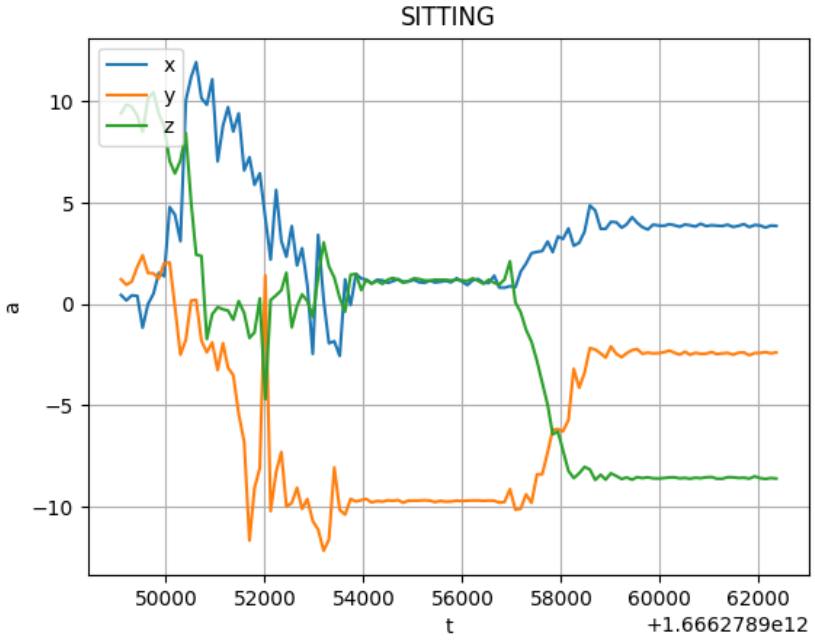
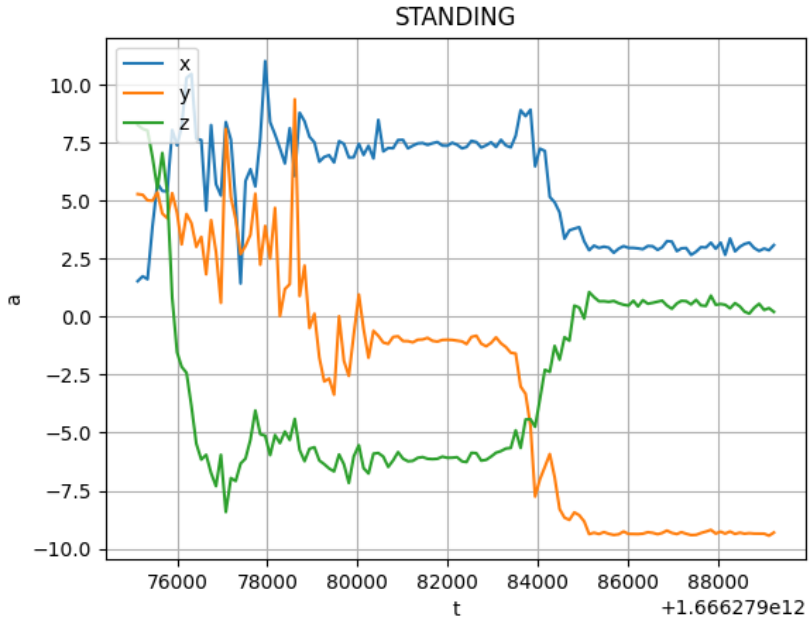
Report

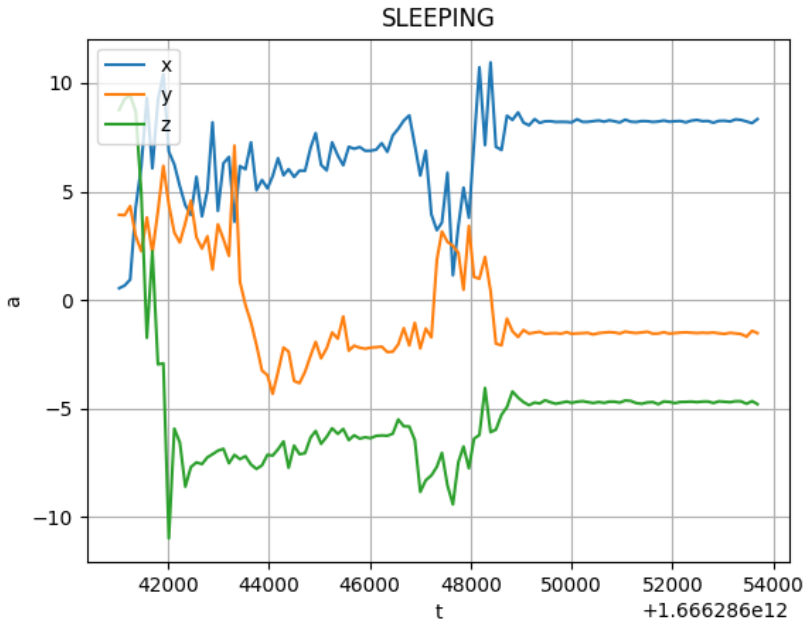
Implementing a Human Posture Detection app

(a) The accelerometer data while sitting, standing and lying down straight are recorded in the following attached CSVs: sitting.csv, standing.csv and sleeping.csv respectively.

The acceleration plot for the three positions are as follows:







Observed Pattern:

The initial part of the curve represents the action of putting the phone in the pocket, followed by a few seconds pause and then the action of sitting, standing and sleeping respectively.

In case of sitting and standing, there is a sharp drop or rise in the readings over a second while performing these actions. This is due to the change in the orientation of the mobile phone. The curve of sitting and standing are quite opposite of each other as we move from sitting to standing while performing standing and vice versa.

In case of sleeping, there is a rise followed by a drop (or vice versa) over a second while lying down. This is due to the movement of our legs from rising to going down on bed while performing this.

(b) **Real-time posture recognition:**

DTW (Dynamic Time Wrapping) Algorithm is used for matching the accelerometer data to recognize the posture. The code live_acc.py plots live acceleration data and performs DTW algorithm for data.csv (real-time data) with the recorded data: sitting.csv, standing.csv and sleeping.csv for all x, y, z directions. If the posture has minimum cost value for **all** 3 directions, it is the recognized posture and is displayed on the title of the plot. Otherwise, nothing is displayed (indicating a random posture/not one of the three given postures).

List of files enclosed with description:

- requirements.txt – Contains all the dependencies required
- PhonePi.py – Records as well as prints real-time accelerometer data using Flask and Socket
- data.csv – Data is recorded in this file in real-time
- sitting.csv – Contains recorded data for sitting (plot for the same is shown above)

- standing.csv – Contains recorded data for standing (plot for the same is shown above)
- sleeping.csv – Contains recorded data for sleeping (plot for the same is shown above)
- live_acc.py – It performs DTW algorithm for data.csv with sitting.csv, standing.csv and sleeping.csv for all x, y, z directions and computes the minimum cost among these. Also plots the accelerometer data in real-time

Steps to run:

- Install all the dependencies: `pip install -r requirements.txt`
- Clear the data.csv so that fresh data is recorded in the file
- Run: `python3 PhonePi.py` in one terminal
- Enter the IP address in the PhonePI+ mobile app
- Change the output format from JSON to CSV in the app
- Update the frequency to 100 ms for the accelerometer
- Turn ON its toggle button. This will start printing real-time acceleration data on the terminal as well as in data.csv
- Simultaneously, run: `python3 live_acc.py` in a different terminal for real-time plotting and posture recognition
- As soon as the plotting starts, perform any action (posture)
- If the action is one out of sitting or standing or sleeping, then it is recognized and the corresponding action is displayed on the title of the plot
- Turn OFF the sensor once the posture is recognized