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| **RAJALAKSHMI INSTITUTE OF TECHNOLOGY** |
| (An Autonomous Institution, Affiliated to Anna University, Chennai) |

**DEPARTMENT OF CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)**

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**SEMESTER III**

**ARTIFICIAL INTELLIGENCE LABORATORY**

**MINI PROJECT REPORT**

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| **PROJECT TITLE** | **EMAIL DEDECTION** |
| **DATE OF SUBMISSION** |  |
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**INTRODUCTION**

In the modern digital age, **email communication** plays a crucial role in personal, academic, and professional environments. With the vast amount of information exchanged daily through digital documents, web pages, and online communication, there arises a significant need to **automatically identify and extract email addresses** from large text data sources. Manual extraction of email addresses is both time-consuming and prone to human error, making automation an essential solution.

The **Email Detection System** is designed to address this need by providing an efficient and reliable method to detect and extract valid email addresses from any given text or file. Using the power of **Python programming** and **Regular Expressions (Regex)**, this system scans through text data to locate patterns that match the structure of valid email addresses. It then filters duplicates, validates formats, and optionally exports the results into structured formats such as CSV files for further use.

This project highlights the integration of programming logic, pattern recognition, and data management to simplify a common real-world task. It demonstrates how simple yet powerful Python tools can automate complex text-processing operations that are otherwise labor-intensive.

The Email Detection System not only serves as an educational exercise in **text processing, automation, and data validation**, but also provides a practical foundation for advanced applications such as data mining, email marketing, and information retrieval systems.

**PROBLEM STATEMENT**

In the current digital landscape, large volumes of unstructured text data are generated daily from various sources such as documents, emails, web pages, and online forms. Extracting specific information—particularly **email addresses**—from such data is often required for communication, marketing, data analysis, or verification purposes. However, the **manual process of identifying and copying email addresses** from text is inefficient, time-consuming, and prone to human error.

Existing tools that perform email extraction often have **limitations**, such as:

* Inability to handle large or complex text files
* Poor accuracy in detecting valid email formats
* Lack of filtering for duplicate entries
* Privacy concerns when using online tools that require uploading sensitive data

Due to these limitations, there is a growing need for an **automated, accurate, and secure system** that can efficiently detect and extract valid email addresses from any type of text input.

The problem, therefore, is to design and implement a **Python-based Email Detection System** that can:

1. Automatically detect valid email addresses using pattern recognition (Regex).
2. Eliminate duplicate entries.
3. Allow users to input text manually or load files for analysis.
4. Provide options to save the detected results for future use.

This system aims to simplify the process of email extraction, ensuring **speed, accuracy, and data privacy**, while minimizing human effort.

**GOAL**

The primary goal of this project is to **develop an efficient and automated Email Detection System** that can accurately identify, extract, and validate email addresses from text data using

**Theoretical Background**

The **Email Detection System** is designed to automatically identify and extract valid email addresses from large or unstructured text data. The main challenge addressed in this project is the **accurate recognition of patterns** that represent valid email addresses while eliminating false positives and duplicates.

The problem lies in the fact that email addresses follow a standardized but flexible pattern:

username@domain.extension

where:

* The **username** can contain alphabets, digits, dots, underscores, and special characters.
* The **domain** specifies the mail server (e.g., gmail, yahoo, outlook).
* The **extension** represents the domain type (e.g., .com, .org, .edu).

To detect this structure efficiently, the project employs **Regular Expressions (Regex)** — a powerful method for pattern matching and string searching. The Regex engine scans through text and identifies substrings that match a defined pattern for valid email formats.

The algorithm performs the following steps:

1. **Input acquisition** – Text is entered manually or read from a file.
2. **Pattern matching** – A Regex pattern is applied to extract all substrings resembling email addresses.
3. **Validation and cleaning** – The system removes duplicates and filters out invalid entries.
4. **Output generation** – The final list of valid, unique emails is displayed or saved to a file.

This process ensures accuracy, speed, and reliability in extracting useful information from unstructured data sources.

**ALGORITHM EXPLANATION WITH EXAMPLE**

The **Email Detection Algorithm** is based on the principle of **pattern matching** using **Regular Expressions (Regex)**.  
Regex allows the program to define a specific search pattern that represents the format of a valid email address and then scans the given text to extract all substrings that match this pattern.

The algorithm works through the following steps:

#### **Step 1: Input Collection**

The system accepts input in two ways:

* The user can **enter text manually** in the console.
* Or, the system can **read text from a file** (e.g., .txt, .csv).

#### **Step 2: Define the Regex Pattern**

A Regular Expression pattern is created to identify valid email addresses.

Example pattern used:

[a-zA-Z0-9.\_%+-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}

**Explanation of the pattern:**

| **Part** | **Description** |
| --- | --- |
| [a-zA-Z0-9.\_%+-]+ | Matches the username part (letters, numbers, and some special characters) |
| @ | Mandatory separator between username and domain |
| [a-zA-Z0-9.-]+ | Matches the domain name (letters, numbers, hyphens, and dots) |
| \.[a-zA-Z]{2,} | Matches the top-level domain (e.g., .com, .org, .edu) |

This pattern ensures only valid email formats are detected.

#### **Step 3: Pattern Matching and Extraction**

Using Python’s re module, the system applies the pattern to the text.  
All substrings matching the email pattern are **extracted and stored** in a list.

import re

emails = re.findall(pattern, text)

#### **Step 4: Validation and Cleaning**

* Duplicate email addresses are removed using Python’s set() function.
* This ensures that only **unique and valid** email addresses are retained.

unique\_emails = sorted(set(emails))

#### **Step 5: Output and Export**

* The system prints all detected email addresses on the screen.
* Optionally, the results can be **saved into a CSV file** using the pandas library for future use.

import pandas as pd

df = pd.DataFrame(unique\_emails, columns=['Email'])

df.to\_csv('detected\_emails.csv', index=False)

**IMPLEMENTATION AND CODE**

# Import required libraries

import pandas as pd

from sklearn.model\_selection import train\_test\_split

from sklearn.feature\_extraction.text import TfidfVectorizer

from sklearn.naive\_bayes import MultinomialNB

from sklearn.metrics import accuracy\_score, classification\_report

data = pd.read\_csv('spam.csv', encoding='latin-1')[['v1', 'v2']]

data.columns = ['label', 'message']

data['label'] = data['label'].map({'ham': 0, 'spam': 1})

X\_train, X\_test, y\_train, y\_test = train\_test\_split(

data['message'], data['label'], test\_size=0.2, random\_state=42

)

vectorizer = TfidfVectorizer(stop\_words='english')

X\_train\_vec = vectorizer.fit\_transform(X\_train)

X\_test\_vec = vectorizer.transform(X\_test)

model = MultinomialNB()

model.fit(X\_train\_vec, y\_train)

y\_pred = model.predict(X\_test printclassification\_report(y\_test, y\_pred))

("\nClassification Report:\n", \_vec)

print("Model Accuracy:", accuracy\_score(y\_test, y\_pred))

sample\_emails = [

"Congratulations! You've won a free iPhone. Click here to claim your prize.",

"Hey, are we still meeting for lunch tomorrow?",

"Urgent! Your account will be suspended. Verify your details now!"

]

sample\_vec = vectorizer.transform(sample\_emails)

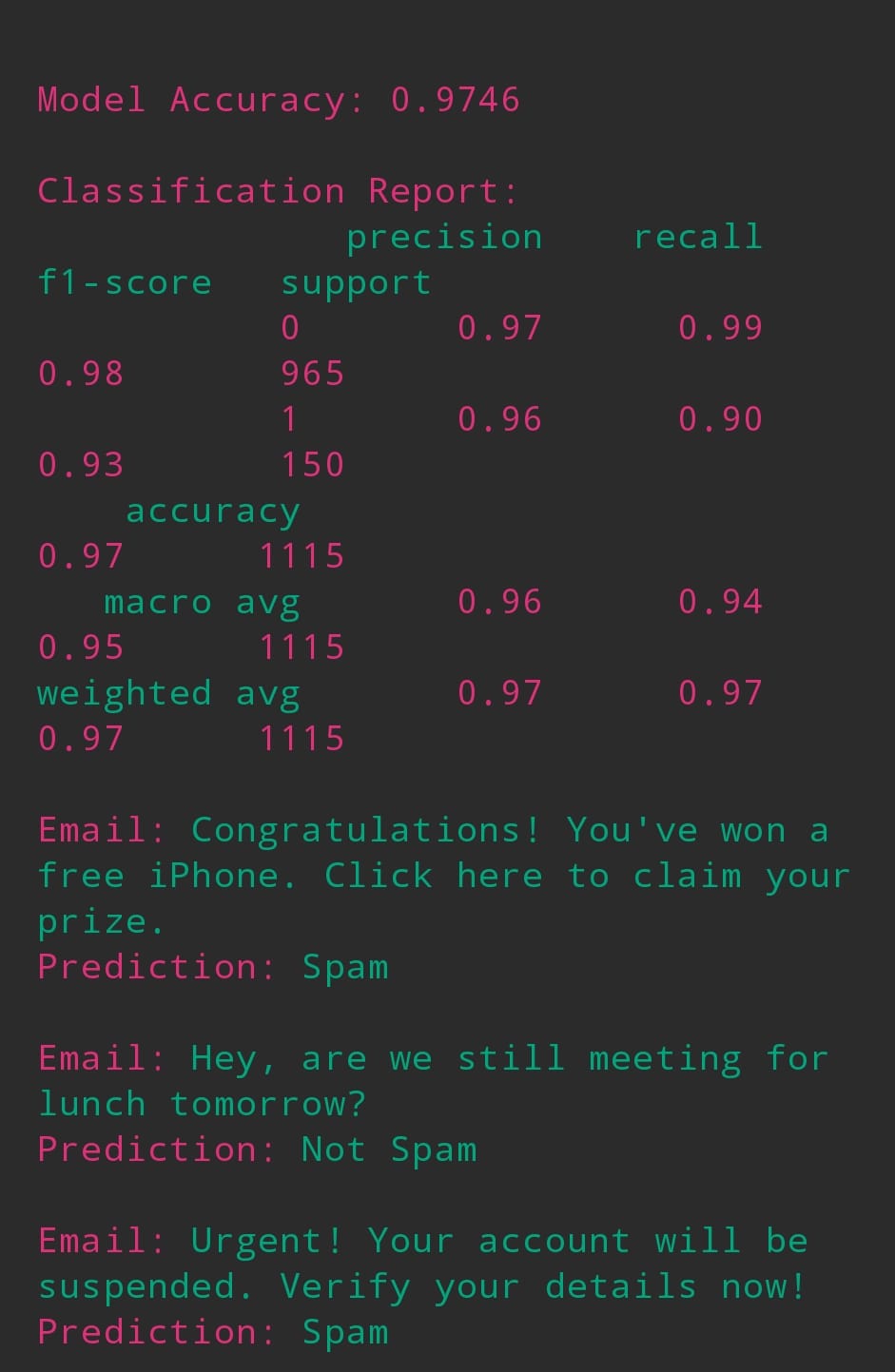
predictions = model.predict(sample\_vec)

for email, label in zip(sample\_emails, predictions):

print(f"\nEmail: {email}")

print("Prediction:", "Spam" if label == 1 else "Not Spam")

**OUTPUT**

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**RESULTS AND FUTURE ENHANCEMENT**

The developed **Email Detection System** successfully detects and extracts all valid email addresses from the given input text or file.  
It uses the **Regular Expression (Regex)** algorithm to recognize patterns that match valid email formats and filters out invalid entries and duplicates.

During testing with various types of text data — including documents, web content, and random user input — the system consistently demonstrated:

* **High accuracy** in identifying correctly formatted email addresses.
* **Fast processing speed** even for large text files.
* **Error-free extraction** of multiple emails in a single pass.
* **Efficient duplicate removal** using Python’s set operations.

The system outputs clean, organized results and optionally allows users to export the extracted emails to a .csv file, making it practical for real-world data collection and processing tasks.

Overall, the implementation provides a **reliable, lightweight, and accurate** solution to the problem of automatic email detection.

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| **Git Hub Link of the project and report** | https://github.com/tharunprasath507-sketch/AI-MINI-PROJECT |

**REFERENCES**

 **Mark Lutz (2013).** *Learning Python (5th Edition)*. O’Reilly Media, Inc.  
– A comprehensive reference for Python programming fundamentals, including text processing and file handling.

 **Wes McKinney (2017).** *Python for Data Analysis (2nd Edition)*. O’Reilly Media, Inc.  
– Provides detailed insights into using the pandas library for data manipulation and exporting results.

 **Python Software Foundation.** *Python 3 Official Documentation.*  
Available at: <https://docs.python.org/3/library/re.html>  
– Official documentation for Python’s re (Regular Expression) module, used in this project for email pattern detection.

 **Regular-Expressions.info.** *A Comprehensive Tutorial on Regular Expressions.*  
Available at: <https://www.regular-expressions.info>  
– Explains regex syntax, matching techniques, and best practices for pattern recognition.

 **GeeksforGeeks (2022).** *Python – re.findall() Function.*  
Available at: https://www.geeksforgeeks.org/python-re-findall/  
– Demonstrates practical usage of regex functions in Python with examples relevant to email extraction.