



# Sentiment Analysis of Tweets using DistilBERT

- The project involves building a **sentiment analysis application** using:
- Fine-tuned **DistilBERT** model for text classification.
- **Gradio** for an interactive web-based user interface.
- **Hugging Face Spaces** for deployment and hosting.
- The app predicts sentiment probabilities: **Positive**, **Neutral**, and **Negative**.

# Problem Statement

## **Goal:**

Create a real-time sentiment analysis application for textual data using a fine-tuned machine learning model.

- **Challenges:**
- Predicting sentiments (Negative, Neutral, Positive) with high accuracy.
- Developing an intuitive user interface for end users.
- Handling duplicate data and improving model performance.

# Dataset Overview

## Source

Twitter data with sentiments.

## Dataset Details

Shape: 74,681 rows, 4 columns.

Columns: Tweet\\_id, Location, Review, Tweets.

## Preprocessing

Replaced "Irrelevant" with "Neutral".

Removed 2,700 duplicate entries.

Tokenization using  
DistilBertTokenizer.

# Preprocessing Steps

1

Handle Missing Data

No null values in key columns.

2

Data Cleaning

Removed duplicate tweets.

3

Label Encoding

Mapped sentiments to numerical labels.

4

Train-Test Split

80% for training, 20% for validation.

5

Tokenization

Texts converted to token IDs and attention masks with a max length of 128.

# Model and Architecture

## Pre-trained Model

DistilBERT (base uncased).

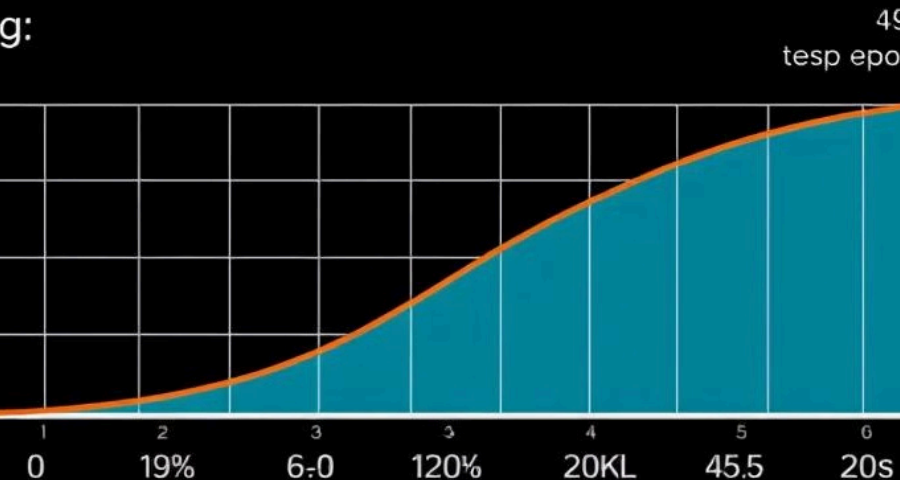
## Reason for Selection

Lightweight, efficient, and suitable for text classification.

## Model Setup

Adjusted for 3-class classification.  
Used PyTorch for training. GPU Utilization: Enabled for faster processing.

# Training



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## Fine-tuning and Training



### Hyperparameters

Learning rate:  $2e-5$ . Batch size: 16.  
Epochs: 5. Weight decay: 0.01.  
Mixed precision (fp16).



### Early Stopping

Patience of 2 epochs.



### Metrics

Accuracy, Precision, Recall, F1-score.



### Training Results

Best Epoch: 4. Accuracy: 92.5%.  
F1-score: 92.5%.

# Evaluation Metrics

0.315

Loss

93.4%

Accuracy

93.5%

Precision

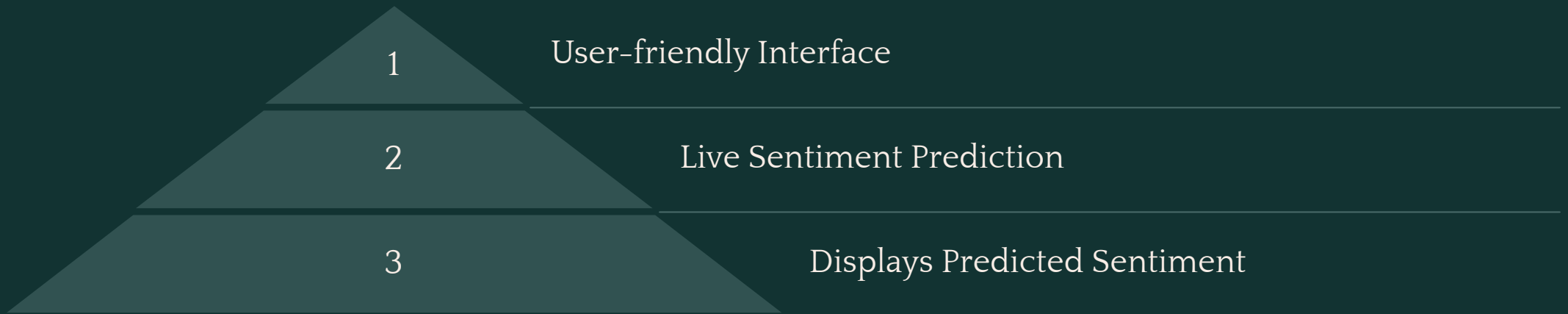
93.4%

Recall

93.4%

F1-score

# Deployment using Gradio





# Application Workflow

1

## Input

User types a tweet.

2

## Processing

Tokenized and passed through the fine-tuned DistilBERT model.

3

## Output

Predicted sentiment displayed along with confidence scores.

4

## Hosting

Application shared publicly via Gradio's sharing feature.