

PIONEERING CROP YIELD FORECASTING IN PRECISION AGRICULTURE THROUGH COMPARATIVE STUDY OF U-NET ALGORITHM AND MOBILENET ALGORITHM USING ADVANCED SATELLITE DATA ANALYSIS

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The study aims to improve precision agriculture's crop yield predictions by comparing the novel U-Net and MobileNet Algorithms using advanced satellite data for accuracy and efficiency. Materials and Methods: The methodology involves processing a dataset gathered from the Kaggle repository, which includes variables like Normalized Difference Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), rainfall data, crop yield, and crop type. The study is structured into two groups. Group 1 utilizes the MobileNet algorithm, and Group 2 employs the novel U-Net algorithm. Each group consists of 20 samples, making a total sample size of 40. Implementation and output are managed through Python programming. Sample size determination and statistical analysis are designed to evaluate the performance of the algorithms, focusing on accuracy metrics. The statistical analysis utilizes clincalc.com, aiming for a G-power of 80%. The significance levels are set with alpha (α) and beta (β) values at 0.05 and 0.2, respectively, ensuring a confidence interval of 95%. Results: The study found that the U-Net algorithm outperformed MobileNet in accuracy, achieving 96.99% compared to MobileNet's 90.44%. This assessment was based on analyzing key precision agriculture indicators like NDVI and NDWI. A two-tailed significance test showed a p-value of 0.014, indicating that the difference in accuracy between the two algorithms is statistically significant, as it is below the threshold of 0.05 ($P < 0.05$). Conclusion: The study conclusively demonstrates that the novel U-Net algorithm provides a more accurate method for crop yield prediction in precision agriculture compared to the MobileNet algorithm.