

Deep Learning-Based Object Detection on Low Quality Images: A Case Study of Real-Time Traffic Monitoring

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Abstract : The installation and management of traffic monitoring devices can be costly from both a financial and resource point of view. It is therefore important to take advantage of in-place infrastructures to extract the most information. Here we show how low-quality urban road traffic images from cameras already available in many cities (such as Montreal, Vancouver, and Toronto) can be used to estimate traffic flow. To this end, we use a pre-trained neural network, developed for object detection, to count vehicles within images. We then compare the results with human annotations gathered through crowdsourcing campaigns. We use this comparison to assess performance and calibrate the neural network annotations. As a use case, we consider six months of continuous monitoring over hundreds of cameras installed in the city of Montreal. We compare the results with city-provided manual traffic counting performed in similar conditions at the same location. The good performance of our system allows us to consider applications which can monitor the traffic conditions in near real-time, making the counting usable for traffic-related services. Furthermore, the resulting annotations pave the way for building a historical vehicle counting dataset to be used for analysing the impact of road traffic on many city-related issues, such as urban planning, security, and pollution.

Keywords : traffic monitoring, deep learning, image annotation, vehicles, roads, artificial intelligence, real-time systems

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