

# Senior Design II – PIRM 1

SDDEC23-14

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Client: Dr. Goce Trajcevski

# Problem Statement

Can you identify which one has a lower time complexity?

$O(m \log \log n \log \log \log n)$   
*Stratified Binary Tree Variant  
of Dijkstra's*

vs.

$O(m + (n \log n) / (\log \log n))$   
*Fredman and Tarjan's Fibonacci Heap  
Variant of Dijkstra's*

Your answer is likely **No**.

- Algorithm research is always developing
- Efficiency is important, but hard to compare

This project aims to develop a system that enables comparing algorithms for this purpose,

# Interactive Evaluation of Shortest-Path Methods

This project aims to develop a system that enables:

- The use of various algorithms on a variety of different existing or given traffic network datasets to output detailed comparisons
- For use by educators, students, and assisting programmers.
- Facilitate the decision-making process when evaluating algorithms for a given project using detailed comparisons and performance metrics

# Stakeholders & Use-Cases

- **Educators**

- Present and educate people about the efficiency of different shortest-path algorithms
- Generate reports on the efficiency of the different algorithms

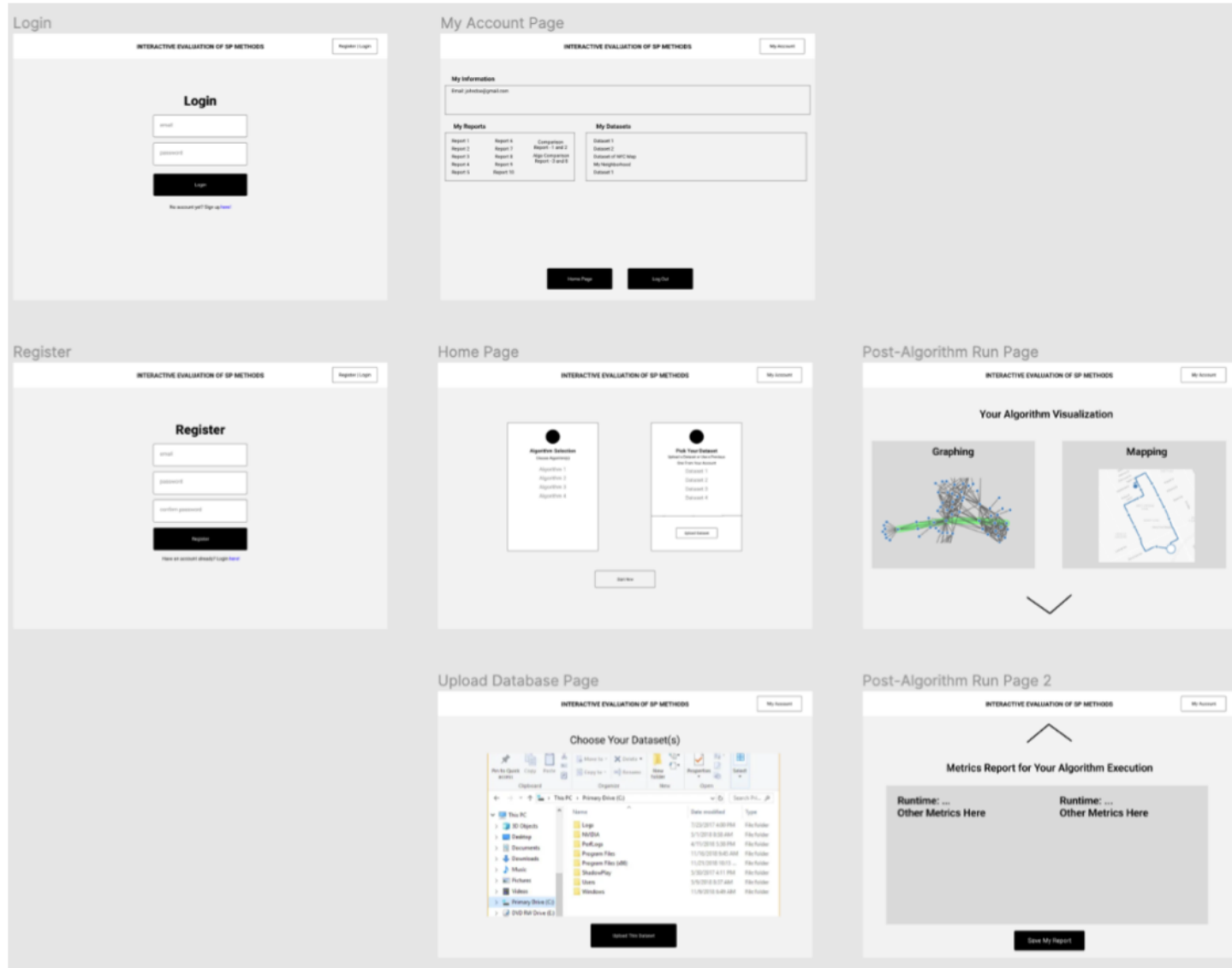
- **Students**

- Tool to better understand and learn about the performance of algorithms on different data sets

# Requirements & Constraints

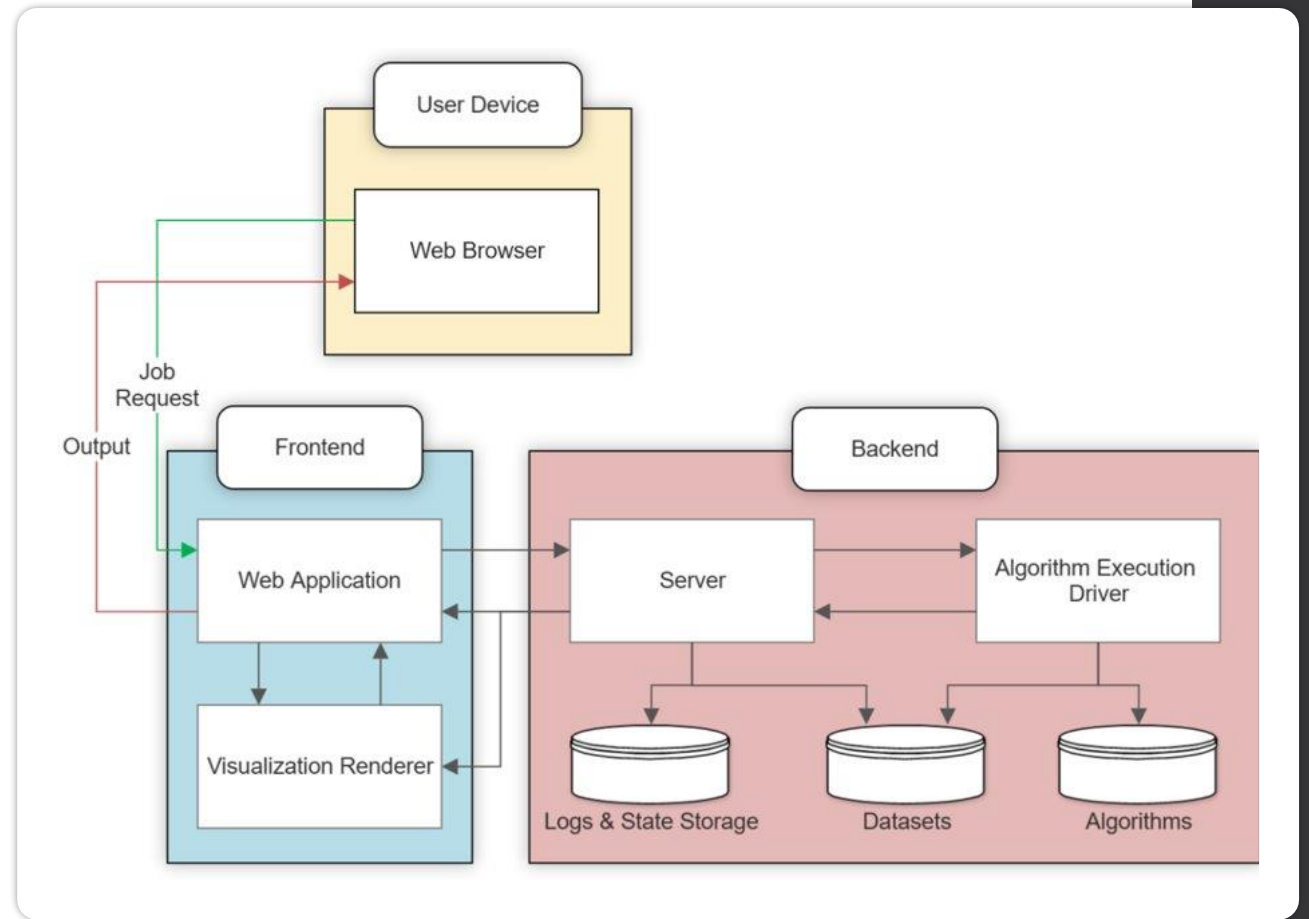
Functional Requirements	UI Requirements
<ul style="list-style-type: none"><li>• Algorithm execution on data sets + metrics report</li><li>• Visualizations of algorithm outcomes/comparisons</li></ul>	<ul style="list-style-type: none"><li>• User upload/algorithm selection</li><li>• Clean, organized presentation of SP visualizations</li></ul>
Resource Requirements	Constraints
<ul style="list-style-type: none"><li>• Optimal resource usage per algorithm run</li><li>• Report generation and storage</li></ul>	<ul style="list-style-type: none"><li>• Model View Controller Framework</li><li>• Budget: No more than \$200</li></ul>

# Design/Wireframe



# Goals

- Research and integrate various code bases containing the shortest path algorithms
- Allowing algorithm and dataset selection through the frontend
- Develop the Algorithm Execution Driver



# Technical Challenges

- Integrate different code bases
  - Provided shortest path algorithms are written a combination of different languages such as C++, C#, and java and will need to be translated and integrated over into our Algorithm Execution Driver.
- Conduct a comprehensive test suite
  - To ensure the algorithms are working as intended after being implemented, we will need to perform a comprehensive test suite on the Algorithm Execution Driver
- Scope of algorithms included
  - How many algorithms do we want to include? Are we going to include different types?