**THESIS/Pre-Thesis REGISTRATION**

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| **TOPIC SUMMARY** | |
| **Topic** | **WASTE OPTICAL CLASSIFICATION MODEL** |
| **Field** | **Information Technology, Environment** |
| **Specialty** | **Internet of Things, Convolutional Neural Network, Object Detection** |
| **Keywords** | **Waste, Classification Model, Pollution** |
| **PROBLEM DESCRIPTIONS** | |
| 1. **Motivation**   Environment-related problems have been some of the most tedious challenges facing humanity in the 21st century. Besides some widely known difficulties such as greenhouse gas and water pollution, there is a lesser-known problem of the ever-increasing volumes of waste (excessive waste), which is a direct consequence as the global population and living standards rise. While recycling and other basic methods to treat waste have been introduced, the conversion of waste back to its constituent parts is still in its infancy.  Despite not being as toxic as industrial waste, municipal solid waste is listed as one of the main sources for human-caused methane emissions. Massive landfills are driving people from their homes, causing bad odour and pollution. Apart from the immediately noticiable problems, municipal solid waste is also the culprit for potential global issues such as the exportation of trash from rich countries to poorer nations.  With the aim to help reduce the amount of municipal solid waste by increasing the proportion of recyclables, we are proud to introduce a convolutional neural network (CNN) model to recognize and classify different types of waste to decide whether a piece is recyclable or not.   1. **Objectives**   The model aims to reduce the amount of disposable waste by recognizing, tracking, and calculating the percentage of reusable/recyclable waste within the mass, hence serves as the early stage for waste classification. Through the collected data and derived results, we can further analyze and set priority for individual areas/bins/etc for collecting and recycling, as well as implement the model into a system of larger scale.   1. **Methodology**   As mentioned before, there are several ways to reduce the volume of municipal solid waste, among which is increasing the efficiency of recycling activities. One way to know which waste should be prioritized to categorize and recycle is by analyzing how “recyclable” is that portion of trash with the help of technology, or in this case, a machine learning model powered by Torch7 framework for Lua. The proposed 11-layer CNN model involves support vector machines (SVM) with scale-invariant feature transform algorithm (SIFT) to help build a set of keypoints for each picture in order to recognize and classify the objects from image inputs.   1. **Expected results**   The model is expected to perform with acceptable accuracy (>90%) while maintaining its lightweight and robustness. It should be built in a way to make it easy to retrain and to add more categories if needed. In practice, the model should have the flexibility to be scaled for bigger system if necessary. | |
| **WORK PLAN** | |
| |  |  |  | | --- | --- | --- | | **Week** | **Date** | **Task** | | 1 |  | Initialize the work. Read the documents. | | 2 |  | Learn about the model, confirm any unclear points. | | 3 |  | Gather datasets and process the data. | | 4 |  | Experiment and work on the model. | | 5 |  | Complete the model and build the model. | | 6 |  | Observe and rate the model’s performance. | | 7 |  | Optimize the model. | | 8 |  | Optimize the model. | | 9 |  | Retrain the model and rate the model’s performance. | | 10 |  | Write documents and report form. | | 11 |  | Revise the report | | 12 |  | Complete the report and submit the report. | | 13 |  | Reserved | | 14 |  | Reserved | | 15 |  | Reserved | | |
| **COMMITTEE APPROVAL**  **Student signature:**  **Advisor signature:**  **Approval Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Committee Chair:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | |