Session Oral 13 (8/9 Fri. 10:20 – 11:20)

Session Topic: Design and Implementation of Deep Learning Based Object Detection Technologies

Session Chair: Kuan-Hung Chen (Feng-Chia University) and Chih-Peng Fan (National Chung Hsing University)

Room: 6F 樂廳

1. 10:20 – 10:32 (SC31) Drunk Driving Detection from Face Images Using Deep Neural Networks

   Chia-Yu Wang, Te-Yun Ma, and Robert Chen-Hao Chang

   National Chung Hsing University

   Drunk driving usually leads to severe injury or death accidents. Regulations set by government are to prevent it from happening. Thus, this paper will introduce the drunk driving detection system using facial images captured by a webcam. The Breathalyzer was used to label the data to be drunk driving or not. The deep neural network is trained to have the ability to identify whether the individual is drunk driving

or not. This resolves the issue of traditional machine learning not being general enough. Experimental results show that the proposed detection system can have better validation accuracy and test accuracy than other works.

2. 10:32 – 10:44 (SC32) Pedestrian Direction Detection Using YOLO-Based Deep Learning Networks

Shih-Chieh Lin, Min-Chi Lin, Yin-Tsung Hwang, and Chih-Peng Fan

National Chung Hsing University

In this paper, a simple and effective deep learning based detection and recognition design by YOLO (You only look once) network is studied for pedestrian direction detections. The proposed image-based detector provides both information of directions and positions simultaneously for pedestrians when the intelligent self-propelled vehicle is moving in crowds. In experimental results, the performances of precision and recall are shown by using the proposed YOLO-based design.

3. 10:44 – 10:56 (SC33) Car Collision-Avoidance Warning System with Deep Learning on Portable Devices

Chuan-Wei Huang, Yu-Hau Huang, Yu-Chieh Chung, and Yeong-Kang Lai

National Chung Hsing University

Developing car collision-avoidance warning system on portable devices aiming to alert drivers about driving environments has become more and more popular. In these systems, robust and reliable car detection is a critical step. This paper presents a vision-based vehicle detection system using a deep learning approach on portable platforms. We focus on the mobile system with camera which is mounted on the vehicle. Integrating detection with tracking is also discussed to illustrate the benefits of deep learning for car detection. Finally, we present the high efficient experimental results based on a portable device mounted on a car. The proposed car collision-avoidance warning system is suitable for selfdriving car applications.

4. 10:56 – 11:08 (SC34) A reconfigurable processing unit hardware design for AI accelerator

   Ching-Shun Wang, Yu-Cheng Hsueh, Hui-Ru Chung, and Chung-Bin Wu

   National Chung Hsing University

   In this paper, a reconfigurable and high-throughput processing unit hardware design for deep learning neural networks accelerator is proposed. To reduce data access between DRAM and processing unit, high data reuse and high computational unit usage architecture are provided. The architecture proposed in this paper implements a Quantization aware INT8 precision, 64-bit AXI bus protocol, and parallel processing with 72 sets of processing units. In this architecture, the internal memory usage is 200 Kbytes, the proposed design working at 100 MHz operating frequency can provide 12.5 GOPS throughput and the average operating unit usage rate is 98.82.

5. 11:08 – 11:20 (SC35) Design and Implementation of Visual Deep Learning Network via HLS

Yu-Ta Lu, Wen-Shen Gu, and Kuan-Hung Chen

Feng-Chia University

Object detection is a technology in the very first priority for machine to become intelligent. Deep learning algorithms have brought obvious detection performance improvement; however, the accompanying huge model size in terms of hundreds of layers and thousands of megabytes of weights sticks the step of physical realization. This article describes the design and implementation in hardware for image recognition with CNN model. It details the design process of hardware accelerator. Instead of manually coded Verilog, the High Level Synthesis (HLS) tool is adopted to generate RTL code used on FPGA to conquer the challenging gap between deep learning algorithm and customized hardware. As a result, a compressed CNN model, i.e., the Agile model [1], with a small size of only 2189KB can be successfully applied to FPGA PYNQ-Z2 for recognition of car, motorcycle, bus and pedestrian.