CCTV Cameras as Sensors

Yaw Adu – Gyamfi and Anuj Sharma

Abstract

Transportation agencies and Departments of Transportation (DOTs) rely on a dense network of CCTV cameras primarily for real time viewing and monitoring of traffic conditions on roadways. Very minimal to no automated analytics is performed on such high-valued asset. This paper develops a computer vision system that leverages recent developments in high performance computing and advanced machine learning algorithms to maximize the use of data streaming from CCTV cameras. The system will provide various video analytic capabilities that will enable CCTV cameras to automatically extract important traffic information: traffic data (volume, density, speed and vehicle classification), traffic condition (congested, stalled vehicle, free – flow) and road condition information (snow, wet or dry pavement). To achieve this, first, a large-scale dataset is prepared for fine-grained object detection and classification. Next, the dataset is used to train and validate a deep neural network on a Graphical Processing Unit (GPU) cluster. The resulting model is then used to develop applications based on principles of traffic flow theory to automate the processing of real time video feed from the CCTV cameras.

Key Words: Computer Vision, CCTV, Deep Neural Networks, Traffic, Transportation, Graphical Processing Unit.