Near real-time change monitoring from remote sensing image time series

Near real-time change monitoring from time series continuously monitor change when new data enters the data stream. As remote sensing time series are becoming dense, near real-time change monitoring from remote sensing image time series has opened immense opportunities in environmental monitoring. For example, an automatic deforestation monitoring system significantly contributes to forest conservation from relevant environmental and political agencies. Time series structural change methods based on cusum (cumulative sum) statistics have been developed to automatically detect forest change from optical satellite image time series. However, the method has difficulties in separating between man-made and natural change (e.g., drought) and requires the modelling of seasonality, which is complex in many forest systems. Also, it is difficult to integrate multidimensional information from space, spectral bands, as well as multiple sensor data into a 1D time series analysis. Deep learning methods have dominated remote sensing due to their great predictive power, and the fact that Earth observations have been growing tremendously in diversity and volumes. Recurrent neural networks and their relatives (e.g. Long short-term memory (LSTM) [1]) are state-of-the-art in time series forecasting and change monitoring [2] but they have been rarely applied in environmental modelling. This study focuses on evaluating deep learning-based change monitoring methods (e.g. recurrent neural network and its relatives) and compare them with statistics methods. *Novel application cases and own datasets are welcomed* but is not a prerequisite. Sentinel 2 and other open archives will be used if the study case is in deforestation monitoring.

Keywords: deep learning, time series analysis, recurrent neural networks, change detection, remote sensing

Reference:

[1] Hochreiter, S. and Schmidhuber, J., 1997. Long short-term memory. *Neural computation*, *9*(8), pp.1735-1780.

[2] Guo, T., Xu, Z., Yao, X., Chen, H., Aberer, K. and Funaya, K., 2016, October. Robust online time series prediction with recurrent neural networks. In *2016 IEEE International Conference on Data Science and Advanced Analytics (DSAA)* (pp. 816-825). Ieee.