SANGAM REVIEW-1

HEALTH CARE AND LIFE SCIENCES

BACK-UP

Project GitHub repo:
https://github.com/spider-tronix/Back-Up

TEAM MEMBERS:

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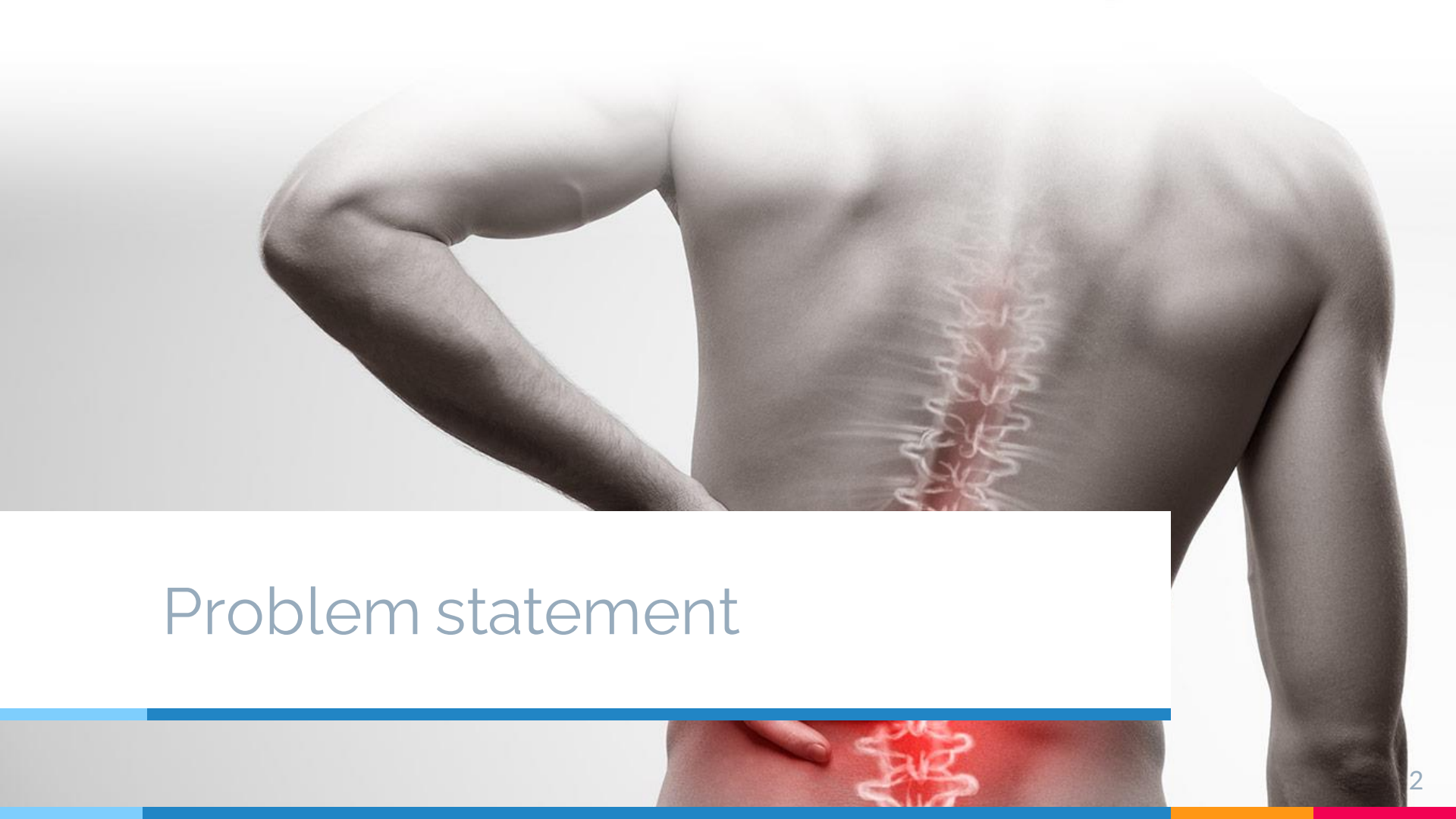


Problem statement

Most of the working population in their 30s or late 20s start facing musculoskeletal disorders, including lower back pain and cervical disc herniation.

People slouch unconsciously from the natural neutral position when working for long hours.

Improper posture increases stress in the spine and neck leading to Musculoskeletal disorder.

May lead to physiotherapy or surgery.

Existing solutions

Wearable vest

- Uncomfortable
- Used post diagnosis

Ergonomic chairs

- Expensive
- Doesn't help a lot

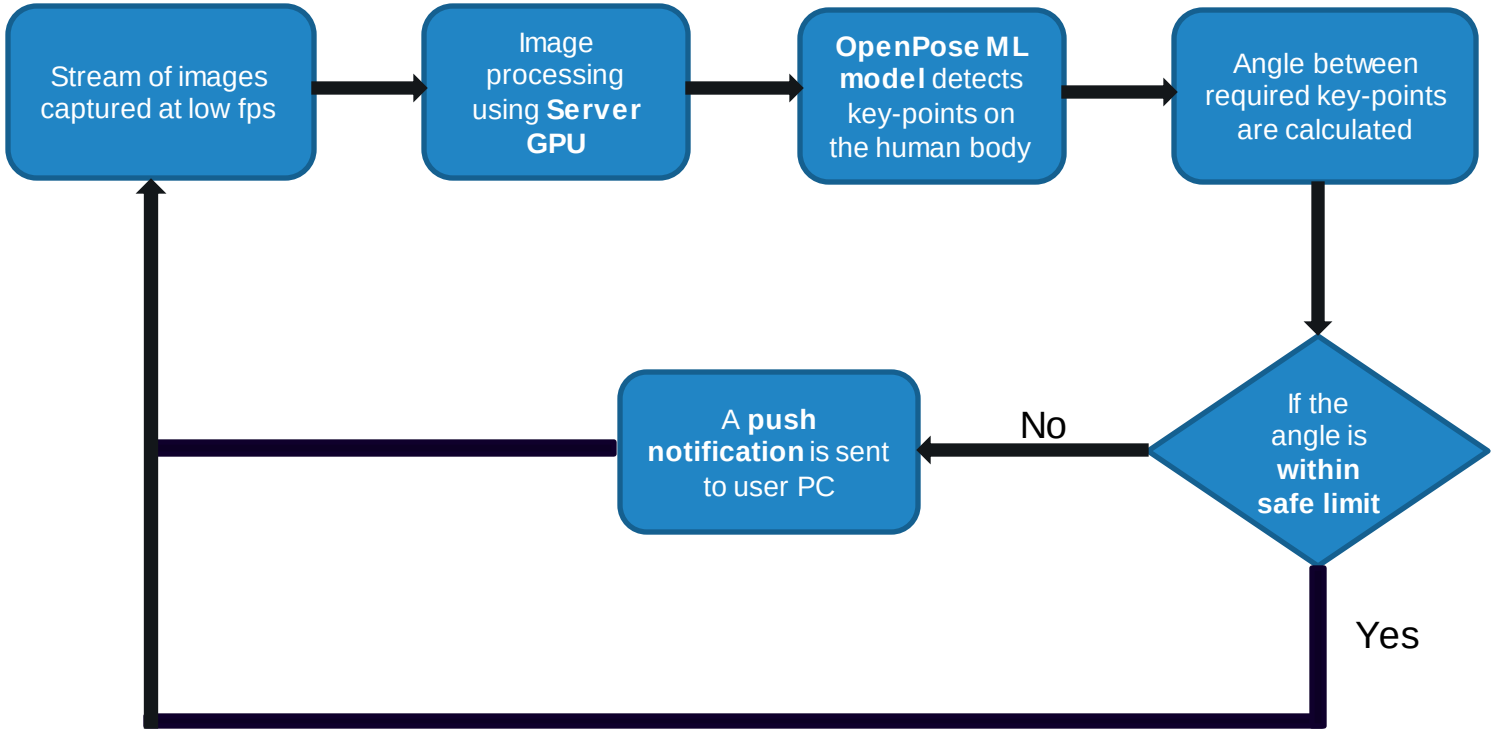
Proposed solution

RPi feeds image into OpenPose ML model, which calculates key points in the human body

Angle calculated between selected key points to check slouching

Sends push notification if siting in wrong posture

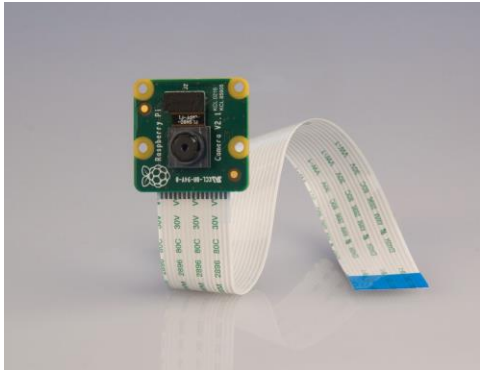
Workflow diagram



Components used

Raspberry Pi 3B+

Used for taking the input from the camera and to transmit the same for processing



Pi camera V2

Used for image capture of the people and sharing data with the RPi

Feed streaming

How it works

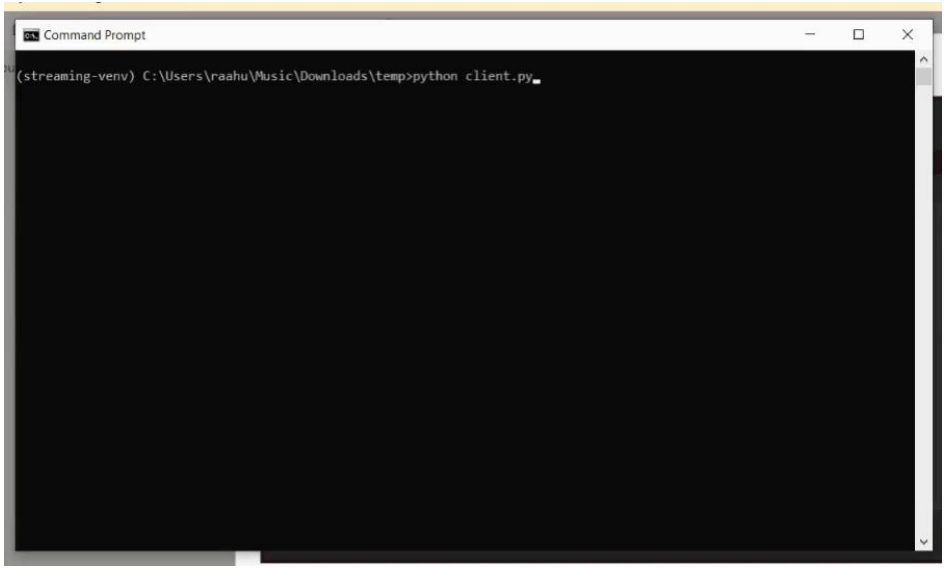
Raspberry Pi takes input from Pi cam

Streams the feed wirelessly to server using its IP address

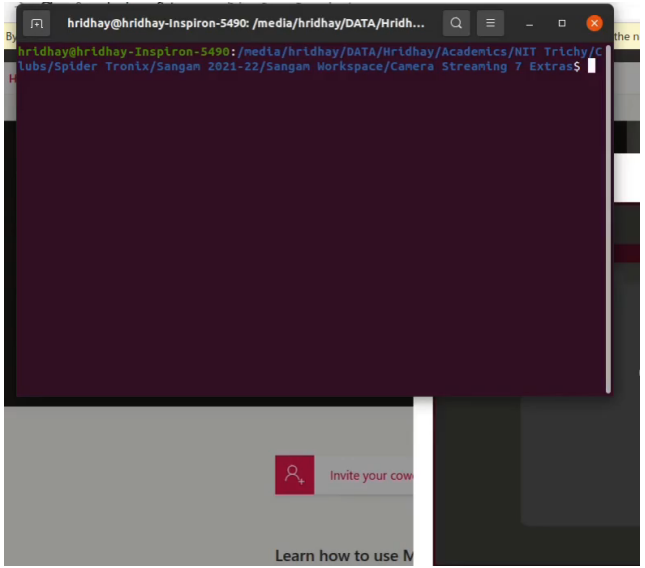
Feed viewed by server

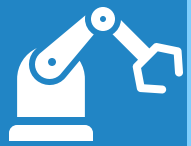
Working demo

- Sender screen



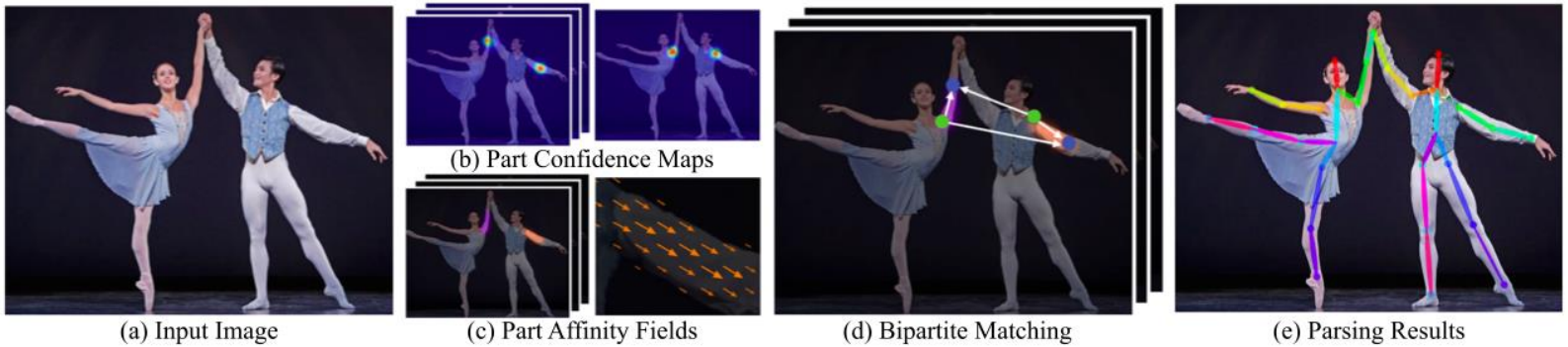
- Receiver Screen





OpenPose ML model

How it works



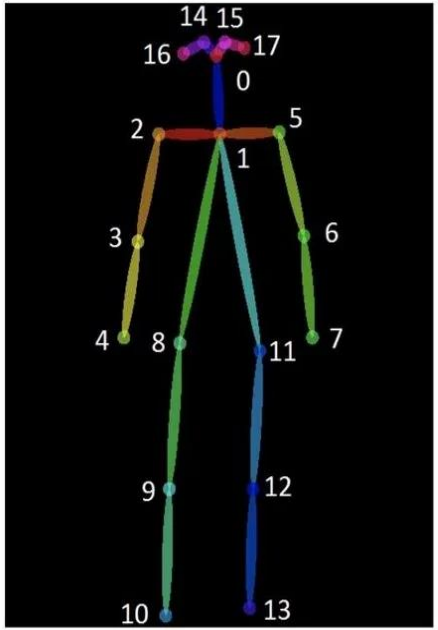
Input image is passed through 10 layers of VGG-19 model to extract feature maps.

Part confidence and Part affinity maps are created from the feature map.

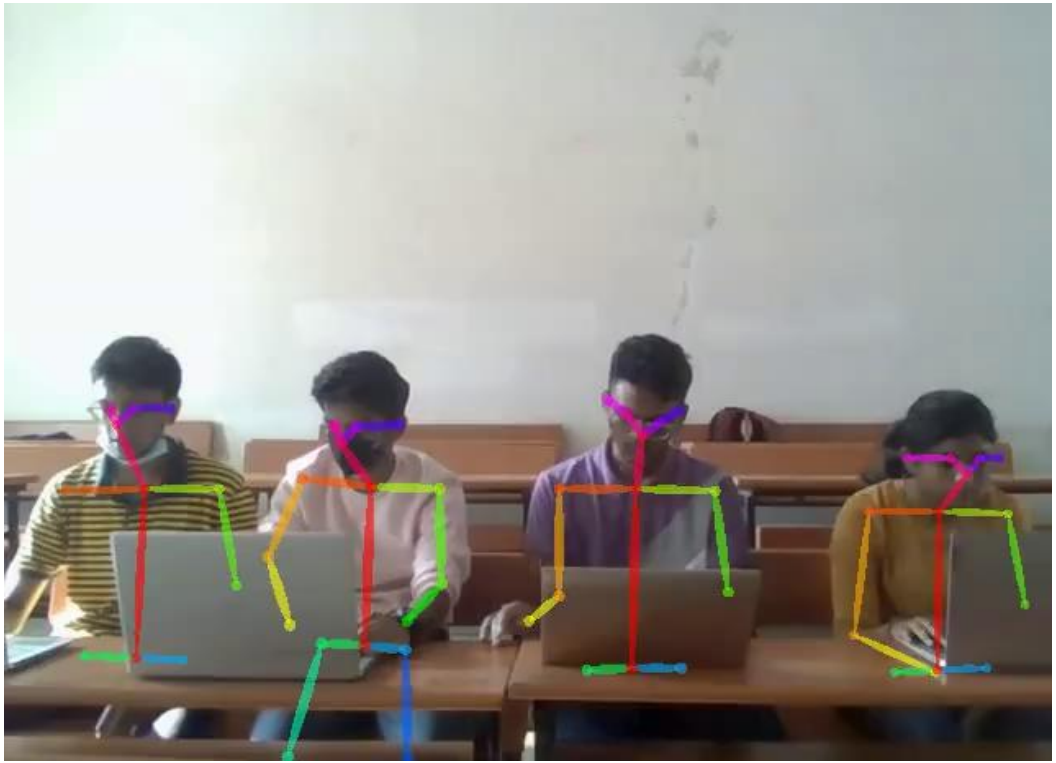
Using the Bipartite matching algorithm, the pose of each person is obtained

Key-point detection

- 18 key points on single person and up to a total of 135 key points from an image.
- Co-ordinates of key points extracted and saved in a JSON file.
- The angle between them is calculated to detect slouching.

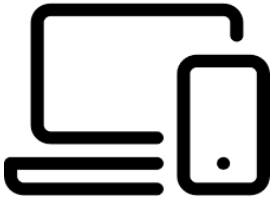


Working demo



Push notification

How it works

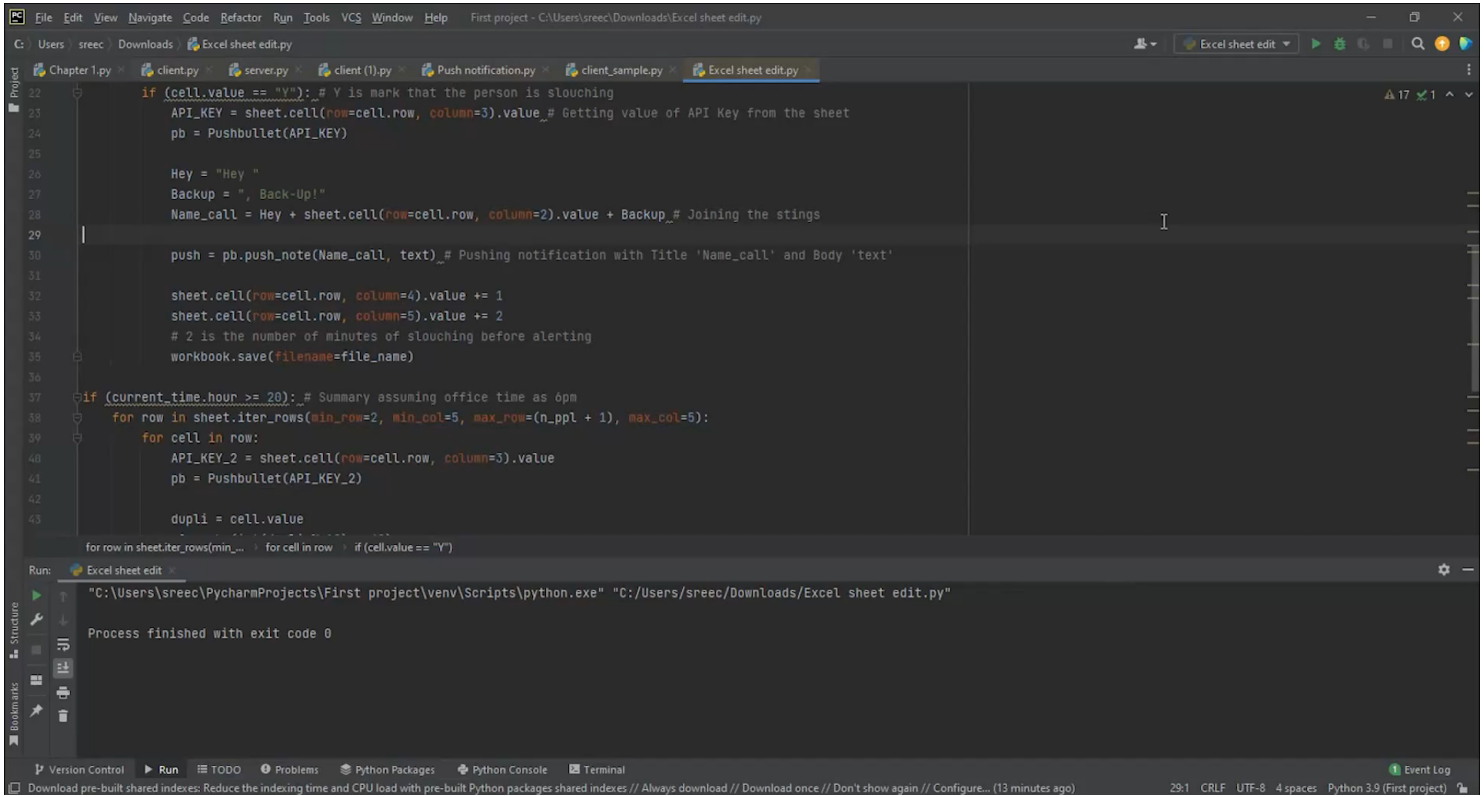


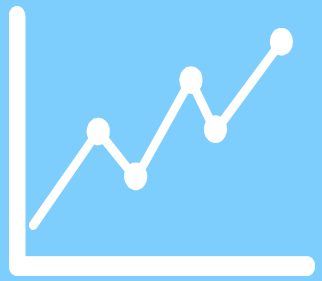
Server sends push notifications to the respective person

Push bullet API used for achieving this

Compatible with both computers and cell phones

Working demo





Impact

WHO stated facts

- Approx. 1.71 billion people worldwide
- Low back pain causes highest burden - 568 million people.
- Limit mobility and dexterity, leading to early retirement from work, lower levels of well-being.
- Has been increasing and is projected to increase in the next decades.

Novelty and future works

Novelty

Cost-effective

Hardware requirement less.

Maximum comfort

No physical attachment

New approach

No implementation yet

Prevention

Prevents from slouching, saves from risk of back pain.

Ease of implementing

Can run on existing server and cameras

Work to be done

- Write code for image streaming
- Implement image streaming in raspberry pi
- Extract key point coordinates and calculate angle between them
- Integrate hardware, image streaming, OpenPose model and notification into single product

Thank You