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Geospatial assessment of phenotype predictive analytics using machine learning techniques

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Sustained increases of crop yield in the Midwest USA are produced by improved technological developments, management practices, and resources availability. However, under the influence of extreme hydrometeorological and climate events (EHCEs) such positive trends become negative. The geospatial extent of this effect is unclearly identified and consequently the genetic resistance of crops to such effects across scales is poorly understood. The present talk aims to create a conceptual model to geospatially identify the areas where the intensity of water deficits challenges our abilities to predict phenotypic responses. The Genomes to Fields (G2F) project have monitored environmental variables through more than 100 weather stations since 2015 across the USA. In such locations a wealth of multidimensional, discontinuous and heterogenous data are also collected from multiple sources (i.e. remote and proximal sensing and various monitoring networks). The objective of this talk is to identify the potential of machine learning techniques to integrate multi-dimensional database to predict phenotypes across scales. We will focus on environmental/hydroclimate variables (i.e. precipitation, wind speed and direction, temperature, among others). We integrate Artificial Neural Networks and kriging interpolations to take advantage of the spatiotemporal proximity between G2F data and publicly available data. Results of this technique evidence an improvement on precipitation and temperature estimates of 20% in some locations when data from other sources (same location) is used as input. We will present contribution of data, from different sources but also different locations, across the experimental areas of the G2F project in areas with and without water deficits resultant from dry spells.