

Crop Recommendation Model Architecture (Deep Neural Network)

This diagram visualizes the structure of the multi-class classification model defined in your TensorFlow/Keras script. The model is a fully connected Deep Neural Network (DNN) designed to predict the optimal crop label based on seven environmental and soil input features.

Architecture Breakdown

| Component | Layer Type | Node Count | Activation Function | Purpose |
|----------------|------------------|------------|---------------------|--|
| Input Layer | Dense (Implicit) | 7 | N/A | Receives the 7 scaled and normalized input features: N, P, K, temperature, humidity, pH, and rainfall. |
| Hidden Layer 1 | Dense | 128 | ReLU (relu) | First layer for learning complex, non-linear relationships within the input data. |
| Hidden Layer 2 | Dense | 64 | ReLU (relu) | Further refinement of features and dimensionality reduction. |
| Hidden Layer 3 | Dense | 32 | ReLU (relu) | Final feature abstraction before the classification decision. |
| Output Layer | Dense | 22* | Softmax (softmax) | Produces a probability distribution over the 22 possible crop classes. The class with the highest probability is the predicted crop. |

*Note: The number of classes (22) is inferred from the original script's target variable encoding (`num_classes`).

Training and Optimization Details

- **Optimizer:** Adam (Adaptive Moment Estimation)
- **Loss Function:** Categorical Crossentropy (Standard loss for multi-class classification with one-hot encoded targets)
- **Evaluation Metric:** Accuracy
- **Data Preparation:** Features are scaled using `MinMaxScaler`, and the target labels are converted to one-hot vectors using `LabelEncoder` followed by `tf.keras.utils.to_categorical`.
- **Epochs:** 50
- **Batch Size:** 32