



INTISARI

Saat ini dunia sedang menghadapi berbagai masalah, salah satu masalah tersebut adalah timbunan sampah yang terus menumpuk. Timbunan sampah semakin bertambah seiring dengan bertambahnya populasi manusia di dunia. Timbunan sampah dapat menjadi ancaman bagi manusia di bumi. Beberapa masalah serius seperti polusi lingkungan, masalah kesehatan, dan masalah ekonomi dapat timbul dari timbunan sampah. Salah satu langkah yang dapat dilakukan untuk mengurangi timbunan sampah adalah daur ulang. Proses daur ulang sampah berbeda-beda tergantung dari jenisnya. Namun, kenyataannya sampah tidak terpisah-pisah sesuai jenisnya saat dibuang dan kepedulian masyarakat mengenai pengelolaan sampah masih rendah. Proyek *Capstone* ini menawarkan solusi untuk mengefisienkan proses pemilahan sampah secara otomatis dan mengubah kebiasaan baru memilah sampah sebelum dibuang. Metode deteksi objek dengan *deep learning* digunakan dalam mewujudkan solusi tersebut. *Deep learning* digunakan karena kemampuannya yang dapat menemukan *feature* secara otomatis. Metode deteksi objek *Single Shot multibox Detector* (SSD) MobileNetV2 FPN dipilih karena metode deteksi objek diimplementasikan pada *Single Board Computer* (SBC) dan harus dijalankan secara *real time* sehingga beban komputasinya harus ringan. Keluaran proyek ini adalah model deteksi objek yang disimpan dalam format Tensorflow dan Tensorflow Lite. Model deteksi objek yang dihasilkan mendapatkan rata-rata akurasi sebesar 83,2% dan presisi sebesar 88,85% ketika diuji untuk mendeteksi empat jenis sampah (kaca, kertas, metal, dan plastik). Untuk meningkatkan performa model dapat ditambah *preprocessing contrast stretching*, tapi peningkatannya kurang signifikan.

Kata kunci : *Deep Learning, Single Board Computer, Single Shot multibox Detection (SSD), Timbunan Sampah*



ABSTRACT

There are many problems in the world today. One of them is waste that has been dumped. As the world's population grows, so does the amount of waste produced. Dumped waste can endanger human life on Earth. Various issues may arise, such as environmental pollution, health problems, and economic problems. One solution that can be chosen is recycling waste. The process of recycling depends on the type of waste, so waste must be separated first. However, in reality, waste is not separated according to its type when disposed of and public awareness of waste management is still low. This Capstone Project proposes an alternative method for streamlining the sorting process and instilling the habit of sorting waste before disposal. Object detection with deep learning is used to realize that solution. Deep learning is used because of its ability to find features automatically. Single Shot multibox Detector (SSD) MobileNetV2 FPN object detector was chosen because it was implemented on a Single Board Computer (SBC) and had to be run in real time so that the computations had to be light. The output of this project is an object detection model saved in Tensorflow and Tensorflow Lite formats. The model that was trained achieves an accuracy of 83.2% and a precision of 88.85% when tested to detect four types of waste (glass, paper, metal, and plastic). To improve model performance, preprocessing contrast stretching can be added, but it does not increase significantly.

Keywords : *Deep Learning, Dumped Waste, Single Board Computer, Single Shot multibox Detection (SSD)*