

VizFit

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Introduction



Team Members



- Alana Matheny

- Background
 - Artificial Intelligence
 - Computer Graphics
 - Information Retrieval

- Noah Buchanan

- Background
 - Artificial Intelligence
 - Machine Learning
 - Deep Learning
 - Information Retrieval
 - IoT

- Sam Donaldson

- Background
 - Artificial Intelligence
 - Computer Graphics
 - Deep Learning
- ArcBest Developer Intern

- Sasha Lawson

- Background
 - Artificial Intelligence
 - Computer Graphics
 - Machine Learning
- ArcBest Developer Intern

Problems Facing Fitness



- Lack of Insight
 - Cannot aim fitness routines toward personal or medical goals
- Failure to be Consistent
 - Can't go to the gym
 - Not convenient
- Proper Fitness is Difficult
 - Could over exercise
 - Incur injury from improper technique

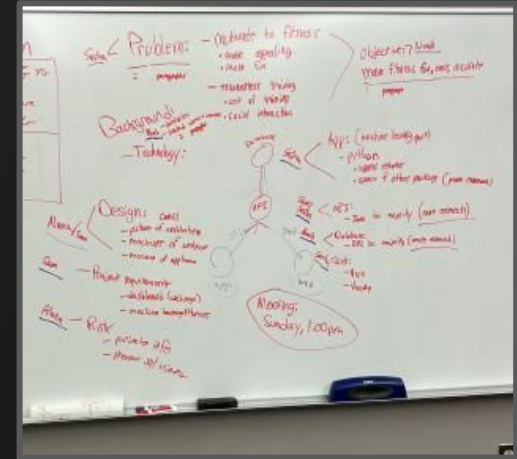
Development



Planning

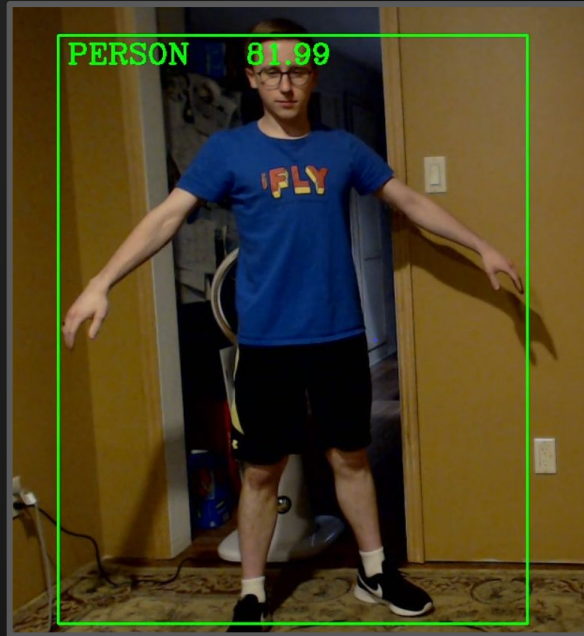


- 3 Major Sections
 - Website
 - Wireframe Model
 - Exercise Recognition
- Regular Checkup and Planning Meetings
 - Increased as needed to meet weekly demands



Implementation

- Trial, Error, Rework
 - Wireframe Model
 - Exercise Recognition
 - Website & Python GUI
- Followed Leads and Determining Worth
 - Different model architecture designs
 - Bounding box
 - Tkinter



Technology



- MySQL
 - Relational database management system
- Java & Spring
 - Create back-end RESTful API built on Java
- Python
 - Implement various packages to create a computer vision based machine learning model
 - PyQt5 - GUI builder
 - OpenCV - Access webcam
 - TensorFlow - Access various datasets and create neural networks
- Vue.js & Vuetify
 - Framework for constructing user interfaces and front-ends using “pre-built” components

Model Testing & Development



Training Data:

- All training image pixel values scaled from 0 - 255 to 0 - 1
- Images are cropped around annotated person in image
 - In practice, a bounding box neural network is used to crop a live feed of image data



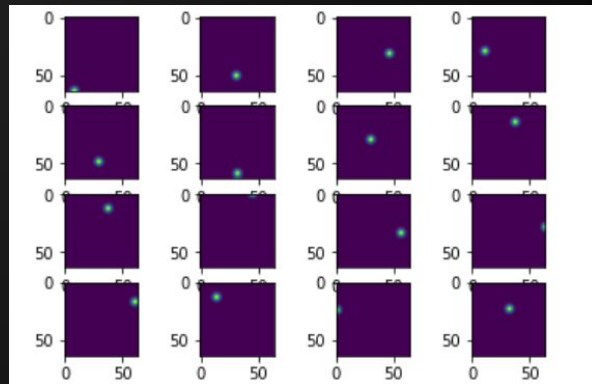
Model Testing & Development (cont.)



Target output:

- 16 keypoint coordinates translated into 16 heatmaps of size 64 x 64
 - Gaussian blurring to generate heatmap
- Heatmaps also consist of scaled values 0 - 1

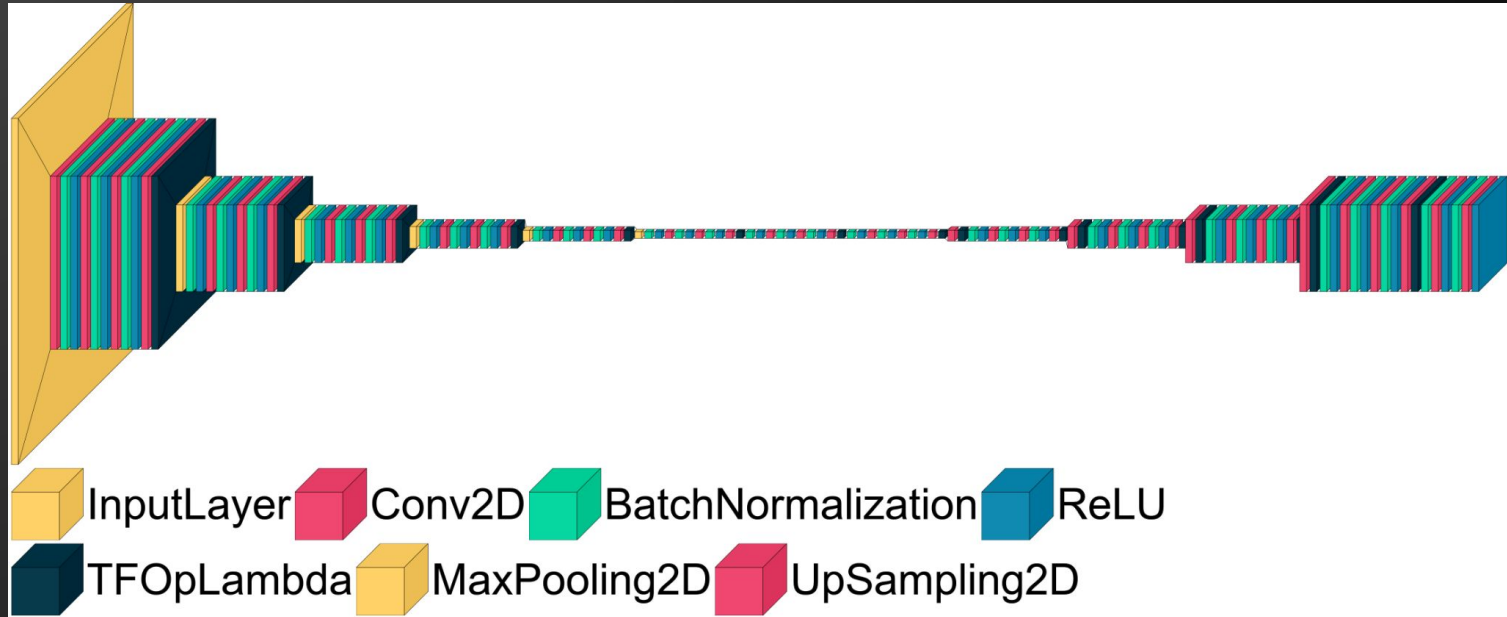
[[x1,y1], [x2,y2], , [x16,y16]]



Model Testing & Development (cont.)



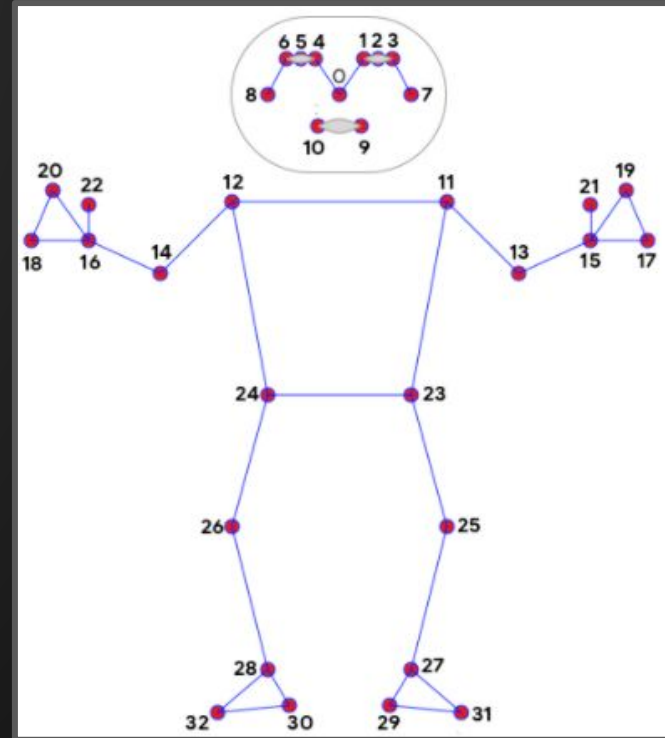
Hourglass module:



Exercise Testing & Development



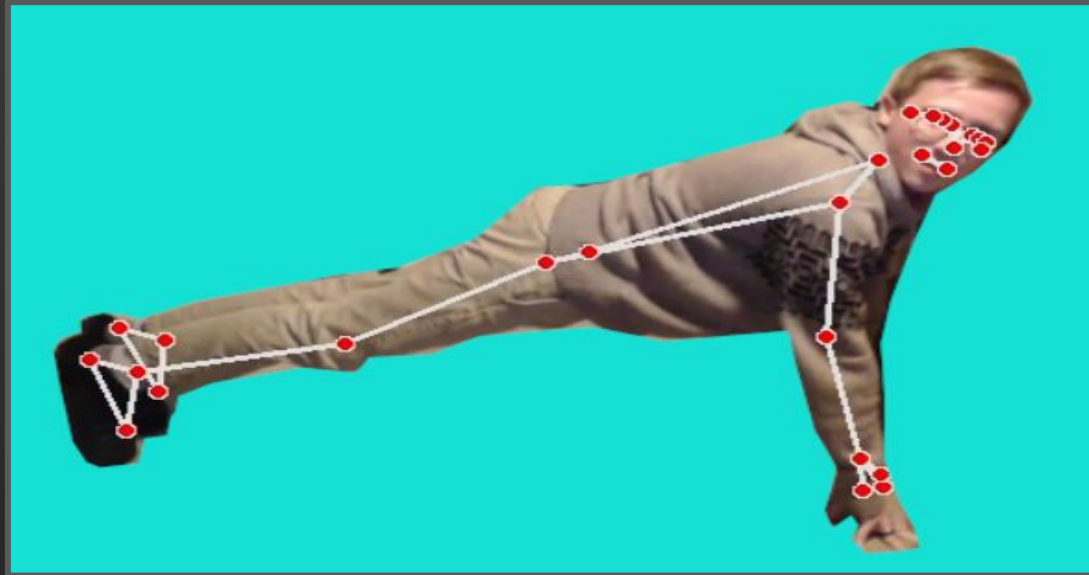
- Push-Ups
 - Main Angle: Elbow
 - Special Case: *Upside Down* push-up
- Sit-Ups
 - Main Angle: Hip
- Squats
 - Main Angle: Knee
 - Special Case: *Arms Out* checker



Exercise Testing & Development (cont.)



- Initial Testing



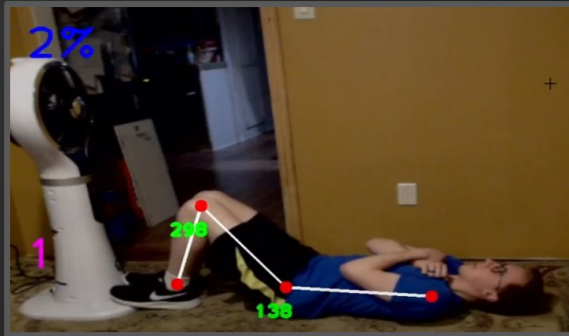
Exercise Testing & Development (cont.)



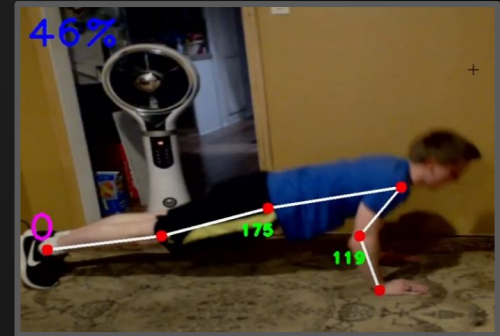
- Initial Specific Exercise Testing



Squats



Sit-Ups

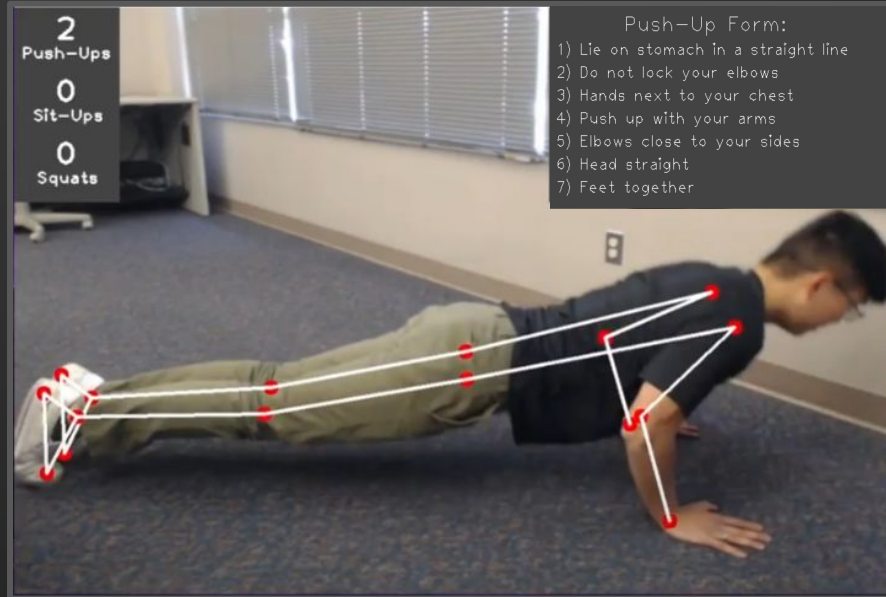


Push-Ups

Exercise Testing & Development (cont.)



- UI & Exercise Recognition



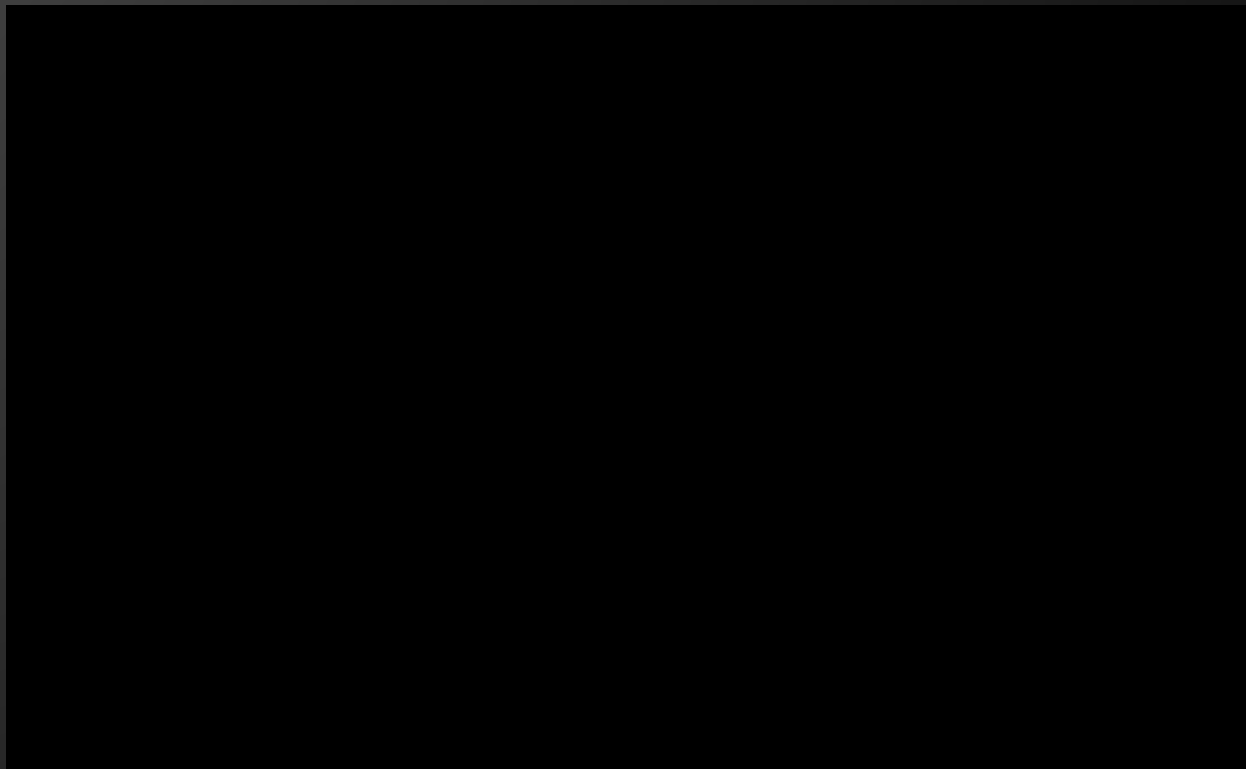
Exercise Testing & Development (cont.)



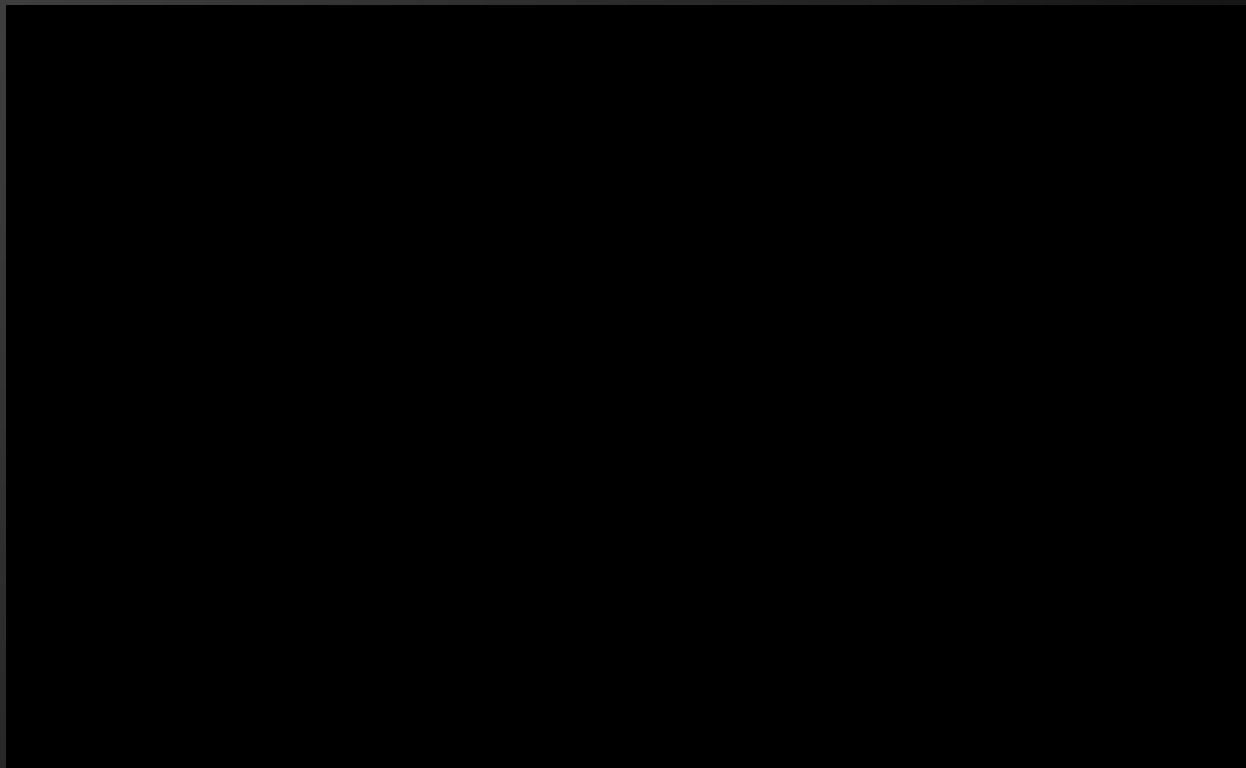
- Other Highlights

- Left Facing v. Right Facing
 - Angle had to be inverted to account for the opposite direction
- Duration System
 - Ensured that points weren't added for being in the correct position
 - Set variable "duration" back and forth between 0 and 1
- In Frame Checker
 - Checks whether the wireframe can fully map onto the body based on if its in frame

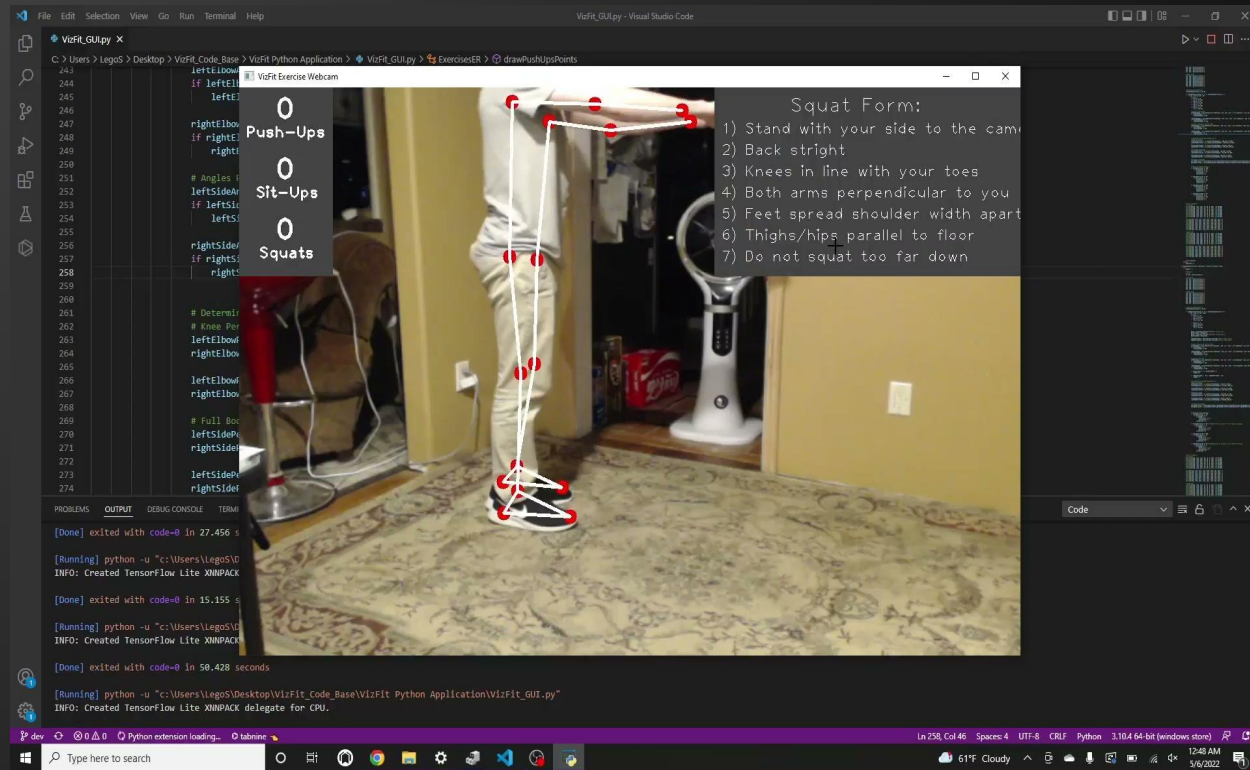
Exercise Recognition Demo - Push-ups



Exercise Recognition Demo - Sit-ups



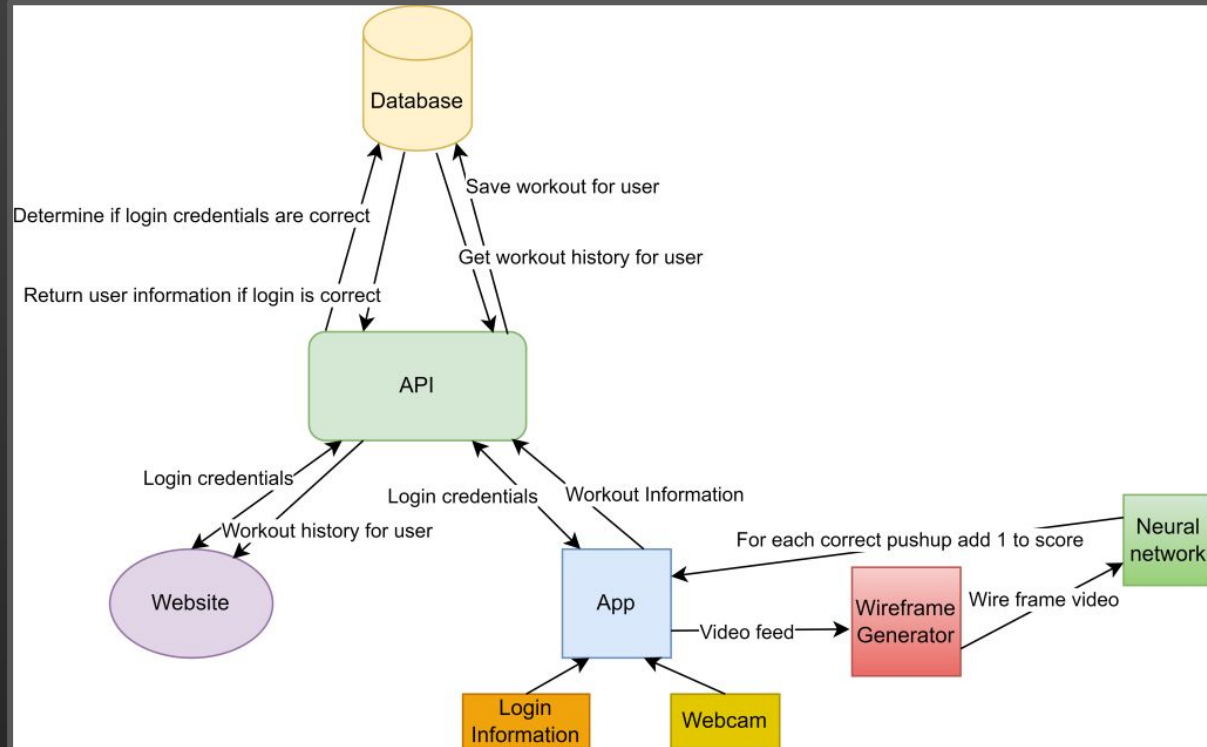
Exercise Recognition Demo - Squats



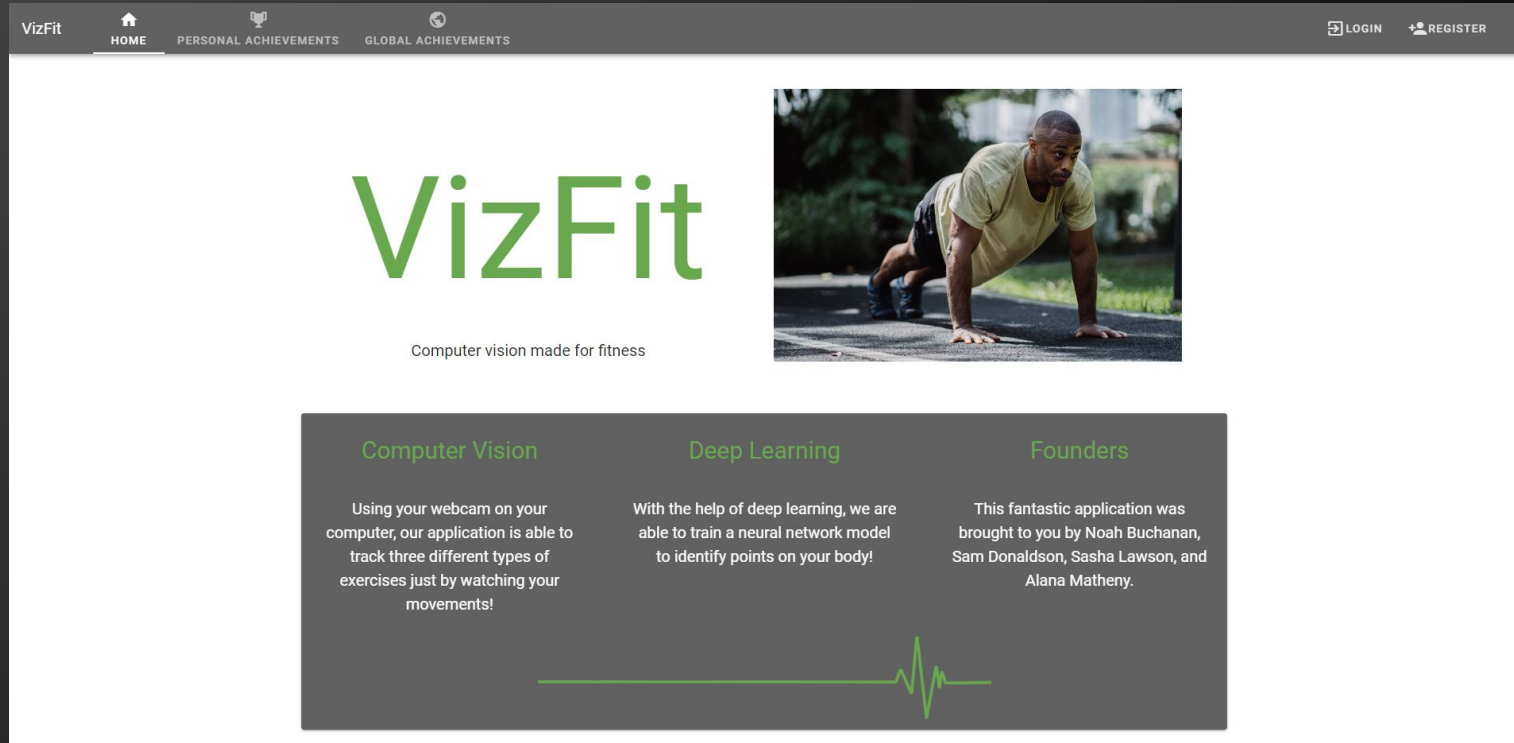
Design Overview



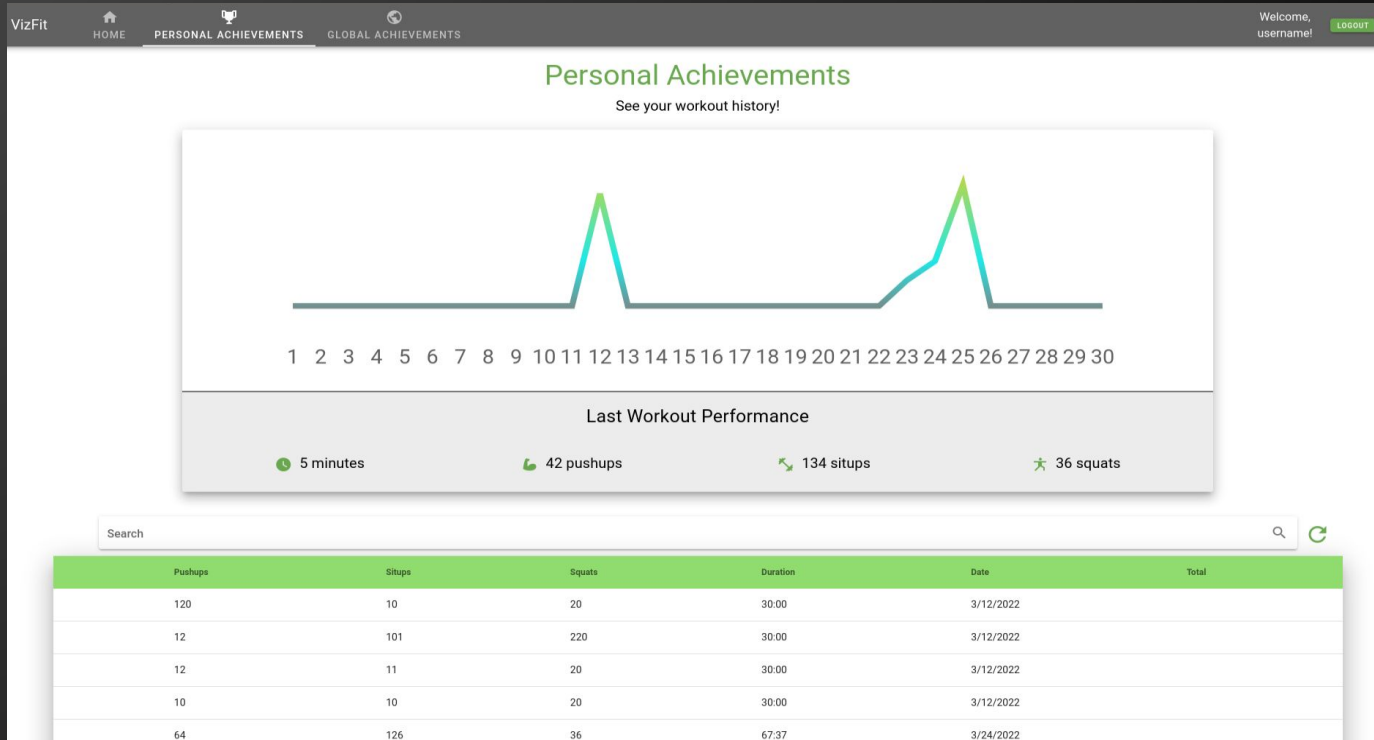
Architecture



Website - Homepage



Website - Personal Analytics



Website - Global Ranking



VizFit

[HOME](#)

[PERSONAL ACHIEVEMENTS](#)

[GLOBAL RANKING](#)

[LOGIN](#)

[REGISTER](#)

Global Ranking

See where you rank!

Rank	User	Pushups	Situps	Squats
1	Bob	100000	1000000	13000
2	Alana	1000	10	11
3	Noah	100	123	11
4	Sam	100	123	11
5	Sasha	100	123	11

Rows per page: 10


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[↺](#)

Website - Login





LOGIN



REGISTER

Website - Register





LOGIN



REGISTER

username

password

confirm password

REGISTER

GUI - Home



VizFit



Computer vision made for fitness.

Username:

Password:

Login

Don't have an account?

[Register!](#)

GUI - Register



VizFit



Computer vision made for fitness.

Please enter your information:

Username:

Password:

Confirm Password:

[Register Account](#)

[Home](#)

GUI - Welcome

A green line graph with a horizontal baseline and several peaks of varying heights, resembling a heartbeat or a signal waveform.

VizFit

A green line graph with a horizontal baseline and several peaks of varying heights, resembling a heartbeat or a signal waveform.

Computer vision made for fitness.

Welcome! Let's get started.

Begin Exercising

View Analytics

Logout

GUI - Results



VizFit



Computer vision made for fitness.

You completed the following number of exercises:

Push-Ups: 0

Sit-Ups: 0

Squats: 0

[View Analytics](#)

[Exercise Again](#)

[Logout](#)