

SlouchDetect

Detecting bad posture with your webcam +
Python + OpenCV

Outline

- Motivation
- An idea for a solution
- Computer vision concepts
- Implemented solution
- References

Motivation

Most of us adopt a bad posture whenever we sit in front of a computer...

This can have terrible consequences for our health and well being!

This is called
slouching



www.alliedtravelcareers.com > blog > [Traducir esta página](#)

8 Negative Effects of Bad Posture - Allied Travel Careers

13 nov. 2019 - Because the body is in a slouched position in **bad posture**, this position puts extra pressure and stress on the upper body. Lower back pain is the ...

health.usnews.com > Wellness > [Traducir esta página](#)

10 Ways Poor Posture Can Harm Your Health | Wellness | US ...

1 feb. 2018 - She was right. "**Poor posture** can have many negative **effects** on your health," says Dr. Kenton Fibel, a family medicine physician specializing in ...

www.thebackstore.com > blog > 5-... > [Traducir esta página](#)

5 Dangers of Poor Posture — and How to Fight Back | Blog

While most people are aware of the common problems of **poor posture**, such as neck and back pain, they don't realize that the issues can extend much further. In ...

I wish...

there were a device to help me
correct my posture.

Upright GO Original | Posture Trainer
and Corrector for Back | Strapless,



An Idea

- Detecting when I slouch =
 - **measuring the vertical position of my face**
 - detecting when it deviates from an ideal position.

CV: Computer vision (*visión artificial*)

- subfield of AI that develops computerized methods to gain **high-level understanding** of images and videos
- **Extracting meaningful information** from images and videos that can be used to **drive decisions**
- **CV Prototypical tasks**
 - Classification
 - Object Detection
 - Landmark extraction
 - Recognition
 - Segmentation
 - Optical flow measurement

Computer Vision tasks 1/6: Object Classification

- Given an image of a single object tell me **what** the object is.
- `def classify(x: Image) -> String`

x =

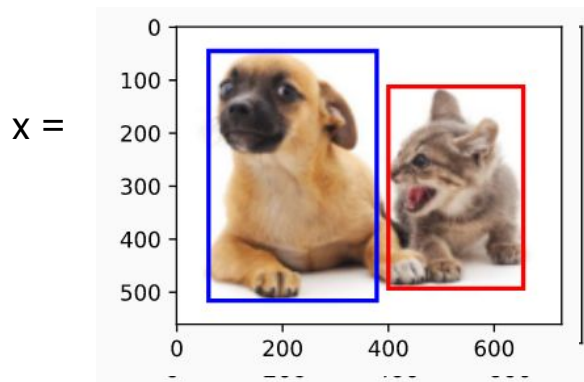


- `classify(x) => "hotdog"`

Computer Vision tasks 2/6: Object detection

- Given an image of a many objects tell me **what and where (in the picture)** the different objects are

```
def detect(x: Image) -> Array[BoundingBox]
```



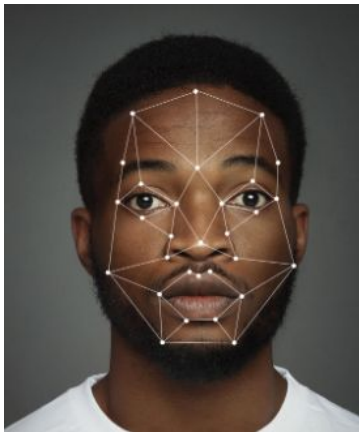
- `detect(x) => [BBox(what="dog", coords=[60, 45, 378, 516]),
BBox(what="cat", coords=[400, 120, 700, 490])]`

Computer Vision tasks 3/6: Face landmark detection

- Given an image of a *face* detect key points within it.
E.g eye corners, nose, lips, etc...

```
def face_lm_detect(x: Image) -> Array[LabeledPoint]
```

x =



Applications:

- emotion detection
- recognition
- ...

- `face_lm_detect(x) => [LabeledPoint("left-cheek", coords=[60, 45]) ,
LabeledPoint("left-eye", coords=[60, 45])]`

Computer Vision tasks 4/6: Recognition

- Given an picture of a person and a database of persons tell me **who** is in the picture

```
def recognize(x: Image, db: PeopleDB) -> PersonId|Null
```

x =



```
recognize(x) => PersonId(1233123) # Obama
```

Computer Vision tasks 5/6: Segmentation

- Given an picture of size $M \times N$, produce a “map” of the same size labeling each pixel with the “object” class

```
def segment(x: Image[M,N]) -> PixelLabeling[M,N]
```

$x =$



`segment(x) ==`



Application: self-driving cars

Computer Vision tasks 6/6: Optical Flow measurement

- Given a video, infer from consecutive frames how fast the objects are moving

```
def measure_flow(frame1: Image, frame2: Image) -> FlowField[M,N]
```

Demo :

<https://www.youtube.com/watch?v=LjjJQ81RbX0>

Implemented solution: SlouchDetect

Key ingredients:

- Python bindings to OpenCV library:
 - Capture images directly from webcam
 - Face detection functionality
- Pygame library:
 - just to play an alert sound when slouching



SlouchDetect: pseudo-code

```
while True:
    image = capture_img( camera )

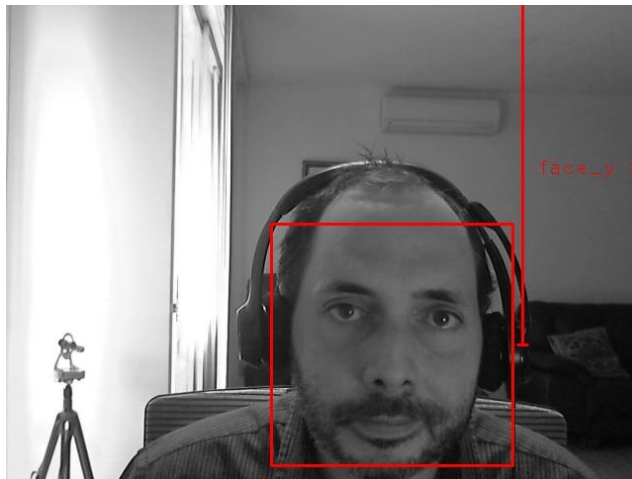
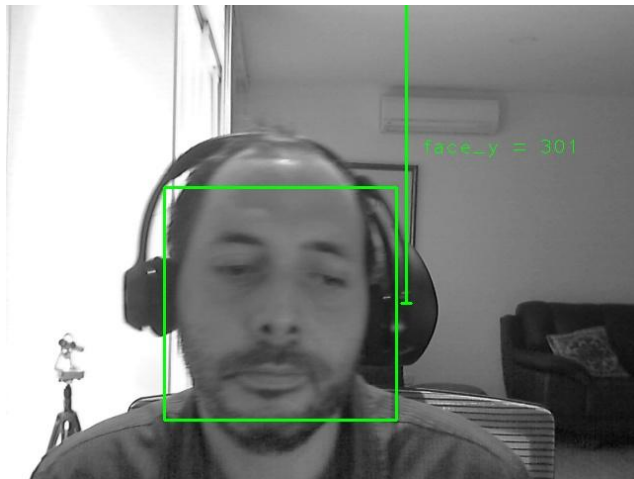
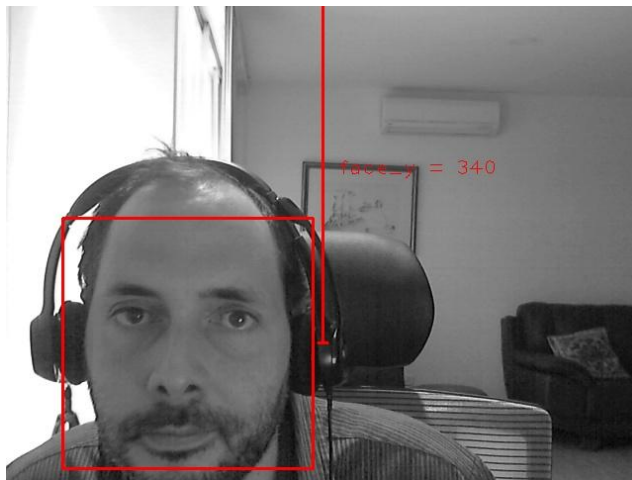
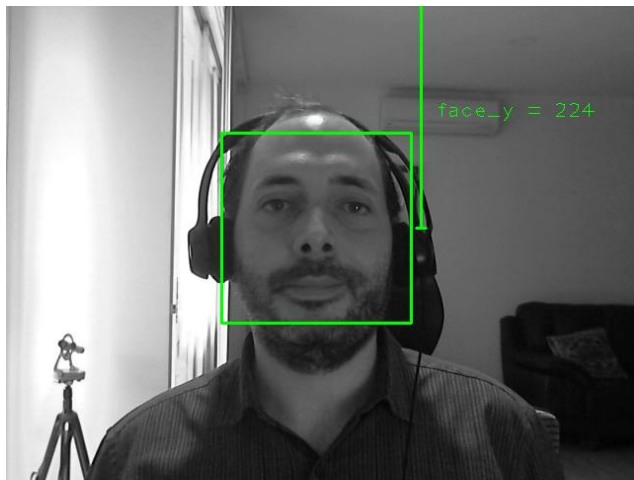
    face_bbox = detect_face_with_open_cv2( image )

    face_y = measure_face_vertical_position( face_bbox )

    if first_iteration:
        reference_y = face_y
    else:
        slouching_y = face_y - reference_y

        if slouching_y > THRESHOLD:
            sound_alert()
```

Visualizing SlouchDetect



SlouchDetect: the actual code

Check it out here:

https://github.com/la-haus/study_group/tree/main/talk-comp-viz-bad-posture-detector

Tutorials, MOOCs

- Interactive book / tutorial on deep learning <https://d2l.ai>
- convolutional neural networks
<https://www.coursera.org/learn/convolutional-neural-networks?specialization=deep-learning>
- <https://www.udacity.com/course/computer-vision-nanodegree--nd891>

Quirky applications

- Neural net that guesses your age <https://www.how-old.net/>
- [Measuring pulse from a regular video](#)
- [AI discovers the heart beat in your faces](#) (Blog)
- [AI Baby Monitor that detects breathing](#)

Open CV

- <https://opencv.org/>
- [OpenCV python tutorials](#)
- [Face detection via Cascade Classiffiers in OpenCV](#)

A cool book

