# CSCI599 - FormBuddy

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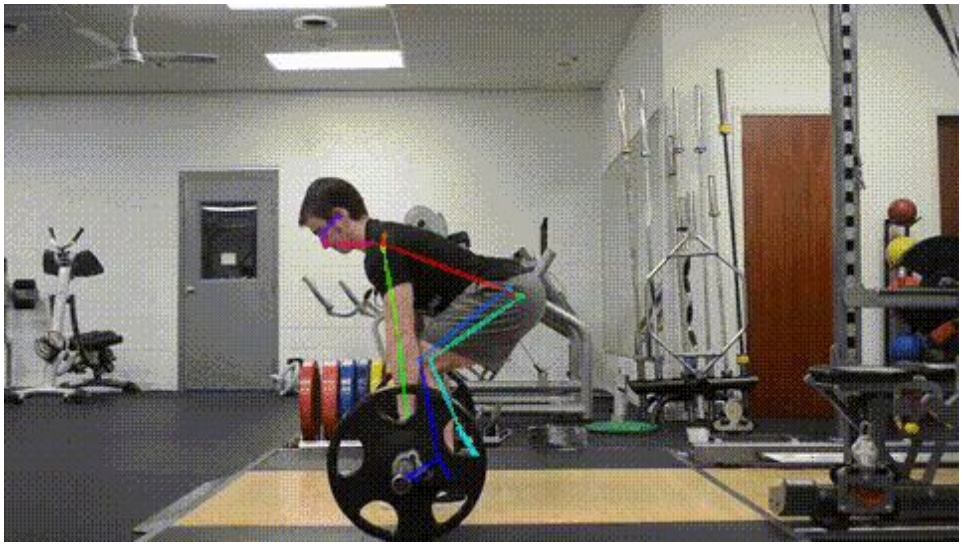
# Project Overview - FormBuddy

- **Goal**: Create an application that can evaluate and give advice on correcting a user's lifting form in real time

- **Motivation**: In an effort to provide assistance to others, we sought to develop an application called **FormBuddy** that could track a person's movements while weightlifting and provide feedback as to whether a person's form was good or bad.

# Desired Outcome

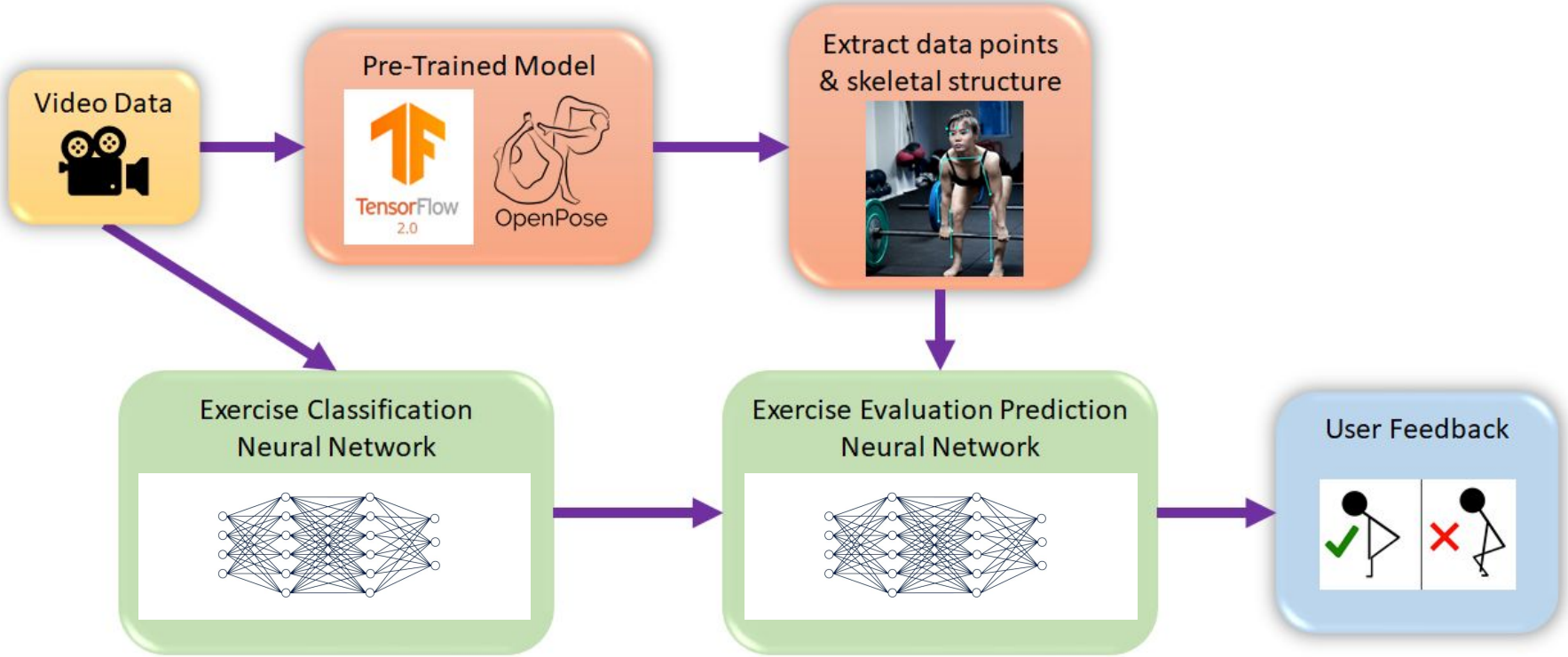


**Exercise:** DEADLIFT
**Evaluation:** GOOD

**Reminders**

- Grab the bar at approximately shoulder width apart
- Keep your back straight
- Keep your chest up
- Stand straight
- Breathe

# High Level Architecture Diagram



# Architecture - Short Term & Long Term

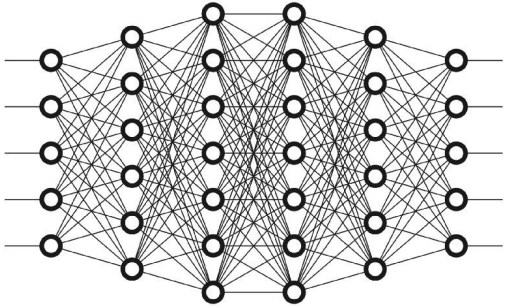
**Short Term:**

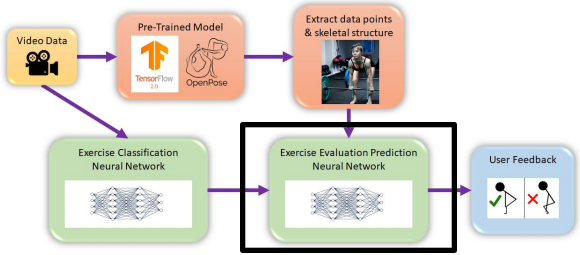
- User defined exercise (i.e. user identifies their own exercise)
- Classifying exercise form correctness with CNNs

**Long Term:**

- Exercise Classification (Neural Network)
- Real time Form feedback (Neural Network)

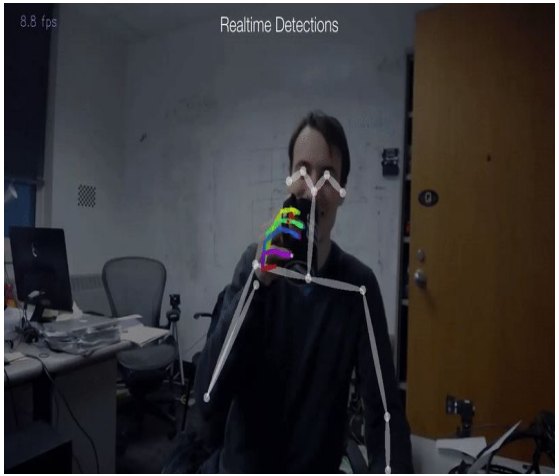
# Short Term Architecture - CNNs



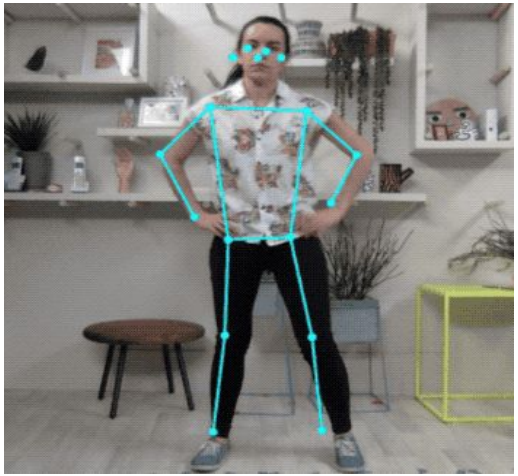



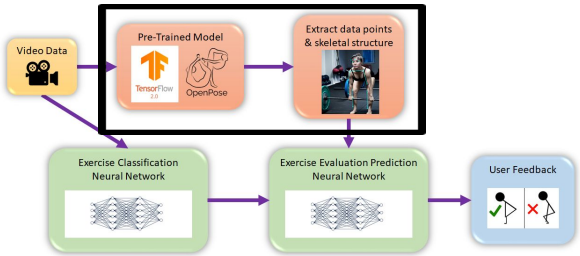
# Long Term Architecture - Pre-Trained Models

OpenPose



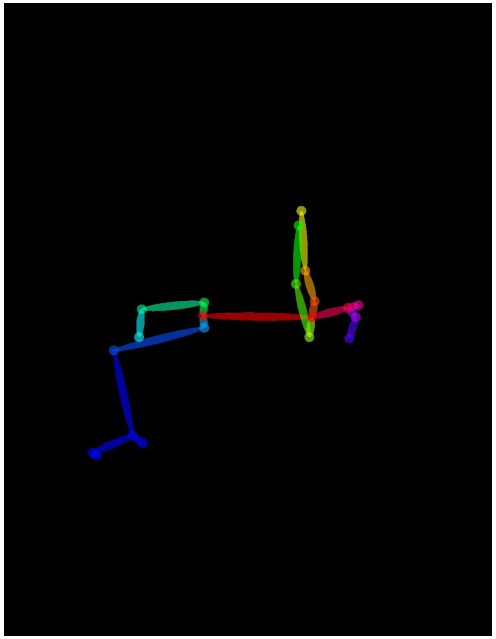

PoseNet



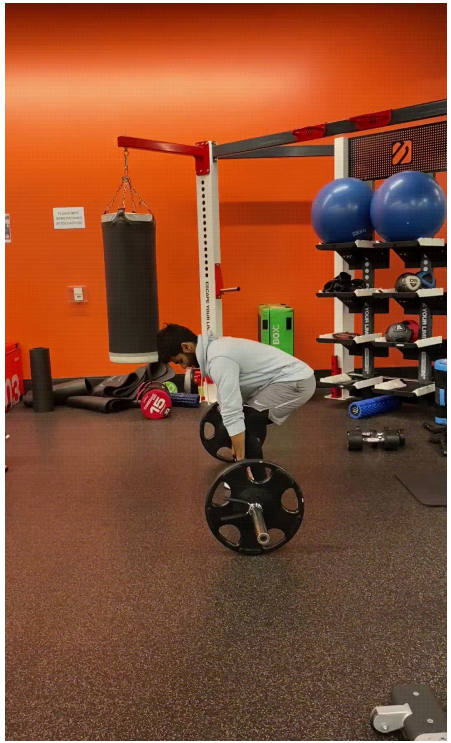


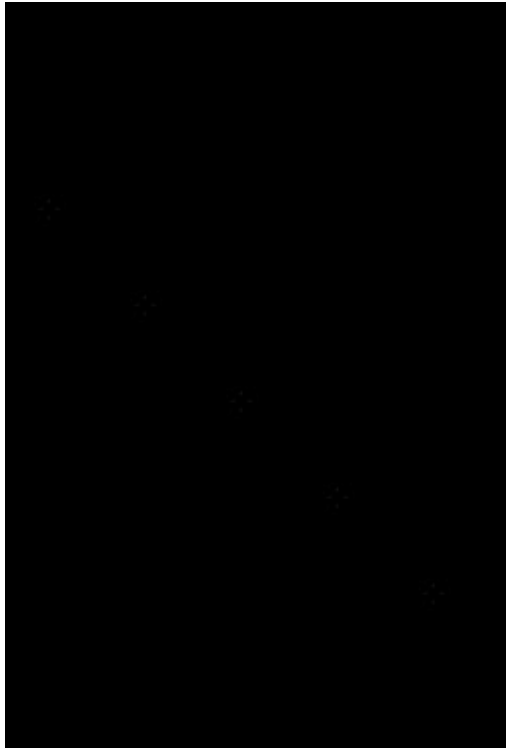
# Demo - Bad Bench Press

Captured with OpenPose

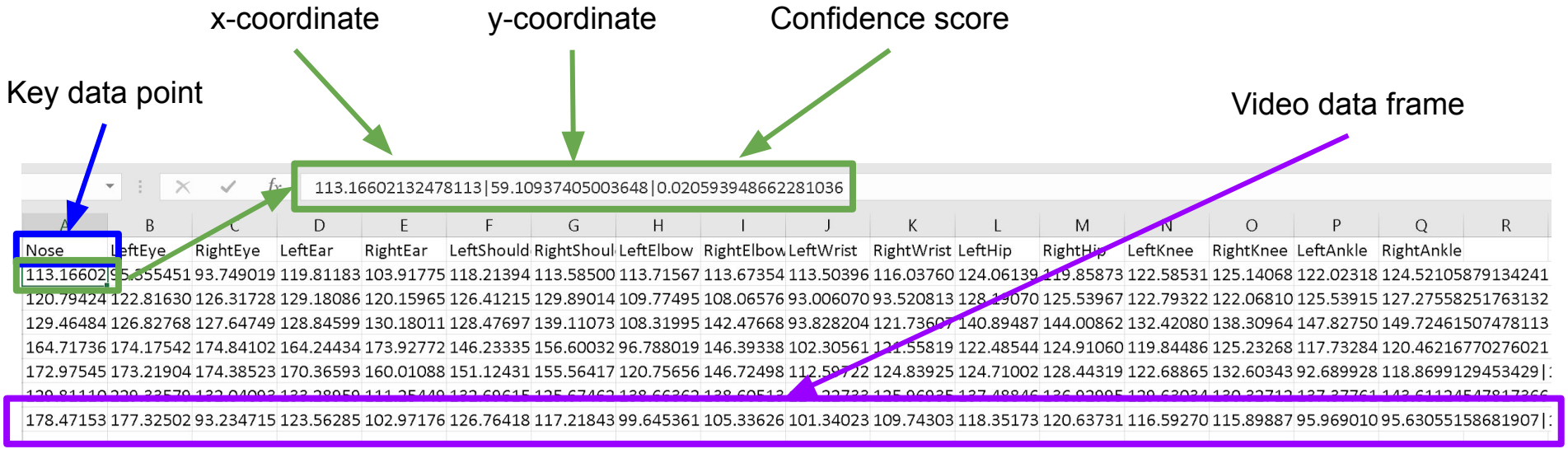


# Demo - Good Deadlift



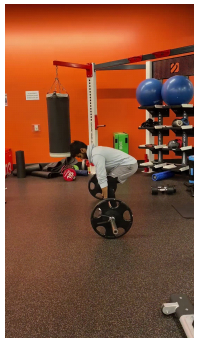


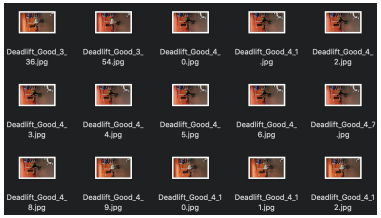
# PoseNet Data

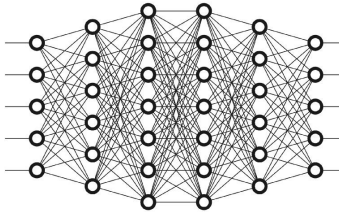



NOTE: Each row is a periodic data frame (image) from the exercise video

# Long Term Architecture - Exercise Classification

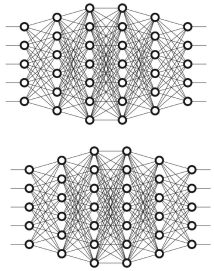






Deadlift

Bench Press

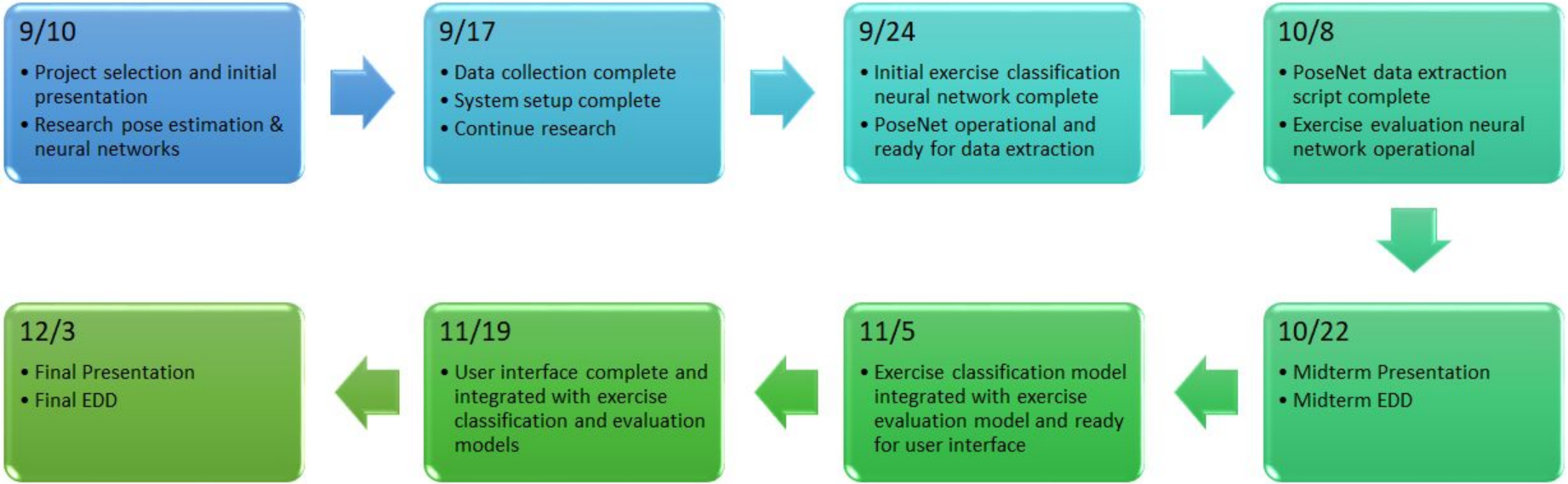


Pre-Trained
Neural Networks

# Way Ahead

- **Current Efforts**
  - Refine the exercise classification model
  - Video background noise removal
  - Use outputs from both PoseNet & OpenPose into the exercise evaluation model and compare results in an effort to improve accuracy
  - Two exercise evaluation model efforts
    - CNN model using frames (images) from the videos
    - HTM or other NNs using the 2D coordinates & confidence scores
- **Future State**
  - Exercise classification and evaluation models are integrated to provide acceptable user feedback
  - User interface built out to accept input, process data, and provide feedback

# Timeline


9/10
• Project selection and initial presentation
• Research pose estimation & neural networks
9/17
• Data collection complete
• System setup complete
• Continue research
9/24
• Initial exercise classification neural network complete
• PoseNet operational and ready for data extraction
10/8
• PoseNet data extraction script complete
• Exercise evaluation neural network operational
10/22
• Midterm Presentation
• Midterm EDD
11/5
• Exercise classification model integrated with exercise evaluation model and ready for user interface
11/19
• User interface complete and integrated with exercise classification and evaluation models
12/3
• Final Presentation
• Final EDD

# Questions?