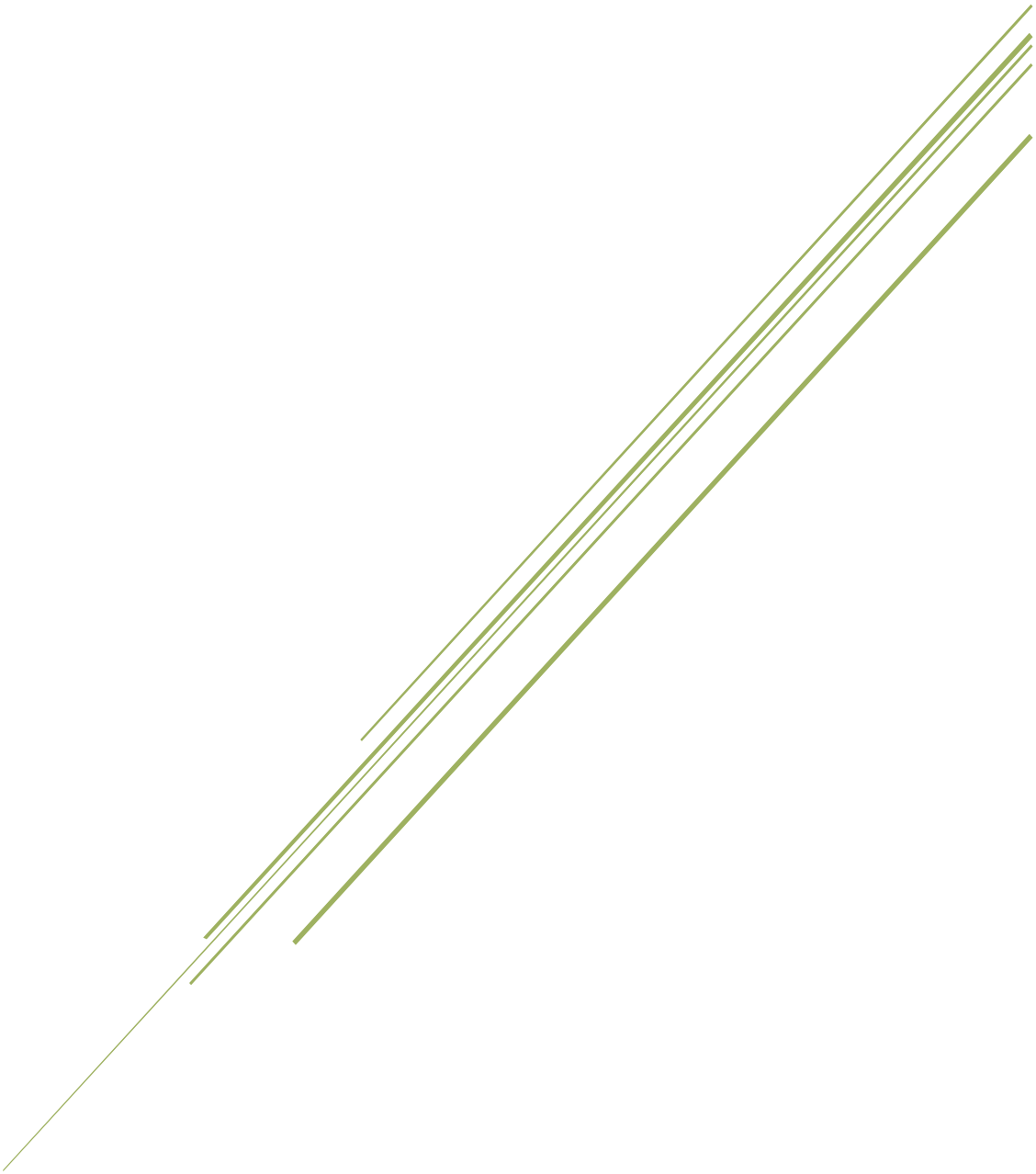
PORTFOLIO

Computer Science Student

223106831



Prof. Shaker EL-Sappagh

Data Structures and Algorithms

Contents

Introduction

About Me

I am Mahros, a dedicated and enthusiastic computer science student with a passion for solving complex problems and building efficient solutions. Throughout my studies, I have developed a strong foundation in various programming languages and technologies, which has empowered me to tackle challenging projects and assignments effectively. I was awarded **1'st** place in a problem-solving contest at Galala University and have participated in various competitions, including the **ECPC** (Egyptian Collegiate Programming Contest).

About the Course

The Data Structures and Algorithms course has been a pivotal part of my academic journey, providing me with in-depth knowledge and understanding of the fundamental concepts and techniques used in computer science. This course has covered a wide range of topics, including arrays, linked lists, stacks, queues, trees, hash table, sorting algorithms, and search algorithms. Through hands-on projects, assignments, and quizzes, I have gained practical experience in implementing and optimizing these data structures and algorithms to solve real-world problems efficiently.

Note on Portfolio Presentation

I consulted one of my senior colleagues at Galala University about the appropriate format for a portfolio, and they advised me to include images of all the project codes I have completed. However, I do not believe this is the most professional way to present programming projects, especially since it is not my first time writing code and sharing it with others. Therefore, I am determined to stick to my approach, which involves providing **GitHub** links for each project, assignment, and quiz, along with descriptions for each. From my perspective, this is the most professional way to present programming projects.

Purpose of the Portfolio

The purpose of this portfolio is to highlight the work I have completed during the Data Structures and Algorithms course, with Instructor: **Dr. Shaker EL-Sappagh**. It includes a comprehensive collection of my projects, assignments, and quizzes, highlighting my skills, knowledge, and growth throughout the course. This portfolio serves as a testament to my dedication and proficiency in the field of data structures and algorithms, and it aims to provide a clear and organized presentation of my accomplishments.

Sections

Implementations

Linked List

View Project

- Implemented a singly linked list with operations for insertion, deletion, and traversal.
- Optimized memory usage by managing dynamic allocation and deallocation of nodes.

Doubly Linked List

View Project

- Designed a doubly linked list to allow traversal in both directions.
- Included additional operations for efficient node removal and insertion.

Stack

View Project

- Created a stack data structure using both array and linked list implementations.
- Integrated stack operations like push, pop, and peek with robust error handling.

Queue

View Project

- Developed a queue data structure using both array and linked list implementations.
- Implemented enqueue, dequeue, and peek operations with optimized performance.

Deque

View Project

- Designed a double-ended queue with support for insertion and deletion at both ends.
- Ensured efficient handling of edge cases and memory management.

Table

View Project

- Built a table data structure for organized storage and retrieval of key-value pairs.
- Implemented efficient search and update operations.

Hash Table

View Project

- Implemented a hash table with separate chaining and open addressing collision resolution techniques.
- Optimized the hash function for uniform distribution and minimized collisions.

Tree

View Project

- Developed various tree structures including binary trees and AVL trees.
- Implemented traversal algorithms (in-order, pre-order, post-order) and balancing mechanisms.

Binary Search Tree

View Project

- Constructed a binary search tree with operations for insertion, deletion, and search.
- Enhanced tree balancing to maintain efficient performance.

Projects

Fast Retrieval Contact App

View Project

- Developed an application for quick and efficient retrieval of contact information.
- Integrated search and filtering functionalities for enhanced user experience.

ATM Full Functionality Interface

View Project

- Designed an interface for ATM machines with comprehensive functionalities including withdrawals, deposits, and balance inquiries.
- Ensured secure transactions with robust error handling and security measures.

Bank System Interface

View Project

- Created a user-friendly interface for bank systems to manage accounts, transactions, and customer data.
- Implemented multi-level authentication and data encryption for security.

Scholarship Database

View Project

- Developed a database system to manage scholarship applications, approvals, and disbursements.
- Integrated search, filtering, and reporting tools for efficient management of data.

Assignments

#	Description	Investigate
1	Revision on C++ syntax and OOP principles.	Open
2	Algorithm time Complexity and Analysis.	Open
3	Algorithms merge sort, swap and get Index functions.	Open
4	Queue assignment how to make it and do crud operations	Open
5	How to use recursion in function and how to calculate time complexity.	Open
6	Hash Table Interactive assignment, how linear collision works	Open
7	Asked to implement linked list, and then followed instructions -> on it.	Open

Quizzes

#	Description	Investigate
1	C++ Revision quiz, syntax.	Open
2	Algorithm Efficiency and time complexity.	Open
3	Searching and Sorting Algorithms.	Open
4	Unfortunately, I have missed this quiz; because of my negligence.	---
5	Stack and its implementation.	Open

What are learning outcomes?

Technical Skills

1. **Programming Languages:**
    - Proficiency in programming languages such as C++, used for implementing data structures and algorithms.
2. **Data Structures:**
    - In-depth understanding of various data structures including:
        - Arrays
        - Linked Lists (Singly and Doubly Linked Lists)
        - Stacks
        - Queues (including Double-ended Queues, Deque)
        - Trees (Binary Trees, AVL Trees)
        - Hash Tables
3. **Algorithm Design and Analysis:**
    - Ability to design, implement, and analyze the efficiency of algorithms.
    - Understanding of time and space complexity.
    - Proficiency in sorting and searching algorithms.
4. **Optimization Techniques:**
    - Techniques for optimizing data structure operations to improve performance.
    - Balancing mechanisms for trees.
    - Collision resolution strategies for hash tables.
5. **Practical Implementation:**
    - Hands-on experience with implementing and optimizing data structures in real-world scenarios.
    - Developing projects that solve specific problems using data structures and algorithms.

Problem-Solving Skills

1. **Analytical Thinking:**
    - Ability to break down complex problems into smaller, manageable components.
    - Developing logical and efficient solutions to problems.
2. **Debugging and Testing:**
    - Skills in identifying and fixing errors in code.
    - Writing test cases to ensure the correctness and efficiency of implementations.

Project Management and Collaboration Skills

1. **Version Control:**
    - Using GitHub for version control and collaboration on coding projects.
    - Managing repositories and maintaining clean, organized codebases.
2. **Documentation:**
    - Writing clear and concise documentation for projects and implementations.
    - Creating well-organized portfolios and presentations.
3. **Communication:**
    - Ability to explain complex technical concepts in a clear and understandable manner.
    - Collaborating effectively with peers and instructors.

Soft Skills

Adaptability:

- Ability to adapt to new challenges and learn new concepts quickly.
- Flexibility in applying different data structures and algorithms to various problems.

Attention to Detail:

- Meticulous approach to coding and problem solving.
- Ensuring accuracy and precision in implementations.

Conclusion

Completing the Data Structures and Algorithms course has been a transformative experience, significantly enhancing my problem-solving skills and deepening my understanding of computer science fundamentals. Throughout this journey, I have tackled challenging projects, assignments, and quizzes, each contributing to my growth as a developer.

This portfolio highlights my dedication to mastering data structures and algorithms, highlighting the practical applications of the concepts I have learned. From implementing fundamental data structures like linked lists and hash tables to developing real-world applications, I have gained valuable insights and hands-on experience.

I am proud of my achievements. These experiences have reinforced my passion for computer science and my commitment to excellence.

As I look forward, I am excited to apply the skills and knowledge I have acquired to new challenges and opportunities. I am eager to continue learning, exploring advanced topics, and contributing to innovative solutions in the tech industry.

Thank you for taking the time to review my portfolio. I hope it provides a comprehensive view of my capabilities and accomplishments.

Contact Information

Feel free to reach out to me through the following links:

#	Type	Contact
1	Email	mahros.work@hotmail.com
2	Phone	+20-101-588-8272
3	GitHub	GitHub/elqabasy
4	VJudge	VJudge.net/mahros
5	LinkedIn	LinkedIn/ma7ros
6	Codeforces	Codeforces/mahros
7	My Website	elqabasy.com