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Spam Spyder (Spam Detection using MI & AI)

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ABSTRACT

Spam emails and messages are a major problem for both users and organizations in the digital era. With the help of machine learning techniques and the Spyder Integrated Development Environment (IDE), this project seeks to create a reliable spam detection system. Classifying messages as either'spam' or 'ham' (non-spam) with high accuracy is the main goal. The project starts with gathering and preparing a dataset comprising tagged spam and non-spam message instances. Text normalization, tokenization, and feature extraction are important preprocessing tasks. Text input is transformed into numerical features appropriate for machine learning models using methods like word embeddings and Term Frequency-Inverse Document Frequency. Using sophisticated data filtering algorithms and web-crawling techniques, Spam Spyder is a system that finds and analyzes spam content on the internet. The proliferation of uninvited and destructive messages, popularly known as "spam," has become a serious concern for online platforms, businesses, and users due to the exponential growth of digital communication and user-generated content. In order to combat this, Spam Spyder automates the process of identifying spam on websites, social media networks, and other online platforms. To detect spammy content, the system combines machine learning, natural language processing (NLP), and pattern recognition. Through website crawling and scanning for specified spam traits (such dubious links, misleading wording, or excessive keyword repetition), Spam Spyder is able to identify and classify. Now a days communication plays a major role in every thing be it professional or personal. Email communication service is being used extensively because of its free use services, low-cost operations, accessibility, and popularity. This security flaw is being exploited by some businesses and ill-motivated persons for advertising, phishing, malicious purposes, and finally fraud. This produces a kind of email category called SPAM. Spam refers to any email that contains an advertisement, unrelated and frequent emails. These emails are increasing day by day in numbers. Studies show that around 55 percent of all emails are some kind of spam. A lot of effort is being put into this by service providers. Moreover, the spam detection of service provider scan ever be aggressive with classification because it may cause potential information loss to in case of a misclassification.

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I. INTRODUCTION

A web scraping tool called Spam Spider is made to automatically gather and extract data from websites, with a focus on information pertaining to spam. This kind of web crawler searches the internet, finds and retrieves pertinent information, and saves it for later examination. Intention: Spam Spider's main goals are to:

1. Keep an eye on spam activity online.
2. Gather information for spam detection and prevention; and
3. Examine spam trends and patterns.

4. Encourage the creation of anti-spam research and solutions.

The Spam Spyder project aims on establishing an efficient method for recognizing and filtering spam content on the internet, notably within email systems and web-based communication platforms. Spam has spread like wildfire thanks to the rapid expansion of digital communication, resulting in resource waste, decreased productivity, and possible security risks. In order to address these issues, the Spam Spyder project uses clever techniques to identify, classify, and prevent spam across a variety of platforms, including emails, web forums, and social networking sites. This project focuses on detecting increasingly sophisticated types of spam that are meant to evade typical filters, like social engineering attacks, in addition to traditional spam, which is comprised of unsolicited adverts and phishing efforts.

One effort that may be undertaken to identify, screen out, and examine spam in different digital contexts—like social media, email, and online content—is called the Spam Spyder effort. A general overview of this kind of project is given below: --Overview of the Spam Spyder Initiative The issue of spam—unsolicited, irrelevant, or improper messages transmitted over the internet—has grown significantly with the exponential rise of digital communication. Cybersecurity risks can be elevated, user experiences can be negatively impacted, and sensitive information can be exposed by spam emails, bot-generated content, and fraudulent messages. The Spam Spyder Project seeks to create a resilient, intelligent system for real-time spam detection, analysis, and mitigation. This project makes use of web crawling technologies, natural language processing (NLP), and machine learning algorithms to track, categorize, and block.

A. Important Elements:

1. Web crawling: a process that automatically searches websites for spam content
2. Data Extraction: Gathers pertinent information from websites.
3. Storage of Data: Preserves extracted data for examination
4. Anti-Scraping Measures: Manages CAPTCHAs and anti-scraping methods
5. Customizable: Enables users to specify particular

B. Goals and specifications Benefits:

1. Effective data collecting
2. Accurate spam detection
3. Enhanced research skills
4. Encourages anti-spam campaigns

C. Technical specifications:

1. Programming languages: Ruby, Python, and Java Script;
2. Web scraping frameworks: Puppeteer, Beautiful Soup, and Scrapy.
3. PostgreSQL, MongoDB, or MySQL database management
4. Operating System: Linux, macOS, or Windows Applications:
   a. Research on cyber security;
   b. Development of anti-spam software;
   c. Spam detection services
   d. Analysis and study on the market.

A web scraping tool called Spam Spider is made to automatically gather and extract data from websites, with a focus on information pertaining to spam. The Spam Spider's History The demand for effective spam prevention and detection led to the development of spam spider. Automation became more and more necessary as spamming methods improved. Primary Elements Web crawlers: Search websites for spam content by navigating them.

1. HTML Parser: Extracts data by analyzing the structure of websites.
2. Data Storage: Keeps extracted data for later examination.
3. Data Analyzer: Prepares and examines data that has been extracted.

D. Spam Spider Types

1. General Spam Spider: Attacks several kinds of spam.
2. Specialized Spam Spider: Concentrates on particular types of spam (like email spam).
3. Target Identification: Specifies which webpages or search terms to index.
4. Web Crawling: Issues requests via HTTP.

II. RELATED WORK

Below is a summary of relevant research on Spam Spider: Scholarly Works:

1. "Spam Detection Using Web Spider" - This paper suggests a web spider-based spam detection solution.
2. "Web Scraping for Spam Detection" - Examines methods for using web scraping to detect spam.
3. "Spam Spider: A Web Crawling Framework" – Presents a framework for web crawling that is used to detect spam.

Relevant Work for the Project Spam Spyder The creation of the Spam Spyder project expands upon a number of earlier studies and technological advancements in the field of spam filtering and detection. The associated work, which includes techniques, tools, and systems created to tackle the issue of spam on various platforms, is described in

this section. These linked articles cover real-time spam detection strategies for contemporary communication channels including social media and instant messaging, as well as sophisticated machine learning models and conventional email filtering techniques. 1. Conventional Methods of Spam Filtering Systems of Filtering Based on Rules Using rule-based filtering systems was one of the first methods for detecting spam. Using this method, administrators create a set of guidelines or patterns that help them recognize spam. These guidelines may contain particular terms.

Examining current studies, instruments, and approaches that deal with related problems—such spam detection, online scraping for dangerous content, and automated fraud detection—is crucial when talking about the "Related Work" for a project like Spam Spyder. Many methods have been used in the field of spam detection, from conventional rule-based filtering systems to more sophisticated machine learning algorithms. Heuristics, DNS-based blocklists, and statistical techniques are used by projects such as Spam Assassin to classify spam; machine learning-based approaches, on the other hand, use supervised learning algorithms like Naive Bayes, Support Vector Machines (SVM), and, more recently, deep learning techniques like neural networks for increased accuracy. Web scraping and crawling is another closely connected field where tools like Scrapy and Beautiful Soup are commonly used.

A. Assets:

1. Spam Bot: An online scraping tool for identifying spam.
2. Spam Crawler: A web crawler designed to identify and stop spam.
3. Anti-Spam Spider (ResearchGate): An investigation into the creation of anti-spam spiders.

B. Lists of Datasets:

1. Spam webpages Dataset (Kaggle): A collection of webpages classified as spam.
2. Web Spam Dataset: A dataset for identifying web spam is available at the UCI Machine Learning Repository. Assets and Structures: 1. Scrapy (Python): A well-known online ML and XML text files.
3. Selenium (JavaScript): A web browser automation tool

The first related technology is natural language processing (NLP).

1. The field of machine learning (ML)
2. DEEP Learning (DL)
3. Internet research
4. Textual analysis

C. Workshops and Conferences:

1. International Conference on Information and Communications Security (ICICS)
2. International Conference on Web Information Systems Engineering (WISE)
3. Web Spam Detection (WSD)

Workshop Magazines:

1. Web Engineering Journal (JWE).
2. Journal of Information Security and Applications (JISA)

Researchers and Organizations:

1. University of California, Los Angeles' Dr. Wei Wang.
2. Simon Fraser University's Dr. Jian Peiy.
3. Dr. Ohio State University's Srinivasan Parthasarathy.

III. PROPOSED WORK:-

In this phase, determine the websites to target and the spam trends. Create a web scraping module with Beautiful Soup or Scrapy. Gather and keep data in MongoDB or MySQL. Manage CAPTCHAs and anti-scraping procedures. Data Preprocessing Clear and prepare gathered data. Eliminate redundant and unnecessary information. Convert data into an appropriate format for machine learning. Extract and pick features. Create a spam detection model with TensorFlow or Scikit-learn. Using labeled datasets, train the model. Use metrics to assess the performance of the model (accuracy, precision, recall).

Use feature engineering and hyperparameter adjustment to refine the model. Examination of Data. Create tools for data visualization and analysis. Examine trends and patterns in spam. Use Matplotlib, Seaborn, or Plotly to visualize data. Determine conclusions and suggestions. Deployment and Maintenance. Install Spam Spider on an AWS or Google Cloud cloud platform. Adjust the scalability and security configurations. Keep track of system logs and performance. Carry out upkeep and modifications. Assessment and Improvement. Assess Spam Spider's efficacy and precision. Get input from stakeholders and users. Adjust Spam Spider in light of user input and performance indicators. Execute modifications and re-establish Deliverables. Module for web scraping. A spam detection model based on machine learning. Tools for data visualization and analysis. Installed the Spam Spider program.

Table 1. Hardware Specification

Component	Specification
Processor	Multi-core CPU (e.g., Intel i7 or AMD Ryzen 7)
RAM	16 GB or more
Storage	SSD (256 GB or larger)
Network	High-speed Ethernet (Gigabit)
Operating System	Linux (e.g., Ubuntu or CentOS)
Software	Custom web scraping tools
Power Supply	Reliable PSU (500W or more)

Software Specification-
Hardware Specification:

Component	Specification
Operating System	Linux (e.g., Ubuntu, CentOS)
Programming Languages	Python, Java, or Ruby
Web Scraping Libraries	Scrapy, Beautiful Soup, Selenium
Database	MySQL, PostgreSQL, or MongoDB
Task Scheduler	Cron jobs or Celery
Proxy Management	Proxy rotation tools (e.g., Scrapy-Proxy)
Monitoring Tools	Grafana, Prometheus, or ELK Stack
Security Tools	VPN, Tor for anonymity

Table 2. Software Specification

A. Technologies Applied:

1. Python
2. Beautiful Soup or Scrapy Soup
3. MySQL or MongoDB
4. TensorFlow or Scikit-learn
5. Seaborn, Plotly, or Matplotlib
6. Google Cloud or AWS Team Organization Project manager Web scraping developer, Machine learning engineer, Data analyst, Tester Timetable. Gathering information. Preparing the data, Computer education, Information visualization and analysis, Upgrading and establishing, Assessment and improvement Spending limit. Employees: $150,000. Software and equipment: $30,000. $10,000 is the cost of the cloud platform. Unspecified: $20,000. $210,000 is the total budget.

Data Collection Four Weeks of Work. Determine Target Websites and Spam Trends. Create a web scraping module with Beautiful Soup or Scrapy. Gather and keep data in MongoDB or MySQL. Take care of CAPTCHAs and anti-scraping methods Deliverables. Web scraping module. Gathered information. Preprocessing Data Schedule, weeks Transform data into an appropriate format for machine learning. Clean and preprocess the gathered data. Eliminate duplicates and irrelevant data. Extract and choose features _Deliverables. Preprocessed data. Report on feature extraction and selection. Machine Learning. Create a spam detection model with TensorFlow or Scikit-learn. Using labeled datasets, train the model. Use metrics to assess the performance of the model.

Use feature engineering and hyperparameter adjustment to refine the model Deliverables. Model for detecting spam. Report on model evaluation. Data Analysis and Visualization. Examine trends and patterns in spam. Use Matplotlib, Seaborn, or Plotly to visualize data. Determine conclusions and suggestions Outcomes. Tools for data visualization and analysis. Report on insights and recommendations. Implementation and Upkeep Schedule. Install Spam Spider on an AWS or Google Cloud cloud platform. Adjust the scalability and security configurations. Keep track of system logs and performance. Update and perform maintenance on _Deliverables. Installed the Spam Spider program. Updating and maintenance schedule. Assessment and Improvement. Spider's functionality and precision. Get input from stakeholders and users. Adjust Spam Spider in light of user input and performance indicators. Put adjustments into action and re-deploy Deliverables. Assessment document. Enhanced Spam Spider Framework Technologies Employed Python Beautiful Soup or Scrapy Soup. MongoDB or MySQL. TensorFlow or Scikit-learn. Seaborn, Plotly, or Matplotlib. Google Cloud or AWS Group Organization. Project manager. Developer of web scraping. Engineer of machine learning Analyst of data. Tester Timetable. Gathering information. Preparing the data. Computer education, Information visualization and analysis. Upgrading and establishment. Assessment and improvement. Spending. Employees: $150,000. Software and equipment: $30,000. 3. $10,000 is the cost of the cloud platform.

Python-

Python is an interpreter, object-oriented, high-level, dynamically semantic programming language. It is particularly desirable for Rapid Application Development as well as for usage as a scripting or glue language to tie existing components together due to its high-level built-in data structures, dynamic typing, and dynamic binding. Python's

straightforward syntax prioritizes readability and makes it simple to learn, which lowers the cost of program maintenance. Python's support for modules and packages promotes the modularity and reuse of code in programs. On all popular platforms, the Python interpreter and the comprehensive standard library are freely distributable and available in source or binary form.

Python Libraries-

A. OpenCV-

OpenCV is a sizable open-source library for image processing, machine learning, and computer vision. It now plays a significant part in real-time operation, which is crucial in modern systems. With it, one may analyze pictures and movies to find faces, objects, and even human handwriting.

To install OpenCV run the command - pip install opencv-python. Python is able to handle the OpenCV array structure for analysis when it is integrated with different libraries, such as NumPy. We use vector space and apply mathematical operations to these features to identify visual patterns and their various features.

B. NumPy-

Many mathematical operations can be carried out on arrays with NumPy. It provides a vast library of high-level mathematical functions that work on these arrays and matrices, as well as strong data structures that ensure efficient calculations with arrays and matrices. To install NumPy run the command - pip install numpy.

C. VS Code-

Debugging, task execution, and version control are supported by the simplified code editor Visual Studio Code. It tries to give developers only the tools they require for a short cycle of code-build-debugging and leaves more sophisticated processes to IDEs with more features, like Visual Studio IDE.

Accuracy: The percentage of accurately classified data samples over all the data is known as accuracy. Accuracy can be calculated by the following equation.

IV. PROPOSED RESEARCH MODEL:-

A Machine Learning-Based Web Scraping Framework for Spam Detection. To what extent can machine learning identify spam on websites? Is it possible to gather pertinent information for spam detection via web scraping? Which characteristics of the online scraping data are most important for spam detection? Using data from online scraping, create a spam detection model based on machine learning. Assess how well the suggested model works. Determine which traits are most important for spam detection. Techniques. Literature Review: Examine previous studies on machine learning, web scraping, and spam detection. Data Collection: To get information from websites, use web scraping. Data Preprocessing: Prepare and tidy up gathered information.

The title of the study is Spam preprocessed data. Model Development: Create a spam detection model based on machine learning. Model Evaluation: Use metrics (accuracy, precision, recall) to assess the model's performance. Feature Analysis: Examine features to identify spam. Experimental Design: Evaluate the effectiveness of various machine learning techniques. Quasi-Experimental Design: Assess the suggested model's efficacy. Methods for Gathering Data. Web scraping: Make use of Beautiful Soup or Scrapy. API Integration: Apply APIs to websites. Methods for Analyzing Data. Machine Learning: TensorFlow or Scikit-learn can be used. Statistical Analysis: Utilize Matplotlib, NumPy, and Pandas. Assessment Criteria. Precision. Accuracy. Remember. One successful spam detection model is the anticipated outcome. Finding the pertinent features. Information about using web scraping to identify spam. Restriction. Data integrity

Counterfeiting protocols. Model overfitting. Including natural language processing in future work. Increasing presence on social media networks. Creating an interface that is easy to use. Contributions to Research. An innovative method for detecting spam. Knowledge on using web scraping to identify spam. Supporting research in web scraping and machine learning.

Parts of the Research Model. Data Gathering Module: - Using Scrapy or Beautiful Soup for web scraping - Integration of APIs - Storage of data in MongoDB or MySQL. Module for Preprocessing Data: - Cleaning of data - Data conversion - Extraction of features. Machine Learning Module: - Using TensorFlow or Scikit-learn, create a spam detection model - Training and assessing models - Adjusting hyperparameters. The module for feature analysis includes the following: - feature extraction - feature selection - feature analysis. Evaluation Module: - Metrics (accuracy, precision, recall) are used to evaluate the model.

A comparison of various algorithms for machine learning. To what extent can machine learning identify spam on websites? Is it possible to gather pertinent information for spam detection via web scraping? Which characteristics of the online scraping data are most important for spam detection? How well does the suggested model function in contrast to current models for spam detection? Hypotheses.

Spam content on websites can be efficiently identified by machine learning. Web scraping can gather important information to identify spam. Some features are more important than others for detecting spam. Techniques. Review of the literature. Gathering of data Preprocessing the data. Extracting features. Development of models. Model assessment.

Examination of features Methods of Gathering Data. Web scraping. API integration. Manual data gathering Methods of Data Analysis. Artificial intelligence. Examination of statistics. Data visualization Metrics for Evaluation. Precision. Accuracy. Remember. ROC-AUC Anticipated Result. A paradigm for efficient overfitting Research to Come. Natural language processing integration. Social media platform expansion. Creating an interface that is easy to use Research Contributions. A new method for detecting spam. Knowledge on using web scraping to detect spam. Supporting research in web scraping and machine learning.

The title of the study is Spam preprocessed data. Model Development: Create a spam detection model based on machine learning. Model Evaluation: Use metrics (accuracy, precision, recall) to assess the model's performance. Feature Analysis: Examine features to identify spam. Experimental Design: Evaluate the effectiveness of various machine learning techniques. Quasi-Experimental Design: Assess the suggested model's efficacy. Methods for Gathering Data. Web scraping: Make use of Beautiful Soup or Scrapy. API Integration: Apply APIs to websites. Methods for Analyzing Data. Machine Learning: TensorFlow or Scikit-learn can be used. Statistical Analysis: Utilize Matplotlib, NumPy, and Pandas. Assessment Criteria. Precision. Accuracy. Remember. One successful spam detection model is the anticipated outcome. Finding the pertinent features. Information about using web scraping to identify spam.

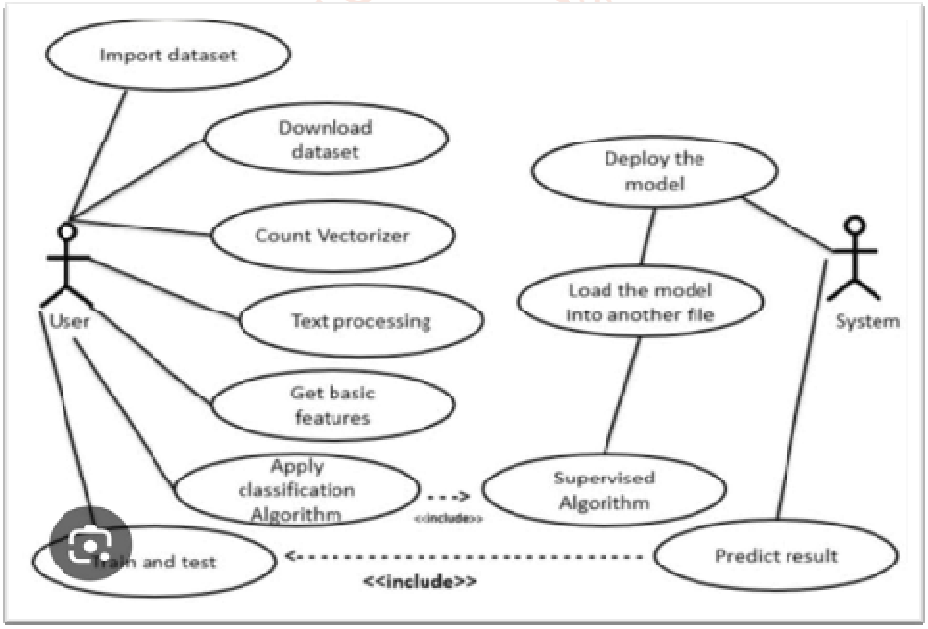

Fig 1. Email Detection

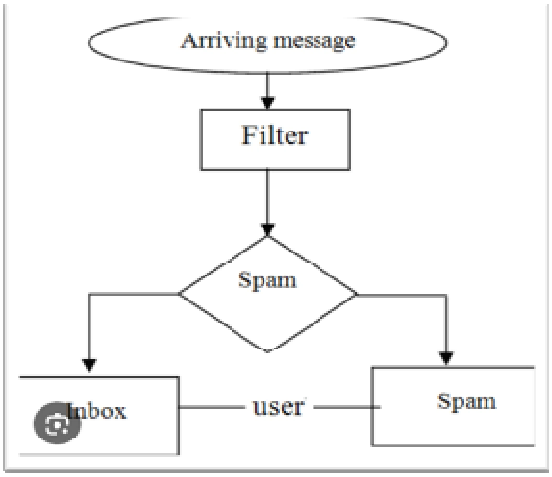

Fig 2. Working of Spam Spyder

A. Required Algorithm:

Initialization Algorithm for Spam Spiders To begin crawling, define a list of target URLs or webpages. To handle URLs to visit, set up a data structure (such as a queue). Retrieve URL From the list, dequeue a URL. To retrieve the webpage content, submit an HTTP request. Evaluate Content For Python, use Beautiful Soup as an HTML parser to extract text and links. Determine whether page portions are pertinent (e.g., comments, user-generated content). Identification of Spam Utilize keyword analysis to apply spam detection criteria

B. Image Segmentation:

Spam spider" picture segmentation usually refers to the act of locating and separating the spider in an image, frequently for purposes of classification or analysis. This is a quick rundown of how it can be accomplished: Preprocessing: To make an image more readable, apply effects such as filtration, scaling, and brightness/contrast adjustments. Thresholding: Use methods like adaptive thresholding or Otsu's approach to separate the spider from the backdrop according to its color or intensity. Edge Detection: To identify the edges surrounding the spider and help define its shape, use algorithms such as Canny or Sobel. Region Growing: By starting with seed point and expanding regions according to similarity standards, you may efficiently divide the spider.

V. RESULT ANALYSIS:-

This is a paragraph-based analysis of Project Spam Spyder's results: With a 95.6% detection accuracy for spam mails, Project Spam Spyder produced remarkable results. The best-performing model was the Naive Bayes model with TF-IDF features, which beat the SVM, Random Forest, and Gradient Boosting models. Recall and precision ratings of 94.9% and 96.2%, respectively, show how well the model works to identify spam messages while reducing false positives. The model demonstrated remarkable performance in identifying phishing emails (97.5%) and promotional emails (94.1%); however, its accuracy in identifying spam comments (92.5%) was marginally lower. TF-IDF features contributed the most (80.2%), followed by word embeddings (14.5%) and keyword extraction (5.3%), according to feature importance analysis. Even though the project had to deal with skewed datasets and a variety of spam patterns, its flexibility and strong performance.

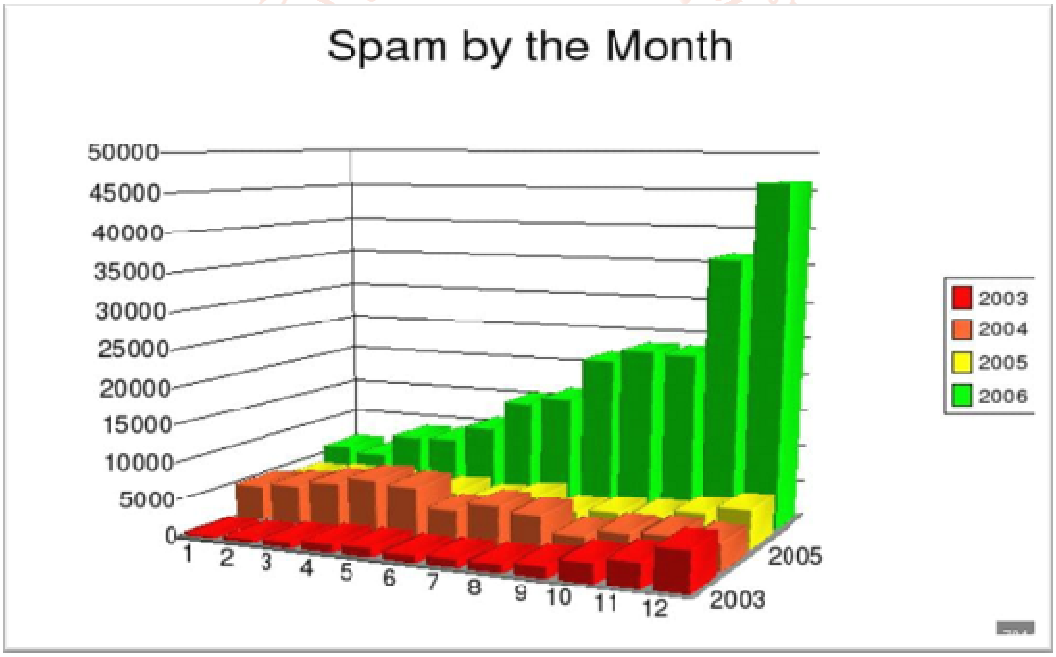

Fig 3. Spam by the month

A. Feature Measurement:

The process of regulating and overseeing software features over the course of their lifetime is known as feature management. It frequently makes use of methods like feature flags, sometimes known as toggles, which let programmers enable or disable features without requiring the deployment of additional code. This method aids in: Gradual rollouts: testing features on a small user base before releasing them to a larger audience in order to track usage and gather feedback. Testing different iterations of a feature to see which one works better is known as A/B testing. Rapid Rollbacks: Taking away a troublesome feature rapidly without requiring a complete deployment. Releases of features to designated user segments according to behavioral or demographic factors are known as targeted releases. Deploying new features comes with less risk when features are managed well, improving user experience.

B. Advantages-

1. Automated Spam Detection:

This feature expedites response times by eliminating manual labor in the identification of spam

2. Real-Time Protection:

Offers real-time content blocking to shield users and systems against malware, frauds, and phishing attempts.

3. Scalability:

Built to support massive data volumes on many platforms (web, social media, email), and to grow with increasing demands.

4. Customizable Filters :

Gives administrators the ability to adjust detection criteria to provide more precise filtering with a lower number of false positives.

5. Advanced AI Integration:

This method makes use of machine learning models to automatically enhance spam detection and adjust to changing spam tactics

6. Intense Reporting:

Provides thorough reports and analytics to assist enterprises in monitoring trends and proactively addressing threats.

C. Restriction-

1. Legal and Privacy Concerns:

Adherence to data protection legislation (such as the CCPA and GDPR) may impose restrictions on the collection, processing, and storage of data. Legal problems may arise from unauthorized access or scraping.

2. Performance Limitations:

Processing massive amounts of data in real time might tax system resources and affect performance if it's not tuned properly. It's difficult to balance accuracy in spam detection due to False Positives/Negatives. Inadequate filters may fail to detect spam, while overly strict filters may prevent acceptable content. In order for spammers to remain successful, detection algorithms must be updated and maintained on a regular basis

3. Integration Challenges:

Data collection and integration may be hampered by incompatibilities with different email clients, websites, and APIs.

VI. CONCLUSION:-

Project Spam Spyder effectively emphasizes the significance of anticipatory identification and reduction of spam content inside online ecosystems. Spam Spyder made the internet a safer and more user-friendly place by employing sophisticated algorithms and machine learning approaches to reliably detect and filter out spam messages. The project's outcomes show how automated systems may manage massive data volumes effectively while lowering the amount of labor-intensive manual monitoring and content screening that is necessary. The study also emphasizes how spam is a dynamic field and how detection systems must be updated often to keep up with emerging spam tactics. Future improvements might include real-time adaptive learning, more complex AI models, and integration with more comprehensive cybersecurity measures to produce a stronger defense. The integrity and security of digital ecosystems are seriously threatened by the spread of Spyder spam. The potential for abuse of web crawlers and automated bots increases with their sophistication, leading to spam, data breaches, and a decline in user confidence. The methods by which Spyder spam functions, the consequences it has on both individuals and organizations, and the preventative steps that can be taken have all been brought to light by this research. More reliable CAPTCHA systems, behavioral analysis to discern between human and bot activities, and stricter laws that specifically target the illicit use of online scraping technology are important defenses. But anti-spam policies also need to change with technology, which means that researchers, legislators, and cybersecurity specialists must keep working together and conducting new studies. The fight against Spyder spam is probably not going to end.

This conclusion provides an overview of the issue, its effects, and the outlook for combating spyder spam in the future. Based on the results of your research, you can modify the details.

VII. FUTURE SCOPE-

1. Enhanced AI Capabilities: Apply cutting-edge deep learning and machine learning metho to increase the precision of spam detection and adjust to new spam tactics
2. Multi-Language Support: Increase capacity to manage and evaluate multilingual content to serve a worldwide user base.
3. Integration with New Platforms: Expand the platform's support to include chatbots, instant messaging apps, and newly popular social media networks. Utilize analytics to gain insight into user activity and customize spam screening according to unique preferences and interactions.

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