Project Report Phase 2

DSL 501: Machine Learning

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Paper: DFN-PSAN: Multi-level deep information feature fusion extraction network for interpretable plant disease classification

Paper Link: https://www.sciencedirect.com/science/article/pii/S0168169923008694

Summary: Accurate crop disease identification is crucial for advancing agriculture by reducing pesticide use and boosting yield. Although deep learning models perform well on controlled datasets, they often struggle in natural farm environments due to variability in real-world conditions, posing challenges for Agri 4.0. To address this, the DFN-PSAN model integrates a YOLOv5-based feature extraction framework with a Pyramidal Squeezed Attention (PSA) mechanism, focusing on critical image regions for better disease classification. It achieves over 95.27% accuracy while reducing model parameters by 26%. Additionally, SHAP and t-SNE improve interpretability, making the model's decision process clearer.

GitHub Repository Link: https://github.com/Niladri-501/-Plant_Disease_Detection-.git

Task and Milestones Achieved (Contribution):

1. **Data:** Plant Diseases Dataset

   Link:https://www.kaggle.com/datasets/vipoooool/new-plant-diseases-dataset/data

   This dataset consists of about 87K rgb images of healthy and diseased crop leaves which is categorized into 38 different classes. The total dataset is divided into 80/20 ratio of training and validation set preserving the directory structure. A new directory containing 33 test images is created later for prediction purpose.

2. **Data Preprocessing:** Image Resizing , Normalization , Data Augmentation (Rotation, Flipping, Scaling, Cropping)

3. **Model Selection:** The model adopts the YOLOv5 architecture for its backbone, which is responsible for extracting multi-scale features from input plant disease images. The PSA(Pyramid Squeezed Attention) mechanism is

designed to emphasize important regions of the plant images where disease symptoms appear. The DFN-PSAN model, therefore, combines the strengths of YOLOv5's robust feature extraction capabilities with a novel attention mechanism to deliver effective and interpretable plant disease classification.

4. **Data Pipeline:**

   Data Input -> Preprocessing -> Feature Extraction using Yolov5 -> Multi-Level Deep Information Fusion -> PSA-> Classification and Post-Processing -> Save Output

Pending Task that will be addressed in the final phase:

1. Implement YOLOv5
2. Integrate PSA (Pyramid Squeezed Attention)
3. Model Output for Classification