Deep Learning Lab Experiment -1

Consider a "**semi-arid soil types**" dataset based on various soil properties. The dataset includes features such as **soil texture, pH, moisture content, organic matter, and more**. The objective is to use a deep neural network to predict **soil types (e.g., sandy, loamy, clayey)** based on these features. Design a simple deep learning sequential model with the following specifications:

- Two hidden layers with 64 and 32 neurons, respectively
- ReLU activation function
- A dropout rate of 30% to avoid overfitting
- Classification into three categories (or more if needed) for soil classification

The following steps should be clearly demonstrated in the code:

1. **Data Preprocessing**:
    - Handle missing data by either removing or imputing the missing values.
    - Separate the features (inputs) and the labels (outputs).
    - Encode categorical features (if necessary): Apply one-hot encoding for categorical variables.
    - Scale the features: Standardize the features to ensure proper neural network performance.
2. **Train-Test Split**:
    - Split the dataset into training and testing sets.
3. **Build the Deep Learning Model**:
    - Use a Sequential model with the defined architecture.
4. **Compile the Model**:
    - Compile the model using the Adam optimizer and the sparse_categorical_crossentropy loss function.
5. **Evaluate the Model**:
    - Evaluate the model on the test data and measure its performance.
6. **Visualize Training and Validation Accuracy**:
    - Plot the accuracy and loss for both training and validation data over epochs.
7. **Make Predictions**:
    - Use the trained model to make predictions on new soil data.
8. **Save and Load the Model**:
    - Save the trained model to a file and load it for future use.
9. **Model Size**:
    - Return the size of the trained model.

Additionally, draw and visualize the proposed deep learning architecture.