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**Plant Disease Detection Using Vision Transformer (ViT)**

***Discussion:***

Throughout this project, I wanted to portray how AI can address one of the biggest challenges in agriculture through plant diseases detection. With the global population expected to exceed 9 billion by 2050, food demand is projected to rise by 70%, making early disease detection critical for food security (Kaggle, n.d). Recognizing the inefficiency of manual inspection, I implemented a Vision Transformer (ViT) model to detect plant diseases from leaf images, leveraging deep learning to improve both accuracy and scalability. Using the PlantVillage dataset from Kaggle, which contains over 50,000 labeled images across 15 disease categories, I trained the model with mini-batch gradient descent to optimize performance.

Unlike traditional Convolutional Neural Networks (CNNs), ViTs segment images into patches and analyze them as sequences, allowing the model to capture complex spatial relationships and identify disease patterns more effectively (Dosovitskiy et al., 2020). Through multiple training iterations, I fine-tuned the model, reducing the loss from 1.3065 to 0.0012 over 10 epochs, achieving an impressive 99.88% test accuracy. This experience reinforced my understanding of deep learning and its real-world impact, particularly in precision agriculture. The success of this model demonstrates how AI can help farmers detect diseases early, prevent major crop losses, and improve yield protection, ultimately contributing to a more sustainable global food supply. Moving forward, I see opportunities to enhance the model by incorporating environmental factors like soil health and temperature data, expanding the dataset to include more plant species, and optimizing the model for mobile and drone-based monitoring. Working on this project has been an eye-opening experience, showing me firsthand how AI can transform industries and create impacts that enhance people's lives.

***Feedback:***

My professor noted that I provided a thorough walk-through code and even introduced a new concept to the class, earning a novelty point. However, on slide 4, I should have emphasized the significance of the "pretrained = True" parameter, as it plays a crucial role. Overall, I think the discussion went well and it was a great learning experience for me as well.

***References:***

Kaggle. (n.d.). PlantVillage. Retrieved from https://www.kaggle.com/datasets/emmarex/plantdisease

Dosovitskiy, A., Beyer, L., Kolesnikov, A., Weissenborn, D., Zhai, X., Unterthiner, T., ... & Houlsby, N. (2020). An image is worth 16x16 words: Transformers for image recognition at scale. arXiv preprint arXiv:2010.11929. Retrieved from <https://arxiv.org/abs/2010.11929>