Crop Yield Estimation Using Spiking Neural Networks Through Spatiotemporal Analysis of Image Time Series

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Abstract

The goal of this study is to show how spiking neural networks (SNNs) can be used for remote sensing spatiotemporal analysis of picture time series. These networks make it possible to use neuromorphic hardware platforms that are extremely parallel and low in power consumption. With the help of normalized difference vegetation index image time series, this study presents the first SNN computer model for estimating crop yield. This model shows how the idea above works. It discusses the creation and evaluation of a methodological framework that uses historical crop yield data as well as the spatial accumulation of time series data with a resolution of 250 meters obtained from a Moderate Resolution Imaging Spectroradiometer in order to train an SNN to produce accurate predictions of crop output. A study on the optimal number of features required to optimize the findings from our experimental data set is also included in the work that was done for the research project. The method that was provided was utilized in order to make an estimate of the production of winter wheat (Triticum aestivum L.) in the province of Shandong, which is one of the most important growing locations for winter wheat in China. Our approach was able to make an extremely accurate prediction of the yield approximately five to six weeks before the harvest. Our method had an average accuracy of 95.64%, with an average error of prediction of 0.236 t/ha and a correlation coefficient of 0.801 based on a nine-feature model. In addition, our accuracy was based on a nine-feature model.

(Keywords:)

Crop yield forecasting , estimation , machine learning , Moderate Resolution Imaging Spectroradiometer (MODIS) , normalized difference vegetation index (NDVI) , remote sensing , spiking neural networks (SNNs)

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