4.8 Experiment No. 7

Aim: Emotion Detection from Text (NLP + Classification)

Build a model to detect emotions (joy, anger, sadness, etc.) from user-generated text like tweets, comments, or messages.

Objective:
The main objective of this experiment is to develop a predictive model that can detect the emotions expressed in text messages, tweets, or user-generated content. The experiment utilizes Natural Language Processing (NLP) techniques and a supervised classification model to identify emotions such as joy, sadness, anger, surprise, and others.

Theory:

Emotion Detection / Text Classification:
Emotion detection is a Natural Language Processing task where a model is trained to classify text into different emotion categories. The text is first preprocessed and converted into numeric features that machine learning models can understand.

Why NLP + Classification?
- Helps automate sentiment and emotion analysis in large text datasets.
- Can provide insights for decision-making in social media, customer feedback, and communication analytics.
- Useful for understanding human emotions and behavioral patterns from text.
- Enables real-time applications like chatbots and virtual assistants.

How it works:
1. **Data Preprocessing:** Text is cleaned by converting to lowercase, removing punctuation, URLs, and extra spaces.
2. **Feature Extraction:** The cleaned text is transformed into numeric features using **TF-IDF Vectorization**, which captures the importance of words in the text.
3. **Label Encoding:** Emotion labels are converted from strings to numeric form so that the model can perform classification.
4. **Train/Test Split:** The dataset is divided into training and testing sets to evaluate the model on unseen data.
5. **Model Training:** A supervised classifier (e.g., Logistic Regression or Multinomial Naive Bayes) is trained using the numeric features and encoded labels.
6. **Prediction:** The trained model predicts the emotion for new text data.
7. **Evaluation:** Model performance is assessed using **accuracy, confusion matrix, and classification report** to understand class-wise performance.

Applications:

Emotion detection and text classification have applications in:

1. Social Media Monitoring: Analyzing public sentiment and trends.
2. Customer Service: Detecting user satisfaction or frustration in messages.
3. Mental Health: Identifying emotional states from text for counseling or support.
4. Chatbots & Virtual Assistants: Responding appropriately based on detected emotion.
5. Market Research: Understanding consumer opinions and reactions.

Input:

The input for this experiment is a labeled text dataset containing text messages or tweets (content) and their corresponding emotion labels (sentiment).

Output:

The output of this experiment is a trained classification model that can predict the emotion expressed in a given text message. For each input text, the model outputs a categorical label indicating the emotion.

Conclusion:

Through the implementation of emotion detection using NLP and classification models, we successfully demonstrated how machine learning can interpret emotions from text. The experiment showcases the ability to convert text into numeric features and classify it into multiple emotions, despite the challenges of noisy and short text data.

Outcome:

The outcome of this experiment is a predictive model that can automatically detect the emotion of new text inputs. This model can be used in applications like chatbots, sentiment analysis, social media monitoring, and customer service to better understand and respond to human emotions.