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# Ambulance Optimal Routing Path Detection Using folium and Polygonal Path Finding

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## ABSTRACT

The patient is not kept waiting for longer than required, it is important to guarantee that an ambulance is readily accessible and that the time it takes to get to the patient can be controlled. Picking the best route is important since it should cover the least ground. Therefore, an interface is developed to help ambulance service providers send an ambulance to a certain ambulance station and emergency location. The goal of the ambulance routing system's user interface is to deliver the fastest feasible route with the least amount of time spent in transit (in km). The code was written in Python, and within the research region, the shortest path for the ambulance was determined using ReLU.

**Keywords -** Congestion, Neural Network, ReLU Algorithm, Machine Learning.

## 1. INTRODUCTION

Medical advancements have allowed for the treatment of a wide variety of illnesses and injuries in today's globe. In the event of an accident, however, it is essential that the victim receive help immediately. The quick arrival of an ambulance at the scene of such an event has enormous social and economic implications. A number of victims have been reported dead after ambulances were rescued too late.

The main causes of this are things like the ambulance not leaving at the scheduled time, the driver not being familiar with the routes, and traffic congestion. A patient in cardiac arrest, for instance, has a 24% lower probability of life for every minute that passes before they receive care. As a result of the critical and immediate influence it has on people's lives, finding an efficient route for ambulances is one of the most challenging study subjects.

As cities expand, the function of emergency rescue systems in ensuring the safety of human life and societal stability grows in significance. The purpose of the ambulance service provided by EMS is to either provide immediate medical attention to patients at the scene of an emergency or transport them to a hospital for more extensive medical care. When an emergency arises, the provided EMS ambulance will be there to help with basic life support measures.

In line with established standards and recommendations, emergency medical services (EMS) offer immediate, often life-saving care to patients in need, including evacuation by ambulance. Standby services for events such as festivals, sports, motor racing, national and international conferences, duties during aircraft emergency landings or crashes, and patient transfer from one hospital to another are all available for a small fee through EMS, in addition to the standard emergency medical services.
Availability of ambulances and the time it takes to get there must be guaranteed to meet the goal time for treatment. Therefore, effective ambulance management and system are crucial for raising EMS quality.

## 2. LITERATURE REVIEW

[1] Taha Darwassh Hanawy Hussein suggested an artificial intelligence-powered neural network to aid in allocating emergency medical care. There are eight values given to the neural network Information collected includes time, date, location, street names, number of injured, kind of accident, ages of individuals involved, and locations of ambulance and hospital. They also include the number of injured people. The ambulance may choose the most practical path to the closest medical centre using this information. This study evaluates the city's resources and response to an accident, the efficiency of current emergency teams, and the availability of ambulances.

[2] Hussein recommended utilising the BAT algorithm to determine the ambulances' most direct route. Node-based construction is used to create the city map. The control centre will initially alert the hospital and ambulance to the accident's location. The driver then enters the data into the BAT algorithm, which uses the node coordinates of the accident and the ambulance vehicle to calculate the quickest path to the accident spot..

[3] In order to determine the optimum route for an ambulance to go in the event of an emergency, Elgarej Mouhcine suggested a distributed technique. Urban rescue operations have traditionally been primarily focused on determining the best course of action. A decentralised approach is suggested that draws inspiration from the algorithmic organisation of ant colonies. This study provides a distributed model that considers aspects including speed limits, traffic, the availability of ambulances, and the proximity of the hospital to choose the best route that significantly reduces time..

[4] Time is wasted sitting in traffic a lot in the fast-paced world of today. This is a serious problem for ambulances and other emergency vehicles. The time that is wasted may have been used to save lives. In order to deal with this dangerous situation, Tressa Michael has suggested using the A* algorithm to choose the ambulance's best course of action. This programme considers the flow of traffic and creates a dynamic route based on the volume of traffic. The ambulance receives the coordinates of the accident, and the fastest path is shown on the dashboard. This makes it easier to get there faster..

[5] Mohamed N. Ashmawy suggested a central hub as a remedy that could manage ambulance dispatching and tracking concurrently. The platform aims to enhance the patient's survival prospects by getting them to the hospital as soon as possible, and it also enables a physician to analyse the patient's biological data while they are still travelling. The latter is advantageous since it gives the hospital time to prepare before the patient shows there. To assist the doctor in identifying any potential health hazards, the obtained data is subsequently analysed using machine learning techniques..

[6] Paramedics must act quickly and rationally in life-or-death situations, especially in crowded locations. Unfortunately, the high traffic and congestion significantly reduce the ambulance's pace. Drivers frequently fail to pull aside for an ambulance when it is farther away because they only do it when the ambulance is directly in their path. AbdelGhani Karkar suggests a more sophisticated ambulance system in this study that distinguishes itself from existing ones by informing drivers in advance of the ambulance's emergency routes. The system offers both a medical application and a user emergency application. The first shows both the location of the patient and

the ambulance (s). Contrarily, the latter not only locates the.

[7] Responding quickly is essential for drivers of emergency vehicles including ambulances, fire trucks, and police cars. Major difficulties arise for emergency services due to traffic congestion, an abundance of crossroads with traffic signals, and lengthy vehicle wait times. Due to the inability of earlier attempts to route EVs to handle continuously shifting traffic circumstances, they were unsuccessful. Real-time information on obstructions is crucial to reducing the wait time for EV mobility and its impact on other traffic. AEVs should be used, according to Subash Humagain, since they can make decisions in real time based on current data, which enables them to negotiate intricate road networks more swiftly and safely. In order to achieve critical reaction time inside a real-time system, AEVs' tasks are specifically planned using the mixed-criticality real-time system (MCRTS)..

[8[Mohammad A. R. Abdeen introduced a revolutionary technology that will use data gathering, processing, and sensing capabilities to revolutionise 911 and ambulance service. In order to choose the best course of action, the intelligent system considers factors like the number of patients at the hospital and the volume of traffic on the roadways. To confirm the algorithm's validity, analytical and simulated studies of its performance are employed. The outcomes, which demonstrated exceptional agreement between the simulation and analytical methodologies, supported the correctness of the analysis. The smart algorithm performed better than other algorithms that had been previously published in the literature under the settings and situations that were taken into consideration.

[9] If lives and property are to be saved, rescue crews must be at the scene of a disaster quickly. The Dijkstra algorithm is used to create an effective device for predicting safe routes over a complicated, unstructured road network. With the help of the anticipated technologies, the evacuation route for police vehicles, ambulances, and fire trucks will be determined. We evaluate the best evacuation route, look for neighbouring relief zones, and guide you to a safe location. The location of the closest emergency service may be found using the neighbouring services system. The haversine distance can be used to calculate the separation between two locations. Once an incident has occurred, the best route from the service centre to the incident area is made.

[10] 108 is one of a number of alternate emergency medical services available in India's several states (EMS). In order to respond rapidly to demand and incorporate real-time travel and traffic data into the vehicle scheduling and routing model, efficient EMS depends on a number of interrelated elements. In order to find the optimal routes for emergency vehicles, this study uses the Google Maps Distance Matrix API to construct an optimization approach based on real-time live traffic data. The truck routing problem is modelled as an integer programming problem in the heuristic technique, and it is then optimised using the Google API. The model's key features include the capacity to optimise dispatching, identify the fastest routes, locate the scene of accidents, and track the whereabouts of vehicles..

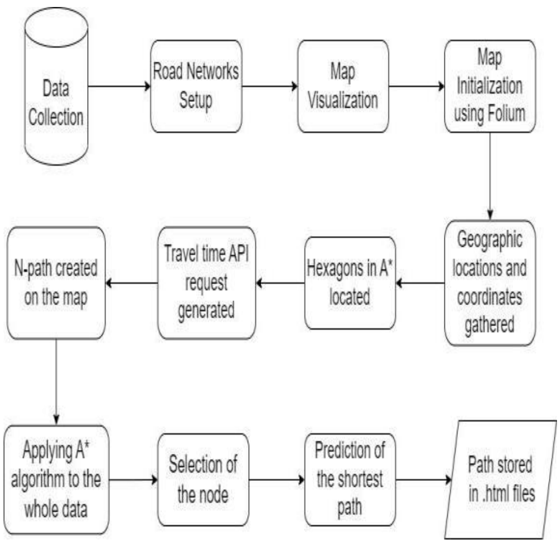
## Existing system

When utilizing a standard disease risk model to make a prediction, the process typically incorporates machine learning and supervised learning algorithms. These algorithms employ training data that is labeled for the purpose of training the models. Patient classification into high-risk and low-risk categories is carried out using group test sets. There is already a great deal of applications that have been developed for use in the area of hospitals, physicians, and medical care. Among the tools that are at your disposal are medical recommendations, an activity log, and drugs, information regarding the procedures, directions to the hospital, and patient reviews of the facility.

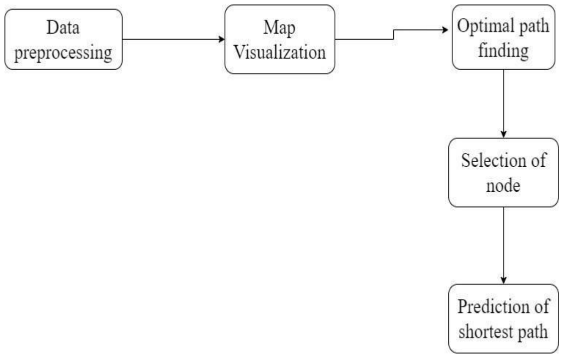
**Proposed system**

We have utilized CNN and ReLU to build a disease classifier which will also find the closest hospital that is the greatest fit for the disease. Combining a pre-trained feature extractor of series with respiratory sound and a CNN classifier allowed us to construct a predictive model for the classification of respiratory sounds. A highly straightforward user interface that provides the appropriate quantity of information is shown here. It lists the hospitals that are closest to the user within a specified radius, along with their ratings, phone numbers, and driving directions.

## 3. ARCHITECTURE DIAGRAM




**SYSTEM FLOW DIAGRAM**




## 4. DESCRIPTION OF THE PROPOSED MODEL/SYSTEM :

### MODULE 1 – DATA COLLECTION

All data location and information related to the routing of ambulances are collected from the libraries online and these libraries are imported. Based on the data collected, a road network is developed, where all major routes used to send patient to designated hospital are constructed in the developed road network. Road network developed involved all major roads which connected to the designated hospital. The road network consists of nodes and edges, which will be the directional links that connects the two nodes between them. The visuals are set for the map. The information related to the latitudes and longitudes of all the major hospitals in a given area is collected. An initial map is created using Folium. The hospital coordinates are loaded on the map using JSON. The data is then sent to the map client.

### MODULE 2 - IMPLEMENTATION OF A* ALGORITHM

Geographic information of roads and junctions are needed for creating road network. Followed by which, the coordinates of the hexagons in the A*algorithm is located. The parking spaces in the form of latitude and longitudes of all the parking spaces is collected using np files. Using Numpy, all the coordinates of the parking space is loaded, followed by which, a travel time API request is generated. The A*algorithm works by maintaining a pair of lists, one containing locations on the tile map which N is the path and another one contains the locations. Then, A*algorithm will continues the loop if there is still next steps that could be consider to be available next step and considers its neighbors.

**MODULE 3 – CREATING A MODEL**

The next step is creating hexagons for implementation of A* algorithm. Once the incident site is identified, we developed a detailed road network that shows complete distances. Here, the A* algorithm will be applied to determine the shortest path of ambulance distance from given location to other locations. Referring to model, the idea of this algorithm is to avoid expanding paths that is already far or expensive. This algorithm choose the next node n whose g(n) + h(n) is minimal. This process repeats until the goal node reached. The algorithm choose their node based on the cost from the start node plus an estimated of the goal node. The shortest paths are based on incident site and current ambulance station. The A*algorithm is applied to the whole data and the results in the form of shortest optimal path is stored in html files.

## 5. CONCLUSION:

In conclusion, the purpose of this application is to improve the standard of emergency medical care. In addition to this, it may be of use in enhancing the effectiveness of the administration of ambulance services provided by Emergency Medical Services. This technology is able to provide information regarding the shortest route and the short distance for an ambulance to take in order to reach at the incident site in a timely manner. In addition to this, the ambulance will be dispatched from any starting node that is desired (the location of the ambulance) to any destination node that is provided (incident site).

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