**GOAL : DYNAMIC TRAFFIC LIGHT CONTROL USING AI**

**Tasks:**

* Find optimum object detection method.
* Is it better to use one microcontroller per intersection or one microcontroller per signal?
* Find object tracker.
* **Detection of emergency vehicles.**
* Can it be trained?
  + Data to be trained
* How to use a video as input to the model.
* Logic for determining the signal green time.
  + Comparing the traffic of all the signals.
* Controlling the red and green time.
* Communicate with other signals.
* Upload data to cloud.
* Hardware used for communicating between signals.
* **Object Tracker: (**<https://www.pyimagesearch.com/2018/07/30/opencv-object-tracking/>**)**

1. Boosting : Based on haar, OLD, slow.
2. MIL : Poor at reporting failure.
3. **KCF** : Faster but low accuracy, Does not handle full occlusion well.
4. **CSRT** : High Accuracy, KCF but slightly slower.
5. MedianFlow : Nice job reporting failures, if there is too large of a jump in motion, such as fast moving objects, or objects that change quickly in their appearance, the model will fail.
6. TLD : Prone to False-Positive.
7. **MOSSE** : Fastest of all, not as accurate as CSRT or KCF.
8. GOTURN : (<https://www.learnopencv.com/goturn-deep-learning-based-object-tracking/>)

Links :

* Open CV for Rpi
  + <https://heartbeat.fritz.ai/real-time-object-detection-on-raspberry-pi-using-opencv-dnn-98827255fa60>
* Virtual environment for Rpi
  + <https://grantwinney.com/how-to-create-a-raspberry-pi-virtual-machine-vm-in-virtualbox/>

**Dynamic Traffic Control using AI – Research.**

Link: <http://www.bbc.com/future/story/20181212-can-artificial-intelligence-end-traffic-jams>

Summary:

Siemens Mobility has built a prototype monitoring system that that uses AI through traffic cameras. Traffic cameras automatically detect vehicles and this information is sent back to a central control centre where algorithms estimate the density of traffic on the road. The system then alters the traffic lights based on real-time road congestions.

To respond in this way, however, requires data. A lot of data. Fortunately, this is not something in short supply. There’s lots of information from traffic monitoring systems, road infrastructure, cars and drivers themselves via their mobile phones.

Researchers at The Alan Turing Institute in London and the Toyota Mobility Foundation recently launched a new project together that is exploring how traffic management systems can become more dynamic and responsive through the use of AI. They are currently using simulations that scale up in complexity and evolve, helping their algorithms to learn how to predict changes in the traffic. Although they are still testing the system, they hope to soon apply their systems in the real world.

In Pittsburgh researchers are already working with city managers on a similar approach that has been operating in the city since 2012. An adaptive traffic control system developed by researchers at the Robotics Institute, Carnegie Mellon University, has been rolled out around the city by a company called Rapid Flow Tech. Their [Surtrac](https://www.rapidflowtech.com/surtrac) technology is being used at 50 intersections in Pittsburgh and since launching, it has reduced wait times at intersections by up to 40%, according to the company. It also claims that journey times in the city have fallen by 25% while vehicle emissions have dropped by up to 20%.

The system uses video feeds to automatically detect the number of road users, including pedestrians, and types of vehicles that are at an intersection. The AI software then processes this information second by second to come up with the best way to move traffic through the intersection, changing traffic lights depending on the most optimal way of keeping traffic moving. Decisions can be made autonomously, and shared with neighboring intersections to help them understand what is coming their way.

In Hagen, Germany, they are using artificial intelligence to optimize traffic light control and reduce the waiting time at an intersection. Simulations suggest it can decrease waiting times at lights by up to 47% compared to a traditional pre-timed signal plan.

The system is already predicting traffic conditions 15 minutes in advance with 89% accuracy compared to what happens in reality.