**📝 Task 4: Spam SMS Detection – Final Report**

**📌 Objective**

Build a machine learning model that classifies SMS messages as **Spam** or **Ham (Not Spam)** using NLP techniques such as **TF-IDF** and **Naive Bayes**.

**📁 Dataset**

* **Source**: [Kaggle - SMS Spam Collection Dataset](https://www.kaggle.com/datasets/uciml/sms-spam-collection-dataset)
* **Rows**: 5,572 SMS messages
* **Features**: message (text), label (ham/spam)

**🛠️ Data Preprocessing**

* Removed irrelevant columns and renamed columns to label and message
* Mapped label: ham → 0, spam → 1
* Used **TF-IDF Vectorizer** to convert text into numerical format
* Split dataset (80% train / 20% test)

**🤖 Model Used**

* **Multinomial Naive Bayes**
  + Efficient and simple for text classification
  + Good with word frequency-based features

**📊 Model Performance**

| **Metric** | **Value** |
| --- | --- |
| Accuracy | 96.86% ✅ |
| Precision (spam) | 100% |
| Recall (spam) | 77% |
| F1-score (spam) | 87% |

**✅ Confusion Matrix**

| **Actual \ Predicted** | **Ham (0)** | **Spam (1)** |
| --- | --- | --- |
| Ham (0) | 966 | 0 |
| Spam (1) | 35 | 114 |

**🔎 Insights**

* The model performs **exceptionally well** on ham messages
* Spam messages were predicted correctly in most cases, with minor misclassifications
* Can be enhanced using more advanced NLP (e.g., Word Embeddings, LSTM)

**🔗 Repository**

[GitHub Repo Link – <https://github.com/thiruvarul11/CODSOFT.git> ]

**✅ Conclusion**

Successfully developed a spam SMS classifier using NLP and Naive Bayes. Achieved high accuracy and precision, demonstrating effective text-based classification.