Table Tennis AI Coach

By Jonatan McDonald

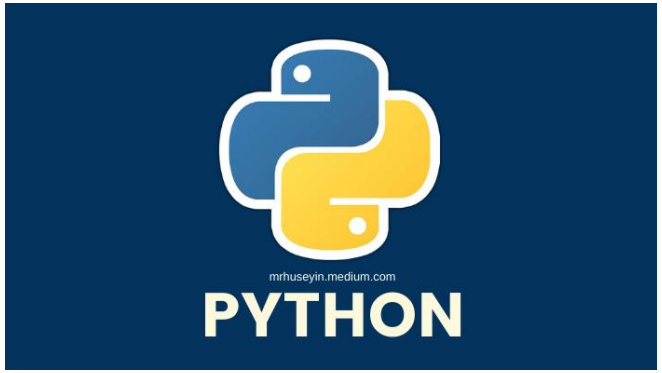
Why did I choose this project, and what is the inspiration behind it?

- I have played Table Tennis my whole life.
- A lot of recreational players in the US want private coaching.
- Many have Ping Pong Robots in their garage.

Technology Used

- MediaPipe
- OpenCV
- VS Code
- Python
- Python libraries

Mediapipe



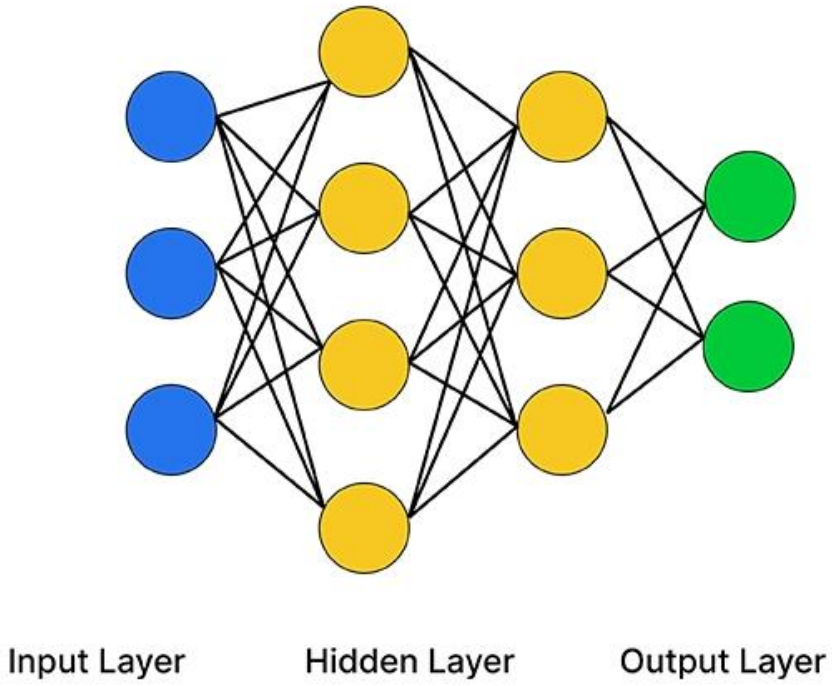
Media Pipe

- Open source framework developed by Google
- Designed to work with computer vision and ML

- Detects human motion
- Tracks joints
- Converts the motion into numerical data points

Python Libraries

- PyTorch, used to build and train neural networks, RNN/LSTM
- Sklearn, preprocessing data, and evaluating model performance
- Numpy stores data and handles mathematical operations quickly



Changes during development phases

- Original idea was to build a prototype in Python
- Then ship model to Visual Studio and build the program in C++
- Build tool Bazel was difficult to set up
- Media Pipe only had legacy solutions for C++

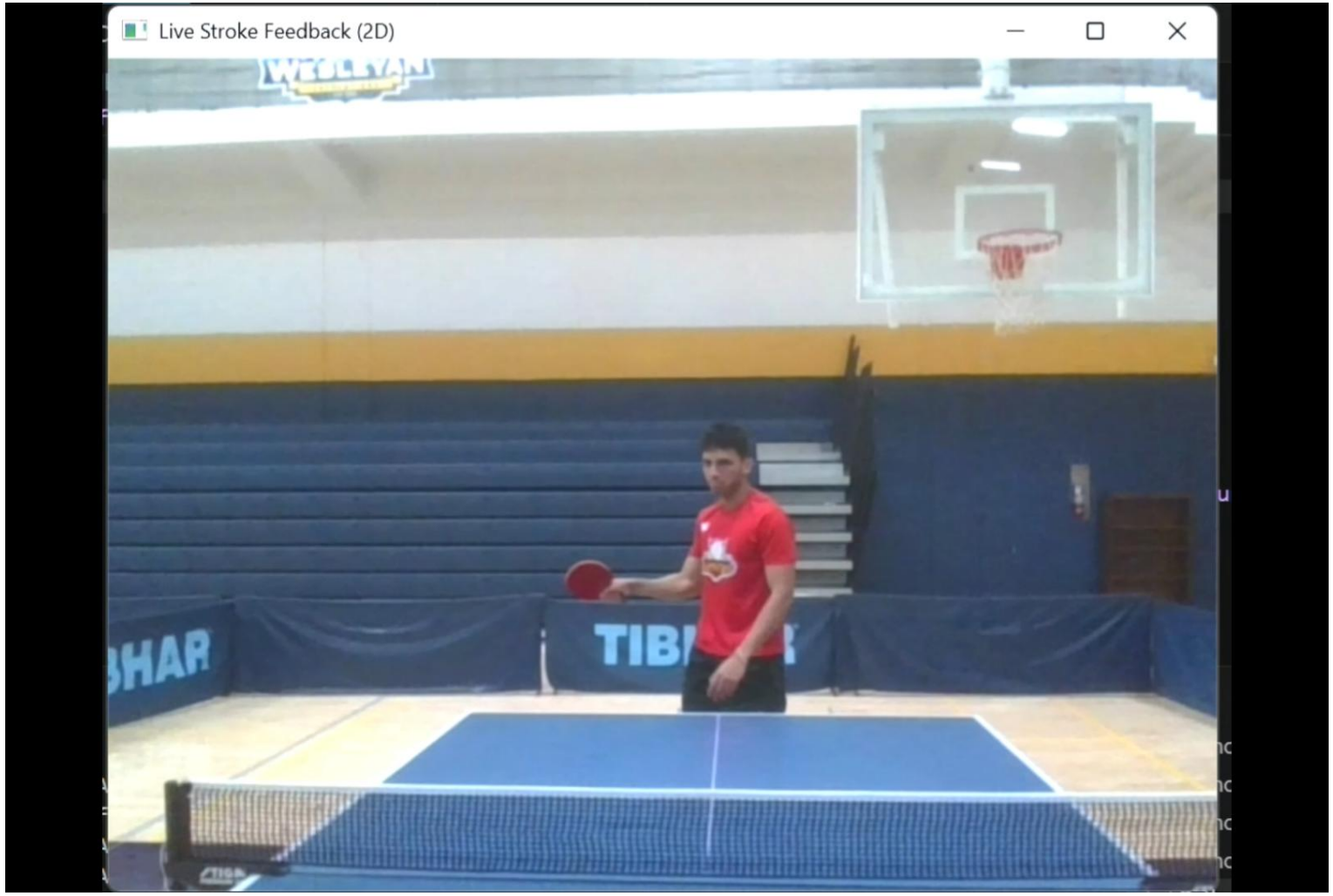
Data Set

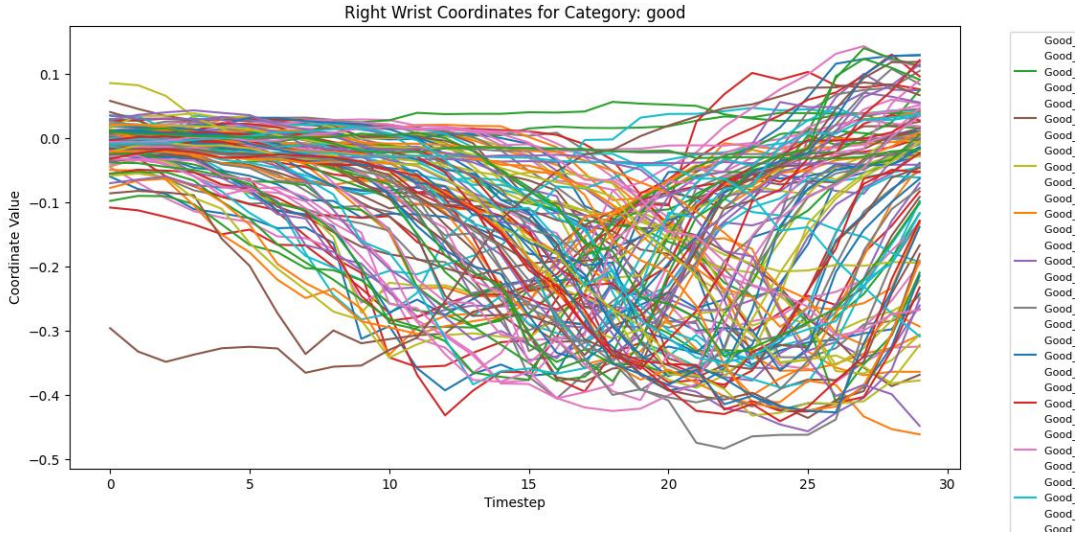
4 Categories: Good, Arm is too low, Elbow flares up, and not rotating the body.

Sampled 8 players' strokes. 8 strokes per video, 2 videos per category.

Total Stroke Data: 8 x 8 x 2 x 4 = 512 total clips, 30 frames each.

Demo





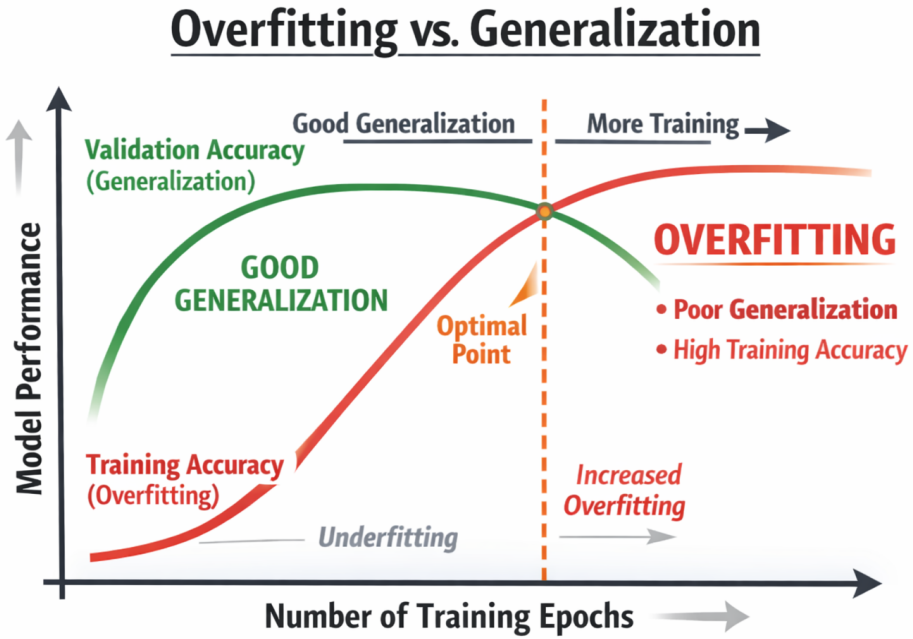
Obstacles during development process

- Big spread in Z coordinate
- Swing Detection
- Finding the right balance between training and over-fitting the training model.

Generalisation vs Overfitting

- Overfitting, the model performs well on training data but not on unseen data

- Generalisation, the model can accurately predict unseen samples



Future Improvements

1. Utilize 2D coordinates from the front
2. Introduce a side camera to measure rotation better
3. Optimize and clean up the data set.