

## **COSC 6373: Project**

**Title:** UAV Tracking for Smart Cities

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### **1. What will the students learn?**

- The students will become familiar with Deep Learning methods involving video
- The students will get a good understanding of the problem of Pedestrian Identification
- The students will become familiar with Computer Vision methods involving obstruction, motion, and angle of capture from an elevated platform.

### **2. Motivation**

Pedestrian identification has become increasingly important, particularly to enable smart cities. While mounted cameras exist in many cities, use of unmanned aerial vehicles (UAV), such as drones, is becoming increasingly common. The first step to enabling use of video footage, from these types of elevated platforms, is to perform pedestrian detection. This step will then enable other tasks such as pedestrian tracking. For example, imagine a situation in which a pedestrian being hit by a car could be detected, so that emergency services could be automatically dispatched to the scene.

### **3. Problem Statement and Overview**

This project will address two related challenges: (i) pedestrian detection; and (ii) pedestrian re-identification. Specifically, once a unique pedestrian has been detected in a video, is it possible to re-identify them (as the same individual) should they be occluded momentarily from the camera view? The project must be able to re-identify a pedestrian given the two primary types of occlusions: (a) person-person occlusion; and (b) person-object occlusion.

### **4. Project Objectives**

There are two main objectives of the project. First, detection of unique individuals must be performed, relative to other pedestrians in the scene. Second, re-identification of an individual must be performed, in the presence of occlusions. If an individual is detected once, then lost temporarily, the methods must successfully identify them again as the same individual.

### **5. Suggested Methodology**

Methods of identification in computer vision are based on the creation of an 'identifier'; some form of compact representation of the detected object or person. However, identifiers built from full-body views of an individual may fail when they are occluded. Given a partial view of a subject, it is often possible to make assumptions about certain characteristics or properties that are hidden from view, such as their pose. While a simple example, this illustrates the possibility of piecemeal methods of identification. These serve as a way to construct 'master' identifiers for an individual.

### **6. Tasks**

- T.1. Register for and download the dataset
- T.2. Choose the best performing method for pedestrian re-identification in the literature

- T.3. Understand and re-implement the method
- T.4. Evaluate the method

## 7. Potential Roadblocks and Barriers to Success

Compute time may be required for the project in order to process video (mp4) data.

## 8. Deliverables (Minimum)

ID	Deliverable Description	Type	Phase Duration
D.1	Midterm Presentation	Presentation	6 Weeks
D.2	The source code for the method	Source Code	12 Weeks
D.3	A report describing the implementation of the method as well as evaluation results	Report	12 Weeks
D.4	Final Presentation	Presentation	12 Weeks

## 9. Data Requirements and Availability

Dataset used will be P-DESTRE [1]. Team is encouraged to register and gain access to the dataset as soon as possible.

## 10. Prerequisite knowledge

- Python
- Deep Learning Framework (e.g., Tensorflow, MXNet, Pytorch)

## 11. References

- [1] S. V. A. Kumar, E. Yaghoubi, A. Das, B. S. Harish, and H. Proença, "The P-DESTRE: A Fully Annotated Dataset for Pedestrian Detection, Tracking, and Short/Long-Term Re-Identification From Aerial Devices," *IEEE Transactions on Information Forensics and Security*, vol. 16, pp. 1696–1708, 2021, doi: 10.1109/TIFS.2020.3040881.