A severe problem the United States faces every summer is the negligence of toddlers and pets in hot cars. This phenomenon is a deadly yet consistent source of casualties during hot summers, costing an average of 37 toddlers and over 120 pets’ lives each year. Exposed to those statistics, our team was determined to develop an affordable and easily accessible device that can potentially reduce loss of so many lives.

The purpose of this project is to notify the operator of any living being present in the car when he/she leaves the vehicle. The device uses the car’s power supply to turn on once the car is off. Then, if there is any object that emits heat (infant or pet for example), the system will notify the user via text or email within a minute along with an image and description.

**Challenges**

**Wi-Fi Dependency:** Since the Raspberry Pi does not support connection to cellular networks, the current system is depending on the connection of Wi-Fi. To improve this prototype there is a need of a simple GSM module that is easily attached to the RPI3.

**Power Source:** Since most cars have different circuit schematics, it was challenging to develop a universal method of powering up the device. For this project, we used a designed the device for a specific model.

**Device Placement:** Each considered location had pros and cons; and while the side placement favored the thermal sensor, the dash board placement offered a good camera angle and decent sensor readings.

**Sensor Understanding:** Without thorough tutorials or guides, there was a need of a comprehensive understanding of the way MLX90621 works.

**Neural Network Development:** A self-construction of convolutional neural network produced unsatisfying results. Pre-trained model was used instead.

**Thermal Sensor:** small size, low cost 16*4 pixels IR array. It offers vision in 60 degrees and reads temperatures between -40 and 85 degrees centigrade.

**Notification:** SMTP (Simple Mail Transfer Protocol) is a standard instant messaging protocol that is able to send emails from an email server over a TCP/IP connection.

**Camera Reading and Object Recognition:** Logistic Regression and Convolutional Neural Networks. Initially with fewer classes logistic regression was an easy and well performing solution, but as the number of classes grew, we were forced to move to a more involved Convolutional Neural Network. The CNN was trained and tested with 400 sample images of 8 classes. The device takes a picture every 15 seconds and processes it as a test image, showing the prediction in the notification.

**Power Source:** Car Occupancy Reporter is connected to a car's electrical lines that go “hot” when the car is turned off.

**References**

- Melexis MLX90621 Developer Manual
- TensorFlow Documentation
- IMTP Manual
- Raspberry Pi Manual