

DEEPEYE // Your Personal Copilot

A Capstone Project By
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Abstract

DeepEye is a driving copiloting system which uses a combination of computer vision and Artificial Intelligence techniques to:

- Detect and classify the following objects in and around the road: vehicles, bikes, pedestrians, stop signs, and traffic lights;
- Detect lanes and determine if the driver is in them;
- Detect possible imminent forward collisions;

All of this information is displayed on an interface that could be on a drivers dashboard in order to notify them.

Research

Our research comprised several academic sources, including Google and Microsoft. Important insights we gathered:

- **CNNs** are best at object detection;
- **TensorFlow** provides pre-trained models and Feature Extractors;
- Photorealistic environments (like GTA) can be effective as well;

Methods

The **DrivingAssistant** class controls the program

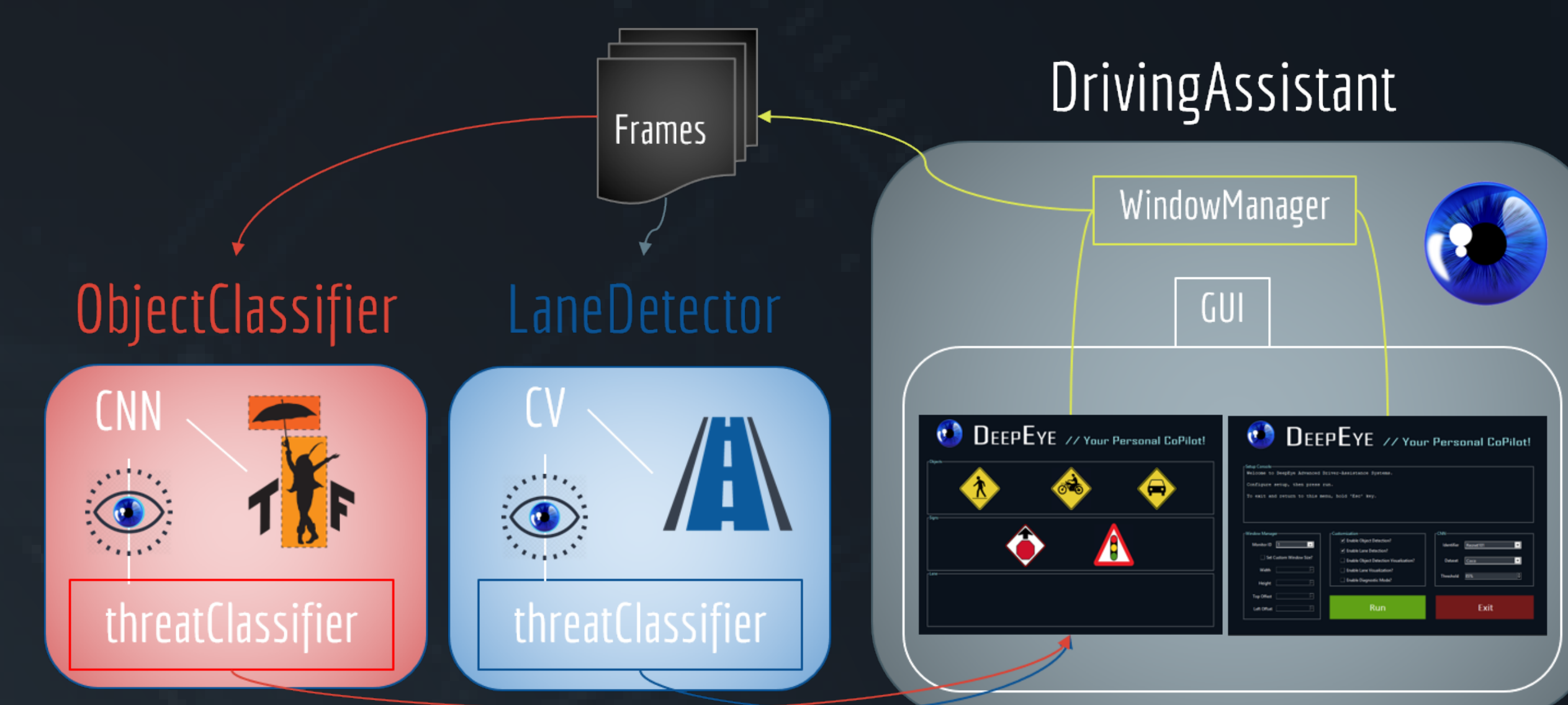
- Manages frames analyzed by the program;
- Controls GUI which allows user interaction;

The **ObjectClassifier** is a Deep Convolutional Neural Network

- Analyzes frames for objects;
- Icons pop up in the interface when a corresponding object is identified through the threatClassifier;
- If object is within a certain small region at the bottom of the frame, collision warning is given;

The **LaneDetector** uses OpenCV filters to detect road lanes

- An icon will be displayed in the interface corresponding to the driver's position in the lane;



Results

We tested with two environments:

- **Grand Theft Auto V**, for a variety of environments, times of day, and weather conditions;
- Stock **Dash Camera Footage**, for more realistic driving;

We compared two data logs; One created by the program listing relevant objects on the screen, and one filled out going through each frame.

GTA-V

Overall Performance	
≅ 30 (minutes)	
count	422 frames
mean	0.874596
std	0.114521
min	0.428571
25%	0.857143
50%	0.857143
75%	1.000000
max	1.000000

Dash-Cam

Overall Performance	
≅ 26 (minutes)	
count	274 frames
mean	0.915537
std	0.114775
min	0.428571
25%	0.857143
50%	1.000000
75%	1.000000
max	1.000000

