system to detect anomaly hot spots of agricultural production for food security analysis. Agricultural Systems, 168, 247-257.