# Research on logistics package detection system based on lightweight MobileE-YOLOv8

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***Abstract*—In order to improve the intelligent sorting and transportation capabilities in warehousing and logistics, and solve the problem of difficult algorithm deployment on mobile devices. This paper proposes a lightweight YOLOv8 network that can quickly realize express parcel detection and sorting. First, the MobileNetv3 network is used to replace the backbone network of YOLOv8. Secondly, in order to improve the feature extraction ability of the network, the neck network is optimized, and the C2f fusion attention mechanism ECA is used to construct a feature extraction module, which effectively solves the problem of small defect features being difficult to extract under complex backgrounds. According to experimental verification, the MobileE-YOLOv8n model constructed in this paper has a 60.4% reduction in parameters compared to the YOLOv8n model, and the detection speed of the source code has been greatly improved. The amount of computation has been reduced by 65.4%. In addition, the size of the weight file is only 2.7M, which is 57.1% less than the source code, and (mAP@0.5) has only decreased by 3.4% compared to the source code. The network constructed in this study is characterized by fast recognition speed and few network parameters. It can complete real-time target detection on embedded devices and can provide key technologies for the express parcel detection industry.**

***Keywords-YOLOV8 model; MobileE network; lightweight network; logistics sorting;***

## I. INTRODUCTION

In 2023, China's economy gradually recovered after fluctuations, stabilizing factors gradually accumulated, and the operating environment of the logistics industry continued to improve. With the increase in the volume of goods transported on the logistics sorting line, smart logistics construction faces higher requirements, especially in improving the automation and intelligence of goods circulation, which is the focus of current research [1]. Since 2019, the "matrix + small machine" sorting mode has been popularized in the industry, and the logistics industry has gradually developed to unmanned, and from 2022, Shanghai FedEx has launched the AI-driven DoraSorter intelligent sorting robot to cope with the growing e-commerce freight volume. At present, the methods for recognizing the label text of items in logistics sorting lines mainly include optical character recognition (OCR [2]) method and deep learning method.

Although OCR can be used to recognize text image files of various sizes and fonts, OCR technology still has limitations in complex lighting and deformation recognition. With the rapid development of artificial intelligence and deep learning technology, a new door has been opened for computational optical imaging technology. Deep learning algorithms are gradually replacing traditional algorithms. Deep learning algorithms are divided into two categories: one-stage networks (YOLO [3], OverFeat and SSD, etc. [4]) and two-stage networks (R-CNN, SPP-Net, Fast R-CNN and R-FCN, etc. [5]).

Deep learning methods improve recognition accuracy and robustness through deep neural networks. They are applicable to complex text images and provide new ideas for solving the “last mile” delivery problem in logistics [6]. However, visual recognition algorithms still face challenges such as high real-time performance, light weight, and high accuracy on mobile platforms. Therefore, it is necessary to continuously streamline the design, reduce the number of parameters, ensure high accuracy, and effectively improve the intelligent operation of logistics.

There are still some challenges in applying visual recognition algorithms to the mobile platform of the logistics system: the visual recognition algorithm must have high real-time performance. At present, most algorithm research is mainly concentrated on the PC side, the model is generally large, and the performance requirements of the CPU and GPU are relatively high; secondly, the visual recognition algorithm must be lightweight. Training a model with good performance often requires a large number of samples, and most current target detection algorithms often have more network parameters if they want to have higher accuracy. Therefore, it is necessary to streamline the algorithm design and reduce the number of model parameters to ensure higher accuracy. The mobile platform can automatically obtain target information and promote more intelligent operation of the logistics system.

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