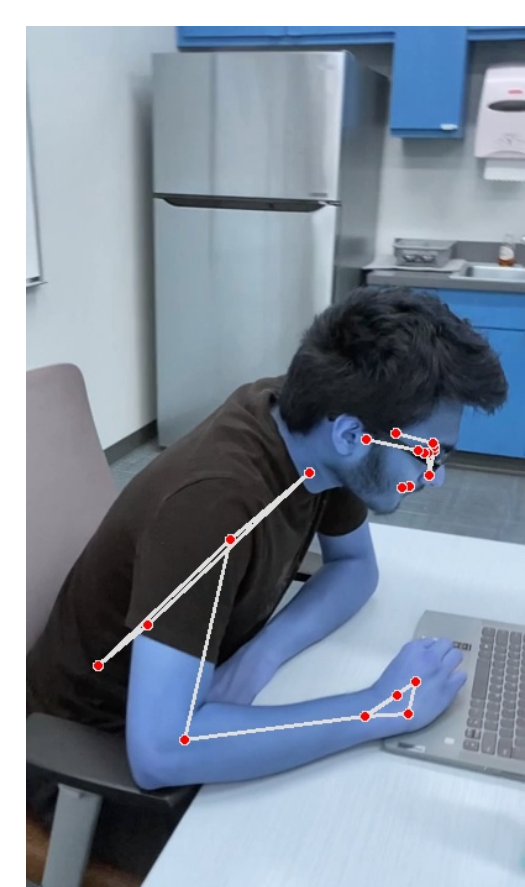
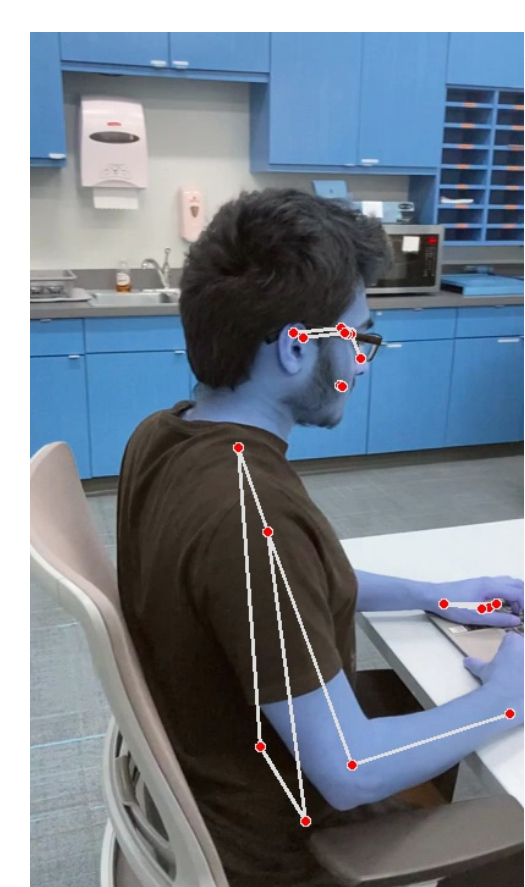
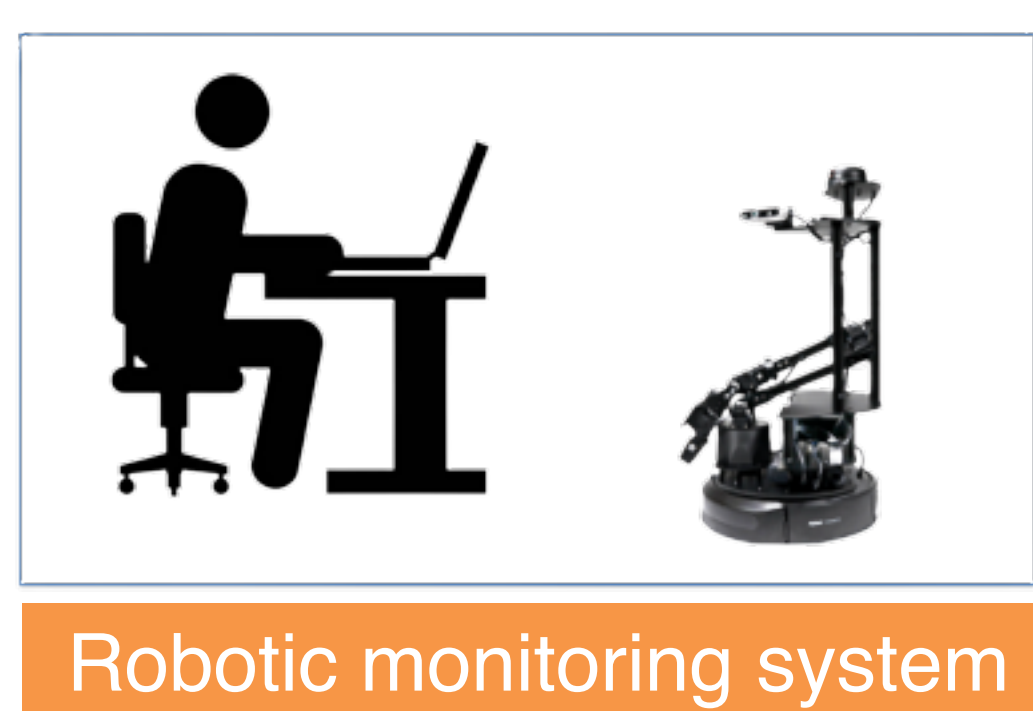


Problem Statement

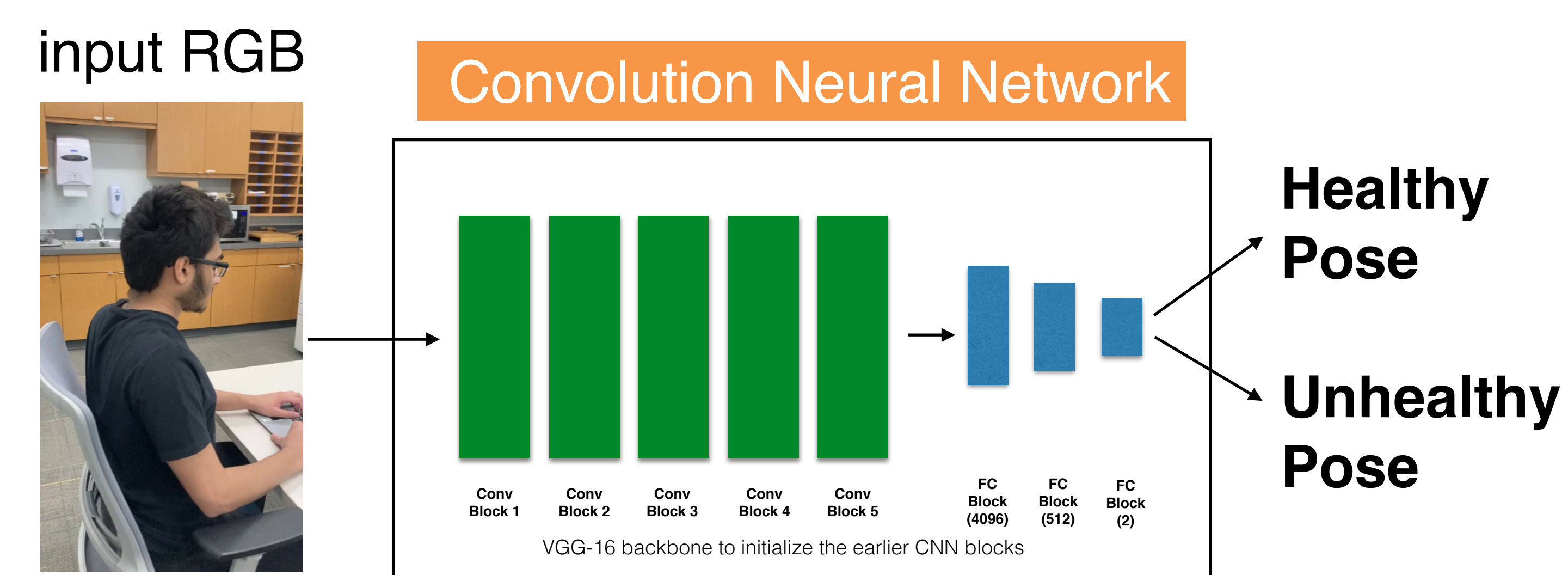
- In the era of digital devices, people spend a significant duration of their daily lives in sedentary positions in various work settings, which can cause injury if they stay in odd postures for prolonged periods
- A robotic monitoring system can help prevent such injuries by continuously analyzing human posture and triggering an alert if needed



- To establish this robotic monitoring system, we are developing a computer vision system that can recognize healthy and unhealthy sedentary postures

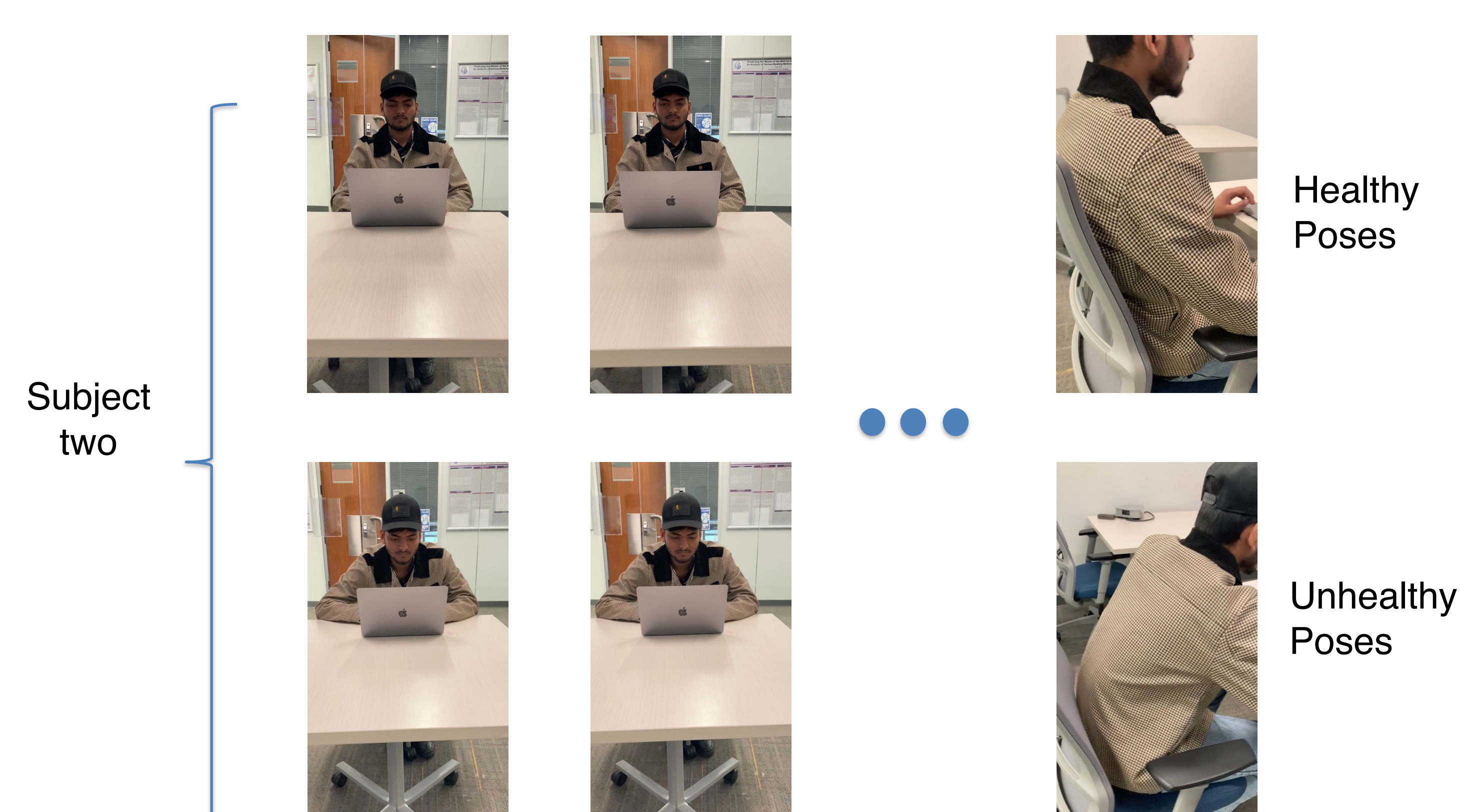
Pose Classification Model

- Developed a Convolutional Neural Network (CNN) to classify individual frames of video as healthy or unhealthy posture
- We have two different backbones: i) VGG-16 and ii) ResNet
- Models were developed in PyTorch framework



Video Dataset Construction

- Collected a set of videos in which human subjects simulated healthy posture, unhealthy posture, or sequential combinations of them. Extracted frames from these videos at a rate of 10 frames per second
- Since subjects were instructed to stay in a healthy (or unhealthy) posture for fixed time period, we can subsequently annotate all the frames within that video segment with healthy (or unhealthy) respectively



References

1. Krizhevsky, A., Sutskever, I., & Hinton, G. (2012). ImageNet Classification with Deep Convolutional Neural Networks. International Conference on Neural Information Processing Systems.
2. QuinnRadich. (2022, June 22). Use PyTorch to train your image classification model. Microsoft Learn. <https://learn.microsoft.com/en-us/windows/ai/windows-ml/tutorials/pytorch-train-model>
3. Getting Started — Interbotix X-Series LoCoBot Documentation. (n.d.). https://www.trossenrobotics.com/docs/interbotix_xslocobots/getting_started/index.html
4. LoCoBot (PyRobot) - ROS enabled research platform with 5 DOF manipulator. (n.d.). <https://www.trossenrobotics.com/locobot-pyrobot-ros-rover.aspx>

Experiments and Future Work

- Currently, we are training the CNN models
- Integrate the CNN model into a robotic monitoring system using LoCoBot, a robot for academic research compatible with Robot Operating System (ROS)
- Continuously analyze human posture and trigger an alert to human subject's display device