

## **Product/Idea**

- **What is the problem you are trying to solve?**  
**(Do you have any supporting statistics from reliable sources, if so please do share.)**

The road is an important mode of transport in India. India has one of the largest road networks in the world with about 59 lakh km of road length.<sup>[1]</sup> In India, road infrastructure is used to transport over 60% of total goods and 85% of total passenger traffic. Pothole related deaths have been increasing in our life because of the presence of heavy traffic and water on roads.

Road safety is very low. In all these cities, an excuse for potholes on the road and the poor condition of roads is always set out by the heavy monsoon.

**The problem we are trying to solve is to reduce the accidents caused due to potholes.**

In 2016, every day six lives were claimed by potholes in India. These are just the numbers of reported deaths and the numbers could be higher as dozens of pothole-related deaths go unaccounted for. According to the data shared by states with the Centre, Uttar Pradesh, Maharashtra, Gujarat, Kerala, Andhra Pradesh, Odisha, and West Bengal are there among the top 10 states in deaths related to potholes in the country.<sup>[2]</sup>

On March 31st, 2017, 63.24% of Indian roads were paved.<sup>[3]</sup> In the three years between 2015 and 2017, potholes in India were a factor in over 9,300 deaths, according to government figures.<sup>[4],[5]</sup> In 2017, 3,579 people were killed and 25,000 injured due to pothole-related mishaps.<sup>[6]</sup>

Drivers can see the potholes when they are dry but they might get stuck in the potholes during the rainy season. So, the drivers should be able to see the potholes on the map on the current route to get the knowledge of any unrepaired pothole. The problem also requires uploading and updating the database of the potholes to allow the responsible authority to take necessary actions and fill the potholes at the earliest in order to prevent accidents and damage to life and property.

### **Sources:**

[1] Ministry of Road Transport and Highways, Basic Road Statistics of India 2016-17, <http://morth.nic.in/showfile.asp?lid=4585>.

[2] Varsha Singh, "The pothole problem in India- Motor Vehicles Amendment Bill is the need of the hour"

Kolkata, Media India Group, July 27th, 2018,  
<https://mediaindia.eu/business-politics/the-pothole-problem/>.

[3] "Basic Road Statistics of India 2016-17" (PDF). Ministry of Road Transport and Highways, March 22nd, 2020.

[4] K. Dash, Dipak, "Potholes: Potholes killed 3,597 across India in 2017, terror 803", The Times of India. July 15th, 2018,  
<https://timesofindia.indiatimes.com/india/potholes-killed-3597-across-india-in-2017-terror-803/articleshow/64992956.cms>.

[5] Kaur, Kamaljit, "Over 9300 deaths, 25000 injured in 3 years due to potholes", India Today, July 24th, 2018,  
<https://www.indiatoday.in/india/story/over-9300-deaths-25000-injured-in-3-years-due-to-potholes-1294147-2018-07-24>.

[6] Dhillon, Amrit, "More deadly than terrorism': potholes responsible for killing 10 people a day in India", The Guardian, July 16th, 2019,  
<https://www.theguardian.com/world/2018/jul/25/more-deadly-than-terrorism-potholes-responsible-for-killing-10-people-a-day-in-india>.

- **How does your idea address the problem?**

Our idea addresses this problem by providing a platform for the drivers as well as the normal users to prevent accidents. Our idea proposes a platform where the drivers can track their live location on a live map and know the location of probable potholes in their way. The presence of markers representing the potholes would help the drivers to either slow down or choose any alternate path. Users can upload the image of the pothole that requires attention. We will record the image as well as the live location of the user to target the reported pothole. That image will be analyzed by our machine learning algorithm to decide the priority based on the different properties of the pothole such as the expected width and depth. This idea will also help the responsible authorities take necessary action to repair the potholes based on priority basis to prevent major mishappenings on more busy roads.

- **Who are the target customers?**

The target customers are all the general masses. It directly targets the vehicle users since they might get stuck in an unnoticeable pothole during rainy season or maybe worse meet with an accident. It can prove to be a life saver for them since the annual deaths and injuries due to accidents because of potholes are

quite large. Pedestrians are also potential customers since they might fall in a water filled pothole and suffer serious injuries. All these people are also the source of information about the potholes which can eventually help other people as well who might otherwise become part of the problem. Municipal corporations or any equivalent authority is also part of our solution since they can easily be updated about the information of the potholes.

- **What makes your idea unique?**

Our idea is unique since we are catering to a larger audience and our deciding factor is actually the accuracy with which the information of a pothole is updated. Till now there is no solution available which shows the potholes in the way and actually helps the drivers dodge them or better report them. Our solution can actually show the potholes in real time with the help of markers indicating their presence. Everytime any user reports a pothole, it is analyzed for the priority it should be repaired on. We have trained our machine learning model and fine tuned it to detect the potholes in an image with very high accuracy. This prediction is used to determine if a pothole really exists and if it exists, what are its approximate dimensions. Our solution can be easily used by any user and reporting a pothole is very easy even for a naive user.

- **Do you have a revenue generation model? If so please do share.**

Yes we have a revenue generation model which will be based on advertisements as well as premium features. The premium features will be the extra features apart from the free features which can be charged monthly, half-yearly or yearly. Premium features can include the extra specifications about road quality and give detailed information about any nearby potholes. There can also be advertisements of various brands or the premium features themselves to increase the sale.

- **What are the geographies, do you think the idea would be suitable for?**

Our solution can work on any geography since we are focusing on the current location in terms of the latitude and the longitude so terrain and geography is not a barrier. On the contrary, our solution can easily reach out to the remote geographies and update the information about any possible pothole filled with water so that the vehicles can move around safely without having to be stuck in a remote area without any help.

- **What are the risks associated with your idea and how can you mitigate it?**

Some of the risks associated are the accuracy of the current location.

Another important risk is the non-existent size of the database since we only have a handful of test coordinates for the potholes and we have to expand this collection to a certain size to get a reasonable accuracy.

- **Who are the stakeholders involved in bringing this idea/product/service to the market?**

**(Ex: State govt, Department of trade and taxes, pollution control board, Manufacturers)**

The stakeholders involved in bringing this idea to the market comprises government organizations responsible for manufacturing and maintaining roads. They have to be in constant touch with our application to know the locations of newly reported potholes and update us regarding any pothole that has been repaired successfully so that it can be updated on the map. Other stakeholders will be the drivers or in general vehicle users since they are the main audience being targeted from this solution. Their experience and further expectations from our side is also responsible for the successful running of this application.

### **Intellectual Property Assessment**

- **Is your idea patentable or patented?**

**(If so please provide details)**

Yes our idea is patentable but has not yet been patented. Our implementation of various machine learning algorithms as well as the server APIs can be patented since they have been implemented by us from scratch. Our implementation of reporting potholes by either selecting the pothole image or clicking the live image is also unique and hence can be patented. Currently there is no existing solution of this problem where we can view the potholes in a map during the ride which can be used to prevent mishappenings so this is a unique implementation of an existing problem.

- **Is your idea built on existing work? If so, how is it different?**

Some individual components might be similar to the existing ones but

nothing is built on an existing work. We have used a currently existing tensorflow model for pothole detection but have fine tuned it and further trained it in order to meet the requirements of our project.

### **Prototype/ Proof of Concept**

- **What is the nature of the prototype/ proof of concept you would be able to submit?**

**(Ex: Github repository, Hardware prototype)**

Our prototype has both the Github repository as well as the hosted links where the user can try our application.

#### **Individual Repositories:**

Front-end GitHub - <https://github.com/namansingh73/potholes>

Back-end GitHub - [https://github.com/namansingh73/potholes\\_backend](https://github.com/namansingh73/potholes_backend)

Computer Vision GitHub -<https://github.com/aryamansharma01/Pothole-detection>

#### **Collective Repository (Recommended):**

GitHub - <https://github.com/VaibhavSharma08/MeAndTheBoys-SIH2022>

#### **Hosted URLs (Highly Recommended):**

Front-end Hosted - <https://potholes.vercel.app/>

Back-end Hosted - <https://potholesserver.herokuapp.com/>

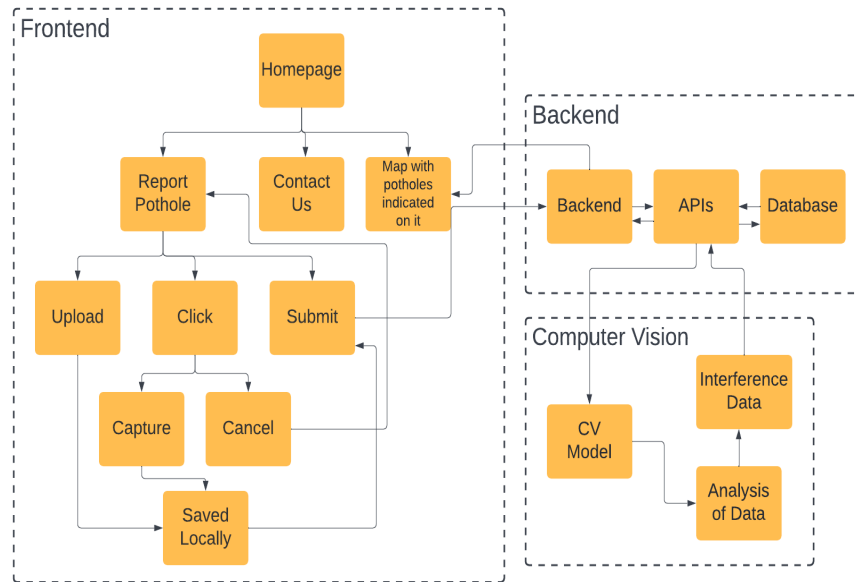
- **Have you completed pilot tests for your prototype/POC? If so please share.**  
We have not yet completed the pilot tests for the prototype as of now.

- **What is the approximate cost of developing the prototype?**

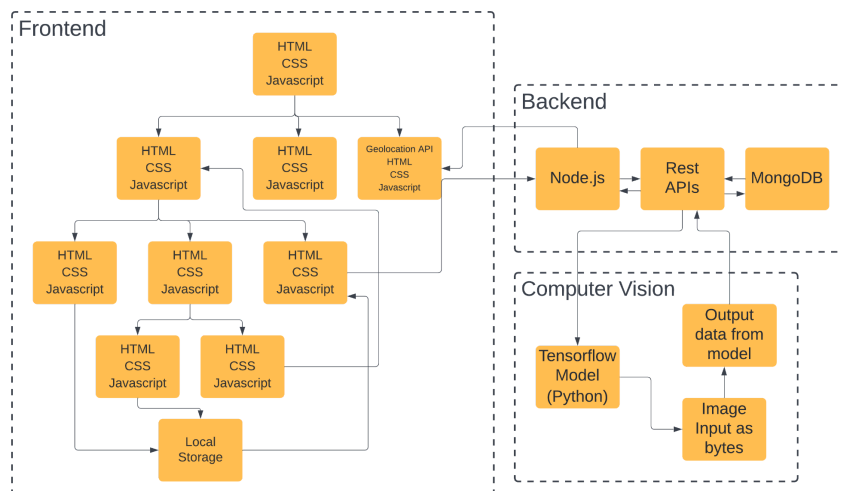
The costs involved in developing the prototype would include hosting costs of the servers and the front end in order to serve a large number of people at the same time as well as the cost of the development hours. This would amount to around 10000 rupees per month for a 50000 footfall. There will also be a small maintenance cost.

- **Please share the relevant elements while submitting the POC/ Prototype**

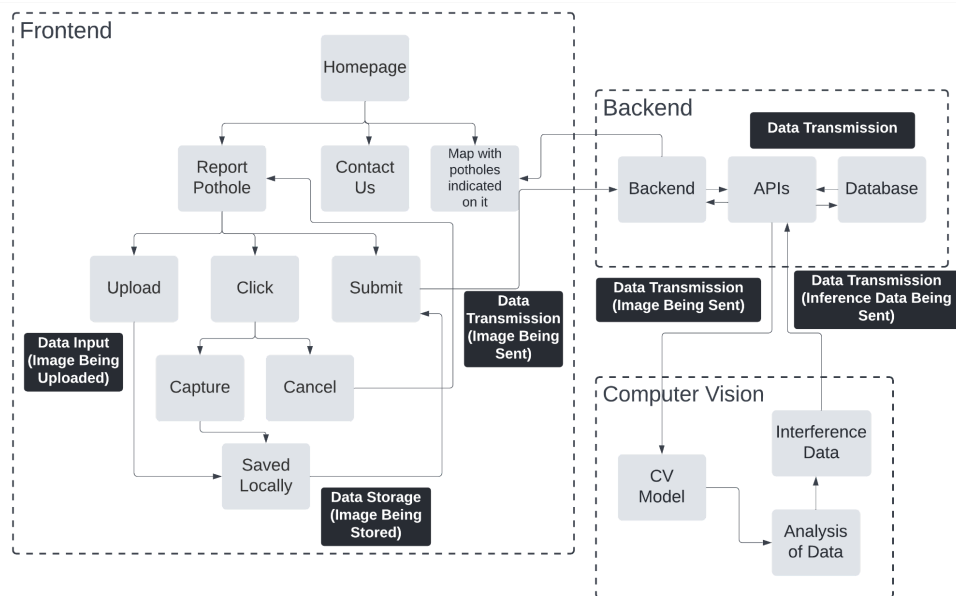
❑ **Block diagram:**



## ❑ Software Architecture- Control/Data flow:



## ❑ Block Diagram of Data Flow -



- ❑ **Hardware architecture - Hardware elements not present**
- ❑ **Components/ Connectors** - The tech stack involved in this project comprises **MERN** (MongoDB, Express.js, React.js, Node.js), **Tensorflow**.
- ❑ **CAD models - Not required**
- ❑ **Visual/Touch Interface** - The UI/UX of our project can be accessed at <https://www.figma.com/proto/S6MjbQEtiUxawD8C1H4DX1/SIH?node-id=1%3A3&scaling=scale-down&page-id=0%3A1&starting-point-node-id=1%3A3>
- ❑ **(Mechanical actuators/switches, touch sensitivity, haptics) - Software solution so no hardware parts involved.**

### Supporting details

- **What regulatory requirements have to be met to bring the idea to life?**  
One of the regulatory requirements would be in the form of a minimum number of days before which an already reported pothole should be fixed. If the designated pothole is not fixed within this specific time, actions will be taken against the responsible corporations.
- **Do you have a business plan/ commercialization strategy? If so please share.**

Our current business plan involves a commercialization model which will be based on advertisements as well as premium features. The premium features will be the extra features apart from the free features which can be charged monthly, half-yearly or yearly. Premium features can include the extra specifications about road quality and give detailed information about any nearby potholes. There can also be advertisements of various brands or the premium features themselves to increase the sale.

- **What is a rough estimate of manufacturing/operational costs?**

The costs involved in developing the prototype would include hosting costs of the servers and the front end in order to serve a large number of people at the same time as well as the cost of the development hours. There will also be a small maintenance cost. This would amount to around 10000 rupees per month for a 50000 footfall.

- **What is the volume of products/ amount of revenue you expect to make in the first year?**

Initially we are planning to provide free services till the time we don't deploy our premium features. Once the premium features have been deployed, based on the footfall we expect a daily use of around 50000 people per day and an yearly revenue of around 30 - 60 lakh per year (initial estimates as per around 100 per person per year as per the expected footfall).