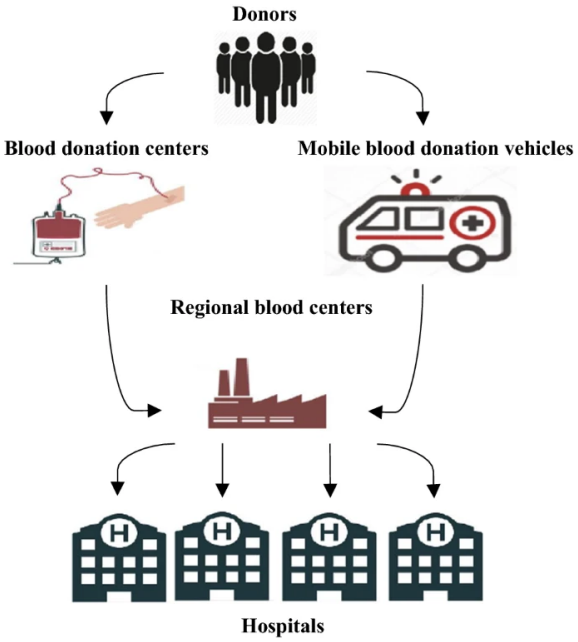
CONTEXT:

According to our exhaustive research we found that there is a tremendous amount of blood being tagged as 'waste' and is disposed of due to 'improper coordination between the blood banks and hospitals' with the given justification that they expired prior to their use. This shows a lack of management skills against the collection and disposition of the blood bags and is in desperate need of proper maintenance formulation.



Why is this topic personally relevant?

Rahil Jhaveri: Blood is a perishable resource, and our literature survey indicates that the wastage of blood bags is at an all-time high, accredited to the reasons for poor management. An article from Times of India in 2017 published a news headline reading *"2.8 million units of blood wasted by blood banks in the past 5 years"*. A recent NCBI report indicated that 8.87% of total donated blood units were discarded. The root cause is that management of blood is inefficient, meaning that closer to expiration blood units are neither used nor they are segmented into plasmas, RBCs, WBCs and platelets which could be used later on. A research paper published in IJERT Year 2020 Vol 9 Issue 2 has proposed a novel solution to introduce traceability of blood bags using BlockChain's Decentralized Architecture. As a team, we plan to pick up this research idea and design an algorithm which improvises the blood supply on top of the BlockChain based Supply Chain Management (SCM). It is of utmost importance to utilize the blood units or segment them appropriately before it expires. Our idea is to create a network of hospitals and blood banks, and apply various algorithms (graph based) to identify an efficient routing system for better usability of blood in cases of emergencies and/or before it perishes.

Krutik Bajariya: The reason behind developing this project is to improve the efficiency and effectiveness of healthcare delivery systems while tackling challenges related to resource allocation and cost reduction. In the healthcare sector, ensuring fair access to essential resources and enhancing patient outcomes relies significantly on the optimal distribution of medical resources.

The project is motivated by the urgent need for sustainable resource allocation in healthcare. The complexities of healthcare logistics and the crucial requirement for timely and reliable access to medical resources have led to the exploration of algorithmic solutions. The expected outcomes, presented as an optimized resource allocation plan, not only aim to reduce costs but also focus on maximizing positive patient outcomes. This project takes a proactive approach to address the intricate challenges within the healthcare system by leveraging technology and algorithmic optimization, ultimately creating a more resilient and effective framework for the distribution of medical resources.

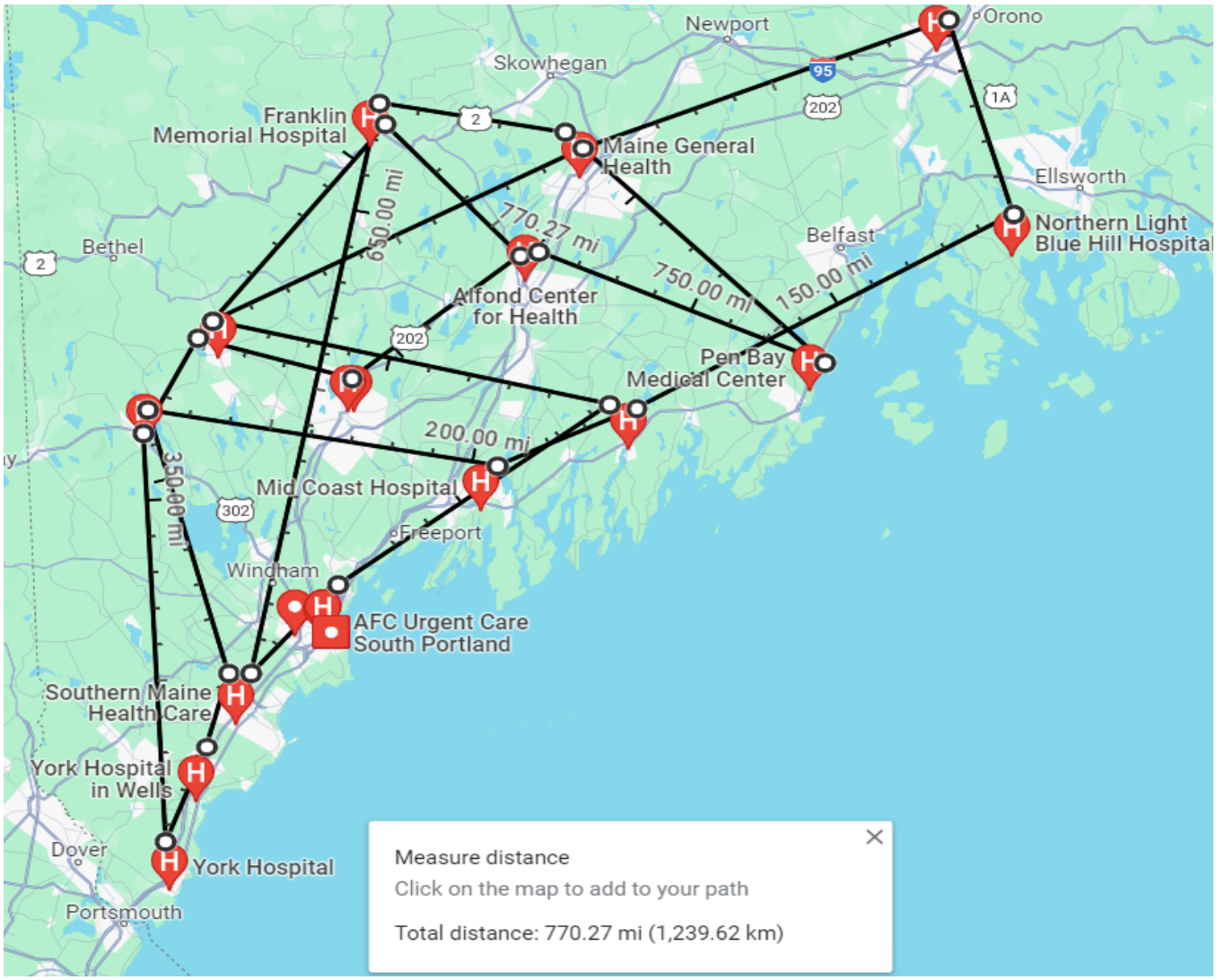
Jheel Kamdar: The shortest path problem is critical in both business and data sectors of graph theory. Utilizing predictive analytics, machine learning, and artificial intelligence is crucial for optimizing inventory levels, reducing transport costs, and enhancing overall supply chain efficiency. In the context of emergency medical resource transportation, a specific algorithm is essential to determine the most efficient route among alternatives. Addressing blood supply challenges, the algorithm should consider factors like low demand leading to blood wastage. It's vital not to assume a constant low demand, requiring a dynamic approach to supply management. Emergency situations necessitate adaptable decision-making. The objective of this study is to improve the effectiveness of health care provision through the resolution of resource planning issues and cost-cutting. It ensures equitable distribution and quality of medical resources in order to save patients' lives. Our team will delve into various algorithms, emphasizing implementation and potential enhancements to tackle this complex problem effectively.

QUESTION:

There are some aspects that are challenging to manage even though they are acknowledged. First, for instance, there is a greater amount of blood available and less need for blood bags, which leads to blood waste. An organization cannot assume that because the current necessity for blood collection is minimal, it will remain low in the future and accept the risk of decreasing blood collection. Our goal is to analyze different algorithms which can be used for efficient blood supply between hospitals and blood banks. These algorithms would be designed keeping in mind the traceability and immutability of various nodes in the architectural graph.

SCOPE:

There is a requirement to develop an optimized healthcare/medical resource allocation plan that ensures efficient and effective healthcare delivery minimizing the cost and maximizing the patient outcomes. In our case, it is Blood; the perishable fluid which keeps us alive. We aim to implement the algorithm on the healthcare facilities network with nodes representing healthcare facilities like hospitals, blood banks and collection centers and edges representing the transportation routes. We aim to find the shortest route to get blood as per requirement in a hospital (source node) from nearby neighboring hospitals (other nodes in the network). Also, we plan to save this route in order to consume less time for calculating the shortest route in future. These transportation routes will also be utilized to transfer blood units before they expire.
In our scope, we would analyze & compare the single source shortest path algorithm (eg. Dijkstra, Prim's, A*) and all source shortest path algorithm (eg. Floyd Warshall).



DESCRIPTION:

1. What have we done thus far?

We have reviewed possible methods used for computing the shortest path between nodes. During our literature survey, we have also studied about the domain i.e. blood supply chain management. So far, we have been able to connect the application of graph based algorithms to solve the transfer of healthcare resources like blood. Our team has worked on drafting this project proposal and have also read a research paper on Blood SCMs, grasping concepts like Graphs, Trees and Path finding algorithms.

2. What are we planning to do next?

Over the next few weeks, we would be comparing the single source shortest path algorithm and all source shortest path algorithm. Analyze their performance in specific situations like emergencies, transfer of blood during its pre-expiration phase. This sort of comparison would help us decide the use-case of the algorithm in appropriate situations. Finally, we'd provide a comparative analysis which would pose a solution for the problem of inefficient blood management.