**AN ENGINEERING PROJECT REPORT**

**ON**

**“****Phishing URL detection using ML”**

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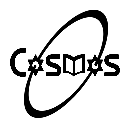
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**Submitted To**

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**DECLARATION**

**CERTIFICATE OF APPROVAL**

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Lastly, we warmly welcome any constructive criticism and suggestions for further improvement of this project.

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# **ABSTRACT**

Phishing attacks continue to evolve as a major cybersecurity threat, resulting in significant financial and data losses for individuals and organizations worldwide. These attacks typically rely on deceptive tactics to trick users into revealing sensitive information such as usernames, passwords, and financial credentials. Common phishing vectors include emails, instant messages, pop-up alerts, and fraudulent websites.

This project presents a machine learning-based approach to detect phishing websites by classifying URLs as either legitimate or malicious. The system is trained on a comprehensive dataset containing both phishing and benign URLs, collected from publicly available threat intelligence sources and academic datasets.

To improve prediction accuracy, multiple machine learning models, including deep neural networks, are employed and evaluated. The dataset, consisting of over 5,000 raw URLs, is expanded into a total of 10,000 samples, split into 80% training and 20% testing data. The features used for classification are grouped into three categories: **address bar-based features**, **domain-based features**, and **HTML & JavaScript-based features**.

As a practical implementation, a web application is developed that allows users to input any URL and receive real-time feedback on whether the link is safe or potentially harmful. This system aims to contribute to safer internet browsing by providing an intelligent and accessible phishing detection tool.

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## List of abbreviations: -

**URL** Uniform Resource Locators

**HTML** Hyper Text Markup Language

**EDA** Exploratory Data Analysis

**SVM** Support Vector Machine

**CSV** Comma Separated Values

**JSON** JavaScript Object Notation

**API** Application Programming Interface

**IDE** Integrated Development Enviromen

# **CHAPTER 1: INTRODUCTION**

## **1.1 Background** **Information:**

Phishing is a social engineering (a type of attack used to steal user data, including login credentials and credit card numbers) as a type of attack that is one of the most common social engineering attacks. The attack happens when an attacker fools a victim into opening an email, instant message, or text message as if it were from a trusted source. Upon clicking the link, the recipient is fooled into believing that they've received a gift and unsuspectingly clicks a malicious link, resulting in the installation of malware, the freezing of the system as part of a ransomware attack, or the disclosure of sensitive information.

## **1.2 Statements of the problems:**

Phishing attacks have gotten increasingly complex; it is very difficult for an average person to determine if an email message link or website is legitimate. Cyber-attacks by criminals that employ phishing schemes are so prevalent and successful nowadays. Hence, this project seeks to address fake URLs and domain names by identifying phishing website links. Therefore, having a web application that provides the user with an interface to check if a URL is Phishing or legitimate will help decrease security risks to individuals and organizations.

## **1.3 Scope of the Study:**

This study explores data science and machine learning models that use datasets gotten from open-source platforms to analyze website links and distinguish between phishing and legitimate URL links.

The model will be integrated into a web application, allowing a user to predict if a URL link is legitimate or phishing. This online application is compatible with a variety of browsers.

## **1.4 Objectives:**

To accomplish the project's purpose, the following objectives have been established:

* dataset collection and pre-processing
* machine-learning model selection and development
* Integration of the developed model to a web application.

# **2. LITERATURE REVIEW**

## **2.1 Overview of the Study**

This chapter offers an insight into various important studies conducted by excellent scholars from articles, books, and other sources relevant to the detection of phishing websites. It also provides the project with a theoretical review, conceptual review, and empirical review to demonstrate understanding of the project.

Ankit and Gupta (2017) mentioned that Statistics show that according to Internet world stats ("Internet world stats usage and population statistics", 2014), the total numbers of Internet users worldwide are 2.97 billion in 2014; that is, more than 38% of the world population uses the Internet. Hackers take advantage of the insecure Internet system and can fool unaware users to fall for phishing scams. Phishing e-mail is used to defraud both individuals and financial organizations on the Internet. (“RSA Anti-Fraud Command Center”, n.d.) Said the Anti-Phishing Working Group (APWG) is an international consortium that is dedicated to promoting research, education, and law enforcement to eliminate online fraud and cyber-crime. In 2012, total phishing attacks increased by 160% over 2011, signifying a record year in phishing volumes. The total phishing attacks detected in 2013 were approximately 450,000 and led to financial losses of more than 5.9 billion dollars (“RSA Anti-Fraud Command Center”, n.d.). Total attack increases by 1% in 2013 as compared to 2012. The total number of phishing attacks noticed in Q1 (first quarter) of 2014 was 125,215, a 10.7 percent increase over Q4 (fourth quarter) of 2013. More than 55% of phishing websites contain the name of the target site in some form to fool users and 99.4% of phishing websites use port 80 ("Anti-Phishing Working Group (APWG)Phishing activity trends report first quarter",2014). According to the APWG report in the first quarter of 2014, the second-highest number of phishing attacks ever recorded was between January and March 2014 ("Anti Phishing Working Group (APWG) Phishing activity trends report first quarter", 2014) and payment services are the most targeted industry. During the second half of 2014, 123,972 unique phishing attacks were observed ("APWG report", 2014). In the year 2011, total financial losses were 1.2 billion, and they rose to 5.9 billion dollars in 2013.

# **3. REQUIREMENT ANALYSIS**

## **3.1 Technologies used**

* Jupyter notebook
* Django framework
* Chrome Browser

## **3.2 Other Tools used**

• Visual Studio Code: Integrated Development Environment (IDE) for development

•Brave, Google Chrome: Web Browsers for testing source code

# **4. METHODOLOGY**

## **4.1 Software Process Model**

A software process model is an abstraction of the software development process. The models specify the stages and order of a process. So, think of this as a representation of the order of activities of the process and the sequence in which they are performed. There are various types of Software Process Model but in this project, we are going to use Iterative and Increment Model.

**Iterative Incremental Model:**

Since, our project has multiple parts (Agent, API server, ML engine, Dashboard), which can be built and tested in small increments with the help of Iterative Increment Model. It has the following phases:

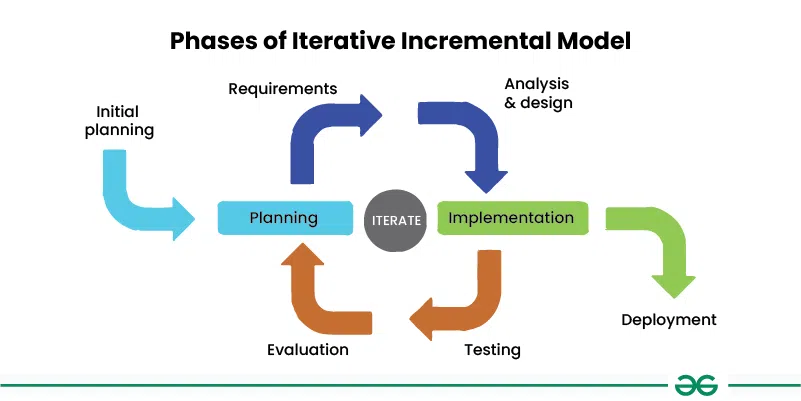


Figure 1 :Phases of Iterative Increment Model

**1. Planning Phase**

In this phase, the team identifies the goals and objectives of the project, along with the project scope, requirements, and constraints on them. The team then identifies different iterations that would be needed to complete the project successfully.

**2. Requirements Analysis and Design Phase**

In this phase, the requirements met are then analyzed and the according system is designed based on these requirements. The projected design should be modular, which would allow easy modification and testing in subsequent iterations.

**3. Implementation Phase**

In this phase, the system is implemented based on the design created in the previous phase. The implementation should be done in small, manageable pieces or increments, which can then be tested in the next phase of the cycle.

**4. Testing Phase**

In this phase, the system is tested against the requirements identified in the planning phase. Testing is done for each iteration, and any defects or issues are identified and resolved, and this helps in each iteration.

**5. Evaluation Phase**

In this phase, the team evaluates the performance of the system based on the results of testing. Feedback is gathered from users and stakeholders, and changes are made to the system as needed, which makes the system more scalable and flexible.

**6. Incremental Release**

In this phase, the completed iterations are released to users and stakeholders. Each release builds on the previous release, providing new functionality or largely improving existing functionality.

Overall, following a structured methodology ensures that the **Phishing URL detection using ML** is developed efficiently and effectively, meets the project requirements, and provides positive user experience for each generation of the user.

# **5. MODEL OF THE SYSTEM:**

*A computer screen shot showing a diagram

AI-generated content may be incorrect.*

Figure 2: Architectural Design of the system

# **6. FLOWCHART: -**

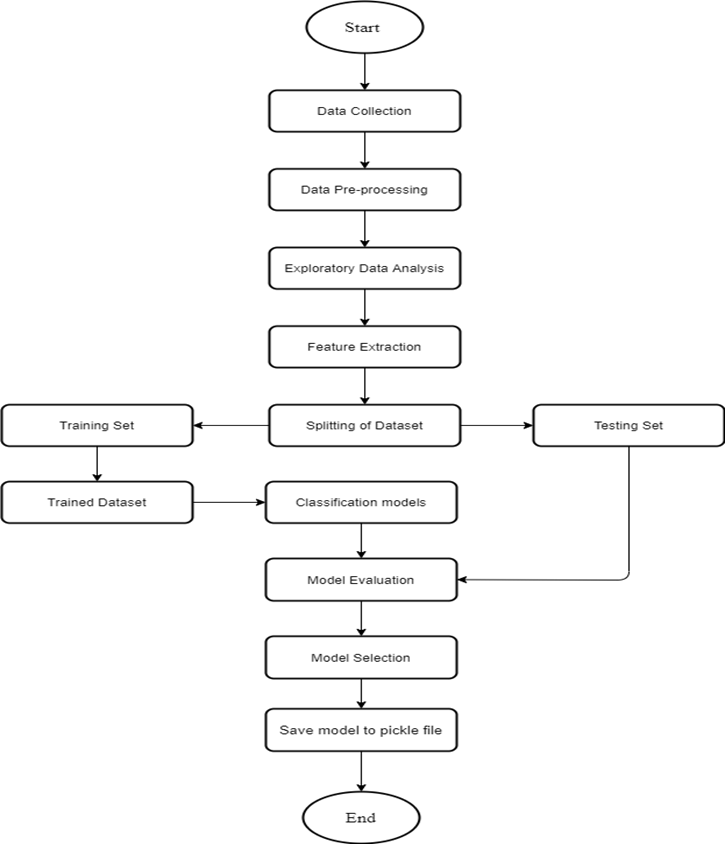


Figure 3: Flowchart of the system

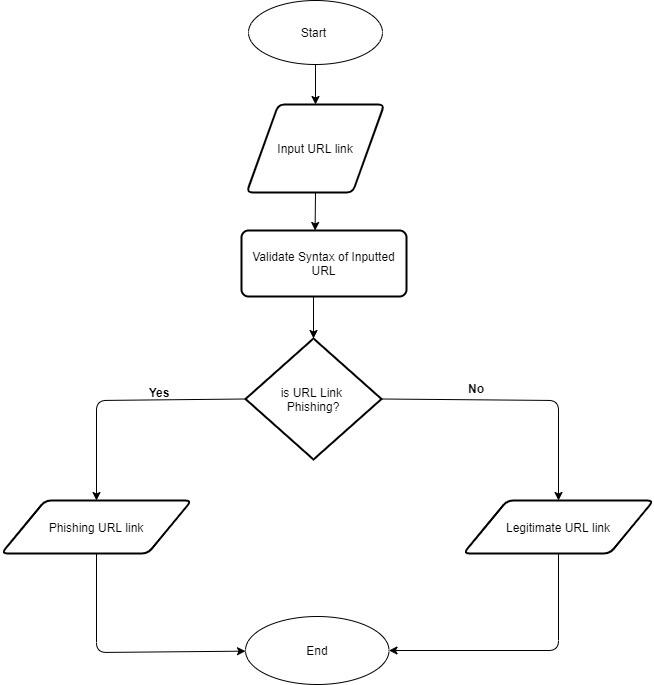


Figure 4: Flowchart of the web interface

# **7. USE CASE DIAGRAM: -**

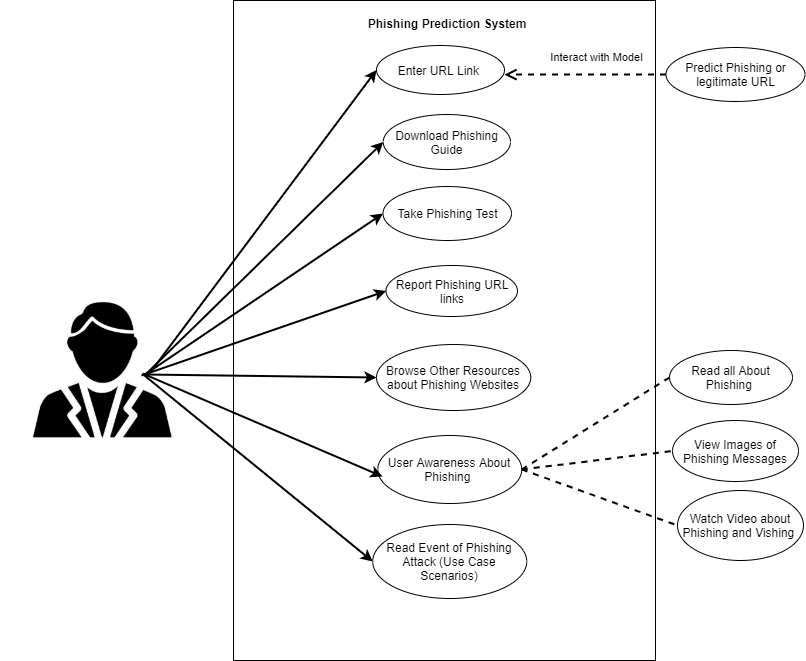


Figure 5: Use case diagram of system

# **7. TIME SCHEDULE: -**

A graph with different colored rectangles

AI-generated content may be incorrect.

Fig 6: Gantt chart

# **8. EXPECTED OUTPUT: -A computer screen shot of a person holding a lock AI-generated content may be incorrect.A screenshot of a computer AI-generated content may be incorrect.**

# **A screenshot of a graph AI-generated content may be incorrect.A screenshot of a graph AI-generated content may be incorrect.**

# **9. CONCLUSION: -**

Our project introduces a proactive and intelligent approach to cybersecurity through the development of a lightweight agent-based threat detection system. By continuously collecting system and user activity logs and analyzing them using machine learning techniques, the system can detect anomalies in real-time, allowing for quicker threat identification and response. This solution reduces reliance on manual monitoring and provides organizations with a scalable, cost-effective way to safeguard their digital infrastructure. With its modular design and automated alert system, our project demonstrates a significant step towards modernizing endpoint security and addressing evolving cyber threats.

The contribution of this research work is to help both individuals and organizations identify and understand phishing techniques used by phisher as well as help them detect phishing URL attack effectively and efficiently by employing machine learning models instead of the previous method of detecting phishing website.

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