Team

- **Background -** Our team comprises of **Naman and Dhruv who worked on the frontend of our project**, **Jhanvi who worked on designing and creating the wireframe of our project** , **Aryaman, who worked on the machine learning model** powering our project and **Yash and Vaibhav who worked on the backend and integration of all the modules**.

- **Record and vision to succeed -** We are really passionate about this project and wish to bring about a change in people's safety in a more finer detail sense of way and make sure that the system of people's welfare is more dynamic and transparent.

- **Vision/Mission -** Our vision is to create a product that will track all the potential threats to people present on the most publicly used service, the roads, which are already prone many other lethal accident causing scenarios. This product aims to reduce one of this risk factors and make driving a more easier and safer activity.

Pothole Detector

Me And The Boys - Team Info

Team Leader Name: Vaibhav Sharma

Branch: Bachelor of Technology Stream: Information Technology Year: III

Team Member 1 Name: Dhruv Tiwari

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Team Member 2 Name: Naman Singh

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Team Member 3 Name: Yash Shahi

Branch: Bachelor of Technology Stream: Information Technology Year: III

Team Member 4 Name: Aryaman Sharma

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Team Member 5 Name: Jhanvi Garg

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Problem

- **Pain points/Landscape -** Currently ,widely used navigation apps like google maps only show routes based on distance between two points. They do not take Into consideration the amount of potholes on that path which can cause accidents, delays and damage to the car .

- **Trends -** Total 3,564 road accidents occurred in India due to potholes in the year 2020. And there are many more accidents which are either sided off or not considered serious enough to be reported. This is because of no information to the public as to where these dangerous potholes are and negligence by the government to take action and fix these problems causing factors. Our product aims to tackle both these problems , by providing information to the user by the user while maintaining its authenticity and also making sure that severe cases are brought to the attention to the respective authorities.

Solution

- **Proposition -** We intend to create a product which works upon collection of data from user feedback and verification based on an ml model and and then use that data to create and overlay for the map apps telling user about the pothole situation on the path provided to them by the navigation apps. The user will be able to see the notifications in real-time if there is a pothole is his/her close proximity and can act accordingly.

- **Value to user -** As the user will get to know about the pothole situation on their path and its corresponding severity, they can choose to either stay vigilant around them or completely avoid them, which ensures not only their safety ,but also maintains a good condition of their vehicle. This will drastically reduce the number of annual accidents due to bad condition of roads which includes presence of potholes.

Market Size

- **Size of market -** We plan to release this product at a global stage as anyone with the app can use to check for potholes on their path on the basis of information provided by other customers around that area. 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.

- **Sales and distribution -** This will be a free to use app as it is an app that is directly related to people's safety and well being because of which we don’t want to put a price tag on it and provide it to anyone who needs it while constantly receiving feedback regarding its performance and if there are any problems present in it. We can later introduce the premium features of the application 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.

Market Validation

- **Development time -** The product first needs a basic skeletal structure , after which we develop its frontend first and merge in the API which contains the basic crud operations. Making the database schema and including it in the backend also requires time and precision. After that we create out ML model ,train it , check its score and after it produces a passing score, deploy and merge it in with our product. This process on an average takes around 1-2 months to completely finish the product.

Product

- **Architecture -** Product is a software based solution build on **MERN** (MongoDB, Express.js, React.js, Node.js) stack and **Tensorflow** library.

- **Ecosystem -** The participants of the ecosystem are all the vehicle users who are directly targeted as well as the normal users whose feedback is being used to improve the accuracy of the product.

- **Adjacent markets -** The adjacent market for this product includes partnerships from navigational apps (like Gmaps , roads,etc) and other apps which use these apps (Uber ,ola) as not only does this increase the user experience, but also reduces risk factor while also introducing a new parameter which can be used to suggest routes.

- **Metrics -** 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).

- **Saleability -** The product is highly saleable due to its role in preventing major damage to life and property. It also aims towards improving the road conditions at a faster speed which is one the most important needs of the hour.

- **Channels -** The distribution channels can be **direct-to-customer** and **selling through intermediaries** where the normal users can directly access the product or they can access it through any third party acting as a link between us and the customers.

Business Model

- **Opportunities -** As a service,Product etc.- the product is mainly a service being provided to the people for their safety and well being so our product could be considered as a welfare service.

- **Sources of revenue -** Our main mode of revenue 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.

- **Intended customer base -** Any person who uses a navigation app to travel, or even travels on the road in general is our intended customer. Normal users who can update the information regarding potholes is also our intended customer since customer feedback is an important element of this application. So this application has a large customer base.

Competition

- **Defensibility -** The defensibility of this product is high, this is the first solution to this problem which actually indicated the presence of any potential threat in the form of a pothole in real-time. We have various APIs to speed up the process of finding potholes for a moving person. It still hasn't been implemented by anyone yet, which means this product will be first of its kind ,which will lead to an influx of partnering companies and further a monopoly on the market. Any successors will only represent copies of our product and won't have the same market value as us.

- **Niche -** Our products niche market is the insurance sector as the information held by us will help the insurance companies in better decision and distribution of policies of vehicular insurances. It can used as an intermediate utility application for many existing companies as well as the new companies who might work on a similar solution in future.

Financial model and projections

- **Investment to develop- Material and manpower-** We don’t require much hardware for this product as it is completely a cloud based product. The only hardware we require are for development and maintenance of servers. We require capital for hosting of the services used by us. Capital is also required in the form of the cost of development hours put to take the product from idea to implementation with high accuracy.

- **Assumptions-** We assume the main load will fall upon our ML model ,so we will try to create many instances of it so that our product never succumbs to the number of requests and also keep working on to make it more accurate. We also aim to cater to a large audience so server load has to be managed so we would have to setup fast servers.

- **Return on Investment-** 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).

Competitive advantages

- **Partnerships -** We expect partnerships from navigational apps (like Gmaps , roads,etc) and other apps which use these apps (Uber ,ola) as not only does this increase the user experience, but also reduces risk factor while also introducing a new parameter which can be used to suggest routes.

- **Strengths of technology/Team (USPs) -** The strength of our technology is that we are catering to a larger audience and our deciding factor is actually the accuracy, efficiency and ease 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. Currently even the Google Maps show the route based on the time required to reach the destination and doesn't consider the road conditions particularly the potholes. 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.

Assumptions and risks

- **SWOT /PESTEL ANALYSIS -** As our product is first of its kind,we expect zero to none competition to it in this market. We will constantly work to make our product accurate, effective and user friendly.

- **CONCERNS and RESPONSES -** Scepticism by users towards using the apps is our biggest concern,as there might be users who say that they haven't been in a problem regarding potholes so it might not be useful. But just because you aren't affected by something doesn't mean the problem does not exist. Our app aims towards a collective public safety product rather than of an individual, as the people help each other by providing and using information provided by each other.

- **Risks and precautions -** There are risks of people's location getting leaked ,or creation of false positives by our ML model , but we'll be constantly working towards creating a better security and ML model system for out product. Another risk is related to the accuracy of the product in terms of the location since accuracy of location is an important factor for correctly determining the position of the potholes.

Summary

- **Elevator pitch -** We are concerned students of NSUT, who've seen far too many accidents happen because of people losing their balance/control over potholes that they didn't know existed there. Total 3,564 road accidents occurred in India due to potholes in the year 2020.

- These are just the serious one's,many other smaller accidents like tripping, damage to vehicle or mild impact are also caused by these potholes.

- We aim to create a (initially) free to use product where the drivers can track their live location on a 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 the busier roads.

Q&A

Q. Is the your product free?

A. Our product contains both free and premium features. Initially we plan to launch with the free features and eventually aim to incorporate premium features as well.

Q. Does your product work? Do you have a working prototype?

A. Yes, we have an initial working prototype which has been hosted on https://potholes.vercel.app/.

APPENDIX/BACKUP

Some reliable sources for information:

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[9] Moore v. Virginia Transit Co., (1948) 493, 50 S.E.2d 268. 188 (Va.) The U.S.A.
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