# Université Paris-Est Créteil (UPEC)

International Master of Biometrics and
Intelligent Vision

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CONSTRUCTION AND VISUALIZATION OF 3D VOLUMETRIC IMAGE FROM 2D BIOMEDICAL IMAGES.


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# OUTLINE

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2. Methods and materials

    - Loading of slices
    - Construction of the 3D volume
    - Visualization of the 3D volume

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# INTRODUCTION

## What is 3D Volumetric ?

- 2D images are obtained using regular cameras;
- 3D images are captured using specific technologies (CT scans);

## Objective of the lab

- Construct a 3D volumetric single image from 2D slices of the chest;
- Visualize the 3D volumetric image;

# METHODS AND MATERIALS (1)

## Loading the slices

- Use of OS module to list all the slices from the directory;
- Read dicom files using **read_file()** function from **pydicom**;

```
path = "/home/yosagaf/devs/medical-biometrics/SCD2001_files"
CT_images = os.listdir(path)
slices = [dicom.read_file(path+"/"+s, force=True) for s in CT_images]
slices = sorted(slices, key=lambda x:x.ImagePositionPatient[2])
```

## Construction of the 3D volumetric image

- Stack the slices using a for loop over the pixel array of each slice to obtain a 3D array with the shape of (21,256,256);

```
for i, s in enumerate(slices):
    array2d = s.pixel_array
    volume3d[i:,:,] = array2d
```

# METHODS AND MATERIALS (3)

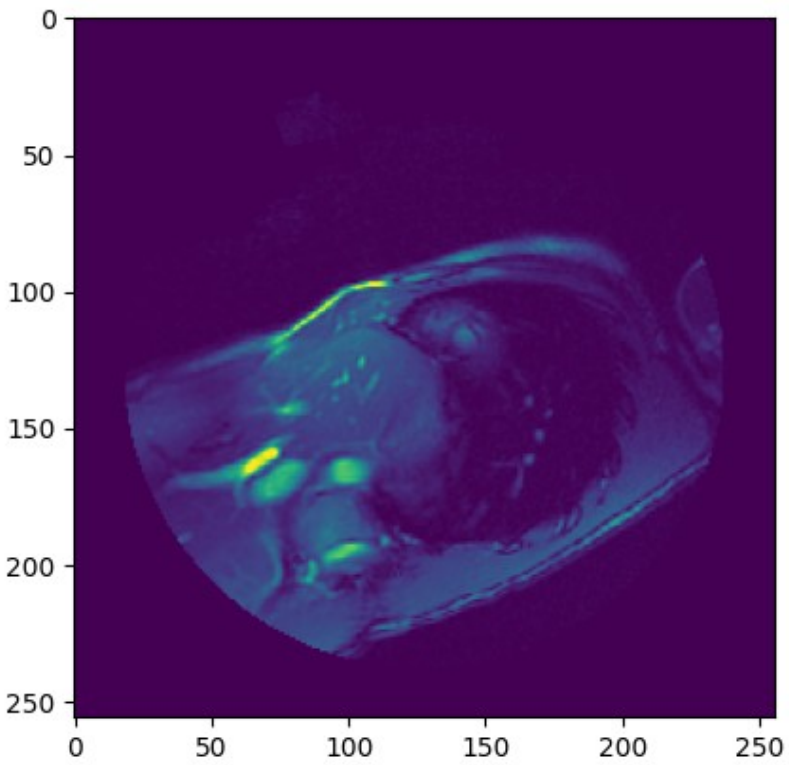
## Visualization of the 3D volume

- To view 2 images, we use **imshow()** function from matplotlib;
- To display 3D volume, we extend **imshow()** function using scrolling capabilities of matplotlib viewer. Following are the given steps :
  - Plotting random index as an additional runtime;
  - Provide two functions **nSlice()** and **lSlice()** to change the index of the 3D volume;
  - Use canvas draw method to redraw the figure with new data;

```
def view3D(volume):
    removeKeymapConflicts({'n', 'l'})
    fig, ax = plt.subplots()
    ax.volume = volume
    ax.index = volume.shape[0] // 2
    ax.imshow(volume[ax.index])
    fig.canvas.mpl_connect('key_press_event', processKey)
```

# RESULTS

- The result is an interaction (animation) showing the 3D volumetric;
- The shape of the 3D volume is (21, 256,256), the same the one given by **volread()** function from imageio library;




```
(dl4cv) yosagaf@xps:~/devs/medical-biometrics/assignement1$ python 3DViewing.py

[INFOS] Type of 2D slices           :  <class 'list'>
[INFOS] Shape of 2D array (slice)  : (256, 256)
[INFOS] Shape of the 3D volume     : (21, 256, 256)

(dl4cv) yosagaf@xps:~/devs/medical-biometrics/assignement1$
```

# CONCLUSION

- We construct and visualize a 3D volumetric image in python;
- Displaying the volume is done using a trick around the **imshow()** function of matplotlib;
- This lab enabled me to highlight my skills in computer vision with medical imaging;

# THANKS
# FOR YOUR ATTENTION

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