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| Capstone Project Proposal |  |

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**Business Goals**

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| **Project Overview and Goal**  What is the industry problem you are trying to solve? Why use ML/AI in solving this task? Be as specific as you can when describing how ML/AI can provide value. For example, if you’re labeling images, how will this help the business? | Over the years, there has been an increase in the usage of service robots for many domestic and industrial needs. They are deployed in a wide variety of applications ranging from simple household to a complicated medical environment. Service robots powered with artificial intelligence, using computer vision and deep learning, have also entered into logistics and delivery services, where they can make nearly human-level intelligent decisions. This creates a greater opportunity for companies to automate their operations to a great extent.  A service robot meant mainly for small deliveries would give them the comfort that they need and this would reduce the delivery and service charges from their total amount. Small deliveries here mean, an order with just one or two inexpensive items.  Our Goal is to make autonomous robot to deliver the food with using AI mapping and have a mobile app that have access:  o to track and control the robots  o to view the status of their deliveries  o to receive the passcode that open the robot  o to solve any bug happened fast |
| **Business Case**  Why is this an important problem to solve? Make a case for building this product in terms of its impact on recurring revenue, market share, customer happiness and/or other drivers of business success. | Small deliveries have always been a pain area for delivery companies due to its higher operating costs and low returns. This is also a problem for human workers who would not get a fair tip for their service and also for the customers who hesitates to make small orders from restaurants.  the operating costs of service robots would be insignificant compared to human. This allows Human also to focus on bigger and long-distance delivery orders which has a potential for a better tip for their service.  this tool should influence the revenue indirectly, by increasing the number of deliveries especially in the small food delivery segment or customers nears to restaurant. |
| **Application of ML/AI**  What precise task will you use ML/AI to accomplish? What business outcome or objective will you achieve? | AI/ML used here to predict the best and short route and can reroute if there is any bugs or mistakes.  Also, to detect objects and avoid it.  By:   * Binary obstacle detection if it clear or not. * Lane detection to move inline. * Real time image classification for object detection (traffic signs and pedestrians). * Connected with google maps for deciding the best and shortest route. |

**Success Metrics**

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| **Success Metrics**  What business metrics will you apply to determine the success of your product? Good metrics are clearly defined and easily measurable. Specify how you will establish a baseline value to provide a point of comparison. | The best business metrics in overall is the customer satisfaction and to sense that we solved a real problem and make it easy and we can measure it from:  •Receive Positive feedback from users and get 4.5 of 5 stars in stores.  •Because of a better arrival time and low cost without tip, there must be an increase in the small food orders from the customers by 15%  •Increasing in reorder by the same customer up to 20% |

**Data**

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| **Data Acquisition**  Where will you source your data from? What is the cost to acquire these data? Are there any personally identifying information (PII) or data sensitivity issues you will need to overcome? Will data become available on an ongoing basis, or will you acquire a large batch of data that will need to be refreshed? | There are many different sources for data like Kaggle but also, we need to train with real workplace for objects to increase detecting and avoiding and we will use Google maps and Google Assistant API to choose the right path and reroute.  There is no sensitive data or PII as it detects objects on its way to avoid and rerouting.  It would be an on-going learning as it learns every day every order by data that the robot can’t solve and needed the operation team to solve it and from various sources. |
| **Data Source**  Consider the size and source of your data; what biases are built into the data and how might the data be improved? | Firstly, there are different types of bias in ML/AI.  These are:  1. Sampling bias  2. Measurement bias  3. Exclusion bias  4. Experimenter or observer bias  5. Prejudicial bias  6. Bandwagon effects  as a note that the ML/DL is not likely to use any human-like common-sense reasoning, which is something not often pointed out about these AI-based systems.  So, we may face biases of: - if the road cut off, we need to decide rerouting  - if there is a cat or dog trying to play with the robot and the robot detects it as object and try to avoid and escape, may need human help.  - lighting conditions (based on data)  I think the best answer for size is “it depends”:  The complexity of the problem  The complexity of the learning algorithm  But in our case from 2 – 3 GB (different objects that can face the robot into its journey + google maps API for the region of work)  We have to collect data as we can to make it easy and work accurate without any bug, but things to be concerned that the robot may work in daylight or night so we need to make the data cleaned and balanced with images to work with the high precision and recall. |
| **Choice of Data Labels**  What labels did you decide to add to your data? And why did you decide on these labels versus any other option? | We will use multi-class labeling that the robot may found cars, recycling box, cats, dogs and peoples. So, we will need to add and educate the robot with all possible data  But we will need only 3 classifications:   1. Go Ahead (the area in front of robot is clear) 2. Stop and avoid obstacle 3. Stop and reroute (The route cut off) |

**Model**

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| **Model Building**  How will you resource building the model that you need? Will you outsource model training and/or hosting to an external platform, or will you build the model using an in-house team, and why? | The model can be built using the Google cloud platform AutoML or amazon sagemaker, which has lot of features to train the model with high accuracy as well. The trained model can be connected with the application. Once I am able to observe that I am able to do what I wanted to do, I will go over the metrics and see if the model is achieving the performance that would be good enough for me. If it is then I go ahead with the model, else I will try to see where I can improve the model like adding more data etc. If I am still not satisfied with the performance of the model, then I try to build the model using in house team as Automated ML tools do not perform well in all use cases. |
| **Evaluating Results**  Which model performance metrics are appropriate to measure the success of your model? What level of performance is required? | precision, recall, F1-score can be used. As it’s based on testing the model we built. And try to be as high as possible like above 98.0 or 99.0 %. |

**Minimum Viable Product (MVP)**

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| **Design**  What does your minimum viable product look like? Include sketches of your product. | The final product contains the robot and mobile app that allow me to control and get data from the robot. For example, we made the product for DoorDash company: |
| **Use Cases**  What persona are you designing for? Can you describe the major epic-level use cases your product addresses? How will users access this product? | As mentioned earlier this product for small deliveries a problem for human workers who would not get a fair tip for their service and also for the customers who hesitates to make small orders from restaurants.  Customer access this product throws the mobile application. |
| **Roll-out**  How will this be adopted? What does the go-to-market plan look like? | Prelaunch – Conduct market research, test the product enough, prepared to fulfill orders, generate awareness and hype.  Postlaunch – Monitor the product performance and keep continuously improving, talk to customers and get their requests, feedback and roll out new features, fix bugs if there are any. |

**Post-MVP-Deployment**

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| **Designing for Longevity**  How might you improve your product in the long-term? How might real-world data be different from the training data? How will your product learn from new data? How might you employ A/B testing to improve your product? | We can increase accuracy by learning from doing to improve routing and avoiding obstacle to deal with all kinds of input it can encounter and adding more features to the robot by using AI we can make this robot more interactive by talking with the customers and get direct feedback from them and  The A/B testing can be done until we achieve high  “Performance metrics” testing against statistically  significant sample size and running tests long enough to  capture any seasonality effects. |
| **Monitor Bias**  How do you plan to monitor or mitigate unwanted bias in your model? | We can go in steps:   1. Identification of unwanted sources of bias. 2. Identifying accurate representation of data.   3. Setting up proper rules and guidelines for  eliminating bias & procedures.  4. Documentation of how data is collected/analyzed  and shared.  5. Model evaluation for performance.  6. A thorough and proper review of models that are  being utilized in this project phase. |