

DEVELOPING A JOB MATCHING COMPONENT USING DATA STRUCTURES AND ALGORITHMS

(Working Duration: Monday of Week 5 to Monday of Week 10 – 30 Marks)

Background:

In today's competitive labour market, job matching plays a critical role in ensuring efficiency and productivity. For employers, it reduces hiring costs, minimizes turnover, and ensures that the right talent is placed in the right position. For job seekers, it increases the chances of career satisfaction by helping them find roles that align with their competencies, interests, and personal aspirations. Modern job matching systems go beyond traditional recruitment methods. They use various job matching algorithms such as rule based matching, weighted scoring, content based filtering, hybrid matching and etc, to name a few. These systems can recommend personalized job opportunities, predict candidate-job compatibility, and even consider factors such as work culture and long-term career development.

The key challenge in job matching is ensuring a *good fit* between job seekers and employers — not just on technical skills, but also on soft skills, work culture, and career goals.

In this assignment, you're required to form a team to design and develop a job matching component utilizing the Array and/or Linked list data structure and appropriate search/ sort algorithms whichever applicable. And performance evaluation is needed for time and memory efficiency.

Question:

Given the datasets.

- *job_description.csv* contains job descriptions in text
- *resume.csv* contains candidate resume description in text

Technical Requirements List:

- data collection classes using array-based and linked list based to store the job and resume description,
- a job matching component with an appropriate algorithm – *any algorithm with justification such as Figure 1*
- a driver program that can test the component.

Task:

Design of data structure	Distribution	Requirement
Array based Component	Team member 1 Team member 2	Refer to technical requirement list
Linked List based Component	Team member 3 Team member 4	Refer to technical requirement list

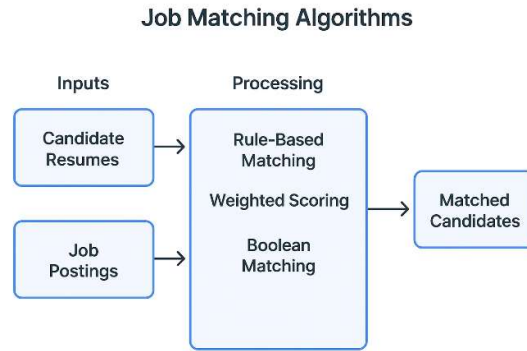


Figure 1: Design of component with the specified algorithms reference

Minimum Requirements for Lab Work #1

1. Each group may have up to **FOUR (4) members**.
2. This assignment requires the development of either one of two or both:
 - a) **Array Implementation**
 - a) Implement an **array-based** data structure.
 - b) Perform operations like sorting, searching, and filtering transactions.
 - b) **Linked List Implementation**
 - a) Implement a **linked list-based** data structure.
 - b) Similar to the array-based approach, allow efficient operations like sorting and searching.
3. **Performance Comparison:**
 - Compare the time and memory efficiency of search and/or sorting algorithms for **Arrays vs Linked Lists**.
4. **Error Handling:**
 - Implement **robust error handling and data validation** to address unexpected formats or missing data.

Submission Guidelines #1: Program and Video Submission – Lab Work #1 (15 Marks)

1. **Programming Language:** Use C++ to develop both programs.
2. **No built-in containers** like `<vector>` or `<list>`, you must create your own data containers with the basic operations.
3. **ZIP Submission:**
 - Include only .cpp, .hpp, and .csv/text files.
 - Follow this file naming format:
`<GroupNo>_<TeamLeaderID>_<1stMemberID>_<2ndMemberID>_<3rdMemberID>.zip`
 - For example, "G1_TP012345_TP014556_TP067554_TP034325.zip"
4. **Video Recording:**
 - Each team leader must also upload **ONE (1)** video recording and the maximum video duration is **30 minutes**.
 - All members must participate (each member speaks maximum of 5 minutes).
 - Each member must relate their explanation to the workload matrix distribution table provided in the Word document.
 - Compress the final video recording to **under 200MB** before submitting.
 - If the video exceeds the specified time limit (30 minutes), it will only be assessed up to the specified duration.
 - Videos must be recorded at normal speed (1x) and cannot be speed up or adjusted to meet the demo video duration requirements.
 - The video recording file must adhere to the following name format:
`<GroupNo>_<TeamLeaderID>_<1stMemberID>_<2ndMemberID>_<3rdMemberID>.mp4`
 - For example, "G1_TP012345_TP014556_TP067554_TP034325.mp4"
5. Refer to the **Page 5** for marking criteria of this Lab Evaluation Work #1 submission.

Submission Guidelines #2: Documentation Submission – Solution Work (15 Marks)

What to include in your documentation:

1. Cover Page**2. Workload Matrix Table with Signature**

Note that this table will impact each member's personal final mark in Lab Evaluation Work #1 based on their stated contribution percentage.

3. Theoretical Explanation

- Explain data containers and operations' implementations in your chosen data structures and algorithm(s).

4. Input-Output Screenshots

- Include system input and output screenshots.

5. Summary Discussions

- Analyze system efficiency (**execution time, time efficiency, space efficiency, or etc.**)
- Summarize and discuss observations made during development.
- Critically evaluate strengths and weaknesses of the code.

6. Conclusion and Reflection

- Summarize key findings.
- Discuss potential improvements and system weaknesses.
- Share personal thoughts on the assignment.

7. References (if applicable)

- Properly cite external sources (APA format).
Failure to reference code will be treated as plagiarism.

8. Appendix (if applicable)**Submission & Formatting:**

- File Naming Format:
<GroupNo>_<TeamLeaderID>_<Member1ID>_<Member2ID>_<Member3ID>.docx
- For example, G1_TP012345_TP014556_TP067554_TP034325.docx

Deadline:	Refer to the Moodle
Max Pages:	30 pages
Max Words:	4500 words

MARKING CRITERIA

(Lab Evaluation Work #1 - 15 MARKS)

This Lab Evaluation Work #1 will be evaluated according to the following performance criteria:

Assessment Components	Inclusive	15 Marks
<i>CLO3: Lab Evaluation Task #1 – 30-Minute Video Recording</i> <i>(Assessment will be based on individual performance)</i>		
Practical Skills: Use of Data Structures & Algorithms + Personal Understanding		
Utilization of data structures	Technical Proficiency	
Implementation of relevant algorithms	Technical Proficiency	
Demonstrates understanding of data structures/algorithms used	Comprehensive Understanding	
Justifies choices of structures/algorithms	Insightful Justification	

MARKING CRITERIA

(Solution Work - 15 MARKS)

This solution work will be evaluated according to the following performance criteria:

Assessment Components	Inclusive	15 Marks
<i>CLO2: Solution Work - Documentation</i> <i>(Assessment will be based on group component)</i>		
Theoretical Explanation (e.g., Data Structures, Algorithms)	Clear explanation	
Input Output Screenshots	Adequate Screenshots	
Summary Discussions (Inclusive Time and/or Space Complexity)	Clear and insightful analysis	
Conclusion & Reflection (Other Relevant / Importance Discussions)	Clearly highlighted and insightful	
Content Organization	Well-structured and logical flow	

Approximation of Total Pages for the documentation: **30 (max).**

Approximation of Words for the documentation: **4500 words (max)**