Object Tracking and Detection Research Project

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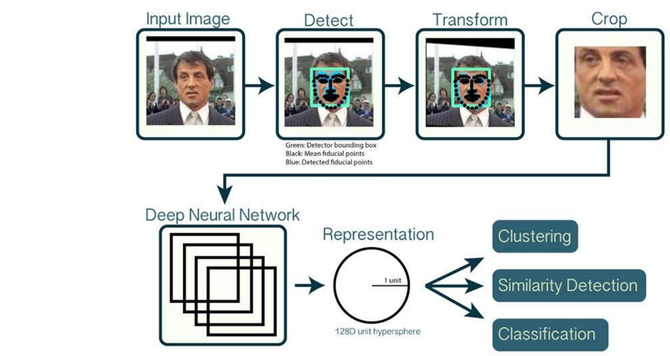
INTRODUCTION

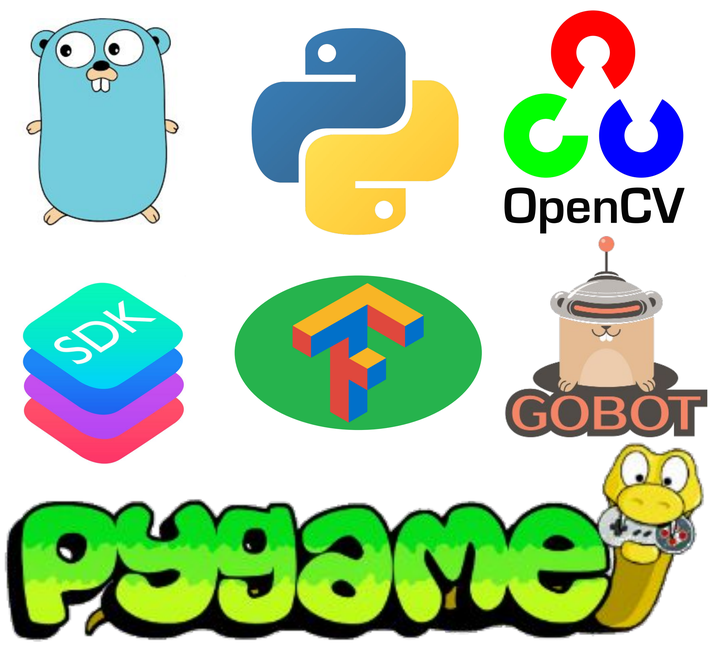
Premise: We wanted to experiment and research the integration of drone image capture and different machine learning and artificial intelligence models. The crux of our research was around deciding which machine learnings models were most interesting and most feasible to implement given our time frame

Facial Recognition Implementation

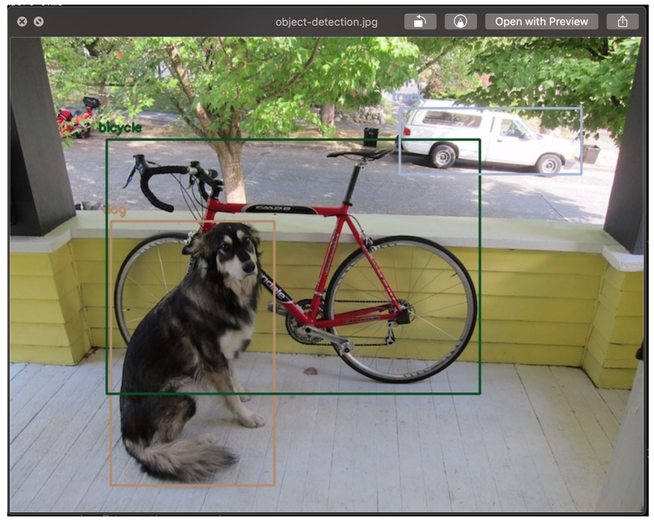


In order to build our OpenCV facial recognition pipeline, we apply deep learning methodologies in two steps:

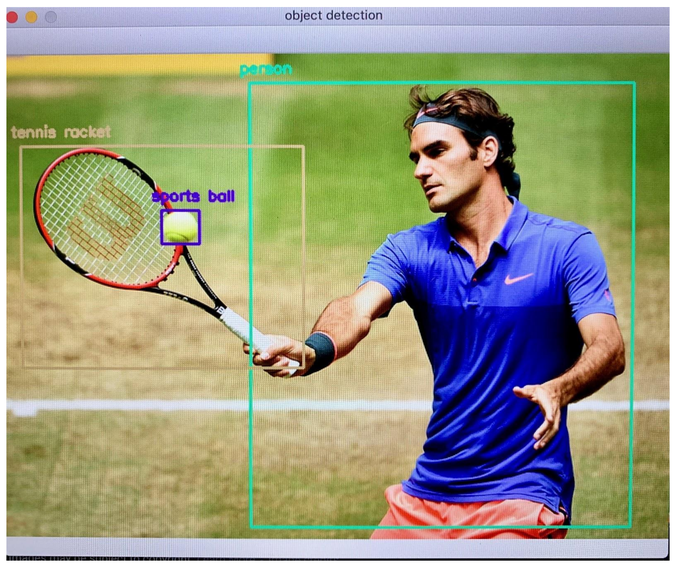
1. To apply face detection, which detects the presence and location of a face in an image
2. To extract the 128-d feature vectors that quantify each face in an image



ML Model: YOLO



- Based on a convolutional neural net model
    - CNNs are popularly used in computer vision projects because the CNN model was originated from the biological visual cortex system
- YOLO differs from other object detection models in that it applies a single neural net to an entire photograph at once
- YOLO superior in performance and accuracy metrics because it classifies objects within an image with the holistic context of the entire image



How it Works

1. Start drone and initialize controls with controller
2. Connect processing unit with video stream
3. Feed video stream through neural network
4. Write output to screen
5. Interface with output data for further manipulation

TOOLS AND FRAMEWORKS

- Drone - Tello EDU: a small quadcopter featuring Vision Positioning
- Sony Dualshock Wireless Controller - Synced with software and is used to control the drone
- OpenCV – A real-time computer vision library that supports deep learning frameworks (i.e. Tensorflow)
    - OpenPose – A real-time multi-person keypoint detection and multi-threading library built using OpenCV
- PyGame – An open-source Python module for developing games & multimedia applications used to sync controller
- Tensorflow & Keras – Artificial intelligence libraries using data flow graphs to build models. Keras provides a Neural Net API that can run on top of Tensorflow

FUTURE OBJECTIVES

- Use a larger drone with more processing power and a better camera to optimize the integration between the neural network and the drone
- Retrofit the Qualcomm Snapdragon to take in live feed data