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A hybrid rainfall prediction model for Tunisian agriculture regions based on OSM data, Voronoi spatial analysis and Long Short Term Memory deep learning

Mohamed Amine Ben Rhaiem, Abderrahmane Ben Hassine, Amine Ouertani, and Imed Riadh Farah
University of Manouba, Manouba 2010, Tunisia, National School of Computer Sciences, RIADI Laboratory, Tunisia (amine15809@gmail.com)

The agriculture sector in Tunisia plays a vital role in the Tunisian economy with 6% of the country's exports earning, 12.6% of GDP and almost one
quarter of the country's labor force. However, Tunisian agriculture is still increasingly exposed to a variety of vulnerabilities and uncertainties including in particular the climate variability such as drought and floods. In fact, Rainfall quantity and its geographic distribution are the main drivers of water productivity and agriculture production and a predominant key factor in the overall agriculture hazard risk management processes. This paper uses the daily open rainfall data from the national observatory of Tunisian agriculture (ONAGRI) to develop an ETL (Extract,Transform and load) tool to automatically spatialize and load the historical data into a big data platform by continuously incrementing the new daily disseminated records. In addition, this paper applies the Voronoi spatial analysis model to estimate rainfall measures for the newly added spatial units using VGI data from OSM world mapping project. Then, based on these spatial estimations, the paper examines the feasibility of applying ARIMA (Auto Regressive Integrated Moving Average) for time series forecasting by comparing it with deep learning methods ANN (Arti cial Neural Network) and LSTM (Long Short Term Memory) in order to predict the rainfall values corresponding to particular agriculture area belonging to a Tunisian region. Our experimental results showed that prediction accuracy increased with LSTM model comparing to the other models for the rainfall time series forecasting embedded now with geographic location.