### Project Overview:

The goal of this project was to build a model capable of determining emotion from facial expressions using the FER2013 dataset. Two different models were developed and compared: one with a custom architecture defined using PyTorch and the other using transfer learning with VGG19. FastAI, built on PyTorch, was used for training both models, with a weighted loss function and an early stopping callback with a patience of 10 epochs to prevent overfitting.

### Methodology:

Two different approaches were evaluated:

1. Custom Model Architecture (PyTorch): A custom deep learning model, defined using PyTorch, designed specifically for emotion classification from facial images.
2. Transfer Learning with VGG19: A pre-trained VGG19 model fine-tuned on the FER2013 dataset.

Data Preprocessing:

* Augmentation: The data was slightly rotated and cropped to increase variability and improve model robustness.

Cross-validation:

* Early Stopping was used with a patience of 10 epochs to stop training if validation performance stopped improving.
* Both models were trained with a weighted loss function to handle any class imbalance in the dataset.

### Evaluation Metrics:

* Accuracy: The main metric used to evaluate the model’s performance.
* Confusion Matrix: Used to further analyze the performance and error distribution across different emotion categories.

### Results:

* Both models were evaluated on their ability to correctly classify emotions from facial expressions.
* The transfer learning model with VGG19 outperformed the custom architecture, making it the selected model for deployment.
* Conclusion:

This project compares two approaches for emotion recognition from facial images: a custom deep learning model (defined using PyTorch) and a transfer learning approach using VGG19. The transfer learning model, fine-tuned on the FER2013 dataset, showed superior performance and was chosen for deployment. The use of data augmentation, weighted loss, and early stopping helped ensure a robust and efficient training process.