

## **AMBI PLUS**

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BTP Track : Research & Entrepreneurial

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Student's Declaration we hereby declare that the work presented in the report entitled AMBI PLUS submitted by us for the partial fulfillment of the requirements for the degree of Bachelor of Technology in Electrical & Communications Engineering at Indraprastha Institute of Information Technology, Delhi, is an authentic record of our work carried out under guidance of Dr. Anand Srivastava. Due acknowledgements have been given in the report to all material used. This work has not been submitted anywhere else for the reward of any other degree.

..New Delhi/1st June 2020.. Place & Date: ..Yogesh Gupta , Vishal Hooda...(student's name)...

### **Certificate**

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

.....New Delhi...Place & Date: ...New Delhi...

..Dr. Anand Srivastava..  
(advisors' name)

### Abstract

**CATS ambulances on an average get around 33,000-35,000 calls every month. CATS fleet has 263 ambulances as of 2019 but around 60 of them are not in use and over 100 outdated. CATS operations fail to allocate the nearest driver to the patient many a time due to reliance on non-digital forms of communications and no live tracking. In India, every second heart attack victim reaches hospital in more than 400 minutes which means death of that person is almost certain as after 180 minutes muscles suffer from irreversible damage. Around 27% of deaths happen in India where the patient dies without getting any medical attention. The situation is worse in rural areas due to unavailability of ambulances as well as hospitals in close proximity. We have proposed two algorithms to counter this issue. The first algorithm divides Delhi into 100 blocks of equal size with an ambulance located on the center of each block. Based on the google maps services, upon a user's request from an app/toll free number, the ambulance allocated to its block will be directed to it. The second much more optimized algorithm, divides Delhi based upon the legislative constituencies (70). We calculate the population and hospital density of each block and based on that set a location for each ambulance which may or may not be at the center of the block. The simulations for both the algorithms are runned and we have received response time of 10 minutes on average which is faster than CATS (25 minutes).**

**(Keywords: Ambulance, Delhi, Block, CATS)**

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***Work Distribution :***

***Algorithms designer and inventor, business and entrepreneurship :***

***Yogesh Gupta***

***Algorithms tested and coded, Business inputs and operations strategy:***

***Vishal Hooda***

**Contents :**

- 1. Introduction**
- 2. Algorithm 1**
- 3. Algorithm 2**
- 4. Business and startup work**
- 5. Conclusion**



## **Chapter 1 : Introduction**

Do you know one out of 10 patients in India die due to ambulances not being able to reach the destination on time? According to the WHO, the ideal response time should not be more than 8 minutes but unfortunately, the average time is around 25 minutes in Delhi for the government as well as private ambulances. Delhi being the densest state among all in India, adds fuel to the problem. CATS, a government service has to reject more than 50% requests they receive every day. They have a fleet of over 200 ambulances but around 25% of them are always off the road due to maintenance work. Moreover, some of them are always employed for official programmes. Hence the number available to the general public consumption is much smaller. Interestingly, India, which has about 31.16% of its urban population living in its major cities like Delhi, Kolkata, Mumbai, or Chennai, has become harder for travelers to reach their points of destination on time. The situation becomes very serious when patients travelling in ambulances are stuck in traffic and die before reaching hospitals. **About 20% of deaths are due to the delays of ambulances reaching late to the hospital.** It is heart wrenching to know that **more than 50% of heart attack victims reach late to the hospital.** The chance of surviving a heart attack reduces by 10 per cent with every minute that passes. Every second heart attack patient in India takes more than 400 minutes to reach a hospital, which is almost 13 times more than the ideal window of 30 minutes. After 180 minutes, the heart muscles suffer irreversible damage due to lack of blood supply. Not just the cities which are the victims of lack of ambulances and traffic delays but also the rural areas. According to global health missions' community which operates in the northeastern parts of India, the **response time has increased by 10 minutes in the last five years.** In rural parts of India, there is a huge shortage of ambulances and often the patients must be taken in jeeps which have no first aid/life supporting equipment. There have been cases in different parts of the country **where patients have waited hours for an ambulance to arrive but sadly couldn't wait more and suffered an unfortunate death.** Not only India, but even England is facing the issue of delayed response time by ambulances due to the number of serious/life threatening cases increasing from 2.2 million in

2011/12 to 3.4 million in 2015/16. Many cases are not dealt with as soon as required which has resulted in 2,500 **deaths on average a year**.

To counter this menace, we have come up with digitizing and optimizing the use of ambulances spread across Delhi. Delhi, being the capital and most dense as well as the city we are currently residing in is the reason for our choice. We have taken parameters such as population density, area, accident prone areas, average daily calls and hospital information to devise algorithms that have drastically reduced the response time for an ambulance to reach a patient. We have also contacted the private hospitals in delhi and asked them to transfer their ambulance requests as in cases they don't have their own ambulance or are out of them at the given moment. We contacted around 20 hospitals and most of them agreed to be on our service and most of them expected that we would serve them with 1-2 patient requests daily. The paper will present the algorithms devised and then the business we hoped to generate out of it.

## Chapter 2 : Block Based Algorithm

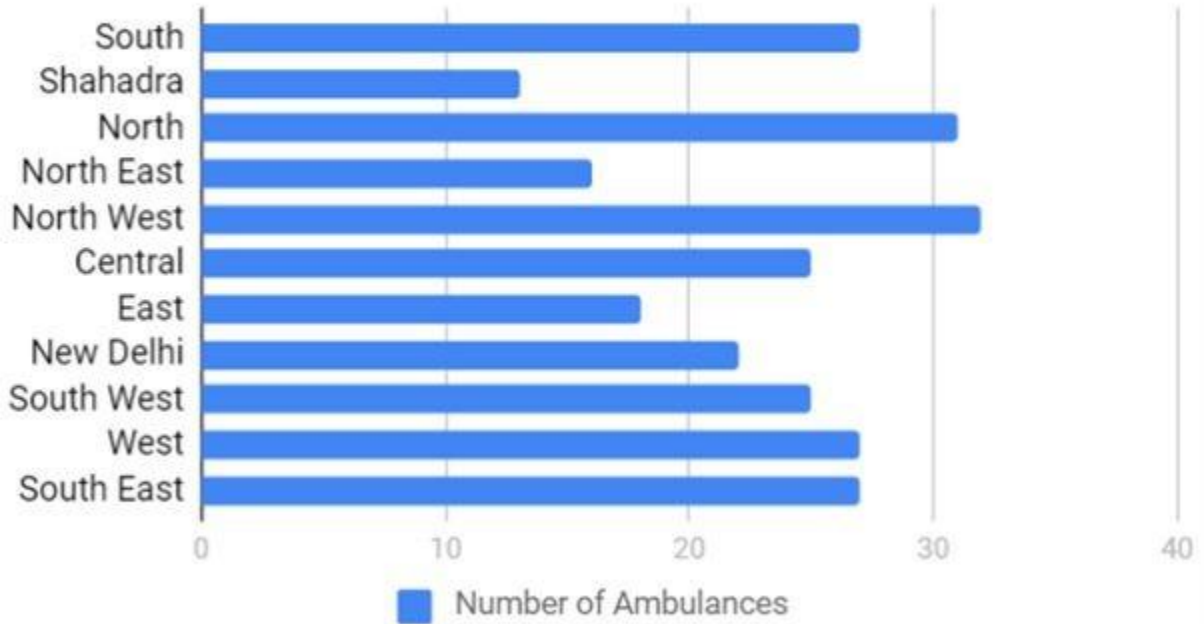
In this algorithm, we divide Delhi into blocks based on the population of each district and not area. Each block will be allocated an ambulance each. Total will be 30 ambulances. When a request for an ambulance will be made, the driver belonging to that block area will receive the request. The request can be made through an application or through a call. The ambulance will start its journey from its initial position to the patient's location via the coordinates provided through the app or manually. During the time between ambulance reaching the patient, a hospital will be allotted by the AMBI+ team which will be nearby to the patient's location to the ambulance driver. The driver will reach the hospital, and after dropping the patient, will return back to its block area. Till the time the driver is reaching the block allotted to it, it cannot accept a new patient's request. This is done so that that block is not left void. In case there is another request from that same block and the ambulance is not free of that block, the ambulance nearby to it will be allotted.

A database can be made for each ambulance in which hospitals nearby to the area it is allotted to can be stored.

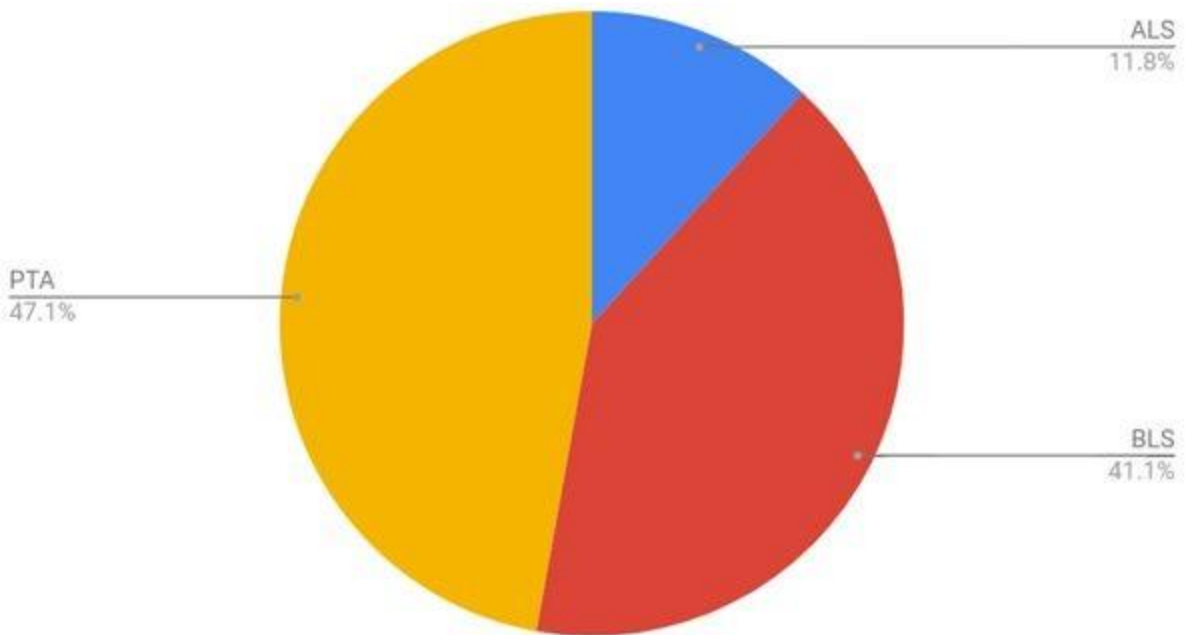
We received the following data from CATS Delhi:-



## Districts

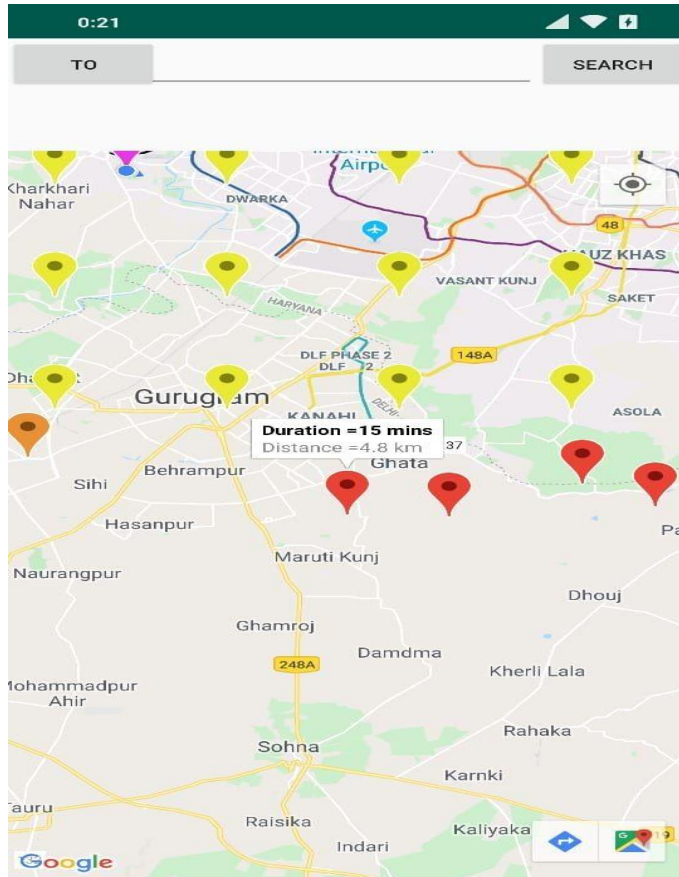


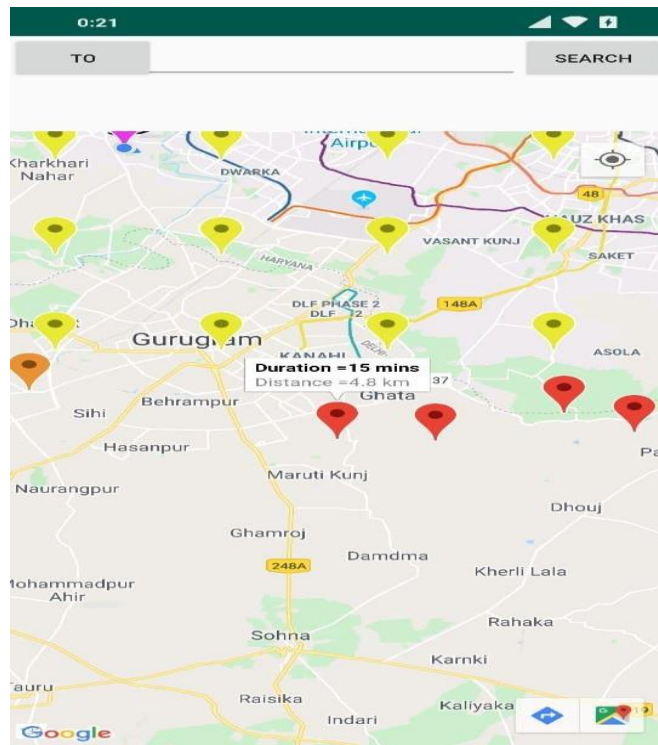
## Number of Ambulances



In our model, we will be employing only ALS ambulances.

We modeled and did a simulation on our code. We randomly generated user requests after fixing the coordinates for each block in our code. We did simulation multiple times at each hour. On average our response time was 12 minutes with the upper limit being 16 minutes while lower limit was 2 minutes.



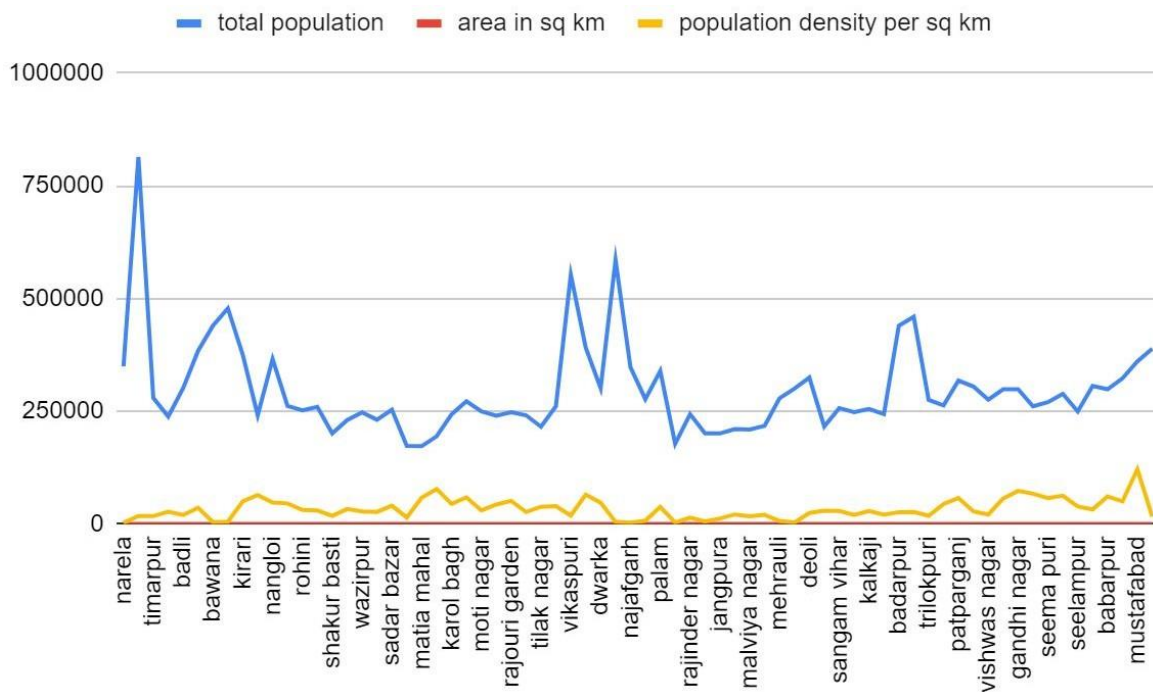


The pictures are from our simulations.

### Chapter 3: Algorithm based on population, hospital and hotspot density

We find the list of all the hospitals and get connected to them. The ones which agree to come on our roster are given a preference and put in a separate list while others are put in another normal list. Based on each block (total 70, one for each MLA constituency), we find the hospital density for each block along with the hospital density. We have a list of hotspots, i.e., areas where accidents happen frequently and have gotten the density for those as well. Based on these parameters, we have located the ambulances in the system which are not always at the center of each block. For example, 2 blocks adjacent to each other. If in block A all the 3 parameters are high while in block B, all the three parameters are low, then the ambulance of the second block will be nearer than the center towards block A.

Hospital density is shown in the figure:-



We ran simulations for this algorithm and got an average of 10 minutes as response time. Due to the pandemic, we were not able to contact any new hospitals.\*

## Chapter 4 : AMBI PLUS as a startup initiative

There are around 700 hospitals in Delhi and we plan to get 350 hospitals enrolled on our panel. This is not a big task as we have talked to around 20 hospitals and more than 15 agreed. We have a B2B and B2C model. In our B2B model, hospitals will be sending us the details of the patients requesting for an ambulance. The reason why so many hospitals agreed were :- faster response time, so patients will be less probable to die along the way, hence can operate on the patient, not all hospitals have ambulances equipped and most of them have PTA while we are giving BLS which costs a whopping Rs. 2500-3000 per request. We are providing that for only Rs.1500. We also plan to have 1 ALS in the model which would cost around Rs.2000 which is 3 times lower than market value.

We talked with the ambulance vendor and were told that ambulance's monthly rent is around 90,000 for BLS and 1,20,000 for ALS(including driver, helper and equipment for 24X7 but excluding diesel). for each BLS to break even, it would require 2-2.5 trips a day and similarly 2-2.5 trips for ALS. Since we won't talk about the functions till we get 350 hospitals connected, then it means 1 ambulance will cater to 3-4 hospitals. So chances of loss are quite low as revenue will be generated from the B2C model too. In the B2C model, a patient can request an ambulance from app/toll free number and an ambulance shall be assigned to it along with the hospital that can cater the needs. Our target audience is 1.3 million people.

CATS ambulances reject around 1,000 calls everyday and our target is to divert those calls to us. Also, in the initial stages, to garner more revenue, a 20% waiver will be given to hospitals for each request they send. We will use kiosks at every hospital for advertisement.

For our pilot model, we will run AMBI PLUS in west delhi. There are around 70 hospitals in the vicinity. We have already enlisted 15 out of these 20 hospitals (couldn't complete due to the pandemic). Assuming we start the operation at 35 hospitals and use 3 BLS and 1 ALS:

Total operation cost - Approx 4.5-5 lacs

Request needed to break even :- approx 300-320

Total requests expected per day- 40

Monthly requests expected (75% for BLS , 25% for ALS)- 900 for BLS, 300 for ALS (not considering b2C model)

Total revenue generated :- 13.5 lacs from BLS and 6 lacs from ALS

(Note we are assuming that 1 ambulance will be able to cater 10 requests in 24 hour cycle, we can't know for sure till we get funds)

Based on the above, our profit is 4X which would only grow with B2C model and with implementing it across the entire Delhi. Also, we plan to sell medicines and other medical equipment in future.

## Chapter 5 : **Conclusion**

Medical transport services is a market which is mostly unexplored and not much thought process has been given to upgrade it. Due to asia hosting many cities such as Delhi, Mumbai, Bangalore, Dhaka, KAthmandu etc, it is quire essential to provide apt ambulance services to citizens. With every minute being utmost precious, bringing down the response time from 25 minutes to 10 minutes, is a huge achievement we believe we have done. More thought is being given to improve our product but unfortunately, **even after being students of a prestigious institute , we weren't able to fund our startup till now else it would have done wonders amid the lockdown.** We went to many MNCs in Gurugram and Noida but could not get funding as most the businessmen want initial seeding to be done by the institute or the inventors itself.