

# Efficient Multi-Functional Convolutional Neural Network for Embedded Automotive Vision Algorithms

The Oakland University and School of Engineering and Computer Science communities are invited to attend Iyad Mansour's defense of his Ph.D. dissertation. Seating is limited. RSVP with Katie Loodeen at loodeen@oakland.edu.

## Efficient Multi-Functional Convolutional Neural Network for Embedded Automotive Vision Algorithms

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In recent years we witnessed massive improvements in the field of deep learning, neural networks, and especially in the sector of computer vision, speech recognition, character recognition, etc. With the extraordinary increase in the amount of data available on the internet for computer vision, and language reliant tasks in the form of videos, web based data etc., labelled and ready to use for specific tasks, and with the increase in computational power of high performance hardware, the neural networks are surpassing their performance.

The computer vision industry is relying more and more on Artificial Intelligence (AI) to process data generated by Cameras, LIDAR and Radar sensors. Neural Networks (NN) have been specifically successful in processing image data and to perform classification tasks in a way that now exceeds human classification capabilities. Traditional Convolutional Neural Networks (CNNs) based algorithms require significant use of Central Processing Units (CPUs) cycles and/or Graphics Processing Units (GPUs). The majority of these CNN models are built to operate on laptops or server like solutions that are not limited by the amount of CPU/GPU available for processing. In several industries (automotive, aerospace, medical, etc.) it is necessary to operate in an environment that is limited in processing power, and current consumption, for these reasons, server-based AI solutions are not always practical. In this work, I propose a new convolutional neural network model as a viable option to reduce the overall memory requirements and execution time while maintaining the required accuracy. The Efficient Multi-Function Convolutional Neural Network (EMF-CNN) is optimized for automotive grade embedded System on a Chip (SoC) solutions that limit the computational, current consumption, and thermal output of the system.

**Time:** 10:00 AM – 12:00 PM  
**Date:** Thursday, March 7, 2019  
**Location:** 347 EC

