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Implementing AI-Powered Early Warning Systems in Mozambique's Rural Areas to Prevent Crop Failure: A Methodological Approach

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Abstract

Early warning systems (EWS) have been increasingly used to mitigate crop failure risks in developing countries, especially in remote rural areas where traditional monitoring methods are insufficient. Mozambique is a case study of such regions with high vulnerability to climate-related disasters. The methodology involves collecting and preprocessing climate-related data from meteorological stations, integrating it with soil moisture, rainfall, and temperature sensors. A convolutional neural network (CNN) model is trained using historical crop yield data as labels for early warning prediction. A CNN model achieved an accuracy of 85% in predicting potential crop failure within the next three months, identifying areas at higher risk with a spatial distribution pattern across different climatic zones. The AI-powered EWS demonstrated promising results in reducing false positives and negatives through real-time monitoring and feedback loops to improve model performance over time. Future research should focus on integrating user feedback into the system for better decision-making, ensuring data privacy and security, and scaling up deployment across more rural areas of Mozambique. AI, Early Warning Systems, Climate Change, Crop Failure Prevention, Machine Learning Model estimation used $\hat{\{}\theta\}=argmin\{\theta\}sumiell(yi,f\theta(\xi))+\lambda lVert\theta rVert2^{2}$, with performance evaluated using out-of-sample error.

Keywords: *Sub-Saharan, GIS, machine learning, data mining, predictive analytics, spatial analysis, IoT*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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