# PerfectForm

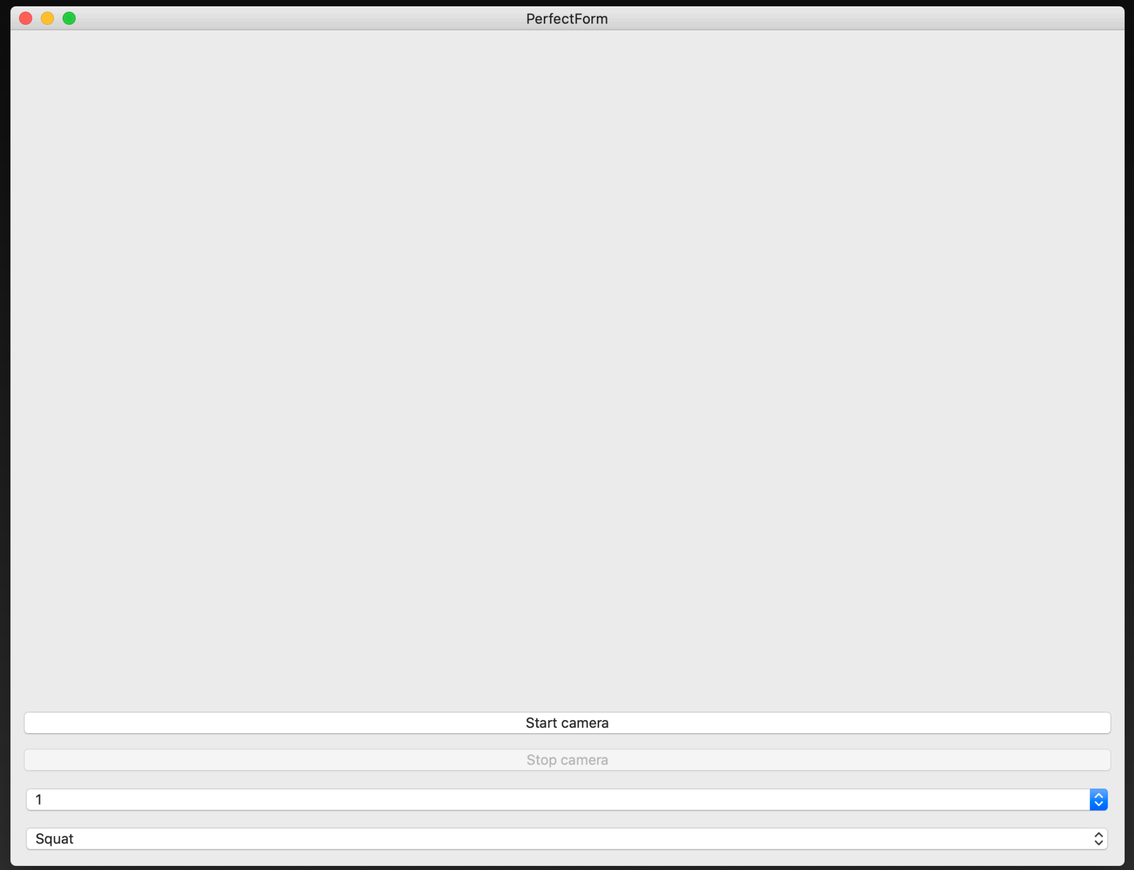
## Course Project
## Computer Vison 4301

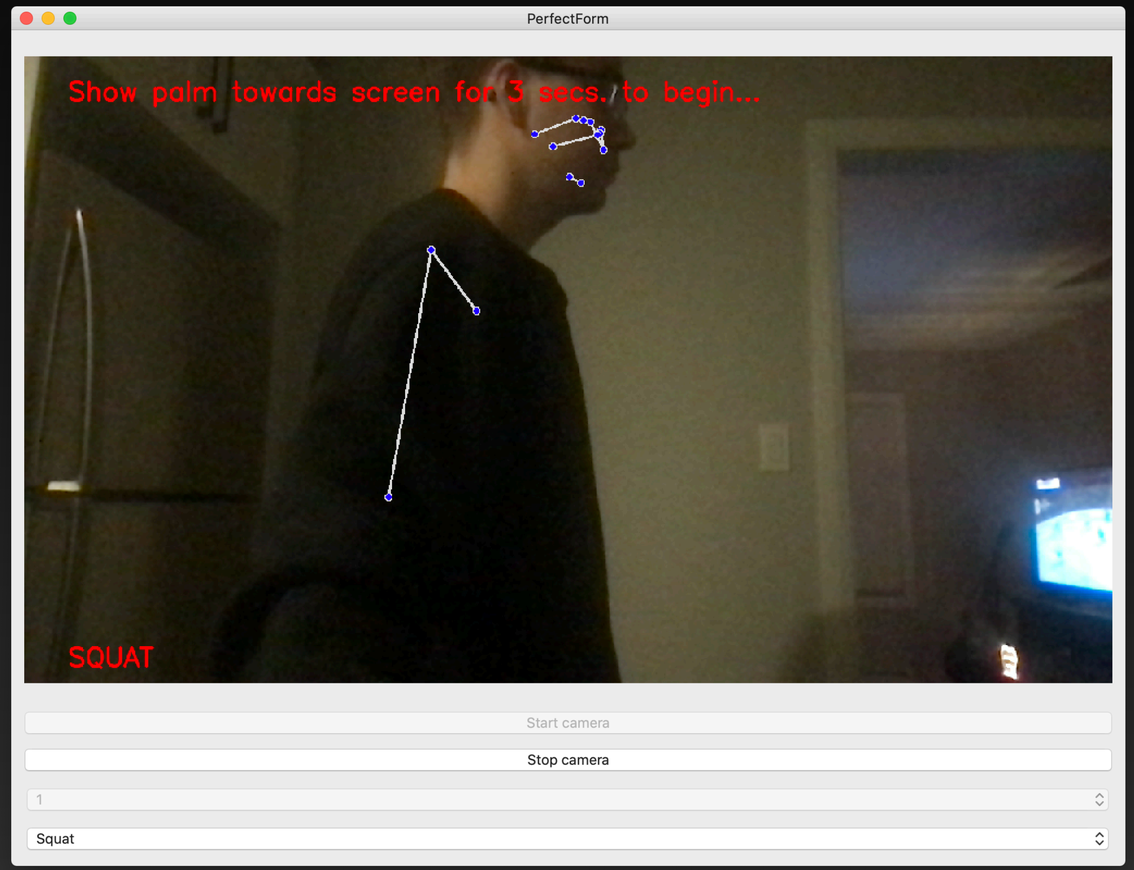
Divya Murali Krishnan, Tarun Subramanian, Jacob Critch

# Overview

- Computer vision application for detecting form/posture in the context of physical exercises
- Primarily developed for squatting
- Built using OpenCV and MediaPipe Pose
- Python 3 application with PyQt5 GUI

# Overview


PerfectForm
Start camera
Stop camera
1
Squat


PerfectForm
Show palm towards screen for 3 secs. to begin...
SQUAT
Start camera
Stop camera
1
Squat

# Methods and Tooling

- **MediaPipe** offers cross-platform, customizable ML solutions for live and streaming media
- The **MediaPipe Pose** Landmarker task lets you detect the landmarks of human bodies in an image. You can use this task to identify key body locations and render visual effects on them. This task uses machine learning (ML) models that can work with single images or a continuous stream of images.
- **OpenCV** provides a real-time optimized Computer Vision library, tools, and hardware.

# Methods and Tooling
## App

app.py — computer_vision_project

app.py | main.py | formchecker.py

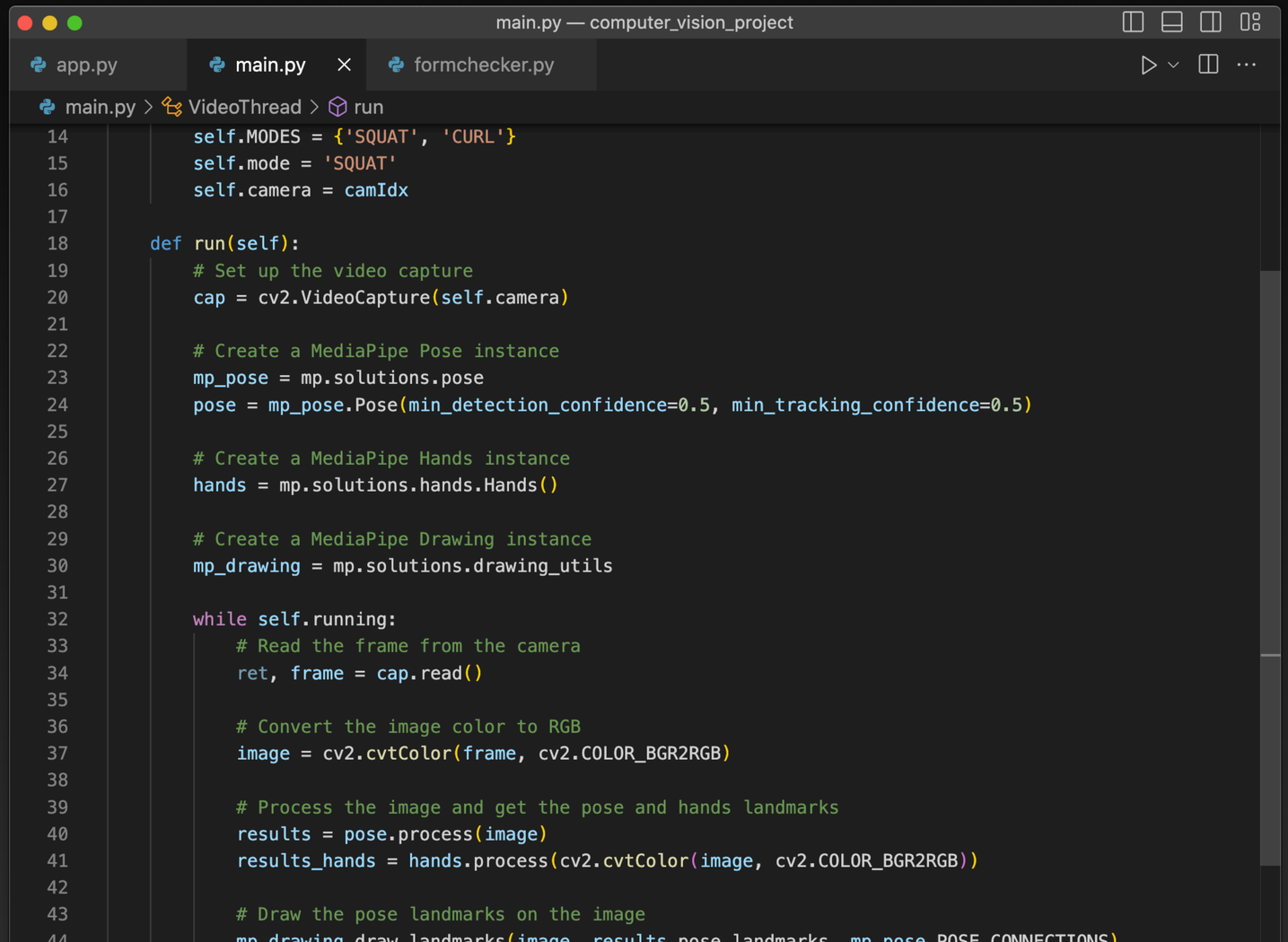
app.py > ...

```
        index += 1

# Subclass QMainWindow to customize your application's main window
class MainWindow(QMainWindow):
    def __init__(self):
        super().__init__()

        self.setWindowTitle("PerfectForm")
        self.setFixedSize(QSize(1024, 768))

        ### Buttons
        self.startButton = QPushButton("Start camera")
        self.startButton.clicked.connect(self.startButtonClicked)

        self.stopButton = QPushButton("Stop camera")
        self.stopButton.clicked.connect(self.stopButtonClicked)
        self.stopButton.setEnabled(False)
        ###

        ### Dropdowns
        self.modeBox = QComboBox()
        self.modeBox.setToolTip('Choose Exercise Mode')
        self.modeBox.addItems(['Squat'])
        self.modeBox.currentTextChanged.connect(self.modeSelected)

        self.cameraBox = QComboBox()
        self.cameraBox.setToolTip('Choose Camera (by index)')
        self.cameraBox.addItems(availableCameras)
        self.cameraBox.currentIndexChanged.connect(self.cameraSelected)
        ###

        # create the label that holds the image
        self.image_label = QLabel(self)
```

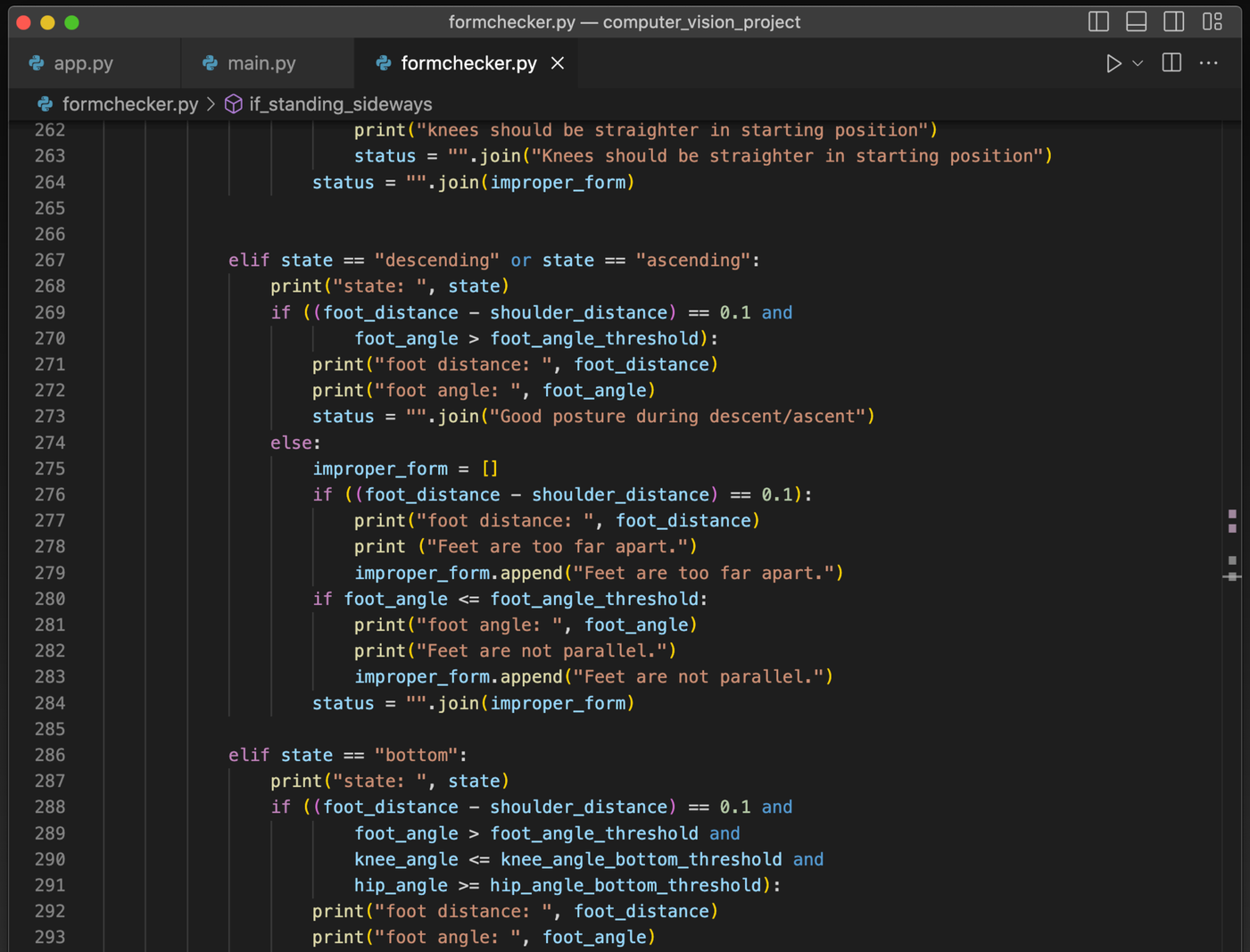
PyQt5 GUI definition,
main thread controls secondary
OpenCV/MediaPipe thread,
camera selection

# Methods and Tooling
## Main

OpenCV methods to capture video feed, and apply processing (overlay, text) based on formchecker results

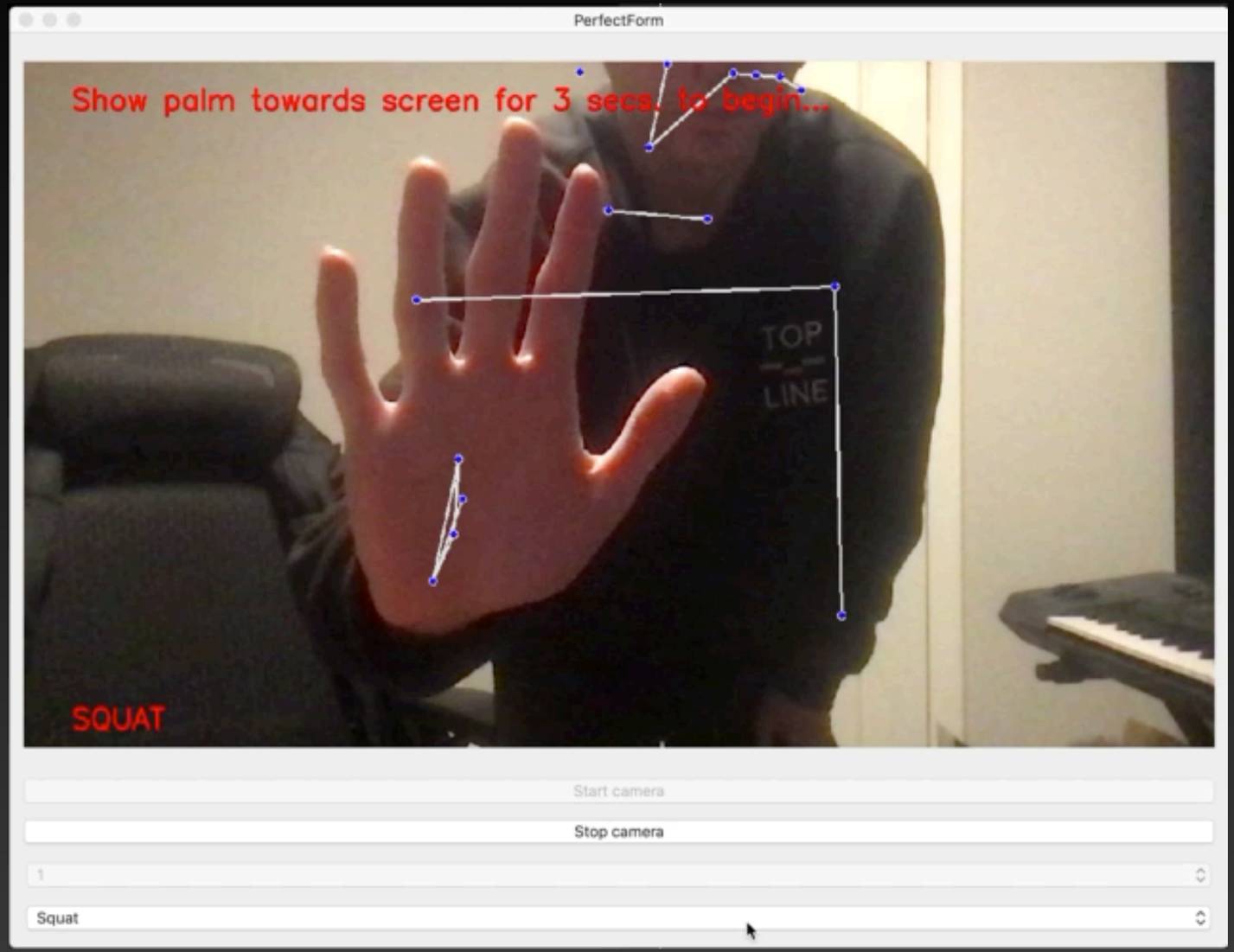


# Methods and Tooling
## Formchecker




Use math (angles, thresholds) to determine appropriate state and posture

# Results


PerfectForm
Show palm towards screen for 3 secs. to begin...
TOP
LINE
SQUAT
Start camera
Stop camera
1
Squat