Vehicle Maintenance Prediction Service for Vehicle Booking Services

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Abstract

In India, the tourism industry, logistics and rentals are full of small to medium sized vehicle booking industry. Due to distinct geographies, uptime and maintenance of vehicles is not generally tracked. Some places incline can cause a lot of stress, in other places water damage can be a key issue. Also overloading of luggage is also a key issue. So, these trips causes a lot of continuous damage to vehicles. Here arises the uptime and repair cycle of vehicles. Now here a optimization problem arises, to do timely maintenance based on the amount of work put on the vehicle. Predicting the time can be learnt from ml model on previous repair history and kind of work load. Optimal servicing can reduce the repair cost and increase the uptime of vehicles.

1. Problem Statement

Vehicle renting is a very popular business in small to medium scale tourism ,general vehicle renting and logistic industry. The drivers are usually hired on a contract basis. The vehicle goes through series of work load - rest – work load. The optimum amount of time to service or repair is directly related to the past work load. So here we propose a ml model to predict servicing time on the basis of quantifiable workloads and prevent vehicles from getting permanently damaged.

2. Business need

The closest thing to such service is timely service provided by big automobile companies. For a personal car owner yearly maintenance is enough. But for heavy usage as seen in vehicle rentals, company based services are generally avoided due to cost. Instead they prefer third party garages only when there is problem. Instead of reacting to repair, we should be proactive to service. Predicting the service time is crucial to maintain the performance of vehicle, prevent permanent damage and reduce the need for replacing parts. So, here we intend to sell our predictive service to the rental owners so less amount of money is spent on repairs and the vehicle performs well.

3. Target Specification

Normally the higher amount of work load , more the data points we can use for input to our ml model. Everyday car owner has a static work load on which our ml model wont be useful. The car rentals usually generate a variety of data points such as passenger crowd overlimit or not, overloading, type of luggage, length of usage , terrain condition(wet, rainy, off-road, hilly etc.), driver's driving style etc. So car rental's generate a lot of data to make prediction for servicing. Hence our ideal customers are car rentals, booking services and logistic dealers.

4. External Searches

Various resources to understand the rental market, future scope of ai-ml in the automobile industry and real life product of predictive vehicle maintenance.

- Indian vehicle rental market
- Indian trucking industry
- How big automobile giants uses ml in the industry?
- One of the product that provides similar service

5. Benchmarking

There are few notable big start-ups in predictive maintenance(automobile) namely Upstream, Uptake etc. But they are aimed at needs of high end customers and are highly expensive.

Notable characteristics of these existing services:

- Use of complex technologies.
- IOT intensive.
- Expensive
- Only focuses on the data point generated from vehicle, not the task.
- Aimed at big automobile industry.

7. Application Regulations

- Data privacy laws.
- Data usage rights as per client's requirements.
- Small-medium industry regulations.
- Information Technology rules and regulation

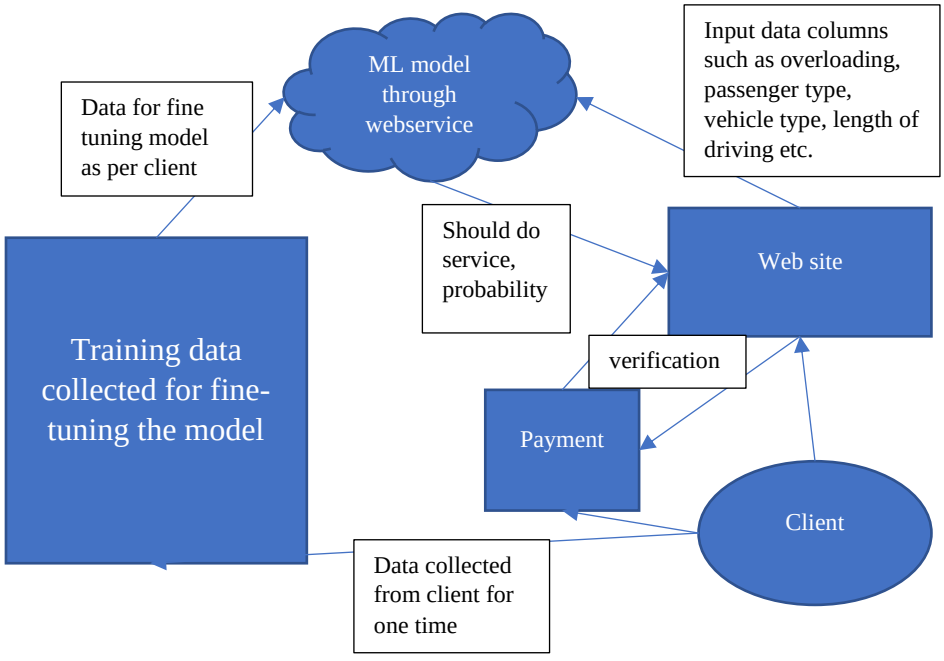
8. Application Constraint

- Creating standard input work load attributes.
- Data input from client side.
- Pre-processing and cleaning the data.
- Cloud and hosting costs for the webservice and website.
- Changing the mindset of clients from being reactive to proactive about repairs.

9. Business Model

1. The client approaches us through the web site.
2. Web-service based subscription model for using our tiered ml models.
3. For premium version , we provide a fine tuned model as per clients requirement.
4. Client after purchasing a subscription, can freely access the model through website.
5. Client receives probability based answer for to service or not.

10. Final Product Prototype



11. Product detail

The product will be a web service delivered through a website.

For the machine learning model, Logistic Regression will be used for a probability-based answer. Our input data will consist of multiple categorical columns such as overload,

passenger amt, vehicle type, road condition, current vehicle status, etc and numerical value such as weight, driven distance, time since last repair etc.

Data collection will be the challenging part as it requires collecting surveys from various car rentals and combining them together.

12. Conclusion

After going through the above points, it can be concluded that a predictive maintenance model for vehicles in Indian vehicle rental industry is feasible.