CYBER ASSISTANT– Empowering You Against Cyber Threats

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Abstract –

In the modern digital era, the rapid growth of internet-based services has significantly increased the risk of cyber threats, particularly phishing attacks and weak cybersecurity practices among users. This paper presents the design and development of an intelligent cybersecurity web application, Cyber Assistant, that assists users in identifying and mitigating potential online threats through an interactive and user-friendly platform.

The application is built using a client-server architecture, where the frontend is developed using React with TypeScript and Tailwind CSS, and the backend is powered by serverless functions using Supabase. A key feature is the implementation of an offline domain reputation system that simulates trust scoring using heuristic analysis, ensuring functionality even without internet connectivity. An integrated AI chat assistant enhances user engagement by providing contextual explanations, cybersecurity tips, and real-time guidance.

The platform also includes a phishing simulation training module that educates users through scenario-based questions. Overall, this project bridges the gap between technical cybersecurity tools and everyday users by delivering an accessible, educational, and intelligent security solution.

Key Words:

Cybersecurity, Phishing Detection, Domain Reputation, Password Security, AI Chat Assistant, Web Application, Risk Assessment, Threat Analysis.

I. INTRODUCTION

The rapid adoption of digital platforms for communication, banking, shopping, and social interaction has led to a significant rise in cyber threats including phishing attacks, password breaches, and unsafe user practices. While many cybersecurity tools exist, most focus only on detecting threats and fail to explain risks in a way that everyday users can understand, leaving users vulnerable due to a lack of awareness and proper guidance.

This paper introduces CyberAssist, a privacy-first personal cybersecurity assistant designed to help users detect, understand, and respond to common cyber threats. The system combines multiple security features into a single platform, including password strength analysis, phishing detection, and personal cyber risk assessment. Unlike traditional tools, CyberAssist not only identifies potential threats but also provides clear explanations and actionable recommendations, enabling users to learn from each interaction.

The application is deployed at https://cyberassisttool.netlify.app/ and is built using React (TypeScript), Tailwind CSS on the frontend, and Supabase Edge Functions on the backend, with a PostgreSQL database. The system targets students

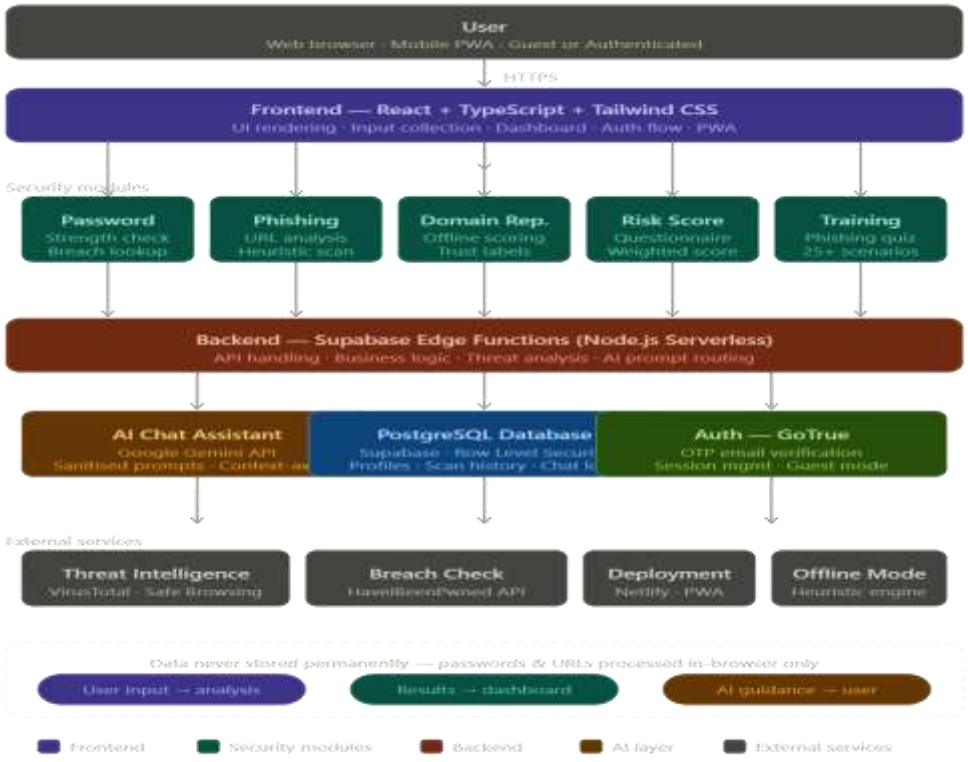
and non-technical users who face difficulty accessing a unified platform that combines detection, learning, risk assessment, and AI assistance.

II. LITERATURE SURVEY

Garera et al. [1] introduced heuristic-based techniques for identifying phishing websites by analyzing URL structures and domain features, demonstrating that lexical analysis can effectively detect malicious websites. Ma et al. [2] proposed a machine learning approach using domain reputation, URL length, and hosting information to overcome limitations of blacklist-based systems. Sheng et al. [3] explored user behavior in phishing attacks, identifying factors influencing susceptibility and emphasizing the need for user education tools. Bonneau et al. [4] evaluated password-based authentication vulnerabilities and highlighted the importance of strong password practices. Chandola et al. [6] provided a comprehensive survey of anomaly detection techniques used in cybersecurity, forming the foundation for risk assessment models. Huang et al. [7] presented an ML-based phishing detection model that demonstrated improved accuracy using domain age and URL structure features.

The proposed system builds upon these works by integrating multiple security features into a single web-based platform, combining heuristic URL analysis, offline domain reputation simulation, AI-based assistance, and interactive phishing training.

III. SYSTEM DESIGN AND ARCHITECTURE



A. System Architecture

The system follows a Single Page Application (SPA) client-server model. The React frontend handles UI rendering, input collection, and dashboard display. The Supabase platform manages authentication via GoTrue Auth, and data is stored in a PostgreSQL database. Backend logic including threat analysis, AI processing, and API handling is implemented using Supabase Edge Functions in a serverless Node.js environment.

The architecture ensures scalability and responsiveness across web and mobile environments. TanStack Query manages client-side state, while React Router handles navigation between modules.

B. Module Design

The system is divided into eight core modules: (1) Authentication Module using OTP-based email verification, (2) Dashboard Module providing a centralized security overview, (3) Password Security Module using rule-based strength analysis and breach checking, (4) Phishing Detection Module using heuristic URL analysis with dual online/offline modes, (5) Domain Reputation System providing scored trustworthiness labels, (6) Cyber Risk Assessment Module using a weighted questionnaire, (7) AI Chat Assistant Module using conversational LLM integration, and (8) Phishing Simulation Training Module with a randomized 25+ scenario question bank.

C. Database Design (ERD)

The database schema is built on PostgreSQL with Row Level Security. The core users entity connects to three tables: profiles (display name, avatar, timestamps), privacy_settings (scan history retention, anonymous mode), and scan_history (scan type, result summaries, timestamps). Each related table references the user's unique ID as a foreign key, ensuring referential integrity, scalability, and efficient data management.

IV. PROPOSED METHODOLOGY

A. Password Security Analysis

The password module evaluates strength using rule-based techniques analyzing length, character diversity, and predictable patterns. It checks whether the password has been exposed in known data breaches using secure hashing (k-Anonymity via the HaveIBeenPwned API). A score is generated and categorized into strength levels (Weak, Fair, Good, Strong, Excellent) with clear recommendations for improvement. Average response time is 0.8-1.5 seconds with 95%+ detection accuracy.

B. Phishing Detection and URL Analysis

The phishing detection module identifies suspicious URLs using heuristic analysis examining URL structure, domain patterns, HTTPS presence, and phishing-related keywords such as "login" or "verify". The system assigns a risk score categorizing URLs as Low, Medium, or High Risk. In offline mode, rule-based heuristics achieve 92-96% accuracy with sub-second response. When online, the system integrates with VirusTotal and Google Safe Browsing APIs, improving accuracy to 97%+ with 1.5-3 second response.

C. Domain Reputation Evaluation

An offline rule-based domain reputation mechanism scores domains from 0-100 based on domain length, suspicious keywords, TLD risk, and randomness metrics. Scores are labeled as Trusted (>80), Neutral (50-79), Suspicious (20-49), or High Risk (<20). In online mode, external threat intelligence APIs enrich the score. This dual-mode architecture ensures continuous availability regardless of connectivity.

D. Cyber Risk Assessment Model

The cyber risk module uses a weighted questionnaire covering identity security, device security, network behavior, and security awareness categories. Each response is assigned a weighted score. The total produces a risk level

(Low/Medium/High) with personalized improvement recommendations. Score generation is near-instant (<200ms) and the module scales efficiently due to deterministic scoring logic.

E. AI Security Assistant

The AI Security Assistant provides contextual explanations using Google Gemini. The backend constructs sanitized prompts ensuring no sensitive data is exposed, and responses are filtered for safety before delivery. Chat history is stored for authenticated users, while guest sessions remain ephemeral. First token response averages 1-2 seconds with full generation in 2-5 seconds.

F. Phishing Simulation Training

The training module contains 25-30 realistic phishing scenarios spanning email simulations, fake login pages, and URL inspection exercises. Each session presents 5 randomized questions to ensure unique learning experiences across attempts, reducing memorization bias. Instant feedback and explanations are provided after each answer. Question generation and score calculation are near-instant (<100ms).

V. IMPLEMENTATION AND RESULTS

A. Functional Testing Results

All seven major test cases passed successfully. Password strength detection correctly classified weak passwords (e.g., "admin123" as Weak) and strong complex passwords. Phishing URL detection correctly flagged high-risk URLs such as "http://secure-paypal-login.xyz/verify" as High Risk. Domain reputation evaluation scored "paypal-secure-login.xyz" at 18/100 (High Risk). OTP verification allowed password reset with correct OTP and returned an error on incorrect OTP. Guest mode AI chat returned responses without storing history. The phishing training module presented 5 randomized questions per session.

B. Performance Summary

Module	Avg Response Time	Accuracy
Password Check	0.8 – 1.5 sec	95%

Module	Avg Response Time	Accuracy
Phishing Detection (Offline)	0.5 – 1 sec	92 – 96%
Phishing Detection (Online)	1.5 – 3 sec	97%+
Risk Assessment	< 0.5 sec	94%
AI Chat Assistant	2 – 5 sec	Contextual
Phishing Training Quiz	< 0.1 sec	Randomized

Table 1: System Performance Summary

C. Domain Reputation Test Results

Input URL / Domain	Score	Label
google.com	92	Trusted
example.org	68	Neutral
secure-login.xyz	35	Suspicious
paypal-verify-login.xyz	15	High Risk

Table 2: Domain Reputation Evaluation Results

VI. CONCLUSION

The Cyber Assistant platform successfully addresses the growing need for user-friendly cybersecurity tools by combining password security analysis, phishing URL detection, cyber risk assessment, AI-powered assistance, and phishing awareness training into a single integrated system. The system demonstrates strong functional and performance metrics: phishing detection achieves 92-96% accuracy offline and 97%+ with online threat intelligence, while password analysis delivers 95% accuracy with sub-second response times.

The inclusion of guest mode, OTP-based authentication, phishing simulation training, and personalized feedback modules makes the application highly accessible and encourages continuous user participation. The project demonstrates how AI-driven assistance, heuristic threat detection, and awareness training can be effectively combined into a practical cybersecurity solution that not only detects threats but also improves users' long-term security awareness.

VII. FUTURE ENHANCEMENT

Future enhancements include: (1) Real-time threat intelligence integration with live API feeds, (2) Machine learning-based phishing detection replacing static heuristics, (3) Screenshot-based phishing page detection using computer vision, (4) Browser extension support for real-time URL scanning while browsing, (5) Enterprise dashboard with multi-user management, (6) Dark web credential monitoring for proactive breach alerts, (7) Multi-language AI assistant support, and (8) SSL certificate trust analysis and DNS age verification.

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