Senior Design Project Description

Company Name	Internal ECE Dept.	Date Submitted	May 09, 2020
Project Title	Artificial Intelligence for Smart Cities **(UNCC_CITY2)**	Planned Semester	Fall 2020, Spring 2021

Personnel

We expect 250 hours per person.

Discipline	Number	Discipline	Number
Mechanical		Electrical	
Computer	4	Systems	
Other ( )			

Project Overview:

With the expansion of Internet of Things (IoT), computer engineering and science is moving toward the era of IoT-based distributed computing. At the same time, Embedded computer vision is considered one top-tier, fast-growing area. Embedded vision refers to the deployment of visual capabilities to embedded systems for a better understanding of 2D/3D visual scenes. By augmenting the IoT devices with vision processing capabilities many new opportunities and interesting application will be emerged which can elevate the impact of technology in our modern society to the next level.

The aim of this project is to create a distributed IoT system with capabilities to run distributed vision processing across multiple IoT devices. The students will create a network of embedded devices for pedestrian detection, tracking and action recognition across multiple cameras. The students will work with multiple boards including Nvidia Jetson Xavier as the IoT devices with the capability of running embedded vision applications. At the same time, the students will create synthetic data set with the label information to enable the learning of Artificial Intelligence (AI), and machine learnings used in this project. At the same time, students will have a chance to work with thermal cameras on also understanding and extracting the body and facial temperature of individuals in community environments to help the mitigation and control of pandemics.

Learning opportunities in this project are many! Overall, accepted student candidates will have a chance to work with Nvidia Jetson platforms, and GPUs platform and learn the basics of Artificial Intelligence and computer vision in a very practical way. The results of this project can be magnificent used for a diverse set of applications required distributed vision processing in a large geographical area. Application examples are video surveillance, smart manufacturing and smart and connected communities.

Initial Project Requirements:

The students will work with Nvidia Jetson Xavier boards, embedded cameras, and wireless routers

and modems. The equipment's would be available in my research lab. The students also can use the space available in my research lab to conduct their research. Also, students will able to use the lab servers and computers for development and simulation.

Expected Deliverables/Results:
The students will deliver a implementation of a distributed vision processing over multiple IoT devices. In addition, the students will deliver the created and labeled video dataset for multiple pedestrian detection, tracking and action detection / recognition.

Disposition of Deliverables at the End of the Project:
A prototyped model of the proposed IoT system with multiple embedded vision devices (Nvidia Jetson Xavier) with capability of distributed pedestrian detection and tracking will be demonstrated.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):
Basic knowledge of C++is a MUST. The students must take the computer architecture course (ECGR 4181) as co-requisite or pre-requisite. Also, the basic understanding of OpenCV, Python programming, embedded systems, Linux operating systems, and computer networks will be beneficial.