IAF EARTH OBSERVATION SYMPOSIUM (B1)
Assessing and Mitigating the Global Freshwater Crisis (6)

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OPTIMIZATION OF WATER MANAGEMENT IN CROPS USING SATELLITE TECHNOLOGY AND ARTIFICIAL INTELLIGENCE TECHNIQUES

Abstract

This groundbreaking project, centered on avocado cultivation, leverages cutting-edge technology to revolutionize agricultural practices. By utilizing satellite technology, advanced Machine Learning algorithms, and precise CHIRPS data, the project aims to redefine crop classification within satellite images.

The strategic choice of avocados as the focal point arises from their unique characteristics, particularly their high water demand, making them one of the most water-intensive fruits to cultivate globally. As the fifth most important tropical fruit in terms of volume and cultivated area, avocados place significant pressure on water resources. Thus, the initiative addresses a critical aspect of sustainable agriculture, seeking to optimize water usage and enhance overall crop management, particularly within the defined scope of avocado cultivation.

In the pursuit of excellence, the project employs rigorous validation methodologies. The use of CHIRPS data specifically focuses on determining water gain or loss in the agricultural environment, providing valuable insights for efficient water management. Additionally, advanced statistical methods, including a confusion matrix and Cohen's kappa value, are employed to evaluate the predictive model's performance.

The confusion matrix visually presents the comparison between the model's predictions and the actual classes within a dataset, ensuring a high level of precision in crop classification. Simultaneously, the Cohen's kappa value, a measure of agreement assessing the reliability of classification, adds robustness to the project's validation process.

Through the integration of satellite technology, Machine Learning, and meticulous validation methodologies, the project not only promises to elevate the efficiency of avocado crop management but also underscores a commitment to sustainable water use. In the face of climate change challenges and their impact on agriculture, initiatives like these become crucial for ensuring food security while minimizing the ecological footprint.

In summary, this project stands as a beacon of innovation in agriculture. By harnessing the capabilities of satellite technology and Machine Learning, and carefully validating its outcomes, it addresses the specific challenges posed by avocado cultivation, aiming to propel the industry towards greater efficiency, sustainability, and resilience in the face of evolving environmental dynamics. The fusion of advanced technologies and agricultural practices exemplifies a forward-thinking approach that aligns with the imperative to create a more sustainable and productive future for global agriculture.