CS221 - Data Structures and Algorithms
Submission Date: October 7, 2024

Instructor: Dr. Zubair Ahmed

Team Members: [Name1, Name2, Name3]
Roll Numbers: [Roll1, Roll2, Roll3]

SecurCore: Advanced Password Manager and Security Analytics System

Team Members: [Name1, Name2, Name3]
Roll Numbers: [Roll1, Roll2, Roll3]

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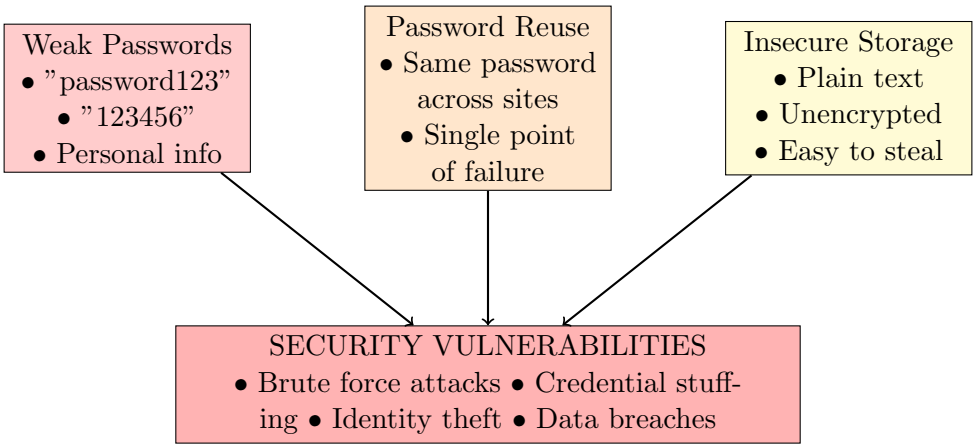
1 Problem Description and Project Aims

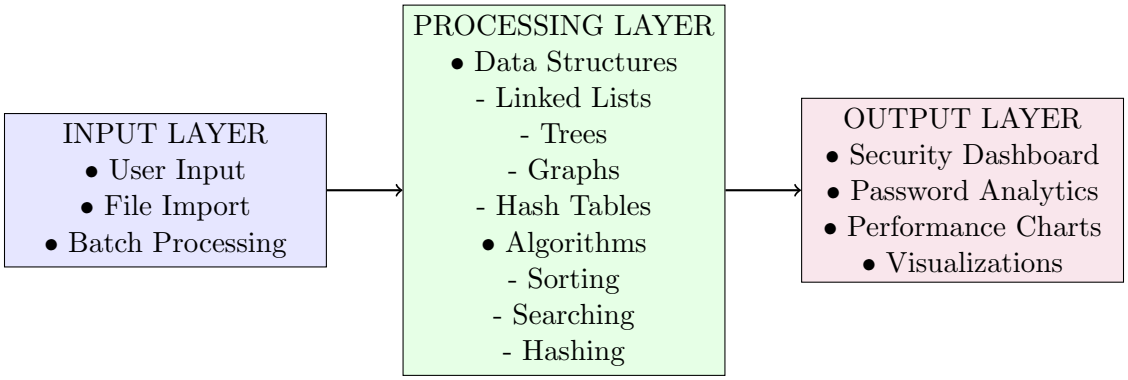
1.1 Problem Statement

In the contemporary digital landscape, cybersecurity threats have evolved into sophisticated attacks that primarily target authentication systems and user credentials. The proliferation of online services has led to an exponential increase in the number of accounts an average user must manage, resulting in concerning security practices...



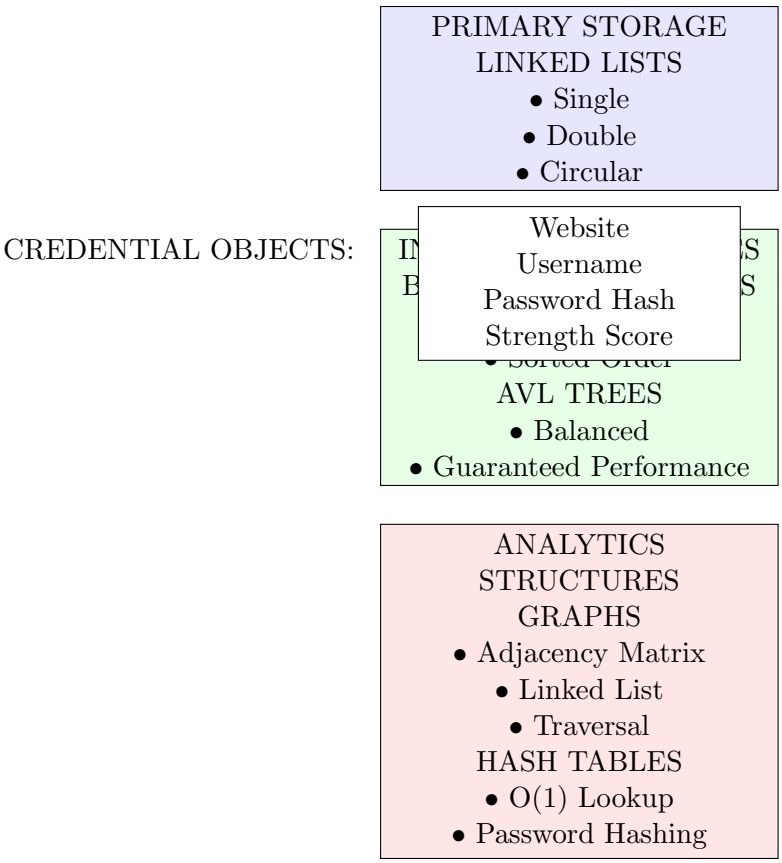
1.2 Project Aims and Objectives

The SecurCore project aims to develop a comprehensive, educational password management system that serves dual purposes: providing robust security functionality while demonstrating practical applications of data structures and algorithms in cybersecurity contexts.

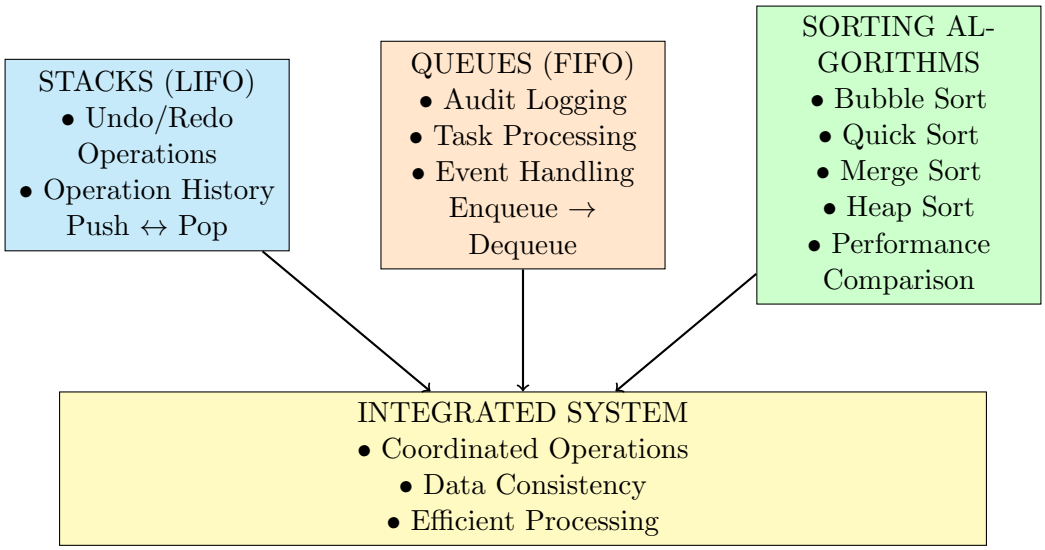


2 Key Data Structures for Implementation

2.1 Core Storage Structures



2.2 Operational and Analytical Structures



3 Main Algorithms and Computational Approaches

3.1 Algorithm Performance Comparison

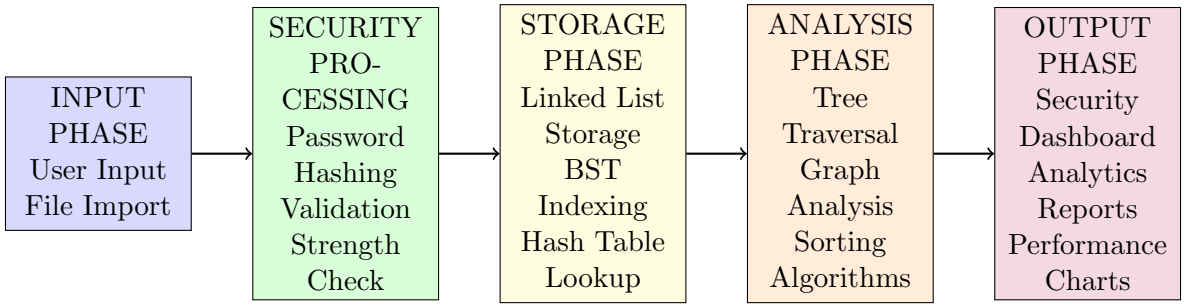
Algorithm	Time Complexity	Visual Performance
Bubble Sort	$O(n^2)$	Slow for large datasets
Insertion Sort	$O(n^2)$	Efficient for small data
Quick Sort	O(n log n)	Fast, efficient average case
Merge Sort	O(n log n)	Consistent performance
Heap Sort	O(n log n)	Good for priority queues

3.2 Search and Analysis Algorithms

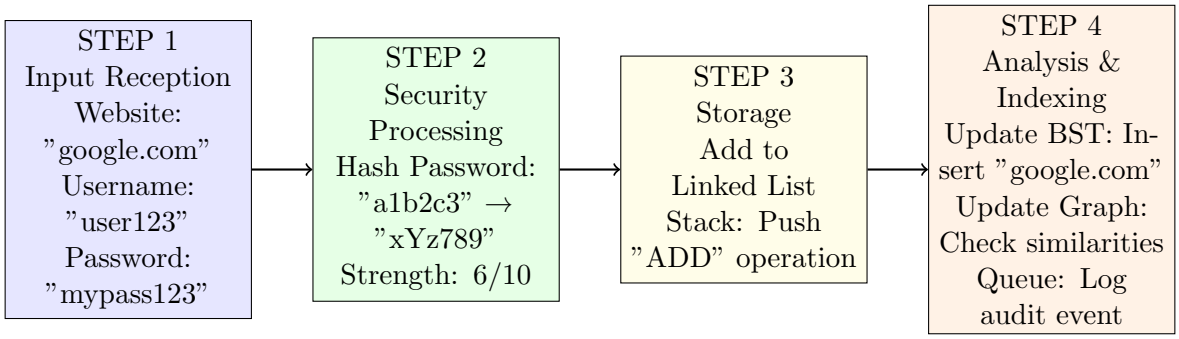
Data Structure	Linear Search	Binary Search	Hashing Lookup
Unsorted List	O(n) Sequential Check	N/A	N/A
Sorted Array/Tree	O(n)	O(log n) Divide & Conquer	N/A
Hash Table	N/A	N/A	O(1) Direct Access

4 Data Processing Pipeline and System Architecture

4.1 Comprehensive System Workflow



4.2 Real-time Processing Visualization

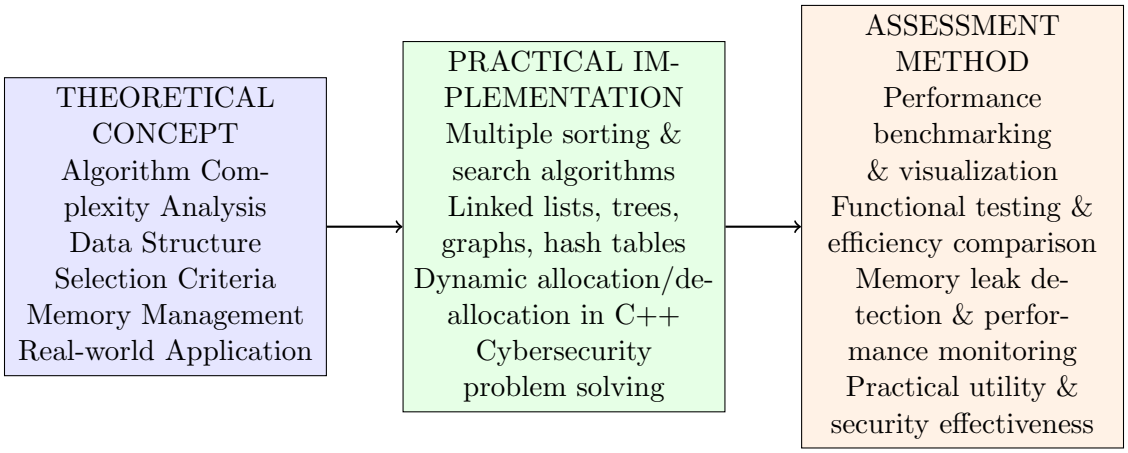


5 Integration with Course Concepts

5.1 Comprehensive Syllabus Coverage Map

Course Concept	Project Module	Implementation
Pointers & Arrays	Credential Management	Dynamic memory allocation, node pointers
Linked Lists	Core Storage System	Single/Double/Circular lists for credential chains
Stacks & Queues	Operation History & Audit	Stack for undo/redo, Queue for event logging
Trees (BST, AVL)	Fast Search	BST for sorted storage, AVL for balanced performance
Graphs & Traversals	Security Analytics	Adjacency matrix & list for password relationships
Sorting Algorithms	Data Organization	Bubble, Quick, Merge, Heap sorts for different needs
Hashing Techniques	Password Security	Hash functions for storage & quick lookup
Complexity Analysis	Performance Monitoring	Benchmarking & comparison charts

5.2 Educational Value Demonstration



5.3 Project Implementation Timeline