Pinnacle Labs Cybersecurity Internship – Task 3 Report

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Track: Cybersecurity

Project Title: Password Analyzer Utility

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Project Overview

This project involves the development of a professional-grade password analyzer utility. The tool evaluates password strength based on entropy, detects structural weaknesses, and offers personalized recommendations to help users create stronger, more secure passwords. The project demonstrates secure coding practices and password auditing concepts essential in cybersecurity.

Objectives

• Evaluate password strength using entropy calculations.

• Detect weaknesses such as length, character diversity, repetitions, and sequences.

• Provide real-time personalized suggestions to improve password security.

• Build a GUI-based utility using Python and Tkinter.

• Educate users on best practices in password management.

Technologies Used

Programming Language: Python 3

GUI Framework: Tkinter

Pattern Matching: re (regex)

Entropy Calculation: math.log2

Security Logic: Custom implementation with character set evaluation

Implementation Details

The utility uses regular expressions to detect whether a password contains uppercase letters, lowercase letters, numbers, and special characters. An entropy formula is applied to calculate the randomness of the password based on character set size and length. A GUI built with Tkinter allows users to enter a password and receive instant feedback including a strength score and improvement tips.

Security Concepts Covered

• Password entropy and strength calculation

• Detection of common patterns (e.g., repeated characters, sequences)

• Importance of password length and character diversity

• Use of password feedback loops to improve security awareness

• Real-world application of secure password practices

Testing Summary

Entropy calculation accuracy: ✅ Verified

GUI input/output flow: ✅ Smooth and user-friendly

Feedback recommendations logic: ✅ Tested for multiple scenarios

Pattern and weakness detection: ✅ Working as expected

No hardcoded data or exposure risks: ✅ Clean and safe

Learning Outcome

Through this task, I gained in-depth understanding of how password strength is calculated, how to evaluate entropy, and how to detect insecure patterns. I also learned how to implement a secure GUI application in Python and gained deeper insights into secure software design from a cybersecurity perspective.

Declaration

This project was independently developed by Abin Shaji Thomas as part of the Pinnacle Labs Cybersecurity Internship. It is intended strictly for educational use and to promote awareness about password security and ethical development.