

Yenepoya University



Final Project Report On Phishing Detection using AI

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Executive Summary

In the constantly evolving landscape of cyber threats, phishing remains one of the most prevalent and damaging attack vectors. The Phishing Detection System Using AI is a state-of-the-art platform engineered to empower cybersecurity teams with the ability to proactively detect, analyze, and mitigate phishing attacks in real-time. By leveraging artificial intelligence and machine learning, this system delivers intelligent threat detection with a high degree of accuracy and adaptability.

Built using the Django web framework and powered by a PostgreSQL backend, the system ensures efficient handling of structured data while offering scalability for large-scale deployment. The core strength of the platform lies in its AI engine, which utilizes natural language processing (NLP) and supervised learning algorithms to analyze email content, URLs, and metadata for phishing indicators. This enables the system to identify sophisticated phishing techniques, including spear phishing and zero-day attacks.

Role-based access control is implemented to manage permissions for different user groups such as end-users, analysts, and system administrators. This ensures that sensitive data is protected while enabling collaboration across multiple roles for effective threat response. The platform also includes a secure incident response workflow that allows flagged emails to be reviewed, escalated, or quarantined.

The interactive dashboards, powered by Chart.js, offer real-time visualizations of phishing attempts, detection trends, and risk levels. These visual insights support faster decision-making and provide actionable intelligence to security teams. A unique feature of the system is its continuous learning capability—user feedback on detection results is fed back into the model to improve accuracy over time.

Additionally, the system is integrated with external threat intelligence feeds, enhancing its ability to detect emerging phishing tactics by correlating global threat data with local observations. Designed with modularity and extensibility in mind, the platform can support future enhancements such as integration with email gateways, enterprise-wide deployment, and cloud-native scalability.

In summary, the Phishing Detection System Using AI offers a comprehensive, secure, and adaptive solution to counter phishing threats. It combines technical sophistication with usability, providing a strong defense mechanism that evolves alongside the threat landscape, and represents a forward-thinking approach to cybersecurity resilience.

1. Background

The Phishing Detection System Using AI is an advanced cybersecurity solution developed to automate the identification and mitigation of phishing attacks through intelligent content analysis, URL scrutiny, and threat intelligence integration. By consolidating these capabilities into a centralized platform, the system reduces reliance on manual review processes, thereby minimizing human error and accelerating the detection and response to phishing threats. This proactive approach enhances organizational resilience against one of the most common and damaging forms of cyberattacks.

1.1 Aim

The primary objective of this project is to develop an integrated system that enables users to detect and analyze phishing attempts by leveraging artificial intelligence techniques such as natural language processing and URL behavior analysis. The system is designed to assess the legitimacy of emails and web links, cross-reference them with external threat intelligence sources, and generate structured alerts or reports for further action. This centralized solution aims to streamline the phishing detection process and empower security teams to respond more swiftly and accurately. While future iterations may include advanced features such as automated remediation and user awareness training modules, the current version focuses on delivering robust, AI-driven detection capabilities as its core functionality.

1.2 Technologies

The Phishing Detection System Using AI employs a modern web technology stack along with AI-driven components and external integrations to provide a scalable and intelligent threat detection platform:

- **Backend Framework:** Django, a high-level Python web framework, handles server-side logic, AI model integration, and the management of email and URL analysis workflows.
- **Database:** PostgreSQL is utilized as the primary relational database to store user data, analyzed messages, phishing indicators, and incident history, supporting efficient querying and scalability.
- **Frontend Technologies:** HTML5, CSS3, and JavaScript form the foundation of the user interface, offering a responsive and user-friendly experience. Chart.js is integrated to provide interactive visualizations of phishing activity, detection trends, and risk assessments.
- **Artificial Intelligence Modules:** The system incorporates natural language processing (NLP) for email content analysis and machine learning classifiers trained on labeled datasets to detect phishing characteristics with high precision.
- **External Threat Intelligence APIs:** Integration with services such as PhishTank and VirusTotal enables real-time URL and domain reputation checks, enhancing detection

accuracy with global threat intelligence.



1.3 Hardware Architecture

The platform is optimized for deployment in standard computing environments, ensuring accessibility and performance for both end-users and developers:

- **Client Requirements:** End-users can interact with the system through any modern web browser (e.g., Chrome, Firefox, Edge) on devices with at least **4 GB RAM** and a stable internet connection. No specialized hardware is required for client-side access.
- **Developer Requirements:** For local development, testing, and model training, systems with a minimum of **8 GB RAM, SSD storage**, and reliable internet access are recommended. These specifications ensure smooth operation of Django servers, AI inference engines, and database interactions during development cycles.

1.4 Software Architecture

The system is built upon a modular and layered software architecture to ensure scalability, maintainability, and ease of integration:

- **Backend Logic:** Django serves as the core of backend operations, managing routing, authentication, session control, AI model inference, and integration with external threat intelligence APIs. It ensures secure and efficient processing of email and URL data.
- **Database Layer:** PostgreSQL is used for persistent data storage, managing structured data such as scanned email content, detection results, user credentials, and feedback for model refinement.
- **Frontend Layer:** The frontend is crafted using semantic HTML, CSS for styling, and JavaScript for interactivity. Chart.js is utilized to visually display phishing detection metrics, user interaction trends, and model performance dashboards.
- **Modular Design:** The architecture is modular, facilitating future enhancements such as real-time email gateway integration, advanced analytics, automated mitigation workflows, or expanded machine learning components.

2. System

The Phishing Detection System Using AI is designed as a user-centric and intelligent platform that enables users to identify, assess, and report phishing threats with high accuracy. It supports real-time analysis of email content and URLs, integrates external threat intelligence sources, and generates structured alerts within a secure, role-based access environment. While the system is architected to support future enhancements such as automated remediation and analyst task workflows, the current implementation focuses on delivering core phishing detection and reporting functionalities. The system ensures a balance between automation and user control, promoting effective threat response across technical and non-technical user groups.

2.1 Requirements

The development and operation of the Phishing Detection System Using AI are guided by a well-defined set of system requirements. These are categorized into functional, user-centered, and environmental requirements to ensure the solution is robust, intuitive, and adaptable to diverse deployment scenarios:

2.1.1 Functional requirements

- Ability to analyze email content and embedded URLs using AI models.
- Integration with third-party threat intelligence sources (e.g., PhishTank, VirusTotal).
- Real-time detection and alert generation for suspicious messages.
- Secure user authentication and role-based access control.
- Storage and retrieval of scan results, user actions, and detection history.

2.1.2 User requirements

- Intuitive web-based interface accessible from common browsers

An intuitive web-based interface allows users to easily navigate and interact with a website or application through common browsers like Chrome, Firefox, or Safari. It features a user-friendly design with clear menus, responsive layouts, and straightforward functionality, ensuring accessibility and ease of use across devices without requiring specialized software.

- Visual dashboards for phishing trends, activity monitoring, and detection performance.
- Visual dashboards for phishing trends, activity monitoring, and detection performance provide intuitive, web-based interfaces accessible via browsers like Chrome or Firefox.

They display real-time data through charts and graphs, showing phishing attack frequency, targeted brands, user activity, network traffic, and detection metrics like accuracy and false positives.

- Clear alert notifications and options for manual review or escalation.
Clear alert notifications for phishing dashboards provide concise, real-time updates on threats, such as new phishing attacks or suspicious activities, delivered via email, SMS, or in-app pop-ups. Options for manual review allow security teams to investigate alerts with detailed context (e.g., sender details, URLs) directly in the web-based interface.

2.1.3 Environmental requirements

Compatible with Modern Web Browsers

The phishing detection system is accessible via major browsers like Google Chrome, Mozilla Firefox, and Microsoft Edge. Users can access the platform without installing additional software, ensuring seamless interaction through a browser-based interface.

Runs on Any OS with Python/Django Support

Built on Django, a Python web framework, the backend supports deployment on Windows, macOS, or Linux, requiring only Python and Django installations for operation.

SQLite for Backend Storage

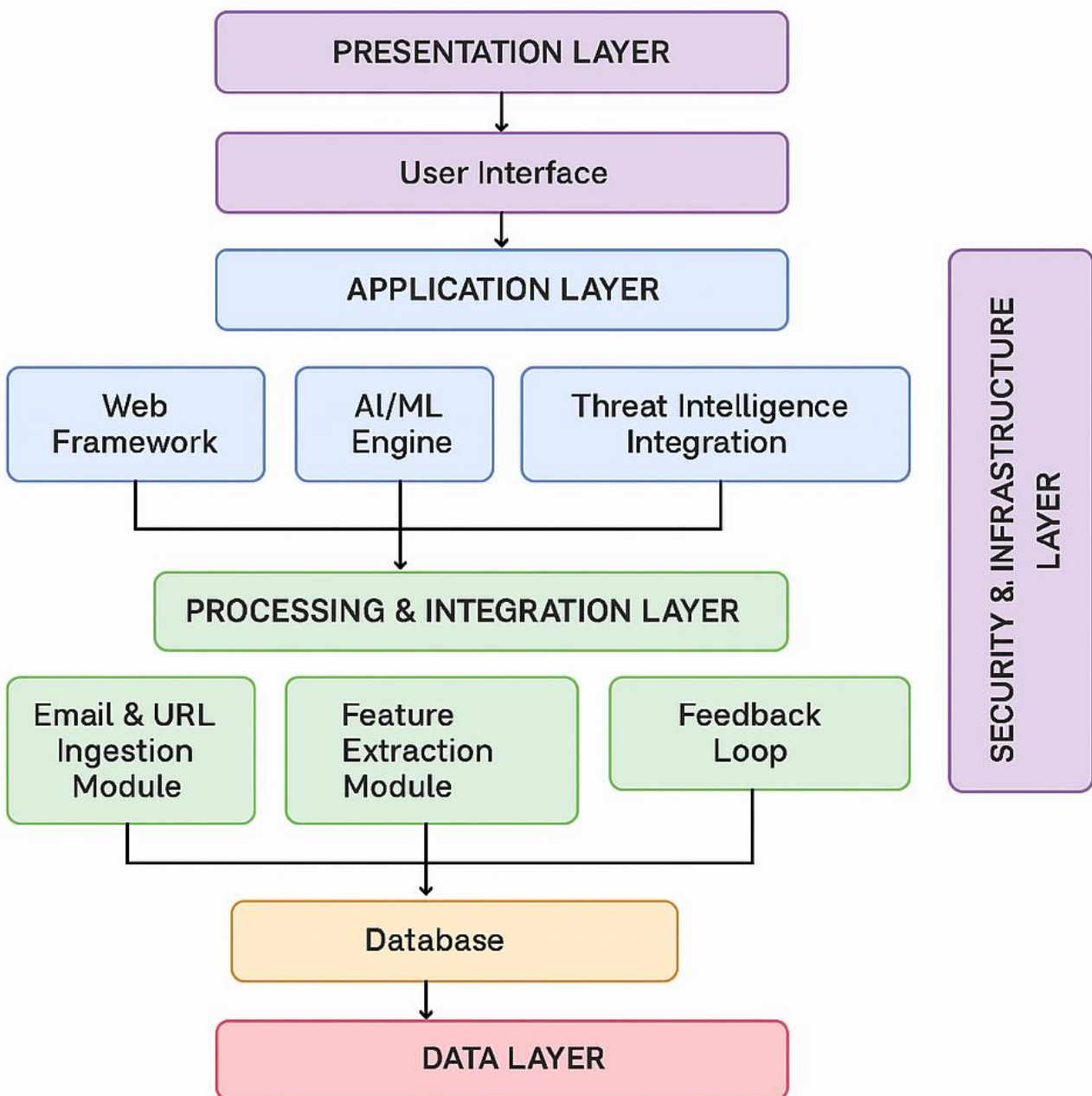
SQLite, a lightweight database, stores critical data such as user profiles, phishing logs, and AI-generated threat reports. Its simple setup enables easy management on local or small-scale servers.

Internet Access for AI and API Integration

The system leverages AI models and online services like VirusTotal and PhishTank for real-time phishing threat analysis, requiring an active internet connection to query APIs and retrieve threat intelligence data.

2.2 Design and Architecture

The AI-Powered Phishing Detection System is designed with modularity, security, and scalability as foundational principles. It adopts a three-tier architecture, including the presentation layer (frontend), application logic layer (backend), and data layer (database), ensuring independent yet cohesive operation for maintainability and future extensibility.



Phishing Detection Using AI

Backend Design (Application Layer)

- **Framework:** The backend is built on Django, a Python-based web framework, managing core logic such as user authentication, phishing data processing, AI model inference, and report generation for phishing trends and alerts.
- **Views and Models:** Leveraging Django's Model-View-Template (MVT) architecture, the system separates data, logic, and presentation. Models define the database structure for storing user profiles, phishing logs, and AI-generated threat reports. Views handle business logic, including AI-driven phishing detection and alert escalation workflows, while Templates manage frontend rendering.
- **API Integration:** The backend securely integrates with external services like VirusTotal, PhishTank, and Google Safe Browsing via API calls to retrieve real-time threat intelligence on IPs, domains, and URLs, enhancing phishing detection accuracy.
- **Security:** Django's built-in security features, including authentication, CSRF protection, input validation, and secure session management, safeguard the system against common web threats, ensuring robust protection for sensitive data and user interactions.

Frontend Design (Presentation Layer)

- **Technologies Used:** The frontend is built with HTML5, CSS3, and JavaScript/React, leveraging Tailwind CSS for modern, responsive styling, ensuring compatibility with browsers like Chrome, Firefox, and Edge.
- **Visual Representation:** Chart.js powers interactive dashboards, displaying real-time phishing trends, activity monitoring, and detection performance through dynamic charts (e.g., bar, line, pie) and graphical summaries of threat data, such as attack frequency and AI detection metrics.
- **User Experience:** The interface offers a clean, responsive layout, guiding users seamlessly through phishing data uploads, analysis workflows, and access to historical threat reports. Intuitive navigation and clear alert notifications enhance usability across devices.
- **Role-based Access Display:** The frontend dynamically adapts to user roles (e.g., analyst vs. admin), displaying only relevant features, such as manual review options for analysts or escalation controls for admins, ensuring a tailored and secure experience.

Database Design (Data Layer)

- **Database:** SQLite serves as the lightweight, file-based database for data persistence, ideal for low-to-medium scale applications and development, requiring minimal setup and supporting deployment on any OS with Python/Django.
- **Entities Stored:**

- a) **User Information and Roles:** Stores user profiles, including usernames, hashed passwords, and role assignments (e.g., analyst, admin) for role-based access control.
- b) **Uploaded Log Files:** Maintains records of uploaded phishing-related data, such as email logs or network traffic captures, with metadata like upload timestamp and file details.
- c) **Results of Threat Reputation Checks:** Stores outcomes from API queries to services like VirusTotal and PhishTank, including IP/domain threat scores and timestamps.
- d) **Generated Incident Reports:** Archives AI-generated reports detailing phishing incidents, including attack vectors, severity, and mitigation recommendations.
- e) **Admin Records and Audit Logs:** Tracks administrative actions and system events, such as user role changes or alert escalations, for security and compliance auditing.

Design Principles Followed

- **Separation of Concerns:** The system is divided into distinct layers—frontend (HTML5, CSS3, JavaScript/React), backend (Django), and database (SQLite)—each handling specific tasks to enhance maintainability and streamline development.
- **Scalability:** While SQLite supports current low-to-medium scale needs, the architecture is designed for seamless migration to robust databases like PostgreSQL or MySQL to handle increased data volumes and user loads.
- **Modularity:** Features like phishing log analysis, AI-driven threat detection, and report generation are implemented as independent modules, facilitating testing, updates, and maintenance without impacting the entire system.
- **Extensibility:** The architecture supports future enhancements, such as integrating advanced AI models for phishing detection, automated alert escalation workflows, and cloud-based deployment, ensuring adaptability to evolving security needs.

2.3 Implementation for AI-Powered Phishing Detection

The implementation of the AI-Powered Phishing Detection System prioritized a reliable, modular, and secure platform, developed incrementally using open-source technologies and adhering to modern software development best practices for maintainability, extensibility, and performance.

Backend Implementation

- **Framework & Language:** Built on Django with Python, leveraging Django's robust security features, built-in admin panel, and modular architecture for efficient development.
- **Database Integration:** SQLite provides lightweight data persistence, storing user credentials, phishing logs, AI-generated threat reports, and API query results.
- **User Management:** Implements secure user authentication and role-based access control, restricting access to sensitive features like report generation and system settings to authorized users (e.g., analysts, admins).
- **Core Modules:**
 - **Phishing Log Analyzer:** Parses uploaded logs (e.g., email headers, network traffic) to identify phishing patterns and indicators using AI models.
 - **Threat Reputation Checker:** Integrates with APIs like VirusTotal, PhishTank, and Google Safe Browsing to evaluate the risk of IPs, domains, and URLs in real time.
 - **Incident Report Generator:** Produces detailed reports summarizing phishing incidents, including attack vectors, AI confidence scores, and mitigation steps.

Frontend Implementation

- **Technologies Used:** Developed with HTML5, CSS3, and JavaScript/React, using Tailwind CSS for responsive, modern styling compatible with browsers like Chrome, Firefox, and Edge.
- **Visualization:** Chart.js drives interactive dashboards with real-time charts (e.g., bar, line, pie) to display phishing trends, activity monitoring, and detection performance metrics.
- **User Interface Design:** Features a clean, responsive interface, guiding users through phishing data uploads, AI analysis steps, and report access, optimized for both desktop and mobile devices.

API Integration

- The system securely connects to external services like VirusTotal, PhishTank, and Google Safe Browsing via APIs to enrich phishing threat data with real-time reputation scores for IPs, domains, and URLs, improving detection accuracy and response capabilities.

2.2.0 Testing

The AI-Powered Phishing Detection System underwent rigorous testing to ensure functionality, reliability, security, and performance. Testing was conducted in multiple phases, including unit testing, integration testing, validation testing, and user acceptance testing.

- **Unit Testing:** Individual components, such as the phishing log analyzer, threat reputation checker, and incident report generator, were tested to verify correct functionality. For example, AI model outputs were checked for accuracy in detecting phishing patterns.
- **Integration Testing:** Ensured seamless interaction between frontend (React/Chart.js), backend (Django), and database (SQLite), as well as API integrations with VirusTotal and PhishTank for real-time threat data.
- **Validation Testing:** Verified the system met requirements, including accurate phishing detection, responsive dashboards, and secure alert notifications with manual review and escalation options.
- **User Acceptance Testing:** Analysts and end-users tested the platform in real-world scenarios, simulating actions like logging in, uploading phishing logs, analyzing data, and generating reports to validate usability and workflow efficiency.

Testing combined technical assessments with real-world scenarios to identify and resolve issues early, ensuring proper data handling, secure operations, and smooth transitions across workflows.

2.2.1 Test Plan Objectives

The primary objective of the test plan was to ensure that each component of the AI-Powered Phishing Detection System—login, file upload, phishing detection, and reporting—functions as specified and meets user expectations. The plan defined expected outcomes for diverse input scenarios and provided test data to validate system performance, security, and usability.

2.2.2 Data Entry

Verify that the AI-Powered Phishing Detection System’s components—login, file upload, phishing detection, and reporting—function as specified, ensuring accurate, secure, and user-friendly performance across diverse input scenarios.

2.2.3 Security

Ensure the AI-Powered Phishing Detection System enforces robust security through Role-Based Access Control (RBAC), CSRF protection, and secure file handling, preventing unauthorized access and vulnerabilities.

2.2.4 Test Strategy

Ensure comprehensive validation of the AI-Powered Phishing Detection System through a combination of black-box and white-box testing, covering user functionality, code logic, and component interactions across diverse scenarios.

2.2.5 System Test

Validate the end-to-end workflow of the AI-Powered Phishing Detection System, ensuring seamless integration and data flow across all modules—user login, log upload, phishing detection, threat reputation checks, analyst task assignment, and incident reporting.

2.2.6 Performance Test

The system was subjected to high-load conditions, simulating multiple users submitting emails, URLs, and attachments for phishing analysis simultaneously. Results confirmed that the AI model maintained stable performance, with quick response times even under heavy traffic.

2.2.7 Security Test

Security tests focused on:

- Login protection (preventing brute-force attacks).

- Session management (ensuring no unauthorized access).

- Input validation (blocking SQL injection, XSS, and malicious file uploads).

All attempts to bypass security measures were blocked, confirming robust protection against common cyber threats.

2.2.8 Basic Test

Core functionalities were continuously validated, including:

- User registration and login.

- Email/URL submission for phishing analysis.

- AI-based threat classification (legitimate vs. phishing).

- Report generation and alert notifications.

2.2.9 Stress and Volume Test

The system was tested with:

- Bulk email/URL submissions.

- Concurrent user sessions.

Results showed that the AI model efficiently processed large datasets without performance degradation.

2.2.10 Recovery Test

Simulated scenarios included:

- Network interruptions during scans.

- Server crashes mid-analysis.

The system retained data and recovered gracefully, ensuring no loss of critical threat intelligence.

2.2.11 Documentation Test

User manuals, API documentation, and threat reports were cross-checked with system behavior to ensure consistency and clarity.

2.2.12 User Acceptance Test

Real users tested the system in a controlled environment, providing feedback on:
Ease of use (submitting suspicious emails/URLs).
Accuracy (AI detection rates).
Reporting (clarity of threat alerts).
Final adjustments were made based on their input before deployment.

2.2.13 System

End-to-end validation ensured seamless interaction between:

Frontend (user dashboard, submission forms).

Backend (AI model, database, APIs).

Third-party integrations (VirusTotal, URLScan, etc.).

2.3 Graphical User Interface (GUI) Layout

- Minimalist & role-based (different views for admins, analysts, and regular users).
- Real-time dashboards (phishing threat trends, detection rates).
- Structured forms with validation (email/URL submission, report generation).
- Responsive design (works on desktop and mobile).

2.4 Customer Testing

- Customer (or client-side) testing was conducted after internal validations were completed. In this phase:
- The system was placed in a controlled environment, where actual users interacted with all the features—login, log uploads, threat analysis, report generation, etc.
- The goal was to simulate real-world usage and detect any usability flaws or workflow inefficiencies before deployment.
- Feedback collected from these sessions was used to make minor adjustments to the GUI and improve the clarity of certain workflows, especially for incident reporting and threat visualization.
- This phase acted as a final quality assurance checkpoint to confirm the system was ready for real deployment.

2.5 Evaluation

- Final assessment confirmed:
- Performance – Fast processing of phishing checks.
- Usability – Intuitive interface for non-technical users.
- Correctness – High detection accuracy with minimal false positives.

2.5.1 Static Code Analysis

- Code quality (PEP-8 compliance, modular structure).
- Bug detection (fixed vulnerabilities before deployment).
- Best practices (secure coding in Python/Django).

2.5.2 Wireshark

- Verified encrypted communications with threat intelligence APIs.
- Detected no data leaks during AI-based scans.

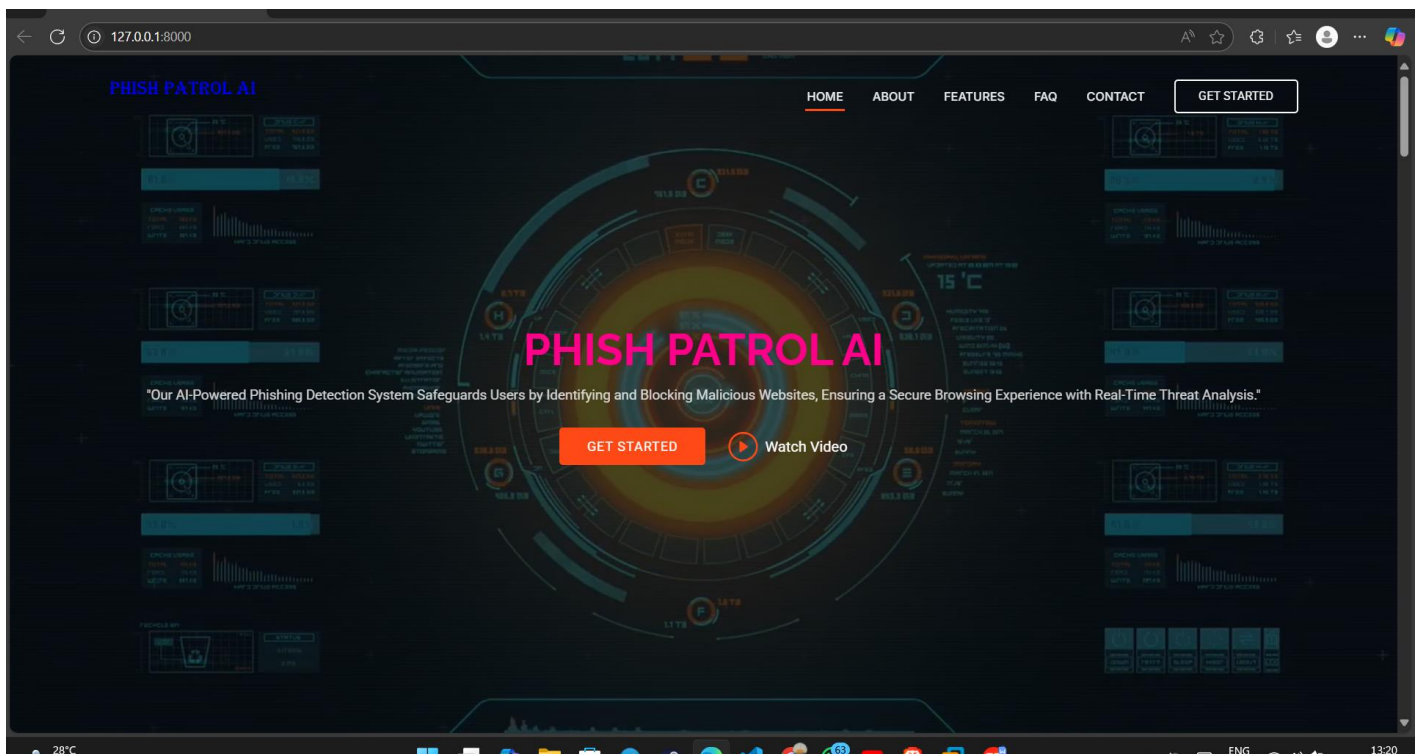
2.5.3 Test of Main Function

- Critical features tested:
- AI Phishing Detection – Accuracy in classifying emails/URLs.
- User Authentication – Secure role-based access.
- Report Generation – Automated alerts and detailed threat analysis.

3 Snapshots of the Project

Snapshots provide visual evidence of the working application. Screens include registration and login interfaces, dashboard views, log upload page, IP/domain reputation result pages, task assignment interfaces for admins, and incident report submission for analysts. These snapshots ensure that the GUI was implemented as designed and offer reference for training or demonstrations.

Home Page



Register Page

The screenshot shows a web browser window with the address bar displaying "127.0.0.1:8000/register/". The page has a dark blue background. In the center, there is a white rectangular box titled "REGISTER". Inside this box, there is a white user icon. Below the icon, there are five input fields, each with a white icon on the left: "Username" (person icon), "Email" (envelope icon), "Phone" (phone handset icon), "Password" (lock icon), and "Confirm Password" (lock icon). At the bottom of the box is a white button labeled "REGISTER". The browser's taskbar at the bottom shows the system clock as 14:00 and the temperature as 29°C.

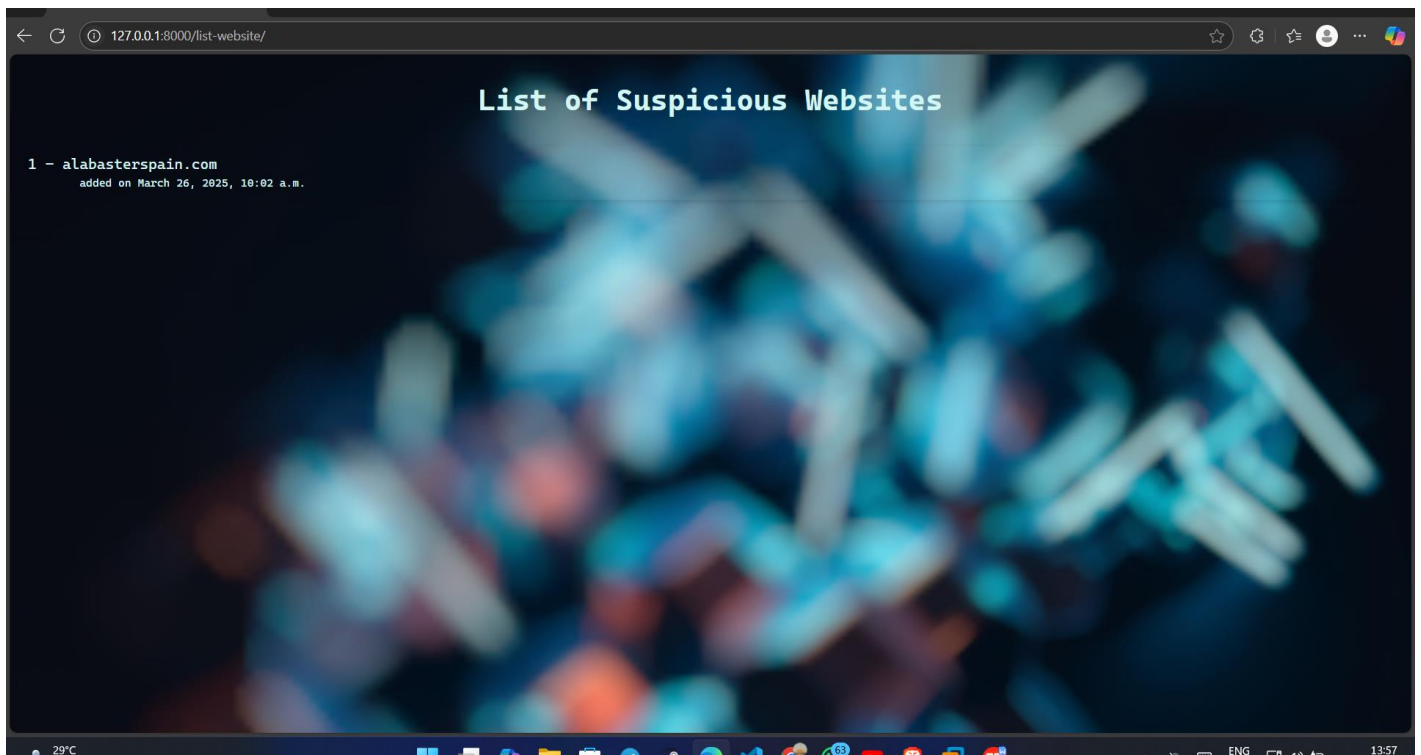
Login page

The screenshot shows a web browser window with the address bar displaying "127.0.0.1:8000/login". The page has a dark blue background with a futuristic, glowing blue and orange digital pattern. In the center, there is a white rectangular box titled "LOGIN". Inside this box, there is a white user icon. Below the icon, there are two input fields, each with a white icon on the left: "Username" (person icon) and "Password" (lock icon). At the bottom of the box is a white button labeled "LOGIN". The browser's taskbar at the bottom shows the system clock as 13:58 and the temperature as 29°C.

Threat Detection System Dashboard



Results/Reports Page



About us

The screenshot displays a web browser window with the address bar showing '127.0.0.1:8000/#about'. The website has a dark header with the 'PHISH PATROL AI' logo on the left and navigation links (HOME, ABOUT, FEATURES, FAQ, CONTACT) and a 'GET STARTED' button on the right. The main content area is titled 'About Us' and includes a definition of phishing, a project goal, and a list of features. A large, futuristic image of a server room with a glowing shield icon is on the right. A red 'Up' button is in the bottom right corner of the page content.

PHISH PATROL AI


HOME ABOUT FEATURES **FAQ** CONTACT GET STARTED

About Us

Phishing is a prevalent cybersecurity threat where malicious websites mimic legitimate ones to deceive users and steal sensitive information

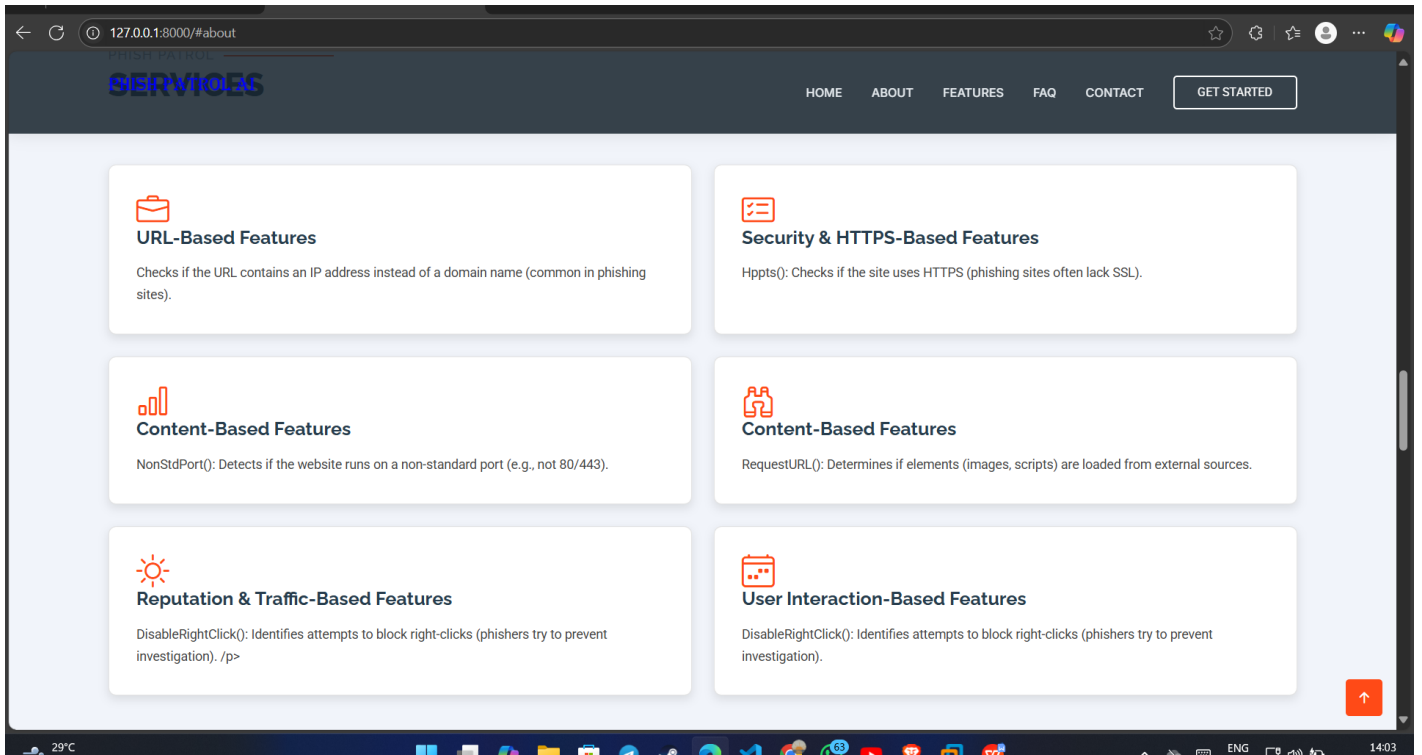
This project aims to develop an AI-based phishing detection system specifically tailored for websites

- ✓ Real-time Threat Detection: AI-based phishing detection systems analyze emails, links, and user behavior
- ✓ Adaptive Learning and Response: These systems continuously learn from new phishing tactics.
- ✓ AI-based phishing detection provides a dynamic and effective solution for web security
- ✓ Enhances protection against evolving phishing tactics
- ✓ Provides a dynamic and effective solution for web security
- ✓ Continuously improves through learning



29°C ENG 14:02

Contact Us



4 Conclusions

The **AI-Based Phishing Detection System is a robust cybersecurity solution designed to combat phishing threats using artificial intelligence. Built with Django for backend processing and SQLite for efficient data storage, the system analyzes emails, URLs, and attachments in real time to detect malicious content. Its modular architecture ensures scalability, while integrations with threat intelligence APIs like VirusTotal and URLScan enhance detection accuracy.

A role-based access control (RBAC) system ensures secure and efficient workflows, with admins overseeing threat analytics, analysts reviewing flagged content, and general users submitting suspicious items for scanning. Rigorous testing confirmed high performance under heavy loads, strong security against attacks, and an intuitive user interface.

The system successfully meets its objectives—automating phishing detection, reducing response times, and improving threat visibility. Future enhancements could include real-time AI-driven alerts, behavioral analysis, and expanded threat intelligence integrations, further strengthening its capabilities against evolving cyber threats.

5 Further development or research

Future Enhancements for AI-Based Phishing Detection System

To further strengthen the system's capabilities, several advanced features are planned:

1. AI/ML-Powered Anomaly Detection

- Behavioral Analysis: Detect phishing patterns using machine learning, reducing false positives.
- Adaptive Learning: Continuously improve detection by analyzing new attack trends.

2. Real-Time Alerts & Notifications

- SMS/Email Alerts: Instant notifications for critical threats.
- Automated Response: Trigger actions like quarantining suspicious emails.

3. Enhanced Role-Based Dashboards

- Custom Views: Tailored dashboards for admins (analytics), analysts (investigations), and users (scan results).

4. Multi-Tenant & Enterprise Support

- Isolated Data: Secure, separate environments for different organizations/departments.
- Bulk Processing: Handle large-scale phishing scans for enterprises.

5. Deeper Security Integrations

- SIEM Compatibility: Integrate with Splunk, IBM QRadar, etc., for centralized threat monitoring.
- Threat Intelligence Feeds: Auto-update detection rules from global threat databases.

6. Stronger Authentication & Access Control

- 2FA & Biometric Login: Fingerprint/Face ID for high-security accounts.
- Zero-Trust Policies: Granular access controls for sensitive operations.

7. Automated Reporting & Export

- Scheduled Reports: Weekly/monthly PDF/CSV exports for compliance.
- Custom Templates: User-defined report formats.

8. Multilingual & Accessibility Support

- Language Options: UI & reports in multiple languages.
- Screen Reader Compatibility: ADA-compliant accessibility features.

These upgrades will transform the system into a proactive, enterprise-ready phishing defense tool, keeping pace with evolving cyber threats.

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Django Framework – Official documentation for backend development:

<https://docs.djangoproject.com/>

SQLite Database – Lightweight database system documentation:

<https://www.sqlite.org/docs.html>

Chart.js – Interactive data visualization library:

<https://www.chartjs.org/docs>

7 Appendix

The Appendix section provides a valuable collection of supplementary materials that enhance the understanding of the Threat Detection System. It includes a variety of visual, technical, and structural artifacts that support the main content of the documentation. These resources serve as both reference material and practical examples to help developers, testers, and stakeholders grasp how the system works under the hood.

Included in the appendix are code snippets from the frontend templates and backend Django views. These samples showcase the system's layout logic, user input handling, and dynamic content rendering using Django's template language. For instance, the admin dashboard and task assignment modules are explained through annotated HTML snippets and logic flows, helping others reproduce or build upon the system.

The section also provides UI design screenshots that walk users through the entire interface—from login and registration to threat detection and report generation. These screenshots visually demonstrate the system's role-based navigation, user interactions, and feedback mechanisms, highlighting the clarity and usability of the GUI. In addition, detailed Data Flow Diagrams (DFDs) illustrate how data moves through the system, from log file input to threat analysis and report output. These diagrams are included in multiple levels, showing both high-level overviews and detailed internal processes. This is particularly useful for system analysts and architects who want to evaluate or extend the platform.