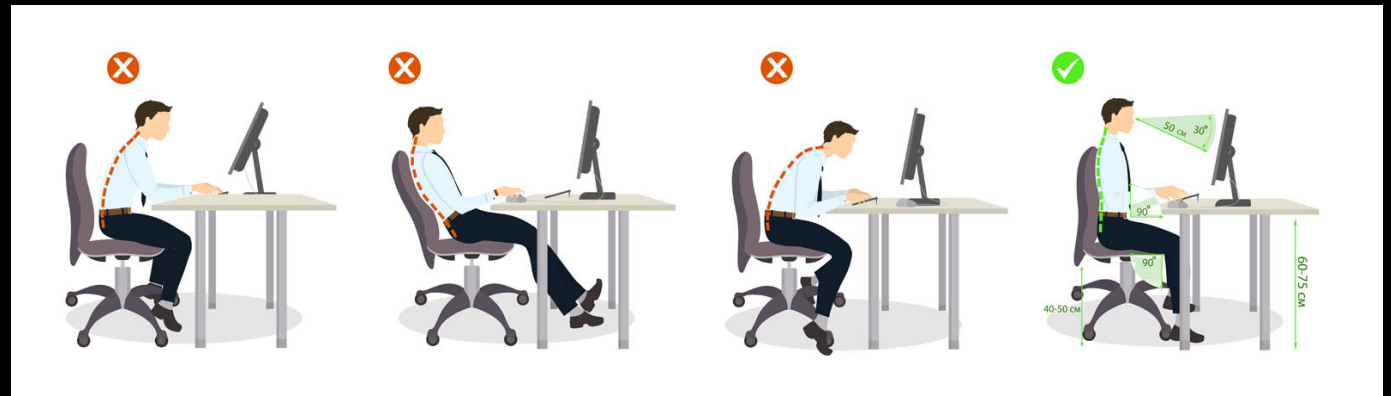# POSTURE MONITOR

Presented by Ed Batutis, Sai Prudhvi Chode & Urvashi Jouhari

OVERVIEW

Posture Monitor monitors your posture during computer usage via your laptop camera or an external camera to provide you with feedback to improve your sitting position and overall physical health.

EFFECTS OF POOR POSTURE

- Poor balance and headaches
- Mood, sleep and fatigue
- Neck and shoulder strain, back pain and even joint damage
  - Forces you to overwork the muscles in your neck and back. Your immune system's efforts to heal those muscles spur inflammation that — over time — can lead to arthritis in nearby joints.
- Incontinence, heartburn and slowed digestion.
  - Slouching puts pressure on the abdomen, which can force stomach acid in the wrong direction,"
- Breathing problems.
  - Impede the ability of the lungs to expand. When slumped over, the lungs have less room to contract and inflate, therefore, decreasing its capacity to obtain the maximum amount of oxygen needed

POSTURE MONITOR FEATURES

Calibration - Calculates initial good posture data.

Icon- Quick access task tray icon

Notifications - Notifies user if bad posture is detected
- Bending forward
- Bending backwards
- Slumping

Customize polling interval - Personalize interval for number of seconds to check position – defaults to two seconds.

Text Preferences - Through the task tray icon, the user can choose to enter in their phone number and network provider to receive text notifications in addition to terminal notifications.

FEATURES cond..

Recalibrate - Quickly recalibrate position if moving positions - From desk to conference room.

Pause/Resume - Pause and the application at any time during the day.

Sound Preferences - Control the notification sounds – on/off.

Reminders - Regular Reminders to self check posture

Supported Platforms - Works on both Mac and Windows platforms.

Data analysis - Saves session data in python notebooks for analysis.

TECHNICAL DETAILS

Data Smoothing:

Uses a moving average of the last 4 measurements from the camera to reduce the noise from natural movements.

Minimum notification interval:

Waits 30 seconds after a notification before sending out a new alert – Allows user to reposition themselves without getting multiple notifications.

Regular reminders:

If there have been no notifications in a 30 minute period, sends the user a reminder to self-check posture. Helps when camera cannot detect your face for long periods of time – for instance when using a dual monitor system

TECHNICAL DETAILS cond..

Face Detection – Open CV Haar Cascades

• Analyzes pixels in the image into squares by function.

• Haar Cascades use machine learning techniques in which a function is trained from a lot of positive and negative images. This process in the algorithm is feature extraction.

• It uses the Adaboost learning algorithm which selects a small number of important features from a large set to give an efficient result of classifiers

Features

Eyes

Nose

Mouth

A Theoretical Face Model
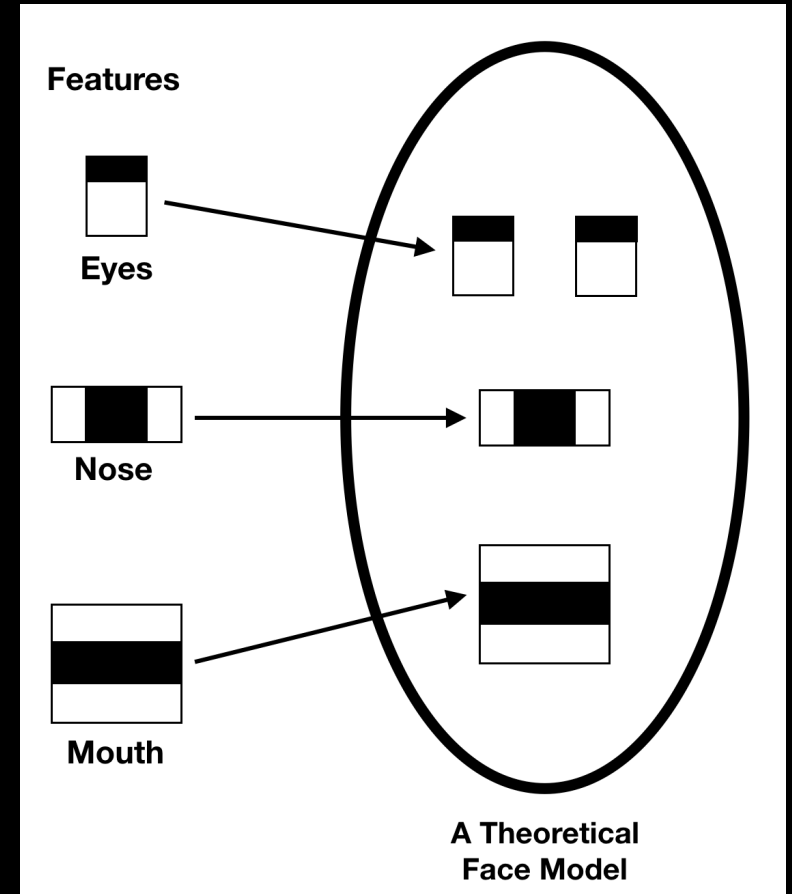
TECHNICAL DETAILS cond..

GUI Programming – PyQt5 library

Qt application framework and runs on all platforms supported by Qt including Windows, OS X, Linux, iOS and Android.

Notifications (on Mac systems) – Terminal Notifier

Terminal Notifier is a command-line tool to send notifications from command line, which are available since Mac OS X 10.8 and newer.

INSTALLATION DETAILS

- Download directory from https://github.com/ujouhari/PostureMonitor

- On Mac systems, start virtual environment, install Open CV, PyQt5 and terminal notifier.
  ```
  python3 -m venv myenv
  source myenv/bin/activate
  pip3 install pyqt5
  pip3 install opencv-python
  brew install terminal-notifier
  ```

- On Windows systems, install binaries for Open CV (Available in directory downloaded from Github) and Open CV and PyQt5
  ```
  pip install numpy pyqt5 opencv-python
  ```

- Run script with command *python3 PostureMonitor.py*
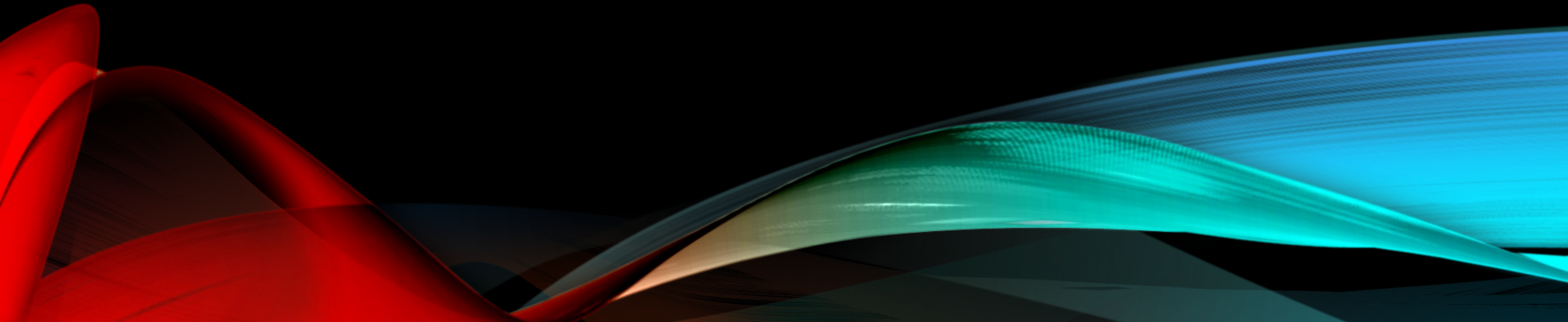
- Use task tray icon to control application.
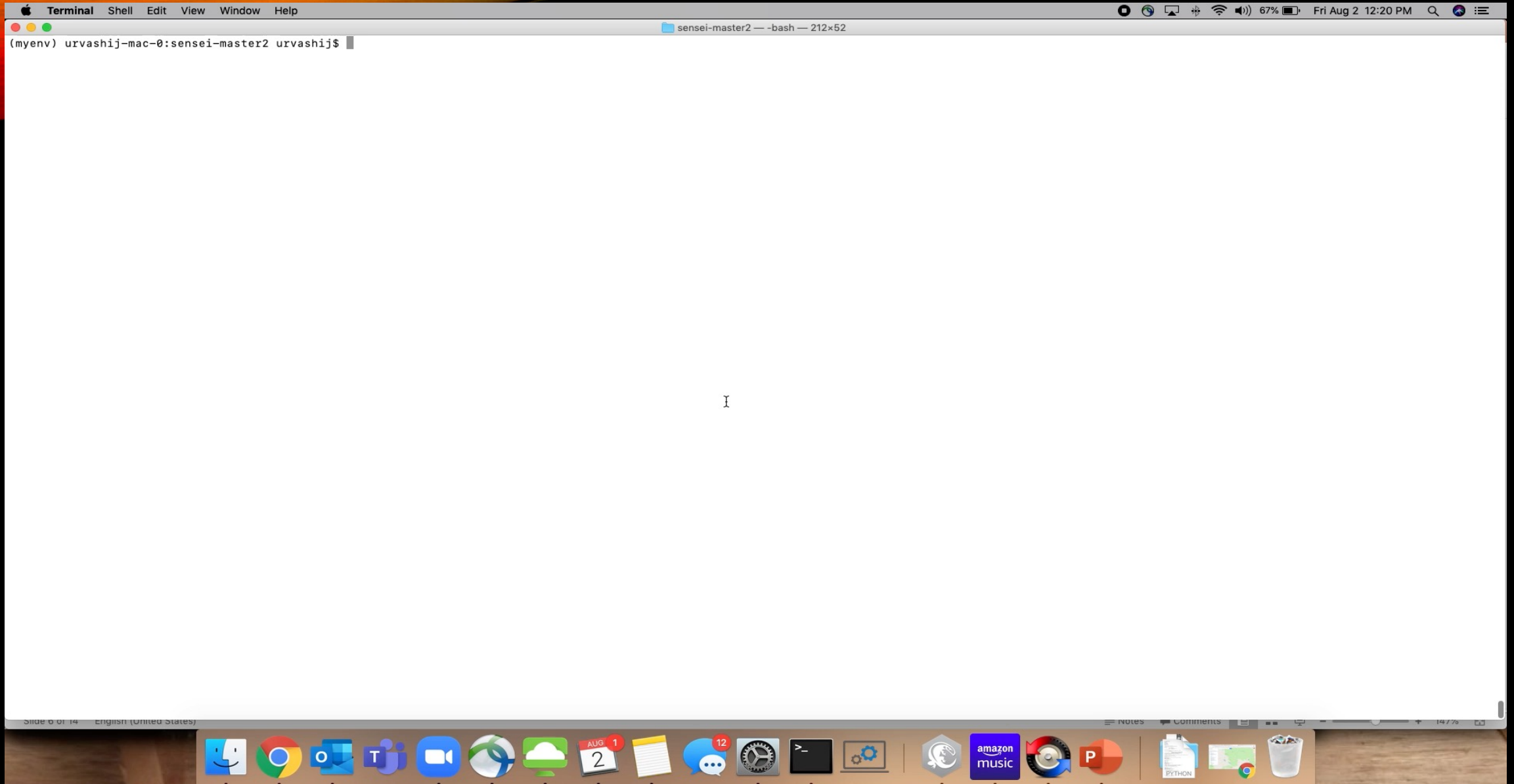
FUTURE IMPROVEMENTS

- Save data for all bad posture records on a **Quark** Pod.

- Data analysis to send user weekly report on posture improvement/decline in percentages.

- Generate compiled application to run without using command line.

- Add machine learning intelligence for personalized bad posture habits.

- Save user details – name, number, network details and sound preferences for personal system.
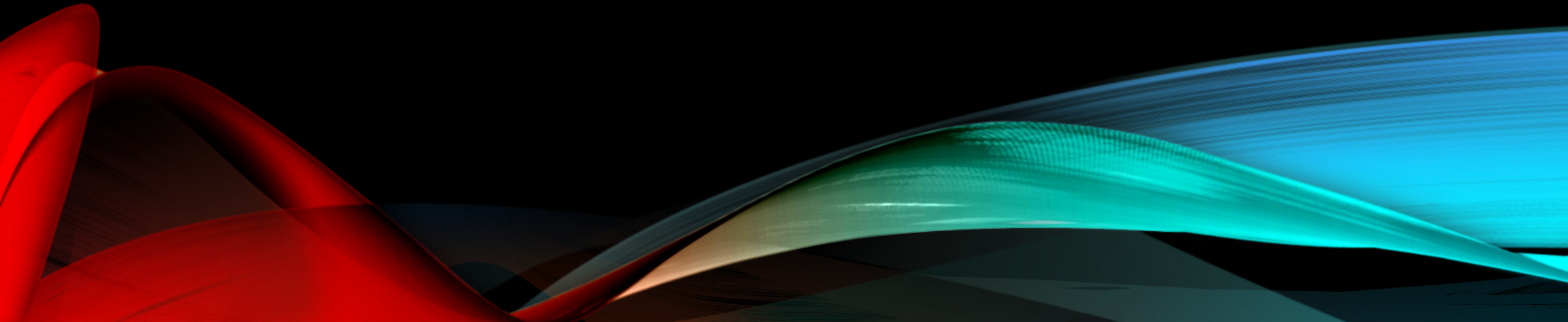
REFERENCES

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- https://becominghuman.ai/face-detection-using-opencv-with-haar-cascade-classifiers-941dbb25177
- https://health.clevelandclinic.org/poor-posture-hurts-your-health-more-than-you-realize-3-tips-for-fixing-it/
- https://www.health.harvard.edu/staying-healthy/3-surprising-risks-of-poor-posture

DEMO

```
(myenv) urvashij-mac-0:sensei-master2 urvashij$
```

QUESTIONS ?

THANK YOU!