■ Project Title: Flower Classification using Convolutional Neural Networks (CNN)

■ Problem Statement

The objective of this project is to design and train a **Convolutional Neural Network (CNN)** model that can accurately classify flower images into different categories such as *Daisy*, *Dandelion*, *Rose*, *Sunflower*, and *Tulip*.

Flowers are among the most visually diverse natural objects, and traditional image processing techniques often fail to capture their complex patterns and colors. Deep learning, specifically CNNs, has proven to be highly effective in such image recognition tasks due to its ability to automatically learn spatial hierarchies and visual features directly from raw pixel data.

In this project, students will build a **CNN from scratch** using **TensorFlow/Keras**, understanding how each layer contributes to the overall learning process. They will experiment with **activation functions** (ReLU for hidden layers and Softmax for the output layer) and use **Categorical Crossentropy loss** for multiclass classification.

■ Objectives

1. Implement a CNN architecture from scratch for image classification.
2. Understand the working of convolution, pooling, flatten, and dense layers.
3. Learn how activation functions and loss functions affect model learning.
4. Evaluate model performance using accuracy, confusion matrix, and visualizations.
5. Prepare the model for real-world image prediction.

■ Concepts Covered

- CNN Architecture and Forward Propagation
- Activation Functions: ReLU and Softmax
- Loss Function: Categorical Crossentropy
- Optimizer: Adam
- Evaluation: Accuracy, Confusion Matrix, Visualization

■ Expected Learning Outcomes

By completing this project, students will:

- Be able to design, compile, and train a CNN using Keras.
- Understand the purpose of ReLU and Softmax activation functions.
- Explain why Categorical Crossentropy is used in multi-class problems.
- Gain hands-on experience in image preprocessing and batch generation.
- Be confident in evaluating and improving CNN model performance.