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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

NALAYATHIRAN PROJECT

Project Title : Estimate the Crop Yield using Data Analytics

Domain : Data Analytics

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ESTIMATE THE CROP YIELD USING DATA ANALYTICS

ABSTRACT:

Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. As per this project we will be analysing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. Agriculture is important for human survival because it serves the basic need. Due to variations in climatic conditions, there exist bottlenecks for increasing the crop production in India. Crop yield prediction is one of the important factors in agriculture practices. Farmers need information regarding crop yield before sowing seeds in their fields to achieve enhanced crop yield. The use of technology in agriculture has increased in recent year and data analytics is one such trend that has penetrated into the agriculture field. The main challenge in using big data in agriculture is identification of effectiveness of big data analytics. Efforts are going on to understand how big data analytics can agriculture productivity.

LITERATURE REVIEW:

To the best of our knowledge, no systematic literature review has been published regarding the application of Deep Learning in crop yield prediction. While there are some traditional review papers on crop yield prediction and some SLR papers that do not focus on the application of deep learning in crop yield prediction (e.g., traditional machine learning in crop yield prediction. Here, we must distinguish shallow learning from deep learning), there is no SLR paper that focuses on the use of deep learning in crop yield prediction yet. In this respect, a pioneering effort has been made in the present study representing the way for systematically reviewing the state-of-the-art knowledge on the development of Deep Learning-based methods for crop yield prediction.

van Klompenburg et al. (2020) performed an SLR on crop yield prediction using Machine Learning. They concluded that neural networks, especially CNN, LSTM, and DNN are mostly applied for crop yield prediction. Also, they stated that the number of features depends on the study. There are cases where the yield prediction depends on object counting and detection rather than tabular data. Regarding the usage of Deep Learning in image processing, **Hani et al. (2020)** compared semi-supervised methods with Deep Learning-based methods for fruit detection and counting in apple orchards. They showed that for yield mapping the former methods, such as Gaussian Mixture Models, outperform the latter, based on U-Net, Faster R-CNN, and CNN. **Koirala et al. (2019)** reviewed the use of Deep Learning methods for fruit counting and estimating yield. They revealed the ability of Deep Learning methods to extract important features while recommending approaches such as CNN detectors, deep regression, and LSTM for estimating the fruit load. **Lee et al. (2019)** conducted experiments using Deep Learning methods to build a self-predictable crop yield platform based on crop diseases. For the crop disease diagnosis module, they stated that the CNN algorithm outperformed R-

CNN and YOLO algorithms. Also, using a ReLU activation function of the artificial neural network showed the highest accuracy for the CYP module. **Zhang et al. (2020)** reviewed the Deep Learning applications in dense agriculture scenes, including recognition and classification, detection, counting, and yield estimation. The results of their survey showed that Deep Learning outperforms in dense scenes.

Concerning the use of Deep Learning methods with tabular data, **Chlingaryan et al. (2018)** performed a review for predicting crop yield and estimating nitrogen status with Machine Learning techniques. They concluded that Machine Learning technological improvements, including the Deep Learning subfield of Machine Learning, will have an impact on providing cost-effective and comprehensive solutions. Moreover, they mentioned that the hybrid systems of Machine Learning techniques will play a role in the near future.

The review of **Dharani et al. (2021)** on crop yield prediction with the use of Deep Learning, showed that hybrid networks and the RNN-LSTM networks outperform all other networks. The reason for the high performance of RNN and LSTM stands on their storage and feedback loop. They resulted that those networks are more capable of making accurate predictions since they can deal with time-series data of crop yield.

The literature appears to contain little on a systematic review analysis on the application of Deep Learning in crop yield prediction. There are not many reviews analysing and assessing the current work on that topic in an objective way. Moreover, there are crops and methods that have not been investigated yet for crop yield prediction. That means future research has to be conducted with no knowledge on the features needed and obstacles that need to be overcome. This can be critically revealed with a systematic literature review. Hence, our aim is to help address these gaps by conducting this SLR and gathering information on the Deep Learning application in crop yield prediction based on the important features and issues.

Study	**Review Type**	**Focus**	**Inference**
(van Klompenburg et al. 2020)	Systematic	Crop yield prediction with Machine Learning	Object counting and detection rather than tabular data
(Hani el al. 2020)	Non-systematic	Fruit detection and counting methods for yield mapping	Semi-supervised method based on U-Net, Faster R-CNN and CNN
(Koirala et al. 2019)	Non-systematic	Fruit detection for yield estimation	Deep regression and LSTM for estimating Fruit Load
(Lee et al. 2019)	Non-systematic	Crop yield prediction using Deep Learning	Crop Disease Diagnosis module to build self-predictable crop yeild platform
(Chlingaryan et al. 2018)	Non-systematic	Crop yield prediction and nitrogen status estimation with Machine Learning	Machine Learning technological improvement impact on cost-effective, comprehensive solutions by use of Hybrid system
(Zhang et al. 2020)	Non-systematic	Employing Deep Learning for dense scenes in agriculture	Deep Learning outperforms in dense agriculture scenes
(Dharani et al. 2021)	Non-systematic	Crop Prediction Using Deep Learning Techniques	Hybrid network and RNN-LSTM networks outperform all other networks with help of time-series data of crop yield