**Crop Health Analysis**

**Abstract**

Crops assessed early for diseases alongside stress conditions result in lower yield losses combined with enhanced farming performance. The system development project investigates the creation of an AI system that utilizes image-based evaluation methods for crop health evaluation. The conceptual model employs CNN from deep learning to examine plant images before it uses visual information for classifying plants into various health groupings.

**Project Objectives: -**

* Implement and compare deep learning models, capable of assessing crop health from image data, focusing on CNN architectures for feature extraction.
* Improve model performance through data augmentation, hyperparameter tuning, and transfer learning techniques.
* Evaluate the classification accuracy using standard metrics such as accuracy, precision, recall, and F1-score.

**Methodology: -**

1. **Feature Extraction using Deep Learning**
   * A Convolutional Neural Network based model will be designed to extract key visual features from plant images.
   * The CNN will include convolutional layers for detecting patterns in leaves, stems, and fruits.
2. **Model Training and Hyperparameter Tuning**
   * The dataset will be split into training, validation, and testing sets.
   * Various CNN architectures will be experimented with to identify the most effective model.
   * Loss functions like categorical cross-entropy and optimizers will be tested to improve performance.
3. **Model Evaluation**
   * The model's performance will be evaluated based on accuracy, precision, recall, and F1-score.
   * Confusion matrices will be used to analyze misclassifications and identify areas for improvement.

**Key Findings: -**

* A trained deep learning model capable of classifying crop health conditions with high accuracy.
* Insights into the effectiveness of CNN-based architectures for plant health analysis.

**Solution Approach: -**

* **Data Preprocessing** - Apply resizing, normalization, and augmentation to prepare the dataset for training.
* **Model Development** – Design and train CNN-based architectures to classify crop health conditions.
* **Model Evaluation** – Assess performance using classification metrics and visualization techniques.

**References: -**

* **Plant Disease Detection Using CNN:** [**https://ieeexplore.ieee.org/document/9276722**](https://ieeexplore.ieee.org/document/9276722)

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