CS 490 Capstone Project Proposal

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In this capstone project, we propose to design and develop a Windows application called SmartBin using a DETR R50 model from GitHub that is similar to Qualcomm's AI hub model. The application that we plan on developing pertains to detecting recyclables, more specifically in detecting bottles and cans from trash. Our key feature for this software is to detect items that should be labeled as waste (i.e. bottles and cans). It operates as a scanning feature that identifies waste, and recyclable items to detect a scene that has waste. This application addresses the inefficiency in our current waste/recycling system, where only a fraction of waste gets disposed properly. By employing a DETR models, our goal is to reduce the amount of improperly sorted waste, hence improving the overall efficiency of waste management systems. Ultimately, we intend to enhance recycling accuracy, reduce contamination, make the waste management more autonomous, promote sustainable waste practices for the future and use Qualcomm AI models to improve the state of the world.

We intend to deploy the Detect-Waste DETR R50 object detection model for our application as object detection is optimal for identifying recyclable and waste materials. We think object detection will be ideal for this application. We would then upload this model to Qualcomm AI Hub to run on Qualcomm products. We will use a Docker to ensure that our application to runs consistently across different systems. The project will be developed for the Snapdragon X Elite Processor. We will write the code in C++, using the ONNX Runtime for our interface API and OpenCV for handling the camera interface. We plan to implement OpenCV to provide a live camera feed allowing for our AI model to recognize objects that can be categorized as a recyclable item. Initially, we intended to use the COCO dataset for the model, but we plan to use a more specific dataset such as detect-waste DETRR50 model, which is better suited for our application. If a recyclable object is found it would be labeled and the user will be notified on which items can be recycled. When a recyclable item is identified and sorted. The application will highlight these objects for easier identification. The Dataset we plan on using is the data sets offered by the detect-waste DETRR50 model since this model is already trained in datasets that cater to detecting trash, as well as trained in the COCO data set. Hence, more catered to our project.

Our team includes four senior Computer Science students, including one who initially majored in Software Engineering before switching to computer science as well. All members have experience developing Windows application using C++ and Java, proficient in scripting languages such as Python. All members have completed courses that include collaborative projects that helped train us to solidify our core skills. Especially, the soft-skills necessary to function in a group setting such as using effective communication, developing timelines and goals, use of methods such as agile development, and good time-management. Additionally, since we have worked on prior web-development projects in the past in a group setting we have a strong hold on collaborative coding. Furthermore, we have developed good habits and prioritization when it comes to having solid documentation. All members are familiar with unit testing and debugging. All members promise to maintain good time management,

communication, meeting deadlines, presentations, professional presentations, and task delegation. All members have experience using version control systems such as GitHub, to collaborate effectively on projects. Each member has taken AI and Deep Learning courses, providing us a solid foundation with AI. One member has expertise in software testing and quality assurance.