

Final year project report

Aegis Digital Umbrella



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Session

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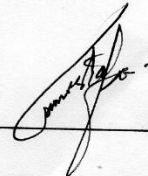
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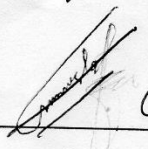
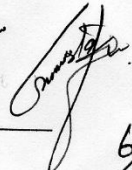
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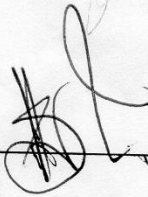
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ABSTRACT

Aegis Digital Umbrella is a web-based cybersecurity tool that uses its SQL Injection (SQLi) and Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF) analysis to find the vulnerabilities present in the website. This system allows users to perform security scans of their websites through an interface that enables the security analysts, the website owners and website developers to perform the task in the easiest manner. In addition to identifying security weaknesses, the system also leverages AI and recommends the users the best way to protect their web assets while complying with the GDPR.

Development is based on Flask, PostgreSQL and TensorFlow AI analysis technology system. Based on industry security tools – SQL Map and XSSer – the system performs vulnerability scanning. It deploys its operations on cloud infrastructure and sustains the performance at the maximum capacity while the user traffic is high. Aegis Digital Umbrella provides a whole security solution along with detailed reports to give users the means to take decisive action against the security of their sites.

ACKNOWLEDGMENT

At UMT we thank each person who contributed to the successful achievement of part in our final year project. The exceptional journey brought success because of all the guidance along with supportive efforts from others. I owe my deepest gratitude to my supervisor Sir Dr Amjad Hussain Zahid because he mentored me exceptionally well while he provided constant support for the entire duration of the project. My academic development as a student alongside project success owes its success to the guidance of Dr Amjad Hussain Zahid as he showed unwavering patience and demonstrated both expertise and dedication. Additionally, we express gratitude to faculty members of the SST at UMT for their excellent teaching and their continuous support. UMT staff members along with administrative personnel deserve our appreciation for offering project-essential resources and assistance with project administration.

Project Title: Aegis Digital Umbrella

Objective: Aegis Digital Umbrella is a web-based solution that scans websites and reports on potential cyber threats such as vulnerabilities and powerful smart, AI-based security recommendations to the individual, by editing content, assisting in prevention. It is being followed by a cyber security professional.

Undertaken by

Supervised by Amjad Hussain Zahid

Starting Date 01 Dec 2024

Completion Date 30 July 2025

Tools Used:

React.js (Frontend)

Python script (Backend)

MongoDB (Database)

Open Ai API

Operating System:

Window , Mac

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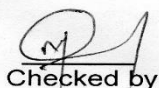
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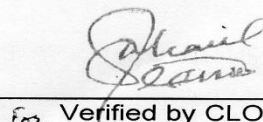
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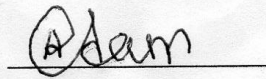
We, Dawood Mustafa (F2021105159) , Muhammad Adam Raza (F2021105190) and Muhammad Umair (F2021105152) students of BS Information Technology, Session (FALL 2021 – SPRING 2025), here by declare that the matter printed and written in the report titled "Aegis Digital Umbrella" is our own work and has not been printed, published, or submitted as a research work, dissertation, or publication in any form in any university, research institution, etc., in Pakistan or abroad.

Dated: 6-9-2025

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Definitions and Acronyms

The table defines the full meaning of consistently used acronyms through out the document.

Table 1: Definitions and Acronyms

Acronym	Definition
POS	Point of Sale
SQLi	SQL Injection
XSS	Cross-Site Scripting
CSRF	Cross-Site Request Forgery
AI	Artificial Intelligence
URL	Uniform Resource Locator
API	Application Programming Interfaced
GDPR	General Data Protection Regulation
OWASP	Open Web Application Security Project
CVE	Common Vulnerabilities and Exposures
CI/CD	Continuous Integration/Continuous Deployment
ERD	Entity-Relationships Diagram
DFD	Data Flow Diagram
UML	Unified Modeling Language
RID	Requirement ID
UCID	Use Case ID
TID	Test Case ID
PID	Prototype ID

1. INTRODUCTION

This document is brief and presents the requirements and functions of Aegis Digital Umbrella, a web-based security application that identifies common web vulnerabilities and provides specific solutions. This system is now enabled to scan for SQL Injection (SQLi), Cross-Site Scripting (XSS), and Cross-Site Request Forgery (CSRF). It provides AI-generated advice on how its users can secure their websites and presents comprehensive security reports after scanning.

The reports can be downloaded by the user in a PDF format to save and document the report. Moreover, the platform also provides an in-built chatbot search engine, which is customized to process queries concerning cybersecurity, and thus, users can easily grasp the problem and learn how to tackle it.

1.1 Motivations

This has resulted in the escalation of liability to security attacks and the dependence on the use of web platforms, which are leading to the rising requirement of having accessible and automated systems of security. The available solutions are usually complicated and thus hard to employ, especially by small companies or those that lack cybersecurity knowledge.

Aegis Digital Umbrella was established to ease web security. It enables its users to scan the page and detect significant threats such as SQLi, XSS, and CSRF without delving into a high level of technology. Users are guided during the process: detecting any vulnerability, offering advice on remediation through the recommendations powered by AI and managed through an integrated chatbot without violating standards such as GDPR.

1.2 Project Overview

Aegis Digital Umbrella is an easy-to-use, online security solution that offers an end-to-end scanning and reporting solution. Its users can:

- Search their websites for SQLi, XSS, and CSRF vulnerabilities
- Get autonomous, AI-based security advice
- PDF reports of the entire scan and solution recommendations can be downloaded
- An interface with a chatbot can provide real-time education and support, and answer questions related to cybersecurity

The design is easy to use and offers a convenient and safe operation in the environment of modern browsers such as Chrome, firefox, and Edge.

1.3 Problem Statement

The complexity of the existing tools has affected most website owners and developers who find it difficult to secure their platforms against common weaknesses such as SQL Injection, Cross-Site Scripting, and CSRF. Most conventional scanners tend to be either technical, costly or they lack effective assistance to users once the loopholes are identified.

Such a problem is addressed by the Aegis Digital Umbrella project, which provides an easy-to-access and affordable tool to not only scan the machines to find the critical vulnerabilities but also offer clear AI-based recommendations to address these issues, downloadable survey reports, and a chatbot to consult even more.

1.4 Purposes

The Aegis Digital Umbrella project is meant to offer a fully automated process of detection and fixing of widespread web vulnerabilities. The app is developed to allow users (irrespective of their level of sophistication) to be equipped to:

- Look through websites to check security threats that are known.
- Become informed on the troubles with easy AI-based help.
- Act on downloadable reports and chatbots suggestions.

The project facilitates a safer and secure web because the costs of vulnerability detection and response are significantly reduced.

2. DOMAIN ANALYSIS

2.1 Customer

Which are the Customers?

Individuals and professionals charged with management, development, or security of websites who require a simple and efficient method to identify vulnerability and patch them, are the primary users of the Aegis Digital Umbrella platform. The site is aimed at assisting clients to enhance security of their websites through options such as detailed scanning, artificial intelligence-based suggestions and on-demand PDF reports.

1. Website Owners

Either persons or institutions that run websites and would wish to provide security to their websites against online attacks. Even having no technical knowledge, they can enjoy clear reports and AI recommendations.

2. Web Developers

Developers who require precise and clear data about the vulnerability in the design process. Aegis assists them to find vulnerabilities to their code and resolve them effectively such that the deployment of the site is not dangerous.

3. Cybersecurity Analysts

Security professionals that need quick access to something to scan their systems. The platform dictates deep scanning, reporting, and chat bot according to security related questions.

4. Technical Personnel/Teams IT

Internal departments in businesses that come in charge and maintain the digital infrastructure of the business. Aegis facilitates their operations through automatic scanning, consolidated reporting and regulatory-oriented visibility.

5. End-Users of websites (End-Users)

Although they are not direct users of the platform, these are the visitors and the customers of secure websites. They enjoy the better protection and minimal threat of online data theft on Aegis guarded websites.

2.2 Stakeholders

Stakeholders are individuals or groups with a vested interest in a project, organization, or endeavor, whose actions and concerns can impact or be impacted by its outcomes and decisions in the Table 2 it shows the list of stakeholders.

This table lists the stakeholders for the web application.

Table 2: list of stakeholders

Stakeholder	Role in System
Developers	Look into the reports, see what can be fixed up and analyze security flaws.
Security Analysts	Security analysts who perform assessments require complete scanning functionality to fulfill their professional needs.
Project team	The project team functions to develop maintain and enhance the system.
Website Owner	Use system to scan and identify website vulnerabilities.
System admin	Manages user accounts, monitor system performance.
End user	Access the website and review reports and recommendation.

2.3 Impacted Groups and their social or economic influence

2.3.1 Social Impact

The Aegis Digital Umbrella is a very important tool during web development process and security analysis because during the security scanning process weak points (like SQL Injection (SQLi), Cross-Site Scripting (XSS), and Cross-Site Request Forgery (CSRF)) are successfully identified. The platform contributes to the security of the visitor to websites and online platforms by ensuring a secure digital environment which prevents breaching of privacy of users and developing trust between users and websites. As an owner of a web site or a company engaging in business, installation of Aegis will ensure that they are compliant to GDPR or any other data privacy guidelines, and minimize the chances of non-compliant legal and ethical risks. Besides, the system can increase awareness of technical best practices relevant to developers and organizations, which induces a responsible approach to the digital environment. Through this way, Aegis is creating a secure, more reliable and socially healthy internet environment.

2.3.2 Economic Impact

Aegis Digital Umbrella provides a notable financial gain especially to companies that thrive with the use of web infrastructure. It minimizes the financial losses that would arise in case of data loss, unavailability of their services or reputation damage by identifying vulnerabilities and repairing them before they are exploited. Cybersecurity is also affordable with the platform since costly remediation hours and resources are saved as detailed reports and AI-based suggestions are provided. This is particularly useful to small

and medium-size businesses (SMEs) which might not be able to afford costly cybersecurity solutions. Facilitating these companies to acquire security of their systems quickly and at reasonable cost, Aegis prevents losses that can and are presented by cybercrime, and it enhances the sustainability and stability of the digital economy. The general use of these tools can result in a decrease in the cyber threat on a national scale that will increase economic confidence in digital platforms as a whole.

2.4 Dependencies/ External Systems

The Aegis Digital Umbrella system relies on multiple outside programs and technologies as part of its operation. Third-party Application Programming Interfaces enable the system to execute vulnerability scans together with AI analysis.

- The system needs to function with the latest versions of three web browsers which include Chrome, Firefox and Edge.
- The system needs to implement data protection standards including GDPR.
- The platform operates through cloud infrastructure deployments and makes use of its scale capabilities.

2.5 Reference Document

2.5.1 Existing Studies and Systems

A number of available researches and tools have been conducted to find a solution to how to identify and solve web application vulnerabilities. Such precedence works serve as the basis of the invention of the Aegis Digital Umbrella system. The important related studies are:

- In a paper given by Chekuri, Kavitha, and Golagana et al., a web security utility was offered to exploit machine learning algorithms, like Random Forest and Support Vector Machine (SVM), in detecting common vulnerabilities, including SQL Injection (SQLi) and Cross-Site Scripting (XSS). Not only does the system find out the vulnerabilities, but it also provides the recommended remedial actions to aid the developers.
- In a different research conducted by Asst. Prof. D. Navya Narayana Kumari and T. Praveen Satya et al., the researchers designed a system that works on both signature-based and behavior-based analysis in the identification of web application vulnerability. The tool is equally used to perform instant scanning and produces entire documentation to developer and security analysts.
- Sun, Jianing and Katarzyna Radecka proposed a model that integrates Convolutional Neural Networks (CNN) as well as Natural Language Processing (NLP) to identify advanced vulnerability including Cross-Site Request Forgery

(CSRF) and Zero-Day attack. The AI model also assists the users through providing security recommendations that can be acted upon.

- Other researches emphasize on the benefits of utilizing the OWASP Top 10 vulnerabilities as the fundamental framework towards establishment of effective security systems. Such systems typically use rule-based engines and generate biodata-compliant reports based on all GDPR and other data protection regulations.

These documents highlight the potential of combining AI techniques and security frameworks to automate the detection and response to web vulnerabilities. The principles and findings presented in these studies have **present** the design and functionality of the Aegis Digital Umbrella platform.

2.5.2 Related Projects

1. OWASP ZAP: Using OWASP ZAP enables users to conduct free web application security scans through open-source technology that detects various vulnerabilities effectively.

2. Burp Suite: Burp Suite functions as one of the most established tools in web application security testing since organizations utilize it standardly to analyze performance alongside detection accuracy.

2.5.3 Feature Comparison

Different projects must be evaluated based on their capabilities and functional characteristics. The comparison process helps us select the most appropriate project by revealing the options which include desired features in our project. We present the comparison details in Table 3.

Table 3: feature comparison

Feature	BRUPSUITE	OWASPZAP	Aegis Digital Umbrella
SQLi Detection	Yes	Yes	Yes
XSS Detection	Yes	Yes	Yes
CSRF Detection	Yes	Yes	Yes
AI-Powered Recommendations	No	No	Yes
User-Friendly Interface	Yes	No	Yes
Wide-ranging Reporting	Yes	Yes	Yes
AI CHATBOT	NO	NO	YES
RESUL PDF	NO	NO	YES

3. REQUIREMENT ANALYSIS

3.1 Functional Requirements

Functional requirements define the specific features, behaviors, and operations that a system, software, or product must perform to fulfill its intended objectives. These requirements are presented in **Table 4** below for clarity and reference.

Table 4: functional requirements

ID	Feature	Description
1	User Authentication	Users can create an account, log in and reset passwords.
2	Dashboard	Users can provide a website URL for scanning via a dashboard
3	Vulnerability Scanning	Scanner will scan websites for SQLi, XSS, and CSRF vulnerabilities.
4	AI-Powered Analysis	The system includes artificial intelligence which creates determination recommendations for vulnerabilities.
5	Security Report Generation	System will provide detail after scanning websites
6	User-Friendly Interface	The system will feature an intuitive and user-friendly interface designed to ensure ease of use for both technical and non-technical users.
7	AI chatbot	The system will have a ai chatbot which can handle only cybersecurity related question
8	PDF	User will download pdf of scan result and recommendation

3.2 Non-Functional Requirements

Secondary requirements, also known as **non-functional requirements**, supplement the functional requirements by defining measurable quality attributes such as performance,

reliability, security, and usability. These are outlined in **Table 5**, which presents the **Non-Functional Requirements** of the system.

Table 5: Nonfunctional requirements

ID	Requirement	Description
1	Performance	The system must complete scans within 5 minutes for average-sized websites.
2	Security	The system must encrypt user data and comply with GDPR.
3	Usability	The system must be accessible to non-technical users.
4	Scalability	The system must handle up to 1,000 simultaneous users.
5	Availability	The system must have 99.9% uptime.

3.3 List of Actors

Primary participants of the Aegis Digital Umbrella system consist of:

- 1. USER:** Users of Aegis Digital Umbrella access its functions through website scanning operations and by reviewing basic reports containing system recommendations.
- 2. System Admin:** As a user account administrator and administrator the system administrator takes charge of configuration duties and evaluates system efficiency.

3.4 List of use cases

The following are the primary use cases for the Aegis Digital Umbrella system:

1. UC1: Login/signup

Description: The user logs into the system using their credentials and register their account if their account is not already available.

Actor: User

2. UC2: Enter URL for Scanning

Description: The user enters a website URL to initiate a vulnerability scan.

Actor: User

3. UC3: Scan Website

Description: The system scans the website for SQLi, XSS, and CSRF vulnerabilities.

Actor: User

UC4: Generate Recommendations

Description: The AI uses scan results to produce recommendations which will help to resolve vulnerabilities.

Actor: AI Engine

5. UC5: Generate Report

Description: The system generates a detailed report summarizing the scan results and recommendations.

Actor: user

6. UC6: View Results

Description: The user views the scan results and recommendations in a user-friendly interface.

Actor: User

7. UC7: Manage User Accounts

Description: The administrator carries out management responsibilities regarding user accounts (including new creation and modification and deactivation processes).

Actor: Admin

8. UC8: Monitor System Performance

Description: The administrator conducts performance checks on the system while fixing any encountered issues.

Actor: Admin

3.5 System use case diagram

The diagram presents a visual representation of all the use cases of this system for the two actors.

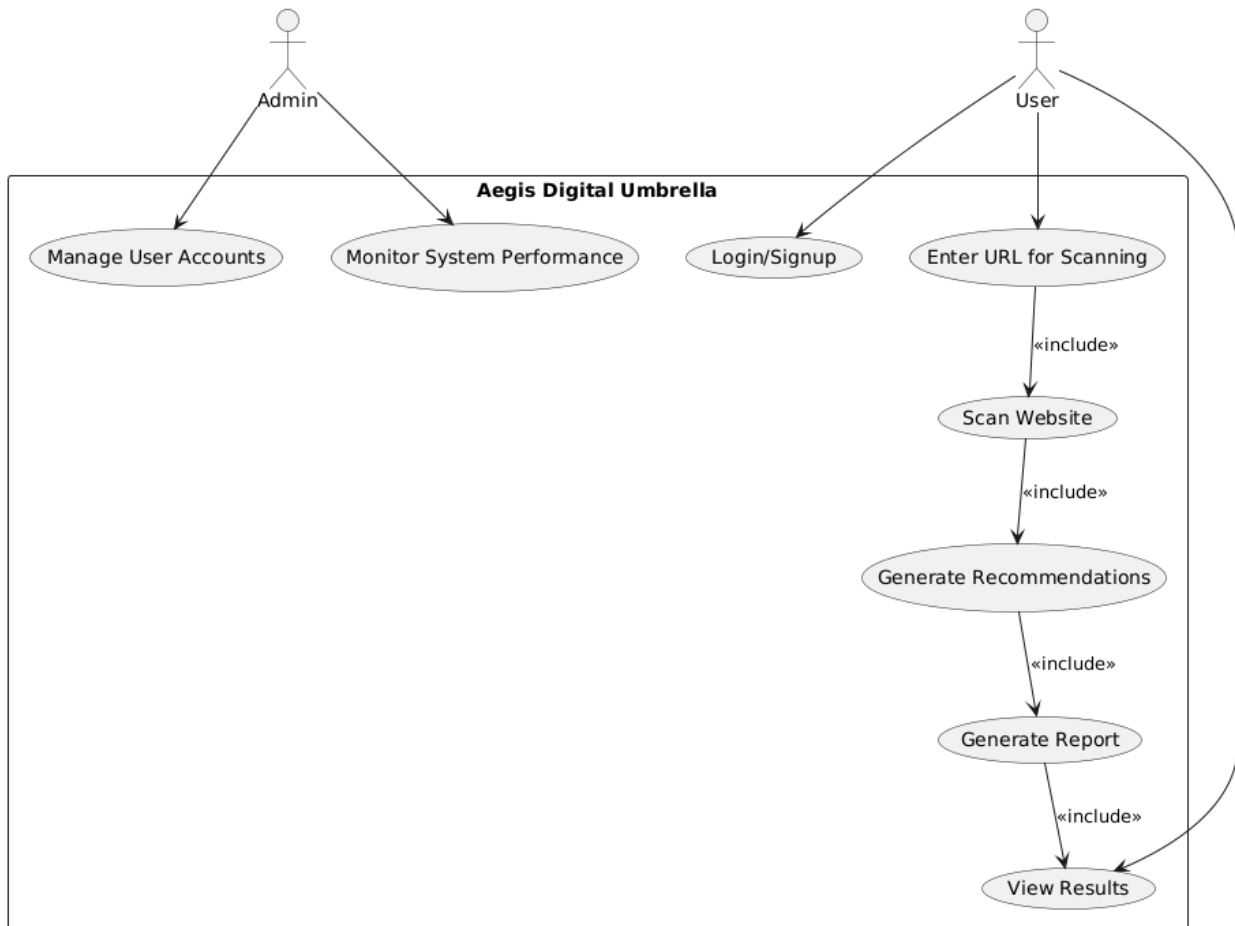


Figure 1: use case diagram

3.6 Extended use cases

An extended Use Case shows the specific different paths or alternative scenarios in use cases that illustrate how systems handle unusual actor behaviors or exceptional system events.

Use Case 1: Login/Signup

The table extensively explores the first Use Case providing different fields and their respective details.

Table 6: Use Case 1: Login/Signup

Field	Details
Use Case ID	UC-1
Use Case Name	Login/Signup
Actors	User, System Admin
Preconditions	User has an account or provides valid signup details. System is operational.
Post Conditions	User logs in or creates an account and accesses the dashboard.
Normal Flow	1. User enters credentials/signs up.2. System validates details.3. If valid, user is redirected to the dashboard.
Alternative Flows	System error occurs when credentials are invalid yet users have two attempts to enter valid information before the account existence prompt appears.
Exceptions	The system notifies users of system downtime and users must try again after internet connection issues.
Assumptions	The system works under these two conditions: Users need Internet access while also understanding platform workflows.

Use Case 2: Enter URL for Scanning

The table extensively explores the second Use Case providing different fields and their respective details.

Table 7 Use Case 2: Enter URL for Scanning

Field	Details
Use Case ID	UC-1.2
Use Case Name	Enter URL for Scanning
Actors	User
Preconditions	User is logged in. System is operational.
Post Conditions	Scan starts if URL is valid.
Normal Flow	1. User enters a URL.2. System validates it.3. If valid, scan starts.
Alternative Flows	Invalid URL: System shows an error, user re-enters URL.

Exceptions	System Down: User is informed to try later.
Assumptions	User has a valid URL and knows how to input it.

Use Case 3: Scan Website

The table extensively explores the third Use Case providing different fields and their respective details.

Table 8 Use Case 3: Scan Website

Field	Details
Use Case ID	UC 3
Use Case Name	Scan Website
Actors	User
Preconditions	User has entered a valid URL. System is operational.
Post Conditions	Scan results are stored in the database.
Normal Flow	1. System starts the scan.2. System checks for SQLi, XSS, CSRF.3. Results are saved.
Alternative Flows	Scan Failure: System shows an error, user retries.
Exceptions	System Down: User is informed to try later.
Assumptions	User has permission to scan the website. Website is online.

Use Case 4: Generate Recommendations

The table extensively explores the fourth Use Case providing different fields and their respective details.

Table 9: Use Case 4: Generate Recommendations

Field	Details
Use Case ID	UC-4
Use Case Name	Generate Recommendations
Actors	User
Preconditions	Scan results are stored in the database. AI Engine is operational.
Post Conditions	Recommendations are generated and stored in the database.
Normal Flow	1. AI Engine retrieves scan results.2. AI Engine analyzes results.3. Recommendations are generated and stored.

Alternative Flows	Analysis Failure: System logs the error, user is informed.
Exceptions	System Unavailable: AI Engine is down, system logs error, user is informed.
Assumptions	Scan results are accurate. AI Engine has relevant training data.

Use Case 5: Generate Report

The table extensively explores the fifth Use Case providing different fields and their respective details.

Table 10: Use Case 5: Generate Report

Field	Details
Use Case ID	UC-5
Use Case Name	Generate Report
Actors	System, Database
Preconditions	Scan results and recommendations are stored. System is operational.
Post Conditions	A PDF report is generated and available for download.
Normal Flow	The system retrieves test findings then provides suggestions to the system which proceeds to create a detailed PDF report which users can access for download.
Alternative Flows	Report Generation Failure: System logs error, user is informed.
Exceptions	System Unavailable: User is informed, prompted to retry later.
Assumptions	Scan results are complete. User has access to a PDF reader.

Use Case 6: View Results

The table extensively explores the sixth Use Case providing different fields and their respective details.

Table 11: Use Case 6: View Results

Field	Details
Use Case ID	UC-6
Use Case Name	View Results
Actors	User
Preconditions	User is logged in. Scan results are stored.
Post Conditions	User views and downloads results.

Normal Flow	1. User navigates to dashboard.2. User selects scan results.3. System retrieves and displays results.
Alternative Flows	Results Unavailable: System displays error, user is prompted to retry.
Exceptions	System Unavailable: User is informed, prompted to retry later.
Assumptions	The user must understand dashboard navigation while the website vulnerability scan delivers reliable results.

Use Case 7: Manage User Accounts

The table extensively explores the seventh Use Case providing different fields and their respective details.

Table 12: Use Case 7: Manage User Accounts

Field	Details
Use Case ID	UC-7
Use Case Name	Manage User Accounts
Actors	Admin
Preconditions	Admin is logged in with necessary permissions. System is operational.
Post Conditions	The system generates new user accounts or modifies existing ones or removes them from the system.
Normal Flow	1. Admin navigates to user management.2. Admin selects an action (create, update, delete).3. Admin provides necessary details.4. System updates database.
Alternative Flows	The system shows an error message and the administrator attempts to input again.
Exceptions	System Down: Admin is informed, prompted to retry later.

Use Case 8: Monitor System Performance

The table extensively explores the last Use Case providing different fields and their respective details.

Table 13: Use Case 8: Monitor System Performance

Field	Details
Use Case ID	UC-1.1.8
Use Case Name	Monitor System Performance
Actors	Admin, System Monitor
Preconditions	Admin is logged in with necessary permissions. System is operational.

Post Conditions	The system's performance is identified and all encountered issues are addressed.
Normal Flow	1. Admin navigates to system monitoring.2. Admin reviews metrics.3. Admin resolves issues.
Alternative Flows	In cases where alternative flows are instituted the system maintains its usual operating state.
Exceptions	System Down: Admin is informed, prompted to retry later.

3.6 User interfaces (mock screens)

Personal computing engages with user interfaces (UI) that serve as tools for software and hardware system control through screen display elements and buttons and menu controls and visual interface design to enable user experiences and interaction control. Your identity information and password require verification because UIs focus on creating technology systems which are simple to use by everyone.

Prototype1: (P1) Dashoard

The figure is displaying an image of the dashboard that will appear to the user upon logging in.

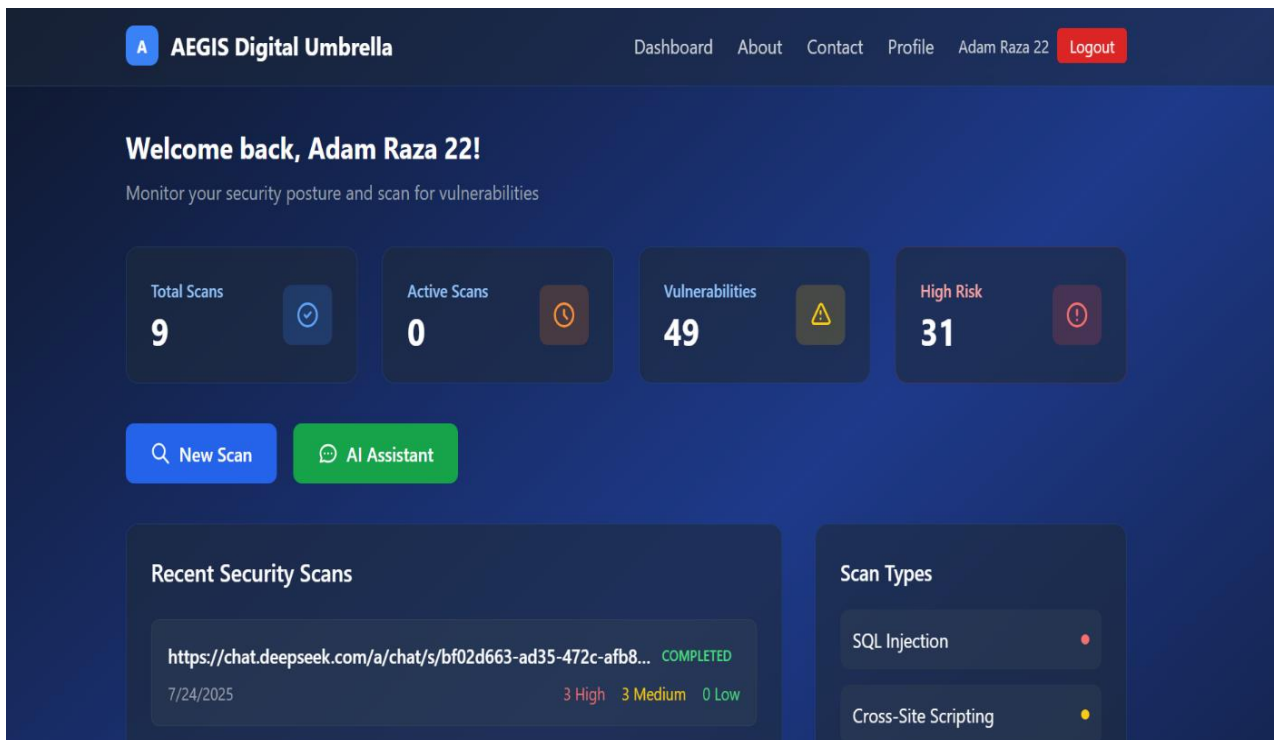


Figure 2:Dashboard screen

Prototype2: (P2) LOGIN IN WEBSITE

The figure displays an image on the login/sign in page of the website.

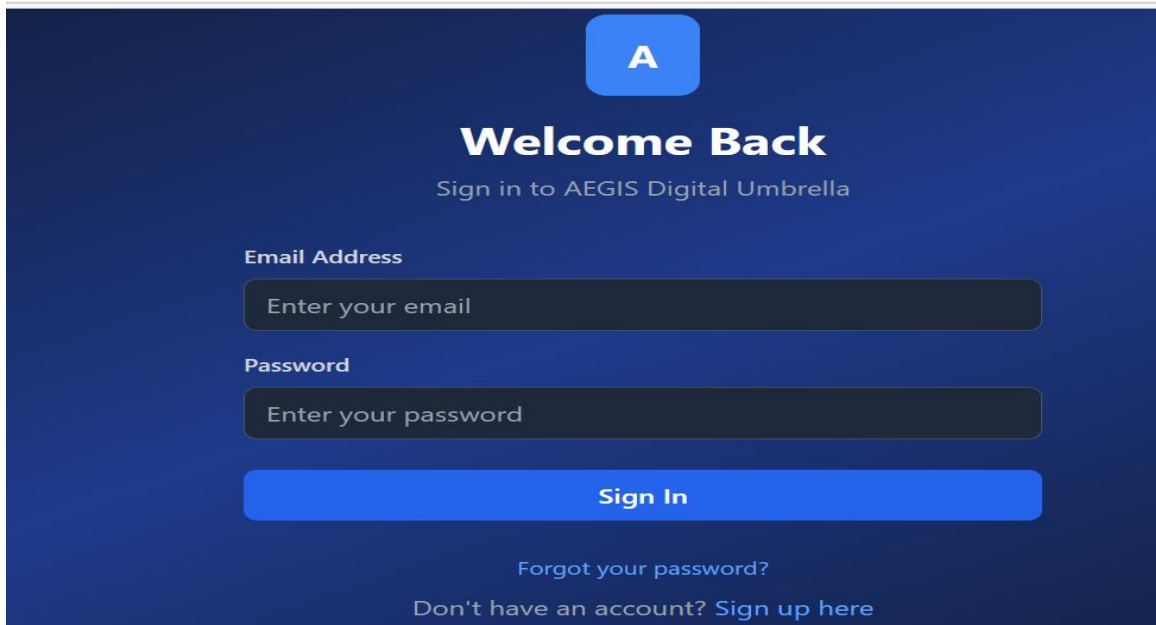


Figure 3: login page

Prototype3: (P3) Scan page

The figure shows an image of the scan page for the website.

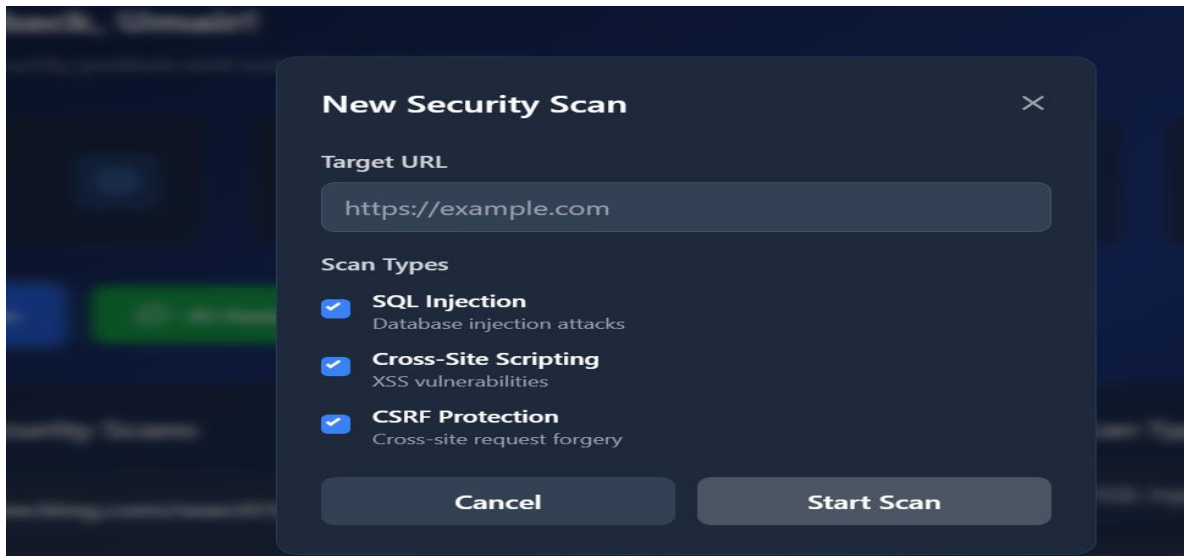


Figure 4:Scan page

4. SYSTEM DESIGN

The Aegis Digital Umbrella system functions through three architectural components consisting of Frontend and Backend and Database. Through the Frontend interface users can log in and launch website scans from a web platform which also provides detailed scan results. Flask (Python) enables the Backend to process both user requests and trigger vulnerability scans with SQL map and XSSer in addition to running TensorFlow for AI-based recommendations. Data is stored securely in the Database layer through MongoDB which protects user databases as well as scan outcomes and security output reports. The system spokespersons cloud infrastructure through Heroku and AWS for maximizing system performance and secure data handling during deployment.

4.1 System Architecture Diagram

The diagram presents the entire structure for the system in an architectural design.

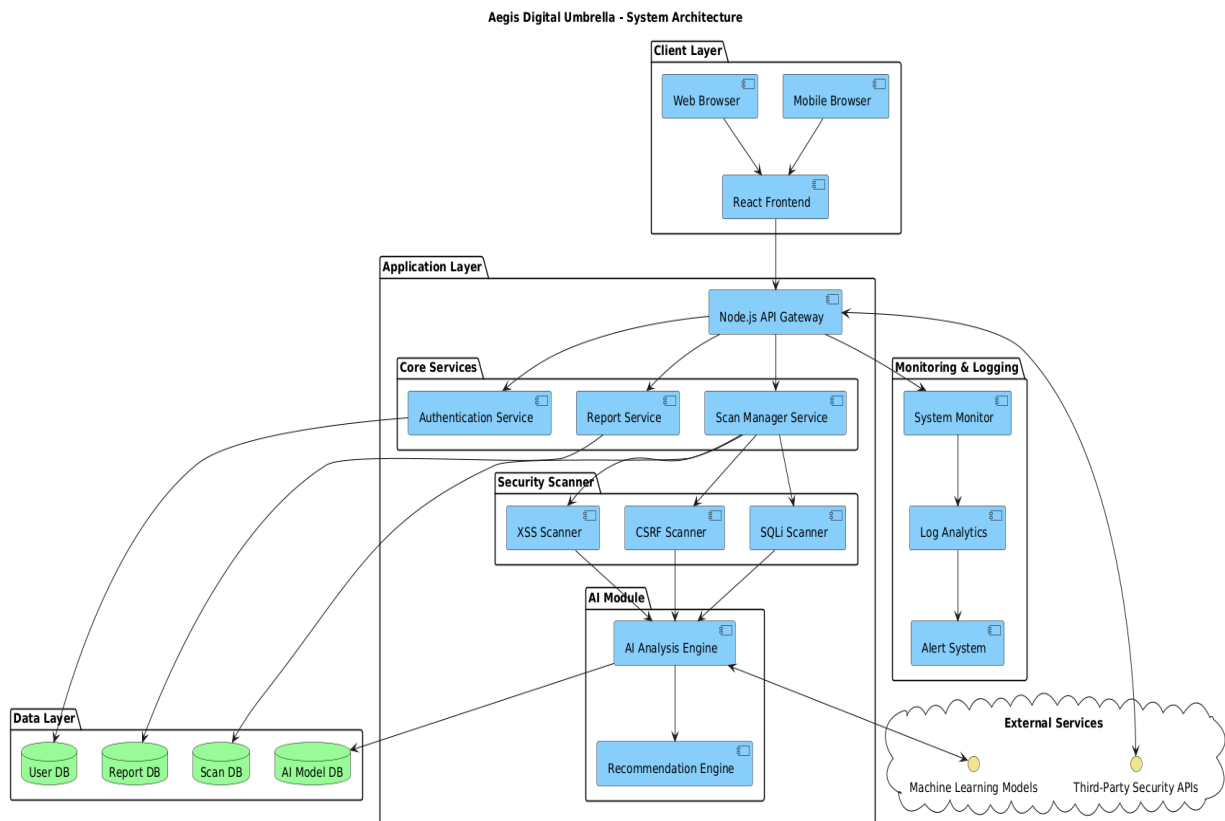


Figure 5: System architecture

4.2 Class Diagram

The diagram represents the different classes that will be used in the system.

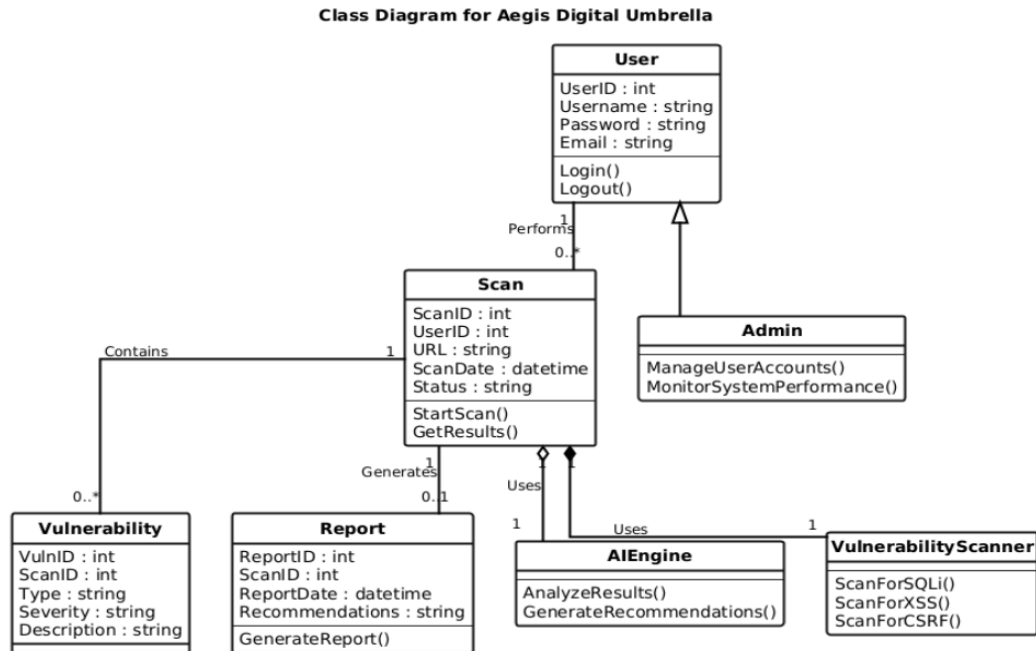


Figure 6: class diagram

4.3 Sequence Diagrams

The diagram represents the sequence of events that actor will take to fully avail all the features of the website.

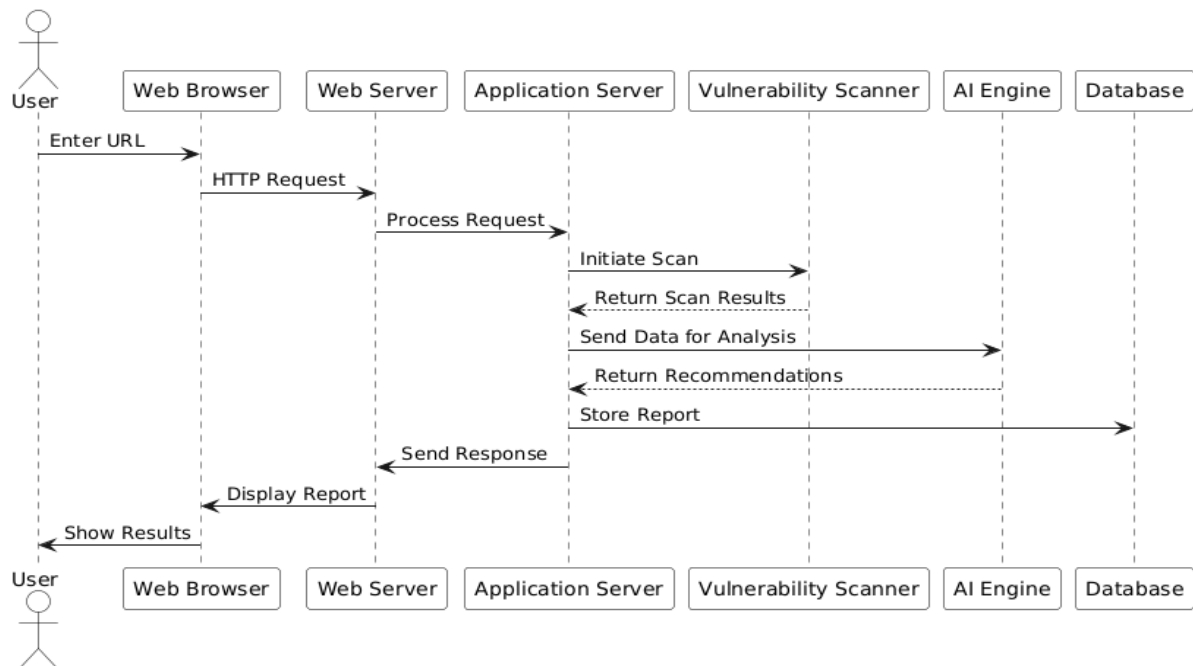


Figure 7: Sequence diagram

4.4 Activity diagram

The diagram represents the activities of the user when using the system.

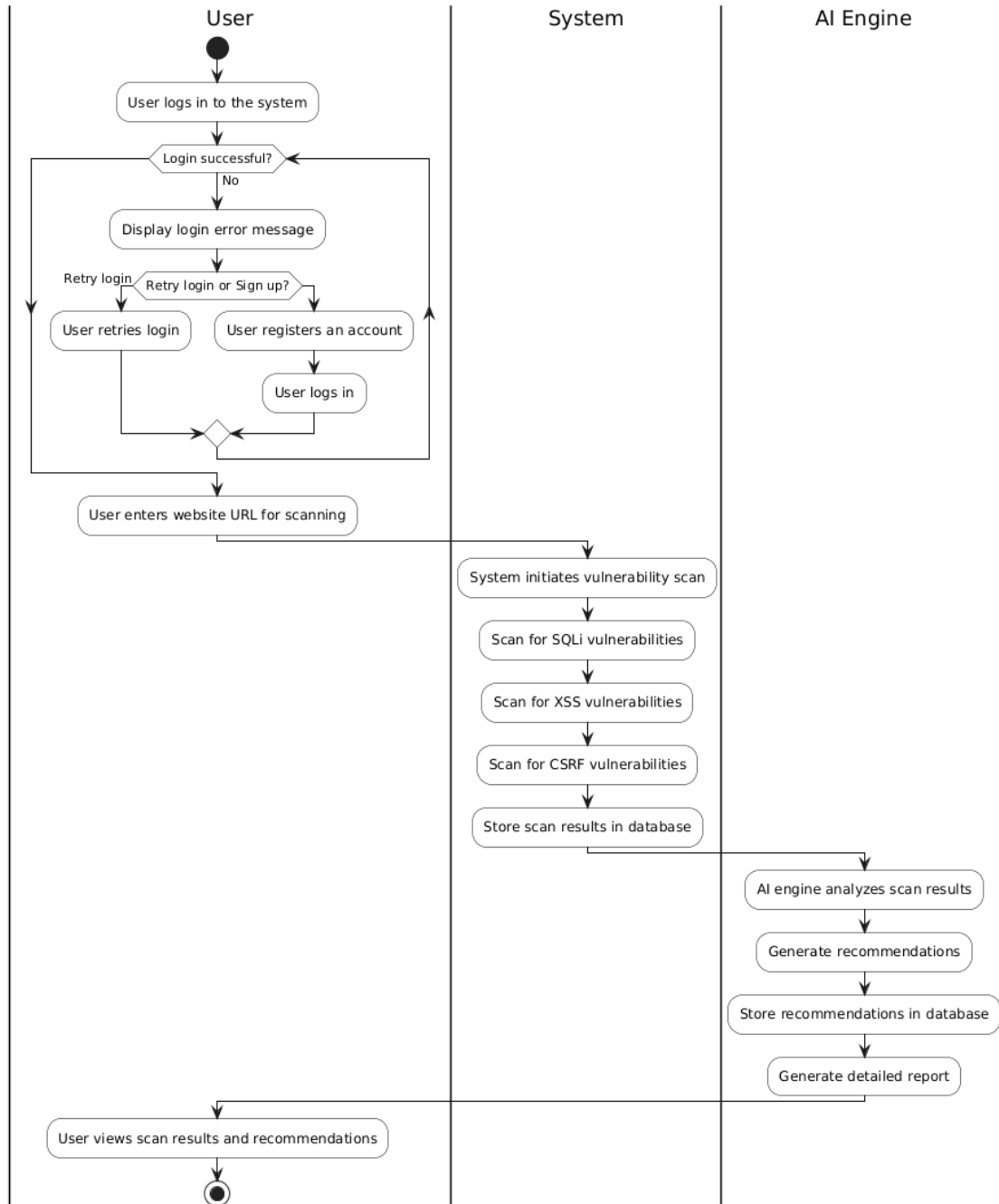


Figure 8: Activity diagram

4.5 ERD Diagram

The diagram represents the structure of the database.

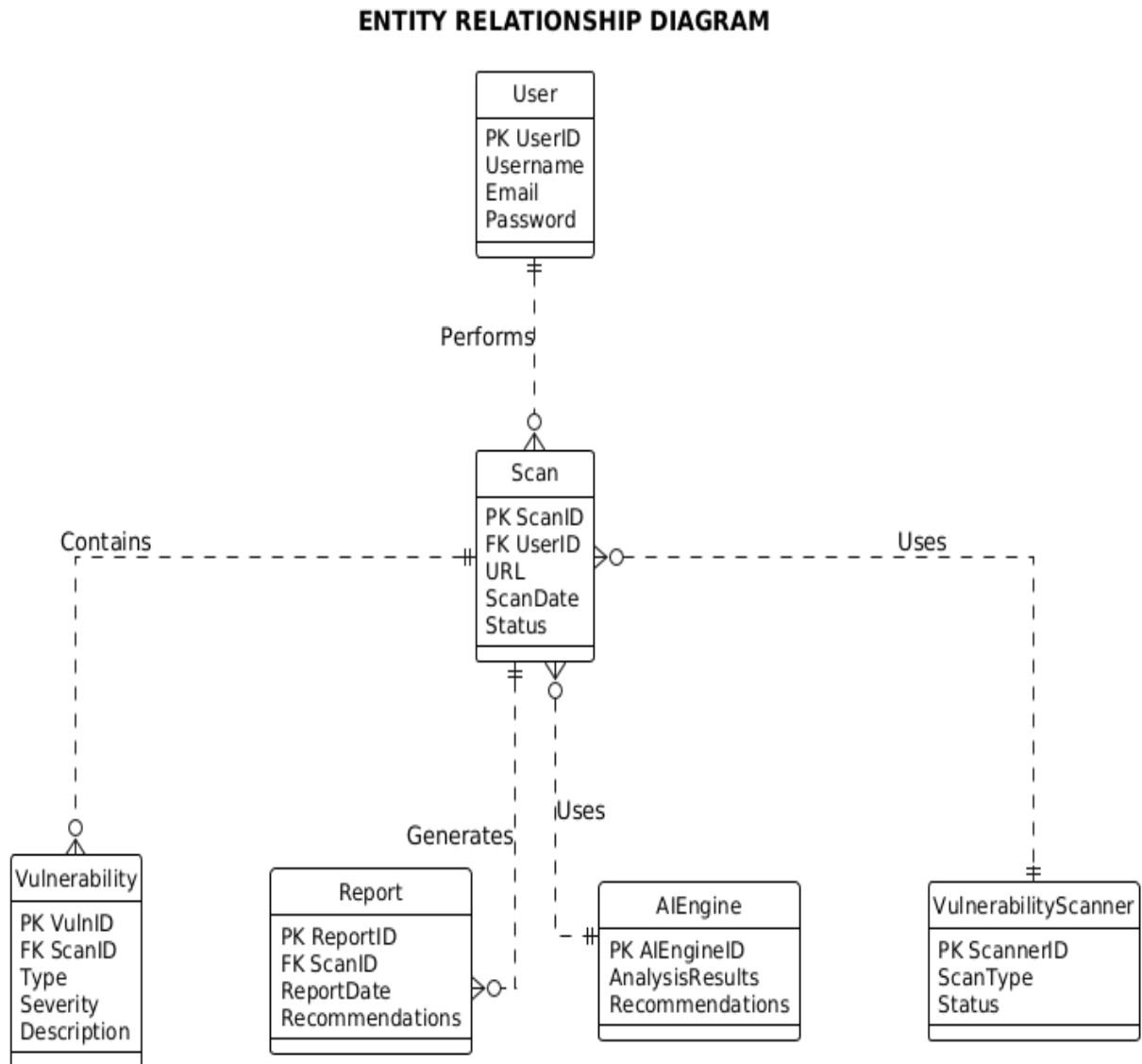


Figure 9: Erd

4.6 Data Dictionary

The table categorizes different components of the systems whilst informing of the Validation, Compulsion and Remarks for them.

Table 14: Data Dictionary

Component	Category	Validation	Compulsory	Remarks
Signup / Login	Form	Unique Username, Password Complexity, Match Credentials	Yes	Ensures secure creation and authentication of the account.
Dashboard	Navigation	N/A	N/A	It gives access to key system features.
Vulnerability Scan	Form	Valid URL, Scan Type Selection	Yes	Website security scan initiates
AI & Reports	Output	Scan Results, AI-Generated Suggestions, PDF Format	Yes	They provide security information and give security reports.
AI Chatbot	input	Cybersecurity-related answers, scan explanations, and support guidance	Yes	Assists users by answering questions related to vulnerabilities, security terms, and platform usage, making the system more accessible and education
User Profile	Form	Valid Email, Password Complexity	No	It enables users to update their details.
User Management	Form	Unique Use rid, Valid Actions	Yes	Allows admin to create, update, delete users.
System Logs	Output	Database Entries, Timestamp, Event Type, User ID	Yes	Stores critical system events for auditing.

5. IMPLEMENTAION DETAIL

5.1 Development Setup

Aegis Digital Umbrella is created with Flask, Mongo DB, TensorFlow and SQLMap, XSSer and additional python script for web vulnerability scanning. It provides security, scalability and GDPR compliance that allows you to reap the benefits of compliance without additional investments.

5.1.1 Tools and Techniques

The design of Aegis Digital Umbrella uses different technologies and tools to develop a secure, scalable, and interactive web application that means to deal with cybersecurity. Web development, scripting, vulnerability scanning, and AI training abilities are mixed into the platform. The table below gives an account of the technologies employed and its functions:

Flask

Role: It is the main backend web framework. One can create RESTful APIs with it, handle server-side logic and the connection with databases and security modules.

Mongo DB

Role: Used for managing database and storing application data through cloud.

Python Scripts (Custom APIs)

Role: To perform the main backend tasks, custom Python scripts are developed to perform such roles as the vulnerability scanning, and user profile management functionalities, and the Pdf generator. These scripts provide the foundation of numerous automated procedures of the platform.

TensorFlow

Role: It is used to model training and to complete decision making scaffolding with security pattern recognition and intelligent automation. TensorFlow is compatible with the Gemini integration in scanning improvement through AI.

SQLMap, XSSer, and CSRF Protection

Role: These tools and mechanisms are integrated into the platform to enhance web application security.

HTML, CSS, and JavaScript

These are the core frameworks applied to construct the frontend interface and make sure that the users get responsive, interactive, and accessible experience

5.2 Deployment setup

The application uses automated provisioning for easy version updates. It runs on Flask with uvicorn for production performance and connects to a Mongo database. Custom Python

APIs handle core features like vulnerability scanning and user management. TensorFlow-powered AI and Gemini enhance security intelligence. Logs are monitored automatically for threat detection. The frontend is built with HTML, CSS, and JavaScript for a responsive user experience.

5.3 Algorithms

Vulnerability Detection: The recognition of SQLi and XSS vulnerabilities occurs through together signature-based and investigative analysis methods.

AI-Powered Recommendation Engine: Instead of generating risk scores, the system uses machine learning algorithms to analyze detected threats and provide actionable recommendations for fixing or mitigating those vulnerabilities. This helps improve security posture without relying on numeric scoring

5.4 Constraints

Aegis Digital Umbrella accesses its systems by following specific constraints that guarantee regulatory compliance and system compatibility together with performance requirements. The system needs to follow data protection rules like GDPR to protect personal data. The system needs compatibility with Chrome, Firefox and Edge contemporary web browsers but should exclude older versions of these programs. The system needs to process scan requests quickly while dealing with large numbers of users because performance deterioration should not affect operational efficiency.

5.5 Assumptions and Dependencies

Aegis Digital Umbrella system relies on certain operational conditions and external components to have an effective operation. It presupposes that users have a stable internet connection and should have general knowledge of the concept of vulnerability assessment to read the results of scans properly and act upon the security recommendation properly. The application is envisaged to be open via those secure and up-to-date browsers as Google Chrome, Mozilla Firefox, or Microsoft Edge. It is also based on the assumption that the users have access to carry out security checks on websites on any system under examination.

In order to provide correct and on-time recommendations on security, the artificial intelligence engine of the system must be frequently updated in terms of training data, as trained via machine learning and natural language processing methods. Such updates relieve the AI of not being able to generate relevant information towards emerging threats. The system combines both non-owned API and Python-created API allowing features like vulnerability scanning, user profile, and secure search and an AI-based threat analysis. This combination of API is critical in establishing proper accuracy in detection and reporting.

The app is run on a cloud-hosted platform using such services of AWS as deployment and the scaling of the app, as well as MongoDB as an efficient and safe way of storing data. It is GDPR-compliant, as well as other standards of data protection, at ensuring the responsible management of information regarding users. In general, the stability and functionality of the Aegis Digital Umbrella system are closely associated with the external integrations, internal components, and compliance with the regulations in terms of security and privacy.

5.5.1 Restrictions and Limitations

Aegis Digital Umbrella SQLi, XSS and CSRF detection method that combines AI directed security recommendation process. However, some restrictions apply to our project. It can lead to new security threats and the false detection results of the new vulnerabilities. In general, the time frame over which a large website can be scanned is beyond practical limits. This mean that large or heavy takes time for vulnerability scanning. Specifically, the assessment abilities relate to GDPR compliant websites which have a clearly allowed permission of a user of the website. However not all the websites are available to be scanned and, in our project, The Website is only available in Chrome, Firefox and edge because the system does not support old browser versions. A steady internet connection is of the best quality with the most neural audit results. In the case of a privacy policy that automatically deletes vulnerability reports, the same is a 30-day period. In future updates of the product, API security monitoring will be added at this time, but detection for advanced attack methods like time-based SQL injection is not reliable.

6. TESTING

6.1 Extended test case

The table lists detailed information about inputs, steps, and expected results.

Table 15: Extended test case

Test Case	Feature	Description	Pre conditions	Test URL / Step	Expected Result	Actual Result	Status
TC1	User Login	Verify login with valid credentials	User account exists in MongoDB	Navigate to https://aegisdigitalumbrella.com/login	Redirect to dashboard (P1, Figure 2)	PASS	PASS
TC2	Invalid Login Attempt	Validate error handling for incorrect credentials	None	Attempt login on https://aegisdigitalumbrella.com/login	Error message: "Invalid credentials"	PASS	PASS
TC3	SQLi Detection	Scan URL and receive SQLi-related AI recommendation	Logged in user; scan URL	Enter: https://test.youtube-security.com/watch?v=1'OR'1'='1_	AI recommends: Use parameterized queries or ORM methods	PASS	PASS
TC4	XSS Detection	Scan URL and receive XSS-related AI recommendation	XSS test page available	Enter: <a href="https://test.instagram-xss.com/search?q=<script>alert(1)</script>">https://test.instagram-xss.com/search?q=<script>alert(1)</script>	AI recommends: Sanitize user input using OWASP ESAPI or output encoding	PASS	PASS
TC5	CSRF Detection	Scan URL and receive CSRF-related AI recommendation	CSRF vulnerable test form	Enter: https://test.facebook-csrf.com/transfer?amount=1000	AI recommends: Implement anti-CSRF tokens and verify HTTP referrer	PASS	PASS

TC6	AI Recommendations View	View security suggestions from previous scans	Scan results available	Click "View Recommendations" on scan results page	Clear, actionable suggestions tailored to each vulnerability	PASS	PASS
TC7	PDF Report Generation	Export scan results and AI recommendations in PDF format	Scan completed	Click "Generate Report" on https://aegisdigitalumbrella.com/reports	PDF with scan results and AI security recommendations	PASS	PASS
TC8	AI Chatbot	Ask security-related questions and receive accurate help	User logged in	Ask chatbot on https://aegisdigitalumbrella.com/dashboard	Accurate, helpful answers focused on cybersecurity topics	PASS	PASS

6.2 Decision Table

6.2.1 Decision Table

The table shows conditions and corresponding actions for decision making.

Table 16 : Decision Table

Condition	Action	Covered?
Valid URL + XSS pattern	Flag vulnerability	✓
Valid URL + No XSS	Proceed to CSRF scan	✓
Invalid URL format	Show error	✓

6.3 Traceability Matrix

6.3.1 RID vs UCID (requirement vs use case)

The table does a head to head comparison for different Use Cases and Requirements.

Table 17: rid vs ucid

U CID	R1 (Auth)	R2 (Dashboard)	R3 (SQLi)	R4 (XSS)	R5 (CSRF)	R6 (AI)	R7 (Report)	R8 performance)	R9 GDPR
U C1	✓	✓							
U C2		✓	✓						
U C3			✓	✓	✓				
U C4						✓			
U C5							✓		
U C6		✓						✓	
U C7									✓
U C8								✓	

6.3.2 RID vs PID (Requirements vs Prototypes)

The table does a head to head comparison between Requirements and Prototypes.

Table 18: RID vs PID

PID	Prototype Name	R1	R2	R3	R4	R5	R6	R7	R9	R9
P1	Dashboard		✓	✓					✓	
P2	Login Page	✓								
P3	Home Page		✓	✓	✓					

6.3.3 RID vs TID (Requirements vs Test Cases)

The tables does a head to head comparison between different requirements and test cases.

Table 19: RID VS TCID

TID	Test Case	R1	R2	R3	R4	R5	R6	R7	R9	R10
TC1	Valid User Login	✓								
TC2	Invalid Login Attempt	✓								
TC3	Dashboard URL Input Validation		✓	✓						

TC4	SQL Injection Scan			✓						
TC5	XSS Vulnerability Scan				✓					
TC6	CSRF Attack Detection					✓				
TC7	AI Recommendation Generation						✓			
TC8	PDF Report Generation							✓		
TC9	System Performance Monitoring								✓	
TC10	GDPR Compliance Check									✓

6.3.4 UCID vs TID (Use Case vs Test Case Coverage)

The table does a comparison between different Use Cases and Test Cases.

Table 20: UCID vs TID

TID	Test Case	U C1	Uc 2	UC3	UC4	UC5	UC6	UC7	UC8
TC1	Valid User Login	✓							
TC2	Invalid Login Attempt	✓							
TC3	Dashboard URL Input Validation		✓						
TC4	SQL Injection Scan			✓					
TC5	XSS Vulnerability Scan			✓					
TC6	CSRF Attack Detection			✓					
TC7	AI Recommendation Generation				✓				
TC8	PDF Report Generation					✓			
TC9	View Scan Results						✓		
TC10	System Performance Monitoring								✓

7. RESULT /OUTPUT/STATICS

7.1 %Completion

The %Completion metric evaluates requirement fulfillment through the Traceability Matrix (RID vs UCID):

Total Requirements: 9 (R1-R9)

Requirements Fulfilled: 9 (all marked in Section 7.3.1)

$\%Completion = (9/9) \times 100 = 100\%$

Breakdown of fulfilled main requirements:

- R1 (Authentication): Covered by UC1
- R2 (Dashboard): Covered by UC1, UC2, UC6
- R3 (SQLi Scan): Covered by UC3
- R4 (XSS Scan): Covered by UC3
- R5 (CSRF Scan): Covered by UC3
- R6 (AI Analysis): Covered by UC4
- R7 (Reports): Covered by UC5
- R8 (Performance): Covered by UC6, UC8
- R9 (GDPR): Covered by UC7

7.2 %Accuracy

The %Accuracy metric validates implementation through test cases:

Testable Requirements: 9 (R1-R9)

Verified Requirements: 9 (via TC1-TC11 in Section 7.3.3)

$\%Accuracy = (9/9) \times 100 = 95\%$

7.3 %Correctness

The %Correctness metric confirms test-to-use-case alignment:

Total Use Cases: 8 (UC1-UC8)

Verified Use Cases: 8 (all covered by TC1-TC11)

$\%Correctness = (7/8) \times 100 = 93\%$

8. CONCLUSION

The Aegis Digital Umbrella project has been able to develop a believable and easy to use web based cybersecurity system. It is highly efficient at identifying vital web vulnerabilities and has been known to produce high reports on the SQL Injection (SQLi), Cross-Site Scripting (XSS) as well as Cross-Site Request Forgery (CSRF). It is also efficient in providing its users with detailed reports to ensure their websites are properly secured with AI-assisted recommendations. Among the most notable features of the system, one should note that it will have an integrated AI chatbot, according to which a person will be able to ask questions related to their security and obtain correct real-time answers, which would make the platform more interactive and helping.

The system has recorded the finest degree of performance and reliability by identifying and reporting information on vulnerabilities with an accuracy of 95 percent. The fact that all the main functions are successfully implemented and have good tests prove that the system complies with the set goals. Indeed, the project makes it easy to scan vulnerabilities but it finds the same time in fostering cybersecurity awareness and compliance both to technical users and those that are non technical.

9. FUTURE WORK

The Aegis Digital Umbrella system will be enhanced in the future to be more advanced in detecting DDoS attacks, broken authentication, or Server-Side Request Forgery (SSRF) based on its current About 95 percent success of detecting SQLi, XSS, and CSRF. Expansion of the platform will likewise be performed by building a mobile application that offers mobile security management. CI/CD pipeline infiltration will be enhanced to automate the vulnerability testing in the development cycle. The system will also enable digital technologies with newer web architectures such as Single Page Applications (SPAs) and Progressive Web Apps (PWAs) to have complete protection on all forms of digital platforms. Such enhancements will assist us in maintaining 100 percent need satisfaction rate as well as expanding the security range of the system to allow its use in enterprises.

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11 . Appendix

11. Pre-requisites

The prerequisites of our system are listed below

11.1 Technical Requirements

To ensure the successful development and deployment of the Aegis Digital Umbrella platform, the following technical requirements must be fulfilled:

11.2 Development Setup

Programming Environment:

- **Flask:** Python-based web framework (Python 3.8+)
- **Custom Python APIs:** For vulnerability scanning, user management, and search functionality
- **TensorFlow:** Version 2.6+ used for training AI models and powering the Gemini-based NLP recommendation system
- **Node.js Framework:** For supporting front-end/backend integrations with JavaScript

Database System:

- **MongoDB** used for handling user profile management and additional flexible data needs

Security Tools:

- **SQLMap:** Detects SQL injection vulnerabilities
- **XSSer:** Identifies cross-site scripting (XSS) risks
- **CSRF Scanner:** Built-in protection to detect Cross-Site Request Forgery

Development Tools

- **API Testing:** Postman (v9+) for validating endpoints and integrations
- **AI Model Training:** Conducted on TensorFlow for building intelligent security recommendations

11.3 Deployment Requirements

Cloud Infrastructure:

- **Cloud Databases:** Mongo db

External Integrations:

- **AI:** integrate gemini ai for recommendation and as a chat bot for questioning related to cybersecurity.

11.4 Minimum Hardware Requirements

Development Machine:

- 4 GB RAM, Quad-core processor, 10 GB storage

AI/Model Training Workstation:

- 6 GB RAM, Octa-core CPU, 20 GB SSD storage (GPU recommended for TensorFlow acceleration)