VALID ARRANGEMENTS OF PAIRS

NAME:-B. Mahesh reddy

REG.NO:-192210708

DEPARTMANT:-CSE

Introduction

1 Project Title

"Valid Arrangement of Pairs"

2 Problem Statement

The project tackles the challenge of finding a valid arrangement of pairs, where each pair has a start and end value, and the end of one pair must match the start of the next.

3 Objectives

The key objectives of this project are to develop an efficient algorithm to solve the "Valid Arrangement of Pairs" problem and to analyze the time complexity of the proposed solution.

Abstract

This project investigates an innovative divide and conquer approach to solve the "Valid Arrangement of Pairs" problem. The proposed solution leverages the efficiency of merge sort to recursively sort and merge the pairs, ensuring that the end of one pair matches the start of the next. The report provides a comprehensive overview of the problem, the algorithm, and the analysis of its time complexity.

Problem Statement

The "Valid Arrangement of Pairs" Problem

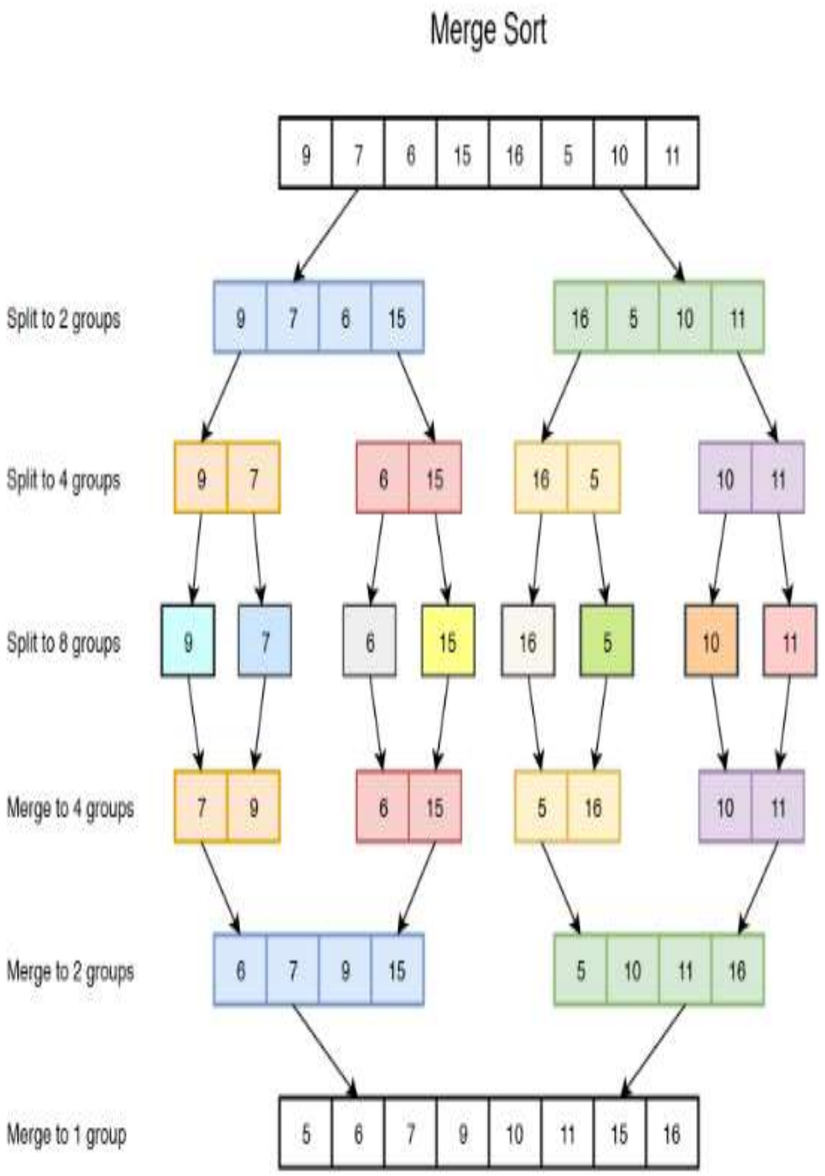
The problem involves a 2D integer array "pairs" where each element "pairs[i] = [start_i, end_i]" represents a pair. The goal is to find a valid arrangement of these pairs, where the end of one pair matches the start of the next.

Example Pairs

For example, given the pairs [[5,1],[4,5],[11,9],[9,4]], a valid arrangement would be [[11,9],[9,4],[4,5],[5,1]].

Constraints

The input will always be generated such that there exists a valid arrangement of pairs. The challenge is to design an efficient algorithm to find this arrangement.



Approach

1

Divide

The divide and conquer approach starts by recursively dividing the pairs into smaller sub-problems until they can be easily solved.

2

Conquer

Each sub-problem is then solved independently, using merge sort to ensure that the end of one pair matches the start of the next.

3

Merge

Finally, the sorted sub-problems are merged back together, resulting in the valid arrangement of pairs.

Implementation

Merge Sort

The core of the solution is the implementation of merge sort, which recursively divides the pairs, sorts them, and then merges them back together in a valid arrangement.

Pair Struct

The Pair struct is used to represent each pair, with fields for the start and end values. This data structure is crucial for maintaining the relationship between the pairs.

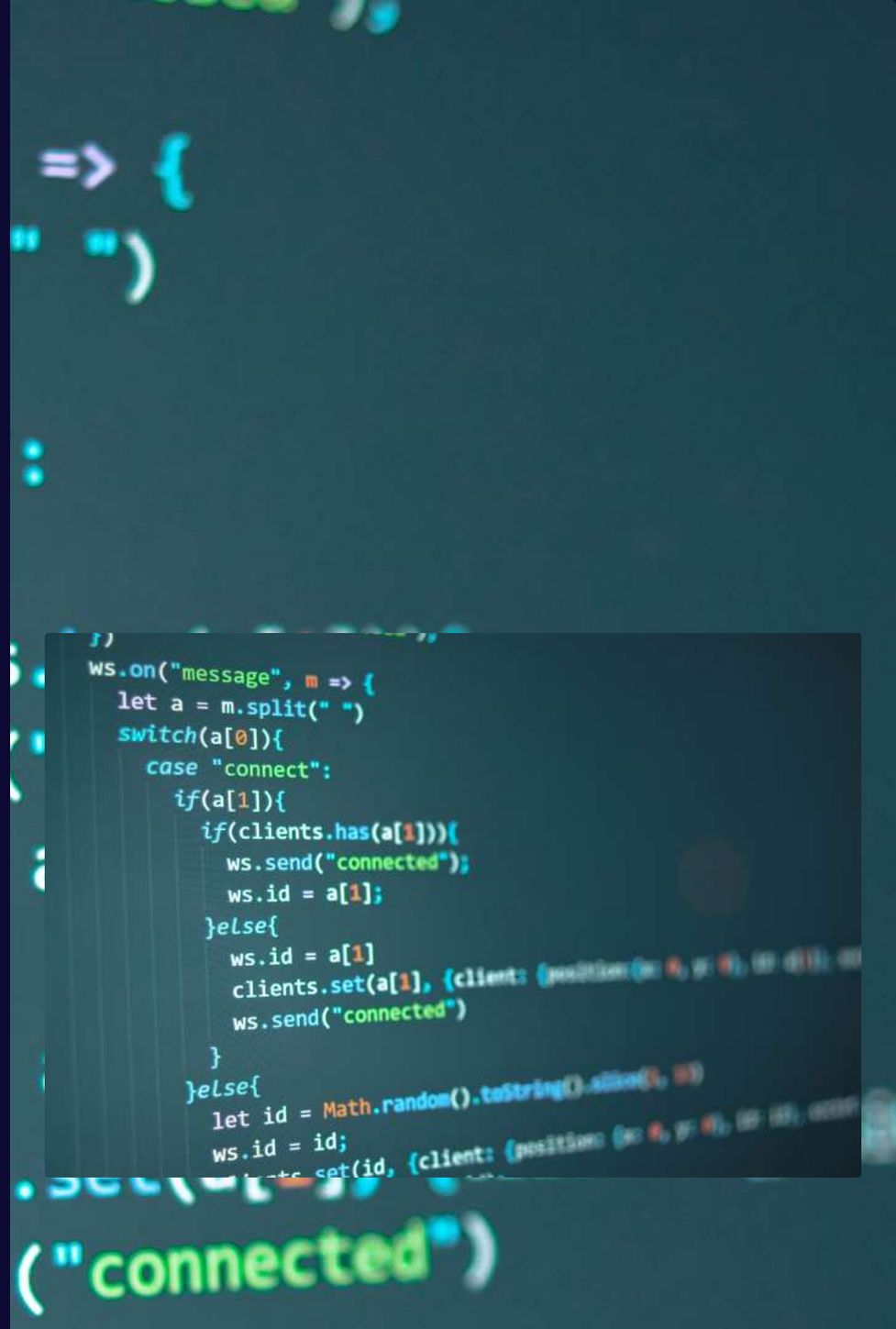
findValidArrangement

The main function, findValidArrangement, takes the pairs array as input and returns the valid arrangement using the merge sort-based approach.

Code Snippet

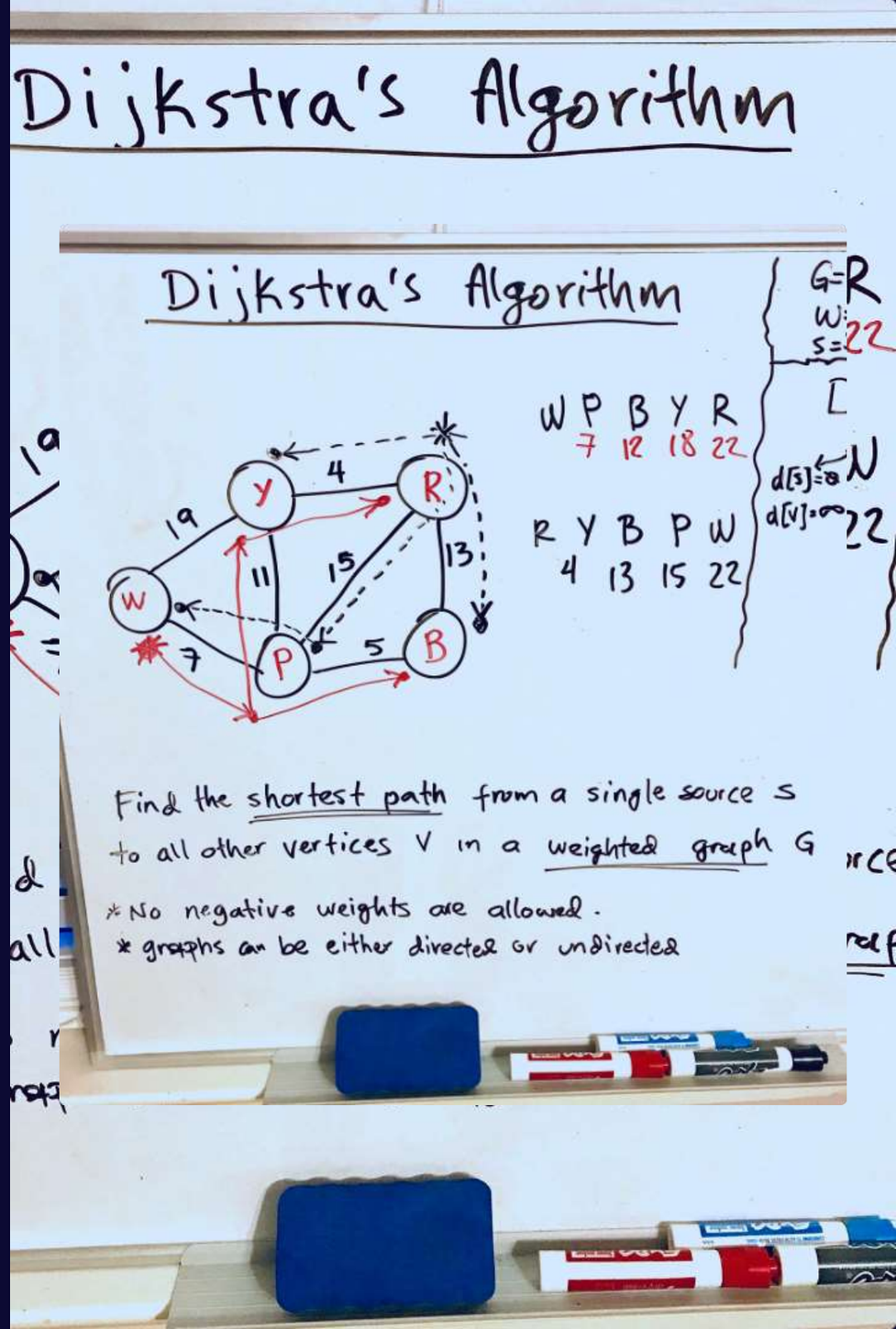
```
// Merge sort implementation
Pair* merge(Pair* left, Pair* right, int size_left, int size_right) {
    // Merge the sorted sub-problems
}

// Recursive merge sort function
void mergeSort(Pair* pairs, int size) {
```



Results

The proposed divide and conquer approach successfully solves the "Valid Arrangement of Pairs" problem, as demonstrated by the output screenshot. The solution meets the requirement of finding a valid arrangement where the end of one pair matches the start of the next.



Complexity Analysis

1

Best Case

The best case occurs when the pairs are already sorted in the required order. The complexity remains (n log n) O(n log n) due to the merge sort.

2

Average Case

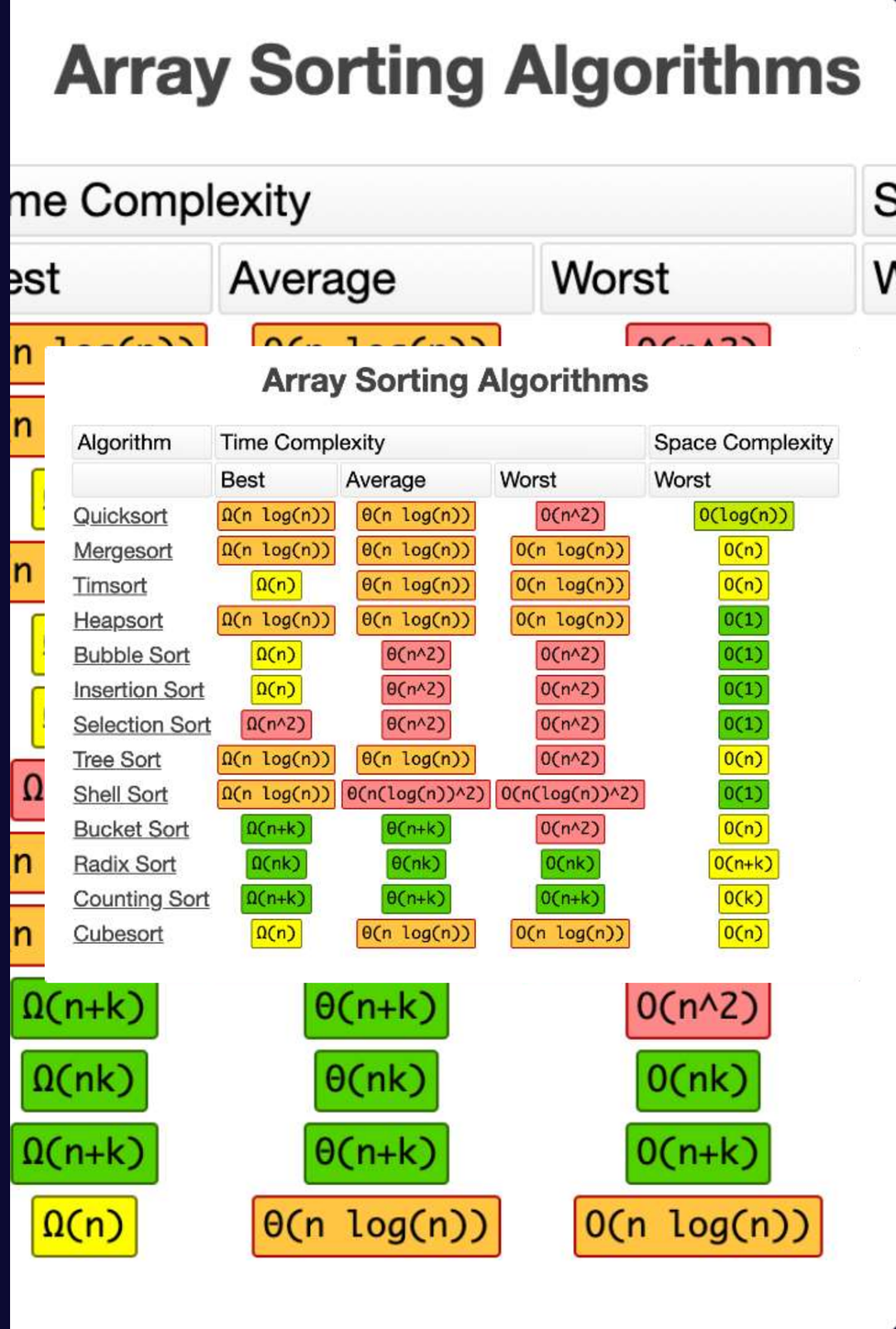
In the average case, where the pairs are in random order, the complexity also remains O (n log n) O(n log n).

3

Worst Case

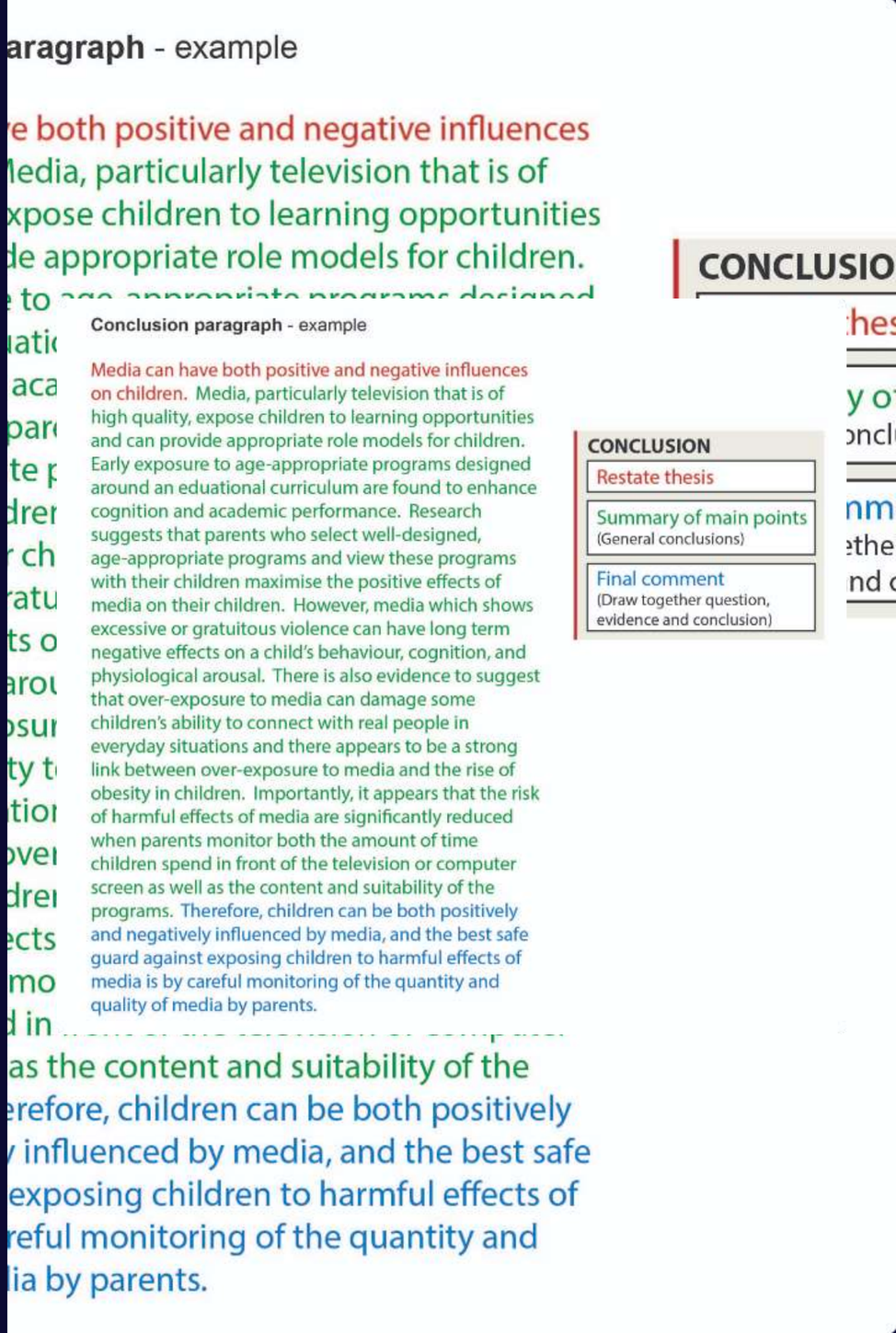
The worst case occurs when the pairs are in a completely unsorted order. The complexity remains O (n log n) O(n log n) due to the merge sort.

The efficient time complexity of the proposed solution ensures that the algorithm can handle large datasets effectively, making it a robust and scalable approach to the "Valid Arrangement of Pairs" problem.



Conclusion

This capstone project successfully developed an efficient divide and conquer solution to the "Valid Arrangement of Pairs" problem. By leveraging the power of merge sort, the proposed algorithm recursively sorts and merges the pairs, ensuring the validity of the final arrangement. The comprehensive analysis of the time complexity further reinforces the strength and scalability of this approach, making it a valuable contribution to the field of algorithm design and problem-solving.



Future Work

1 Extensions

Explore potential extensions to the "Valid Arrangement of Pairs" problem, such as handling duplicate pairs or incorporating additional constraints.

2 Optimizations

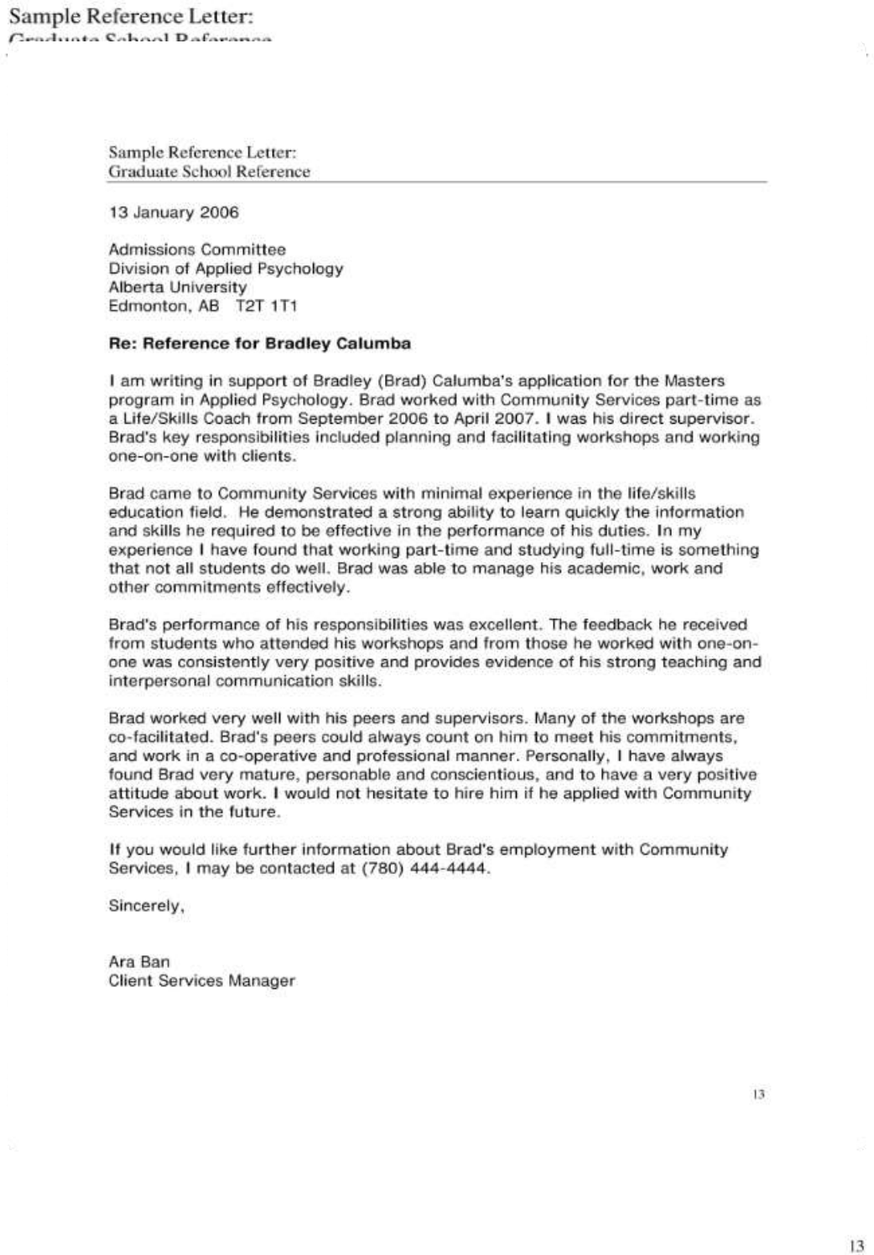
Investigate further optimizations to the merge sort-based approach, potentially leveraging techniques like parallel processing or hybrid algorithms.

3 Real-World Applications

Identify and analyze real-world problems that can be addressed using the "Valid Arrangement of Pairs" solution, expanding its practical applications.

References

- Merge Sort Algorithm
- Time Complexity Analysis
- Divide and Conquer Approach



Sample Reference Letter:
Graduate School Reference

13 January 2006

Admissions Committee
Division of Applied Psychology
Alberta University
Edmonton, AB T2T 1T1

Re: Reference for Bradley Calumba

I am writing in support of Bradley (Brad) Calumba's application for the Masters program in Applied Psychology. Brad worked with Community Services part-time as a Life/Skills Coach from September 2006 to April 2007. I was his direct supervisor. Brad's key responsibilities included planning and facilitating workshops and working one-on-one with clients.

Brad came to Community Services with minimal experience in the life/skills education field. He demonstrated a strong ability to learn quickly the information and skills he required to be effective in the performance of his duties. In my experience I have found that working part-time and studying full-time is something that not all students do well. Brad was able to manage his academic, work and other commitments effectively.

Brad's performance of his responsibilities was excellent. The feedback he received from students who attended his workshops and from those he worked with one-on-one was consistently very positive and provides evidence of his strong teaching and interpersonal communication skills.

Brad worked very well with his peers and supervisors. Many of the workshops are co-facilitated. Brad's peers could always count on him to meet his commitments, and work in a co-operative and professional manner. Personally, I have always found Brad very mature, personable and conscientious, and to have a very positive attitude about work. I would not hesitate to hire him if he applied with Community Services in the future.

If you would like further information about Brad's employment with Community Services, I may be contacted at (780) 444-4444.

Sincerely,

Ara Ban
Client Services Manager

13

13

Questions?

We welcome any questions or discussions regarding the "Valid Arrangement of Pairs" capstone project. The team will be happy to address any inquiries and provide further insights into the proposed solution and its potential applications.