

# Pose estimation and de-identification in research data sources

Student : Massimo Pantucci

Professor : Henning Müller

## Summary

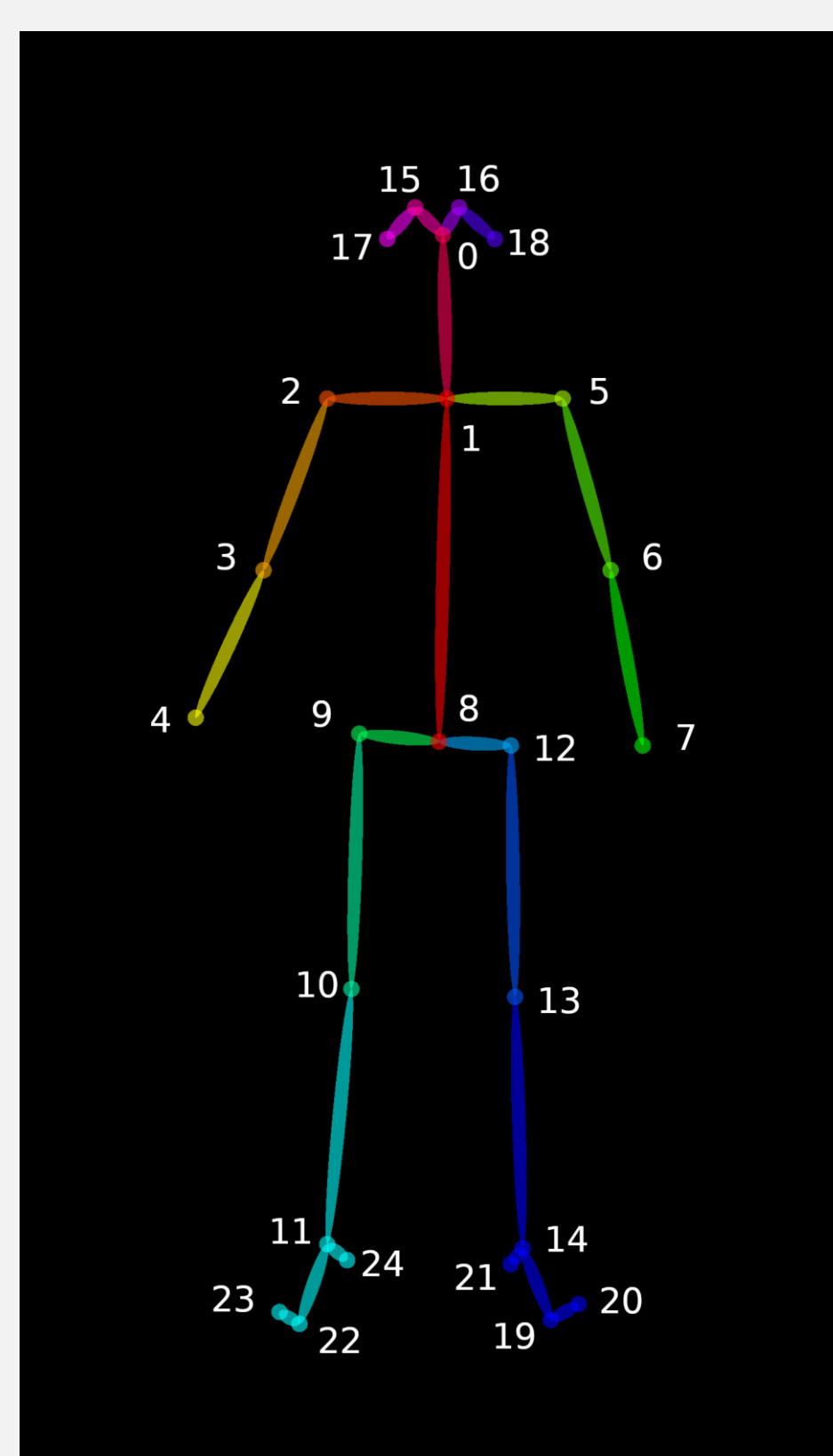
1. Anonymization of patients video in physical rehabilitation
2. Development of an automated program
3. Measuring impact of anonymization on pose estimation algorithm

## Introduction

- Data protection is becoming more and more strict
- While leading to more protection for customers, it makes the sharing of research data very difficult, especially in medical fields
- There is a need for a way to anonymize video of patients in order to make them shareable with the whole scientific community
- This will help research and the spreading of knowledge

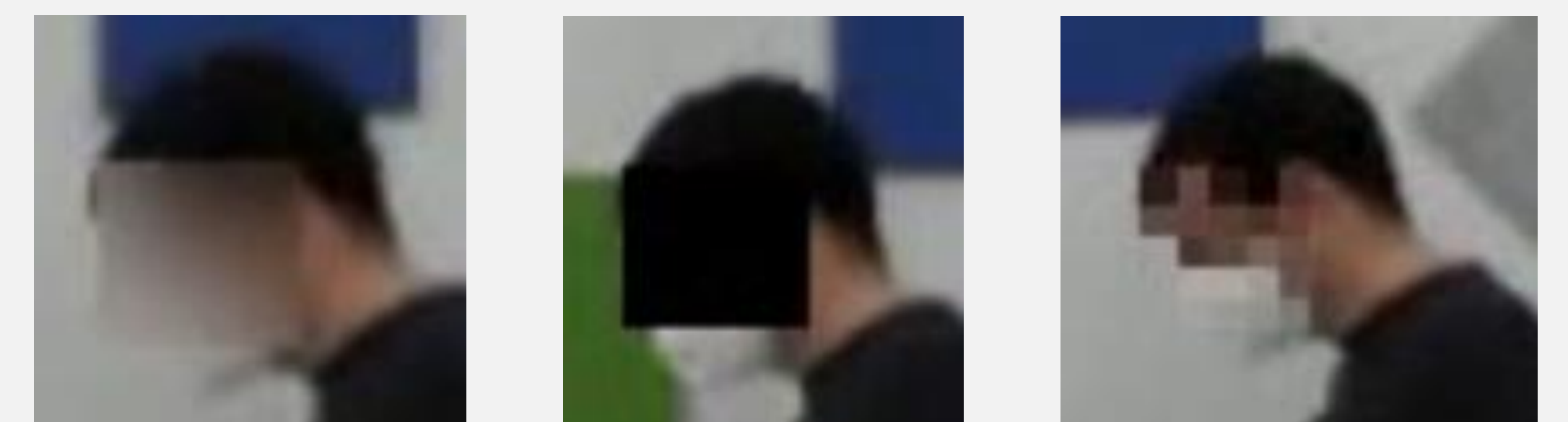
## Methods

- To create the prototype, anonymization methods were analyzed, and a selection was made
- They had to have a minimal impact on the movements of the subject
- The same was done to pose estimation algorithm
- They had to be fast, and the less resource intensive possible
- Different architectures for the program were discussed
- The chosen one is a web application



## Results

- The result is a web application with several features:
  1. **Upload:** Users can upload video to be anonymized
  2. **Anonymization:** Users can choose between three anonymization methods



3. **Pose Estimation:** Users can pose estimate the original and anonymized videos and see metrics to show the differences, that they can download
4. **Download:** Users can download the anonymized video or the anonymized video the Open Pose skeleton

### Process

#### 1. Upload

Aucun fichier n'a été sélectionné

#### 2. Anonymization

Method:

Blur  Block  Pixelate

#### 3. Open Pose

#### Original video results

Angle of the left knee:

Confidence:

Angle of the left elbow:

Confidence:

#### 4. Download

### Instructions

#### 1. Upload

Upload the video that you want to anonymize. It should be in the ".mp4" video format.

The first frame of the video must contain a person.

During the upload process, all metadata are removed from the video for privacy reasons.

#### 2. Anonymization

Choose the de-identification method you wish to use.

Blurring: the face is blurred using a gaussian blur.

Blocking: the face is replaced by a block of solid black color.

Pixelating: the face is blurred in a pixelated way.

A YUNet algorithm is used to detect the face of the subject. Then, the chosen method is applied to it.

#### 3. Open Pose

Test how affected by the anonymization process the pose-estimation algorithm is. Before using this step, you need to upload and anonymize the video.

Use the "Test" button to get results from both the original and anonymized videos. It computes the left knee and elbow angles as well as their respective confidence.

The "Pose Estimate" button passes the anonymized video through Open Pose and applies the skeleton to it.

It uses the BODY-25 Model.

Finally, the "Download CSV Metrics" downloads the metrics calculated in a CSV file.

#### 4. Download

In this final step, you can download the output of the process.

The "Download Anonymized" button lets you download the anonymized video.

The "Download Posed and Anonymized" button lets you download the anonymized video with the open Pose skeleton on it.

## Conclusions

- The prototype, while still in experimental state, is fully functional
- The results show that there is a difference of about 1% to 10% depending on the video or the anonymization method used