Password Strength Checker Tool

1. Introduction

Weak passwords remain one of the most common causes of security breaches. Attackers frequently exploit poor password practices such as short length, lack of complexity, and predictable patterns.
The objective of this task is to design and implement a **Password Strength Checker Tool** that evaluates user passwords based on widely accepted security criteria and provides clear feedback on password strength.

This tool is implemented as a **Python-based GUI application** to improve usability while maintaining simple and transparent security logic.

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2. Objective of the Tool

The main objectives of the Password Strength Checker Tool are:

- To evaluate password strength based on predefined security rules
- To classify passwords as **Weak**, **Medium**, or **Strong**
- To provide user-friendly feedback on missing password requirements
- To visually represent password strength using a progress bar

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3. Technology Stack Used

- **Programming Language:** Python
- **GUI Framework:** Tkinter
- **Libraries Used:**
    - re – for regular expression based pattern matching
    - tkinter – for graphical user interface
    - tkinter.ttk – for progress bar widget

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4. Password Evaluation Criteria

The password strength is calculated using five independent security checks:

Criteria	Description
Length	Minimum 8 characters
Uppercase	At least one uppercase letter (A–Z)
Lowercase	At least one lowercase letter (a–z)
Digit	At least one numeric digit (0–9)
Special Character	At least one special character

Each satisfied condition contributes **1 point**, resulting in a maximum score of **5**.

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5. Strength Classification Logic

The total score is mapped to strength levels as follows:

Score	Strength
0 – 2	Weak
3 – 4	Medium
5	Strong

This scoring model is simple, transparent, and commonly used in entry-level security tools.

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6. Tool Architecture

The application consists of the following components:

1. **Input Field**
   Allows the user to enter a password (masked for privacy).
2. **Check Strength Button**
   Triggers the password evaluation logic.
3. **Password Evaluation Engine**
   Uses regular expressions to verify each security rule independently.
4. **Progress Bar**
   Displays password strength as a percentage based on the total score.
5. **Result Display**
   Shows the password classification (Weak / Medium / Strong).

6. **Feedback Section**
   Provides specific improvement suggestions if requirements are not met.

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7. User Interface Description

- The interface is built using Tkinter for simplicity and portability.
- Password input is masked using the show="*" option.
- The progress bar visually represents strength from **0% to 100%**.
- Strength result is color-coded:
  - Red → Weak
  - Orange → Medium
  - Green → Strong
- Feedback messages guide users to improve their password.

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8. Security Considerations

- The tool does **not store or transmit passwords**.
- Passwords are processed only in memory.
- No hashing or encryption is applied, as the tool is designed for **strength evaluation**, not authentication.
- Regular expressions ensure accurate and efficient validation.

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9. Limitations

- The tool does not check against leaked or common password databases.
- Entropy-based scoring is not implemented.
- GUI is desktop-based and not accessible via web or mobile platforms.

These limitations are acceptable given the scope of the task.

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10. Possible Enhancements

Future improvements could include:

- Real-time strength evaluation while typing
- Detection of commonly used or breached passwords

- Entropy-based strength calculation
- Web-based implementation using Flask
- Password visibility toggle (show/hide)

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11. Conclusion

The Password Strength Checker Tool successfully meets the task requirements by:

- Implementing standard password security rules
- Providing clear strength classification
- Offering actionable user feedback
- Presenting results through a simple and intuitive GUI

This tool demonstrates fundamental cybersecurity concepts, logical implementation, and basic GUI development skills suitable for an entry-level or internship-level assessment.