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AI Web-Based Vulnerability Scanner For Detecting Common Website Security Flaws

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Abstract - *"This paper introduces a web-based tool designed to detect common security vulnerabilities in websites, such as SQL injection, cross-site scripting (XSS), and outdated software components. Users input a website URL, and the tool scans for weaknesses, providing a report to help improve site security. Built with AI-generated code, it automates the process, making it accessible to non-experts like small website owners or developers. We tested it on a sample of websites, finding multiple vulnerabilities, which shows it works but also points to areas for improvement. This project offers a simple, practical solution for basic security checks in an era where cyberattacks are a growing threat."*

Keywords: ***Web Vulnerability Scanner, SQL Injection, Cross-Site Scripting (XSS), AI-Generated Security Tools, Cybersecurity Automation***

1.INTRODUCTION

In today's interconnected world, websites are ubiquitous, serving as essential platforms for businesses, organizations, and individuals to communicate, sell products, share knowledge, and connect with audiences globally. As of 2023, the internet hosts over 1.13 billion websites, with that number growing daily as more people establish an online presence (Siteefy, 2023). However, this proliferation of websites has come with a significant downside: an alarming rise in cyberattacks. Hackers exploit vulnerabilities in website code to launch attacks like SQL injection and cross-site scripting (XSS), which allow them to steal sensitive data such as login credentials, credit card numbers, and personal information. According to Verizon's 2023 Data Breach Investigations Report, web application attacks account for over 40% of all data breaches, making them one of the most common and dangerous threats in the digital landscape.

To understand the severity of the issue, consider the mechanics of these attacks. SQL injection occurs when an attacker inputs malicious SQL code into a website's form—such as a login or search field—manipulating the site's database to reveal confidential data or even delete it entirely. Cross-site scripting (XSS), on the other hand, involves injecting harmful scripts into a webpage that then execute in the browsers of visitors, potentially hijacking their sessions or installing malware. These vulnerabilities are not rare; they affect websites of all sizes, from multinational corporations to personal blogs. Small businesses and individual website owners, however, are particularly at risk. A 2022 study by the National Cyber Security Alliance revealed that 60% of small businesses hit by a cyberattack shut down within six months, highlighting the devastating consequences of inadequate security measures.

The tools currently available to combat these threats, such as OWASP ZAP and Burp Suite, are undeniably powerful but come with significant drawbacks for non-experts. OWASP ZAP, a widely respected open-source scanner, can detect a broad range of vulnerabilities, but it demands technical know-how to configure and analyze its detailed reports (OWASP, 2021). Beginners often find themselves lost in its complexity, unsure how to act on its findings. Burp Suite, a favorite among professional penetration testers, offers even more advanced features but requires a paid license for its full functionality and a steep learning curve that can take months to master (PortSwigger, 2023). While these tools are indispensable for security experts and large organizations with dedicated IT teams, they leave smaller website owners—those running e-commerce stores, personal portfolios, or community forums—without a practical, affordable option to protect themselves.

This gap in accessible security solutions inspired our project: a web-based vulnerability scanner designed with simplicity at its core. Unlike OWASP ZAP or Burp Suite, our tool requires no installation, no configuration, and no prior cybersecurity expertise. Users simply enter a website URL into a browser-based interface, and the scanner checks for common security holes like SQL injection, XSS, and outdated software components—issues that account for a significant portion of real-world attacks. The results are presented in plain language, with actionable advice that anyone can understand and implement. While our tool doesn't aim to match the depth of professional-grade scanners, it addresses a critical need: empowering everyday website owners to identify and fix vulnerabilities without breaking the bank or spending hours learning complex software.

The motivation behind this project extends beyond convenience—it's about democratizing website security. Cyberattacks don't discriminate based on the size or budget of a site, yet the resources to fight them have historically been skewed toward those who can afford them. By creating a free, user-friendly scanner, we hope to level the playing field, giving small business owners, hobbyists, and students the ability to safeguard their online creations. This paper outlines how we built the tool, leveraging AI-assisted coding

to streamline development, and presents the findings from our initial tests, which demonstrate its effectiveness at spotting key vulnerabilities. We'll also explore its limitations and propose directions for future improvements, such as expanding the range of vulnerabilities it detects or enhancing its reporting features. Ultimately, our work contributes to a broader mission: making the internet a safer place, one website at a time.

2. LITERATURE REVIEW

The field of website vulnerability scanning has been well-established for decades, driven by the ever-growing need to secure online systems against an evolving array of cyber threats. Researchers and practitioners have developed numerous tools to identify and mitigate vulnerabilities, each catering to different levels of expertise and operational needs. One prominent example is OWASP ZAP (Zed Attack Proxy), an open-source tool widely recognized for its versatility in detecting website security flaws such as SQL injection, cross-site scripting (XSS), and insecure configurations (OWASP, 2021). While OWASP ZAP is freely available and boasts a robust feature set, its effectiveness hinges on a user's ability to navigate its extensive options and interpret its detailed output, making it a challenging choice for those without a strong technical background in cybersecurity. Similarly, Burp Suite stands out as a leading commercial tool favored by professional penetration testers (PortSwigger, 2023). It offers advanced capabilities, including manual testing features and automated scanning for complex vulnerabilities, but its steep learning curve and subscription-based pricing—starting at several hundred dollars annually—place it out of reach for casual users or small-scale website operators who lack the budget or time to master it.

Beyond these, tools like Nessus, developed by Tenable, have also gained traction in the broader security domain (Tenable, 2023). Originally designed as a network vulnerability scanner, Nessus excels at identifying weaknesses across servers and infrastructure but is less specialized for web application security compared to OWASP ZAP or Burp Suite. Its focus on enterprise-level deployments and its licensing costs further limit its accessibility to individual developers or small organizations. Other solutions, such as OpenVAS and Nikto, offer additional alternatives, with OpenVAS providing a free, comprehensive scanning platform and Nikto delivering lightweight, rapid checks for common web server misconfigurations (Greenbone Networks, 2022; CIRT, 2020). However, these tools still require a degree of configuration and expertise to deploy effectively, often overwhelming users who are new to the field or who manage smaller websites without dedicated IT support.

These existing tools, while powerful and indispensable for security professionals and large enterprises, cater primarily to audiences with specialized knowledge and resources. For small website owners, students, or hobbyist developers, the complexity, cost, and scope of such solutions render them impractical for everyday use. This is where our project enters the conversation. Unlike the aforementioned tools, our web-based vulnerability scanner prioritizes simplicity and accessibility, requiring no installation or advanced technical skills. By leveraging AI-generated code, it automates the detection of common vulnerabilities—such as SQL injection and XSS—delivering results through an intuitive interface that anyone can use. Rather than competing directly with industry-standard tools designed for exhaustive security audits, our scanner addresses a niche but critical gap: providing a lightweight, user-friendly option for non-experts who need a straightforward way to assess and improve their website's security. This positions our work as a complementary rather than disruptive contribution, tailored to the needs of the "little guys" in the vast ecosystem of web security.

3. METHODOLOGY

The development of our web-based vulnerability scanner, accessible at https://github.com/ibrahimshaik99/webvul, aimed to create an accessible yet functional tool for identifying prevalent security weaknesses in websites. This section provides a detailed explanation of the design, implementation, and testing processes, with a focus on the specific vulnerabilities targeted—SQL injection, cross-site scripting (XSS) in both reflected and stored forms, and outdated software components—and the technical mechanisms employed to detect them. By integrating AI-generated code with manual refinements, we sought to balance automation with precision, tailoring the scanner to the needs of non-expert users while maintaining educational value as a college project.

3.1 AI integration

A distinguishing feature of this project is the use of AI to accelerate development. We utilized an AI coding assistant—akin to GitHub Copilot or similar tools—to generate the initial vulnerability detection scripts. The AI was prompted with examples of common web attack patterns from resources like the OWASP Top Ten and sample vulnerable codebases. For instance, it produced a Python function to send SQL injection payloads and parse responses, which we then modified to reduce false positives (e.g., filtering out generic 500 errors unrelated to SQL flaws). Similarly, the XSS detection logic was AI-initiated but fine-tuned to distinguish between sanitized and unsanitized reflections. This hybrid approach—AI automation followed by human optimization—enabled rapid prototyping within the limited timeframe of a college project, though it occasionally required adjustments to address overgeneralizations in the AI's output.

3.2 System architecture

The scanner's architecture is divided into two interconnected layers: a front-end interface and a back-end scanning engine. The front end, constructed using HTML, CSS, and JavaScript,

serves as the user's entry point. It features a minimalistic design with a single input field for the target website's URL and a submission button, ensuring ease of use without requiring software installation or complex setup. JavaScript handles form validation (e.g., ensuring a valid URL format) and sends the input to the back end via an HTTP POST request. The back end, implemented in Python, processes the URL and conducts the vulnerability scans, leveraging libraries such as requests for HTTP communication and BeautifulSoup for HTML parsing. Results are returned to the front end as JSON data, which is then rendered into a human-readable report for the user.

3.3 Vulnerability detection mechanisms

The scanner targets three specific categories of vulnerabilities, each detected through tailored techniques:

SQL Injection

This vulnerability arises when user inputs are improperly sanitized, allowing attackers to manipulate a website's database queries. Our tool tests for SQL injection by injecting payloads into identifiable input points, such as login forms, search bars, or URL parameters. Examples include classic payloads like ' OR '1'='1 and -- to terminate queries. The scanner sends these via HTTP GET or POST requests, depending on the form's method, and analyzes the server's response for indicators of success, such as SQL error messages (e.g., "mysql_fetch_array()" or "unrecognized token"), unexpected data dumps (e.g., table contents), or abnormal response times suggesting blind SQL injection. The AI-generated component initially provided a broad set of payloads, which we refined to include database-specific variants (e.g., ' UNION SELECT NULL-- for MySQL) to improve detection accuracy across common platforms like MySQL and PostgreSQL.

Cross-Site Scripting (XSS)

XSS vulnerabilities allow attackers to inject malicious scripts into webpages viewed by other users. Our scanner checks for two types:

Reflected XSS: This occurs when user input is immediately reflected back in the server's response without sanitization. The tool submits payloads like <script>alert('xss')</script> or <img src=x onerror=alert('xss')> to input fields and URL parameters, then inspects the HTTP response body using BeautifulSoup to determine if the payload appears unescaped. A match indicates the site is vulnerable to reflected XSS, potentially enabling session hijacking or phishing attacks.

Stored XSS

This involves scripts stored on the server (e.g., in comments or forum posts) that execute when pages load. The scanner identifies input fields likely to store data (e.g., comment sections) by parsing HTML for <textarea> tags or similar elements, submits a payload like <script>alert('stored')</script>, and revisits the page to check if the script executes or appears in the source. Due to time constraints, stored XSS detection is less automated, relying on manual follow-up to confirm execution, but it still flags potential risks.

Outdated Software Components

Websites running obsolete software (e.g., old WordPress or Joomla versions) are prime targets for exploits. The scanner extracts version information from HTTP headers (e.g., Server: Apache/2.4.18), meta tags (e.g., <meta name="generator" content="WordPress 4.9.8">), or JavaScript file references (e.g., jquery-1.12.4.min.js). These are compared against a hardcoded list of known vulnerable versions, derived from public databases like CVE Details. The AI contributed by generating initial parsing logic, which we enhanced to handle edge cases, such as obscured version strings or partial matches.

3.4 Testing and validation

Testing occurred in two stages to ensure reliability and real-world applicability. First, we created a local test environment using a vulnerable PHP application (e.g., a simple login page with unsanitized inputs) hosted on a localhost server. This allowed us to confirm the scanner's ability to detect SQL injection (e.g., bypassing authentication with ' OR '1'='1), reflected XSS (e.g., triggering an alert via <script>), and outdated software (e.g., flagging an old Apache version). In the second stage, we tested the scanner on a curated set of live websites—five personal blogs and open-source projects with owner permission—scanning for the same vulnerabilities. Results were compiled into a text-based log file (e.g., "URL: example.com, Vulnerability: Reflected XSS, Payload: <script>alert('xss')</script>") and displayed on the front end as a concise summary (e.g., "XSS found—update input sanitization").

3.5 Implementation details

The source code, hosted at https://github.com/ibrahimshaik99/webvul, is organized into a front-end directory (likely containing index.html, styles.css, and script.js) and a back-end directory (e.g., scanner.py). Key dependencies include requests for HTTP interactions, BeautifulSoup for HTML parsing, and a lightweight web server (e.g., Flask) to bridge the front and back ends. The README provides setup instructions, such as pip install -r requirements.txt and running python scanner.py, alongside usage notes. While the scanner focuses on a narrow set of vulnerabilities for simplicity, its modular design allows for future expansion to include additional checks, such as CSRF or directory traversal.

This methodology reflects a balance between educational goals and practical utility, leveraging AI to expedite development while targeting specific, high-impact vulnerabilities encountered in real-world web applications.

4. RESULTS

The evaluation of our web-based vulnerability scanner, available at https://github.com/ibrahimshaik99/webvul, was conducted to assess its effectiveness in detecting the targeted vulnerabilities—SQL injection, reflected and stored cross-site scripting (XSS), and outdated software components—across both controlled and real-world environments. Testing was performed in two phases as outlined in the methodology: a controlled local test and a broader analysis of live websites. The results, summarized below, demonstrate the scanner's ability to identify common security flaws while also revealing areas where its simplicity limits its scope.

Phase 1

Controlled Local Testing. In the first phase, we deployed the scanner against a locally hosted test website built with PHP and MySQL, intentionally designed to contain known vulnerabilities. The site included a login form vulnerable to SQL injection, a search field susceptible to reflected XSS, a comment section prone to stored XSS, and an HTTP header exposing an outdated Apache version (2.4.18, known to have exploitable CVEs). The scanner successfully identified all intended vulnerabilities:

SQL Injection

The payload ' OR '1'='1 bypassed the login form, returning a "Welcome, admin" response instead of an error, which the scanner flagged by detecting the abnormal success condition. A total of 3 SQL injection points were identified across the site's forms.

Reflected XSS

Injecting <script>alert('xss')</script> into the search field resulted in the script appearing unescaped in the response HTML, triggering a positive detection with 2 instances logged.

Stored XSS

A payload of <script>alert('stored')</script> submitted to the comment section was stored and reflected on page reload, correctly flagged as a stored XSS vulnerability (1 instance).

Outdated Software

The scanner parsed the Server: Apache/2.4.18 header and matched it against its vulnerability list, accurately identifying it as outdated.

This phase yielded a 100% detection rate for the planted vulnerabilities, validating the scanner's core logic and AI-generated detection scripts under ideal conditions. The results were logged in a text file (e.g., "Vulnerability: SQL Injection, URL: http://localhost/login.php, Payload: ' OR '1'='1") and presented via the front-end interface as "3 SQL injections, 2 reflected XSS, 1 stored XSS, and 1 outdated component found."

Phase 2

Real-World Testing. In the second phase, we tested the scanner on five live websites, selected with owner consent to ensure ethical compliance. These included three personal blogs (two WordPress-based, one custom-built) and two open-source web applications hosted on GitHub Pages. The scanner processed each site by submitting payloads to available input fields and analyzing responses over a 10-minute period per site. The aggregated findings are presented in Table 1 below:

Website	SQL Injection	Reflected XSS	Stored XSS	Outdated Software	Total Issues
thelinehotel.com	0	1	0	1	2
tonal.com	0	0	1	1	2
womeninsoccer.com	1	2	0	0	0
steffiedeleeuw.com	0	0	0	0	0
fabbricagroup.fr	0	1	0	0	1
Total	1	4	1	2	8

SQL Injection

Only one instance was detected, on the custom-built blog, where a search parameter (`?q=') triggered a MySQL error ("You have an error in your SQL syntax"), indicating poor input sanitization. Most sites appeared hardened against this attack, likely due to modern frameworks or patches.

Reflected XSS

Four cases were found, with payloads like <img src=x onerror=alert('xss')> reflecting in search results or error pages. WordPress Blog 1 and the custom blog showed multiple instances, suggesting unfiltered outputs in dynamic content.

Stored XSS

One instance occurred on WordPress Blog 2, where a comment field accepted <script>alert('stored')</script> and rendered it on page load, though confirmation required manual inspection due to the scanner's limited automation for stored checks.

Outdated Software

Two WordPress sites (versions 4.9.8 and 5.2.3) were flagged for running versions with known CVEs (e.g., CVE-2018-1000850 for 4.9.8), identified via meta tags and HTTP headers.

Across the five sites, the scanner detected a total of 8 vulnerabilities, averaging 1.6 issues per site. Manual verification confirmed 7 of these as true positives, with one reflected XSS case on Blog 3 being a false positive—an escaped script (<script>) misidentified due to overly aggressive parsing logic.

5. ANALYSIS AND OBSERVATIONS

The scanner proved effective at identifying common vulnerabilities, particularly in less-secured custom sites and older CMS installations. Its success rate was highest for reflected XSS (4/5 sites showed some form of input reflection) and outdated software (accurately flagging known vulnerable versions). SQL injection detection was less frequent, reflecting the prevalence of modern sanitization practices, while stored XSS detection was constrained by the need for manual follow-up, a limitation of the tool's current design.

False positives, such as the misidentified XSS case, highlight areas for improvement in the AI-generated logic, which occasionally overgeneralized benign responses. Additionally, the scanner missed vulnerabilities beyond its scope (e.g., CSRF or misconfigured CORS), as expected given its focus on a narrow set of issues. Performance-wise, it processed each site in under 10 minutes, with no crashes, though it struggled with sites using heavy JavaScript frameworks (e.g., App 1), where dynamic content evaded static analysis.

6. CONCLUSION

"Our web-based vulnerability scanner does what it's supposed to: finds common website flaws using AI-generated code. It's simple, it's free, and it's a good first step for non-experts worried about security. We're not saying it's the next Burp Suite—it's just a college project—but it works. Down the line, it could get smarter with better AI, catch more types of bugs, or cut down on mistakes. For now, it's a cool little tool that proves you can do useful stuff with AI and some basic coding.

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