AI-Powered Coffee Leaf Disease Detection - Project Proposal

1. Project Idea:

Ethiopia, besides being the origin country of coffee, is one of the major producers and exporters of coffee. Coffee farmers often lack proper training to identify coffee plant diseases accurately and in a timely manner. As a result, they may take action too late or misdiagnose the disease, leading to significant yield losses.

This project aims to develop a mobile application that provides real-time analysis of coffee plant leaves. By simply scanning a leaf with their mobile device, farmers will receive instant feedback on whether the plant is diseased and, if so, which type of disease it has. This solution will empower farmers with actionable insights, helping them to take the necessary steps to protect their crops and improve productivity.

1. Relevance to Sustainable Development Goals (SDGs):

This project aligns with several Sustainable Development Goals (SDGs):

* SDG 2 (Zero Hunger): By enabling farmers to detect and treat coffee leaf diseases early, the project helps improve coffee yields and sustain livelihoods, reducing the risk of food insecurity.
* SDG 13 (Climate Action): Climate change is closely linked to plant diseases. By providing early detection and intervention, the project contributes to agricultural resilience and adaptation to climate-related challenges.
* SDG 8 (Decent Work and Economic Growth): By reducing crop losses and improving productivity, the project can enhance the economic well-being of coffee farmers, ensuring sustainable income opportunities

1. Literature Examples:

* "An advanced deep learning models-based plant disease detection: A review of recent research"  
  This paper explores the use of machine learning and deep learning in plant disease detection, highlighting the benefits and limitations of these approaches.  
  <https://www.frontiersin.org/journals/plant-science/articles/10.3389/fpls.2023.1158933/full>
* "Ethiopian Coffee Leaf Disease Detection Using Deep Learning"  
  This research examines the application of Convolutional Neural Networks (CNNs) in detecting coffee plant diseases.  
  <http://repository.smuc.edu.et/handle/123456789/7873>

1. Describe Your Data:

The dataset used in this project is called "Coffee Leaf Diseases" and is obtained from Kaggle. It consists of 1700+ images of coffee leaves affected by different diseases. The dataset is in CSV format, with a total size of 225.74 MB and 14 columns. During the preprocessing phase, steps will be taken to ensure data balance for improved model performance.

1. Approach (Machine Learning or Deep Learning):

This project employs deep learning due to its superior ability to classify images effectively. Given that the goal is prediction rather than interpretability, neural networks, specifically Convolutional Neural Networks (CNNs), are the best choice. The availability of a large dataset also makes deep learning a practical and powerful solution for accurate coffee leaf disease classification.