

3<sup>rd</sup> Iranian Python Conference (PyCon) 2016  
Iranian University of Science and Technology, Tehran, Iran

# MEDICAL IMAGE PROCESSING

PREPARING CT SCAN IMAGES FOR  
COMPUTATIONAL USE

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# پردازش تصاویر CT اسکن

آماده سازی تصاویر برای مدل‌های محاسباتی

وحید نائینی

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- TERMINOLOGY
- OBJECTIVES
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- RESULTS
- `from __future__ import anything_we_need`

# TERMINOLOGY

- WHAT IS CT SCAN, & WHAT IS IT ABOUT?

# TERMINOLOGY

- WHAT IS CT SCAN, & WHAT IS IT ABOUT?



Source: [https://en.wikipedia.org/wiki/File:UPMCEast\\_CTscan.jpg](https://en.wikipedia.org/wiki/File:UPMCEast_CTscan.jpg)

# TERMINOLOGY

- WHAT IS CT SCAN, & WHAT IS IT ABOUT?
- IN GEEKY WORDS, IT IS A KIND OF FUNCTION

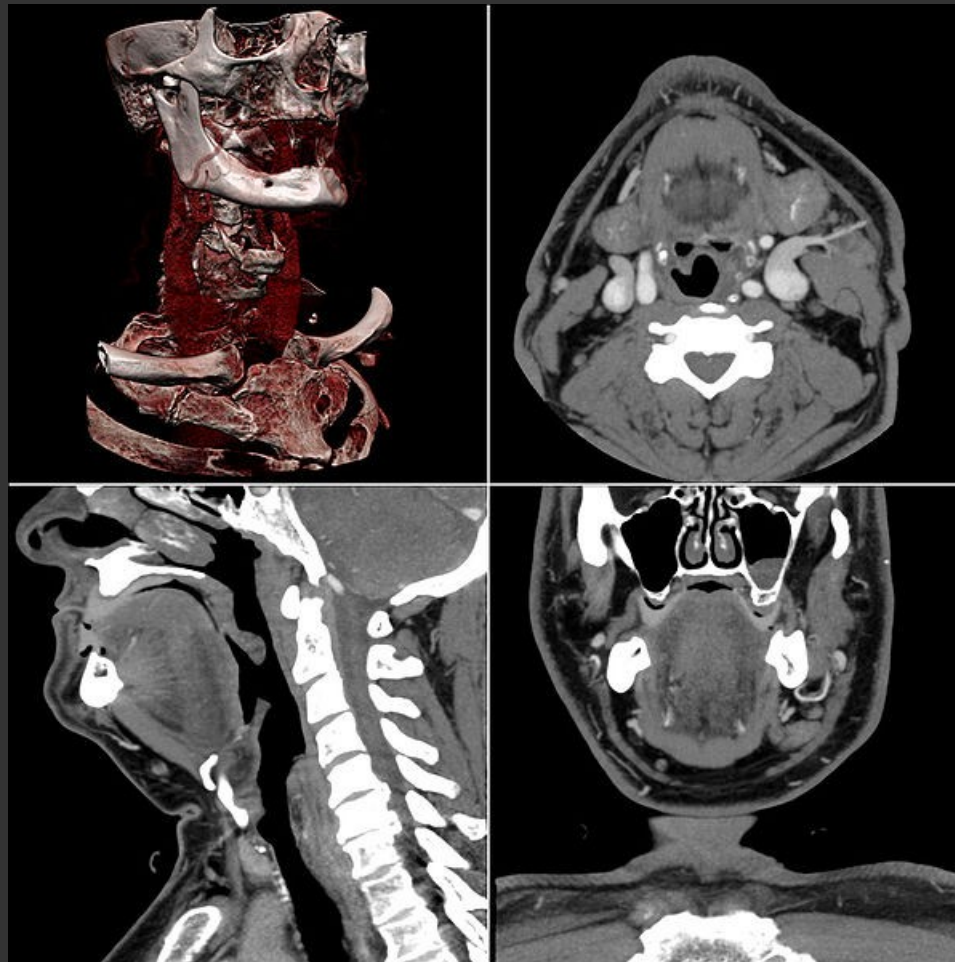
# TERMINOLOGY

- WHAT IS CT SCAN, & WHAT IS IT ABOUT?

```
def ct_scan(SOMETHING):  
    # blaah blaah, I don't care  
    # what is inside it ...  
    # blaah blaah  
  
    return WHAT_IS_INSIDE_THE_SOMETHING
```

# TERMINOLOGY

- WHAT IS CT SCAN, & WHAT IS IT ABOUT?



Source: <https://en.wikipedia.org/wiki/File:Ct-workstation-neck.jpg>

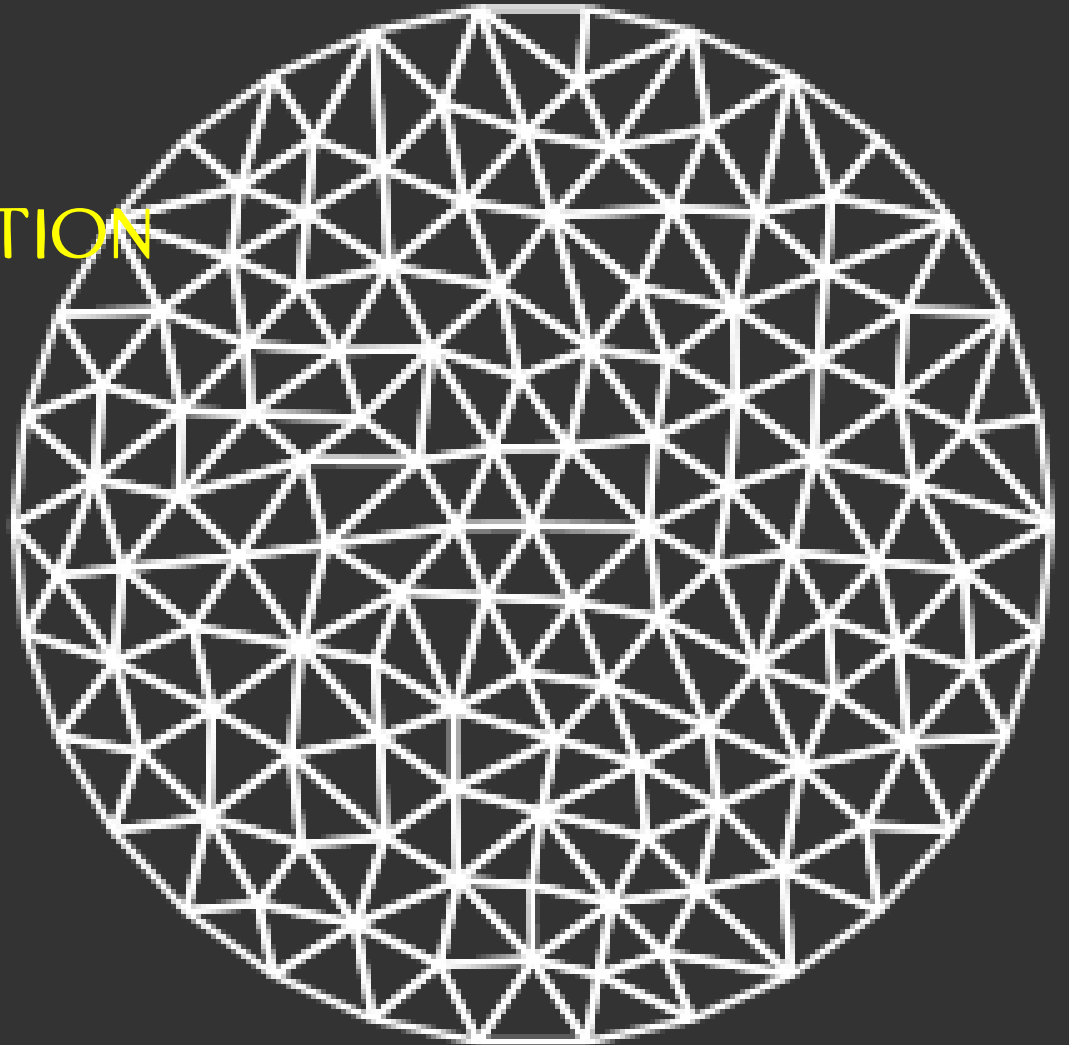


# TERMINOLOGY

- WHAT IS CT SCAN, & WHAT IT IS ABOUT?
- 3D ARRAY
- GRAY SCALE, SHOWS THE HU UNIT
- APPLICATIONS IN MEDICINE
- APPLICATIONS IN ENGINEERING

# TERMINOLOGY

- FEM (FINITE ELEMENT METHOD)
- NUMERICAL METHOD
- APPROXIMATE SOLUTION
- MESH



# OBJECTIVE

- GENERATE A COMPLEX 3D MODEL
- INCLUDE ALL INFORMATION
- PREPARE IT FOR COMPUTATIONAL PURPOSES

# METHODOLOGY

JUST IMPORT, IMPORT, IMPORT  
AND IMPORT MORE LIBRARIES

scikit-image

Image Processing

pydicom

Open CT Scan Files

numpy & scipy

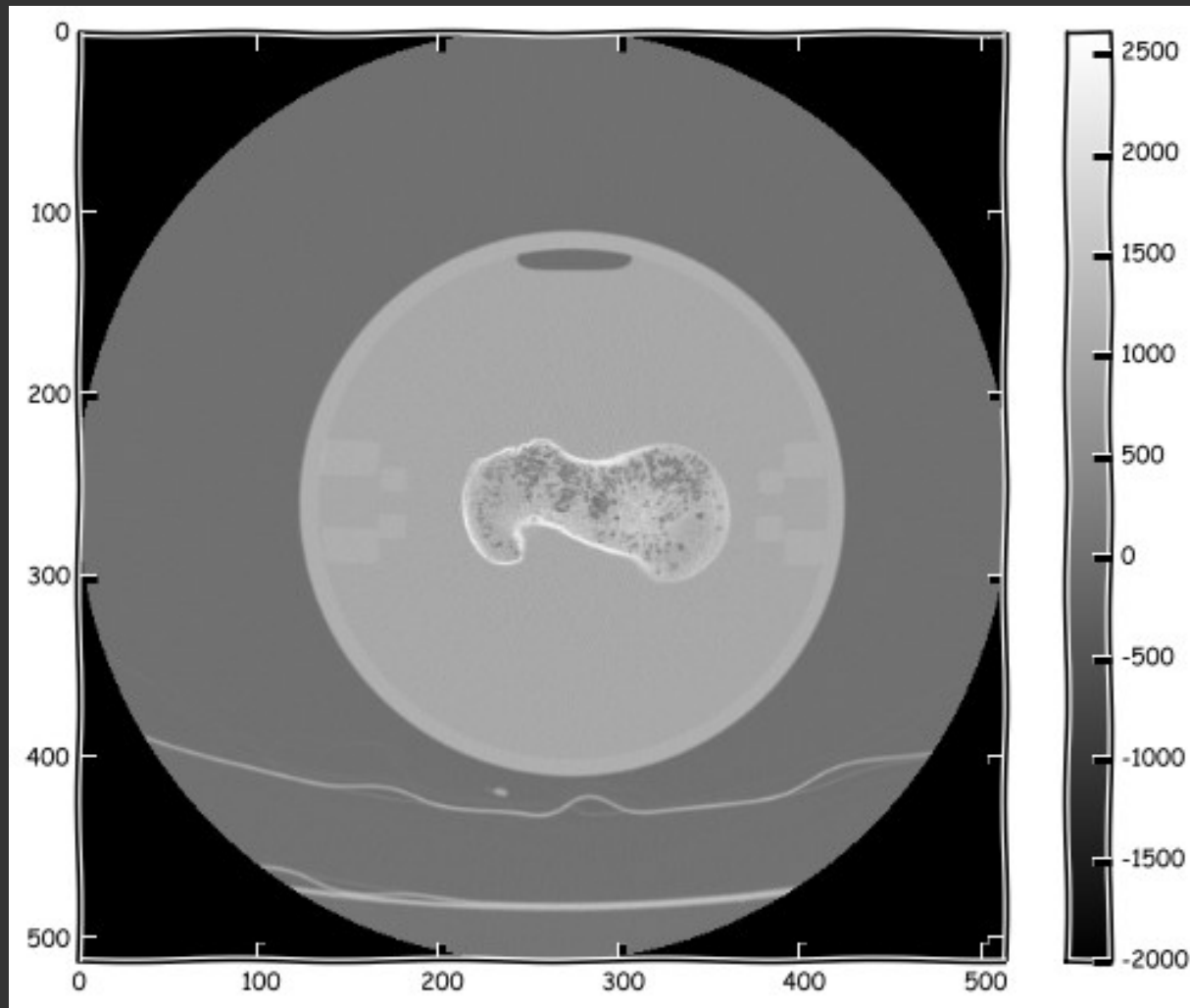
Calculations

matplotlib

Visualization

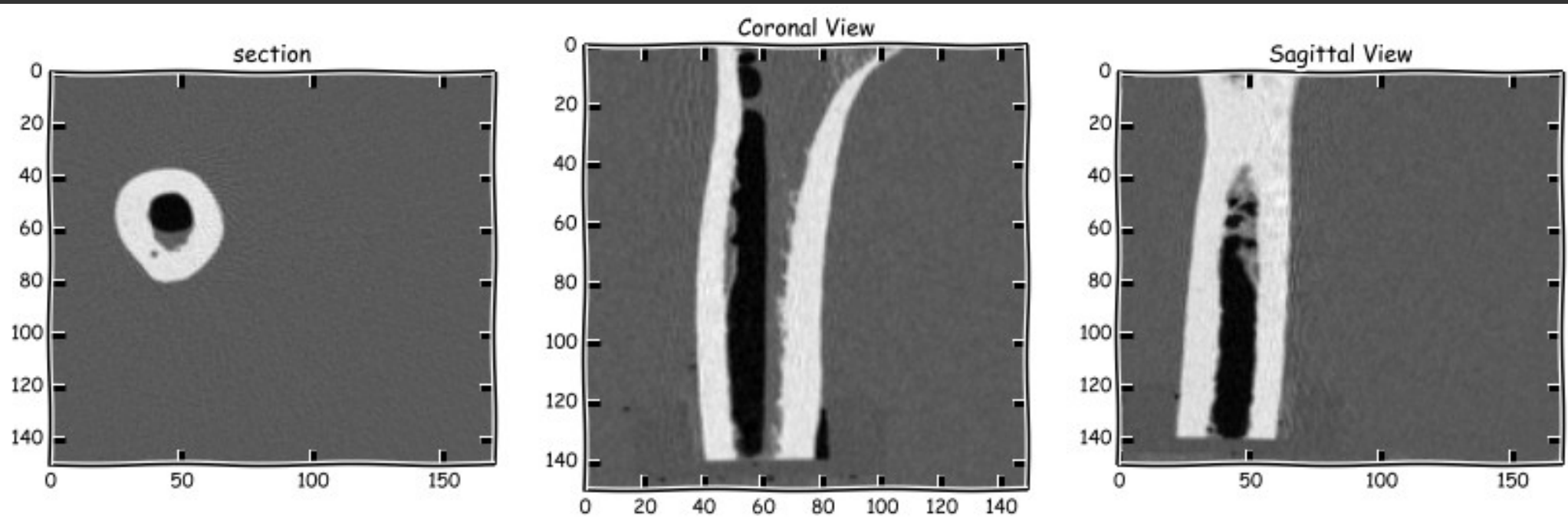
# COOL PYTHON STUFF

- `import pydicom`



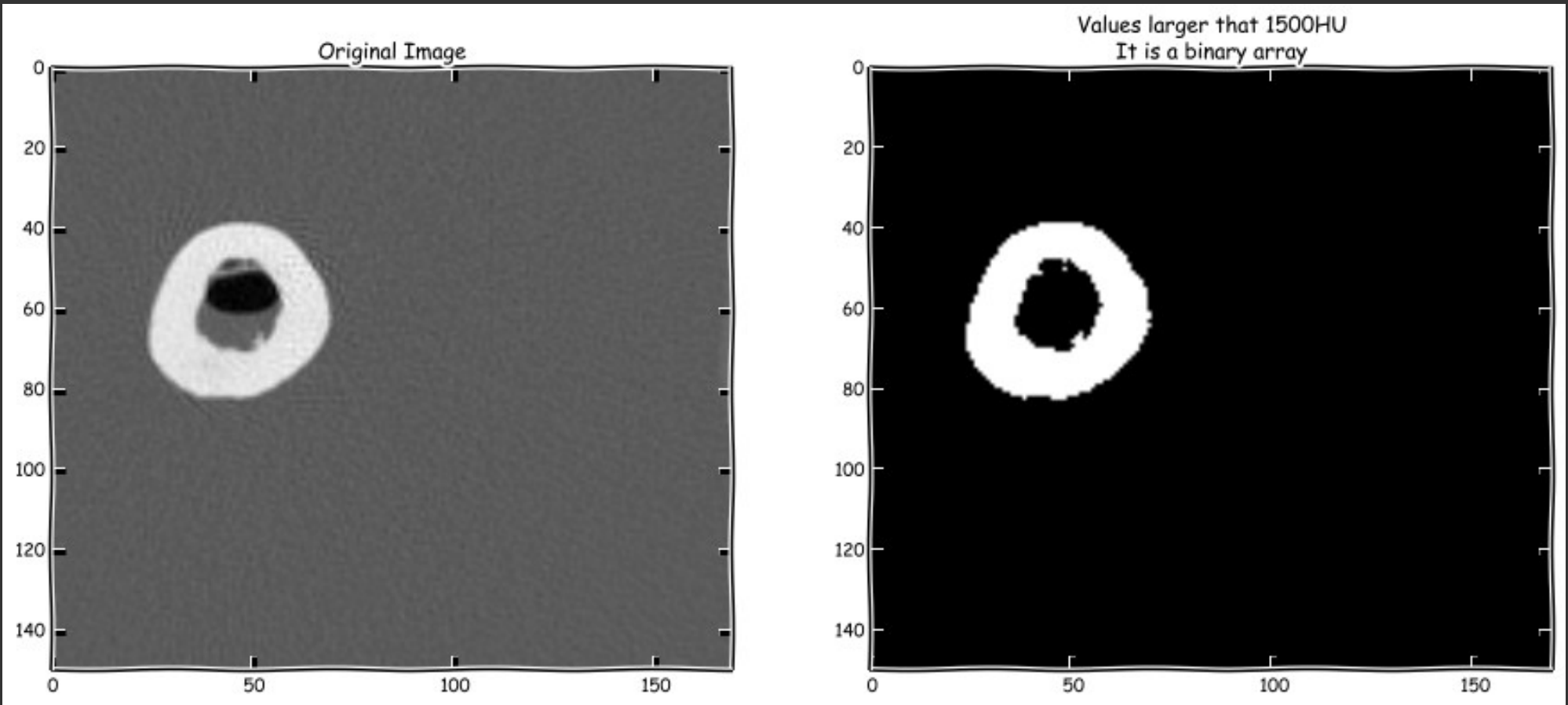
# COOL PYTHON STUFF

- pylab
- **VISUALIZE DIFFERENT VIEWS**



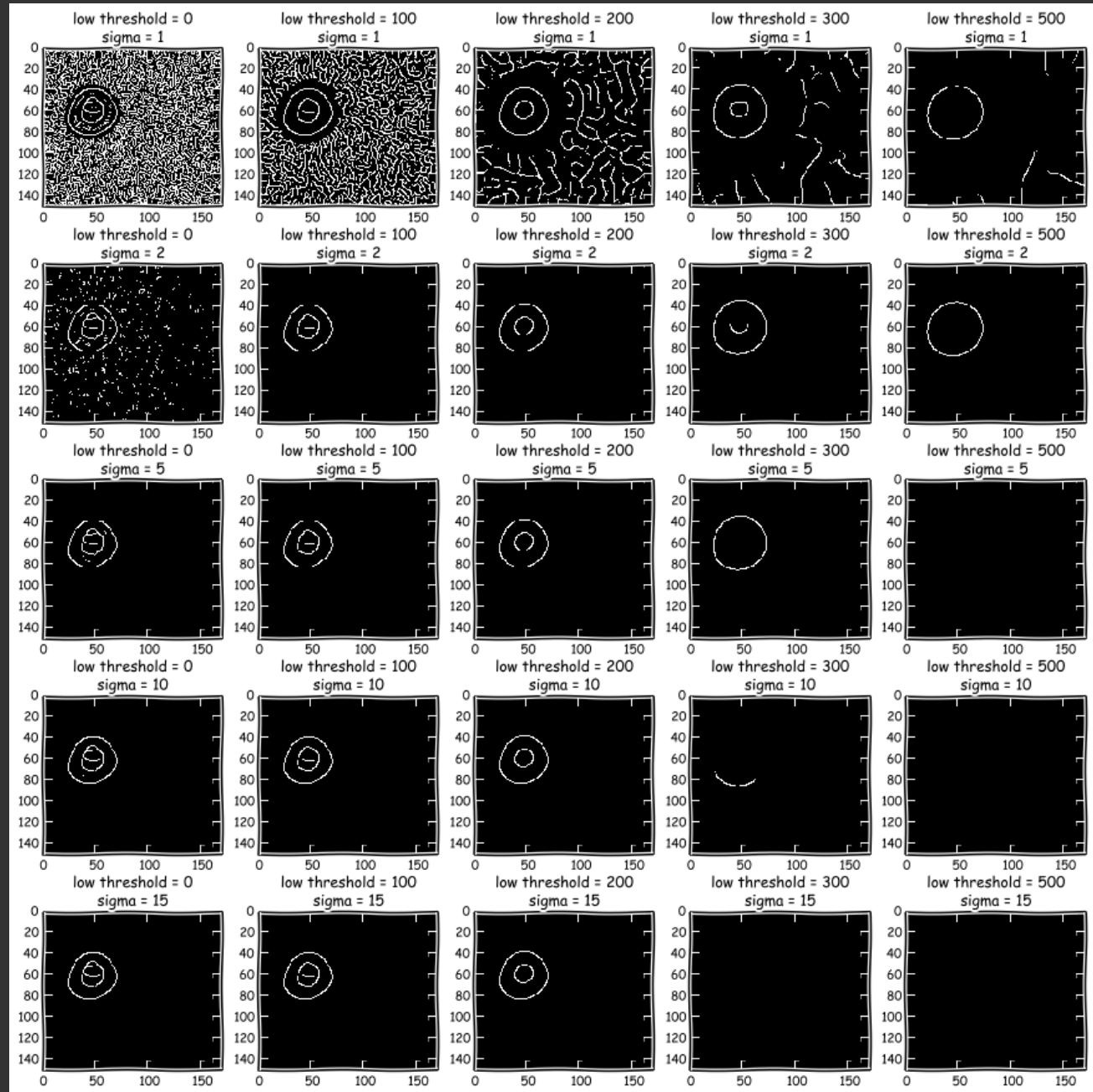
# COOL PYTHON STUFF

- SIMPLE THRESHOLDING



# COOL PYTHON STUFF

- CANNY  
EDGE  
DETECTOR





# COOL PYTHON STUFF

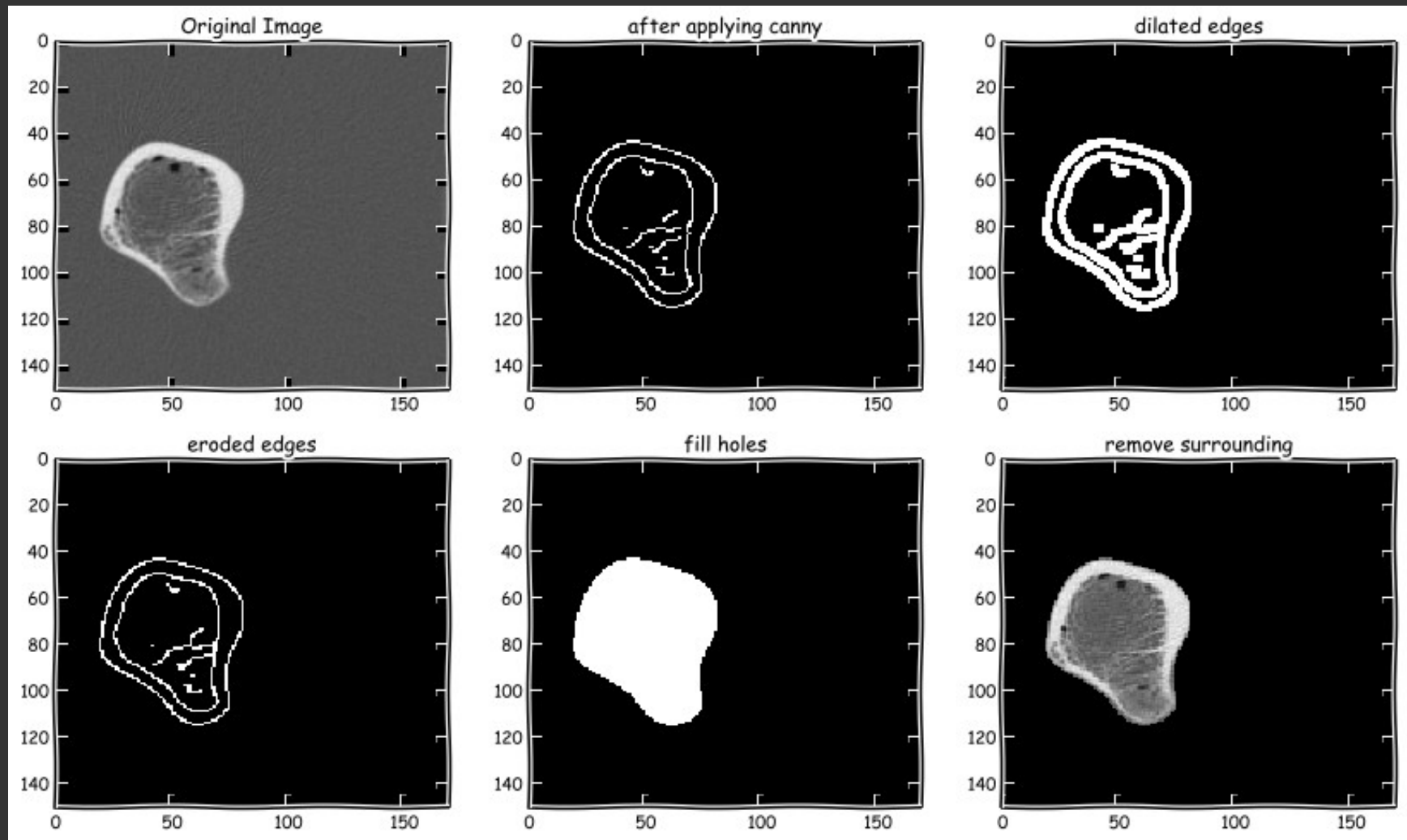
- FEW MORE STEPS ...



Source: <http://bearingdrift.com/2011/05/09/on-monty-python-status-day-will-ken-cuccinelli-tell-the-killer-joke>

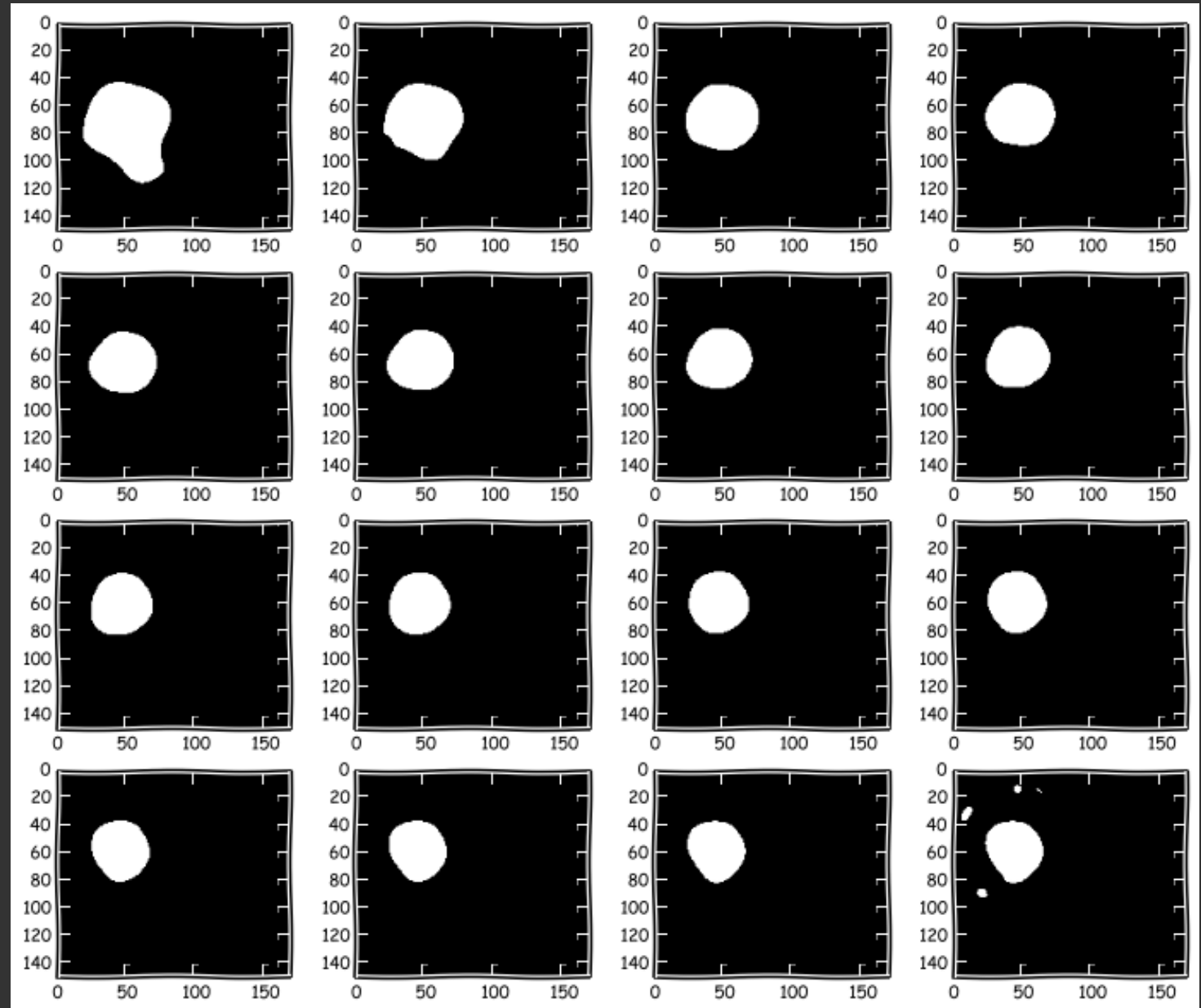
# COOL PYTHON STUFF

- MORE STEPS



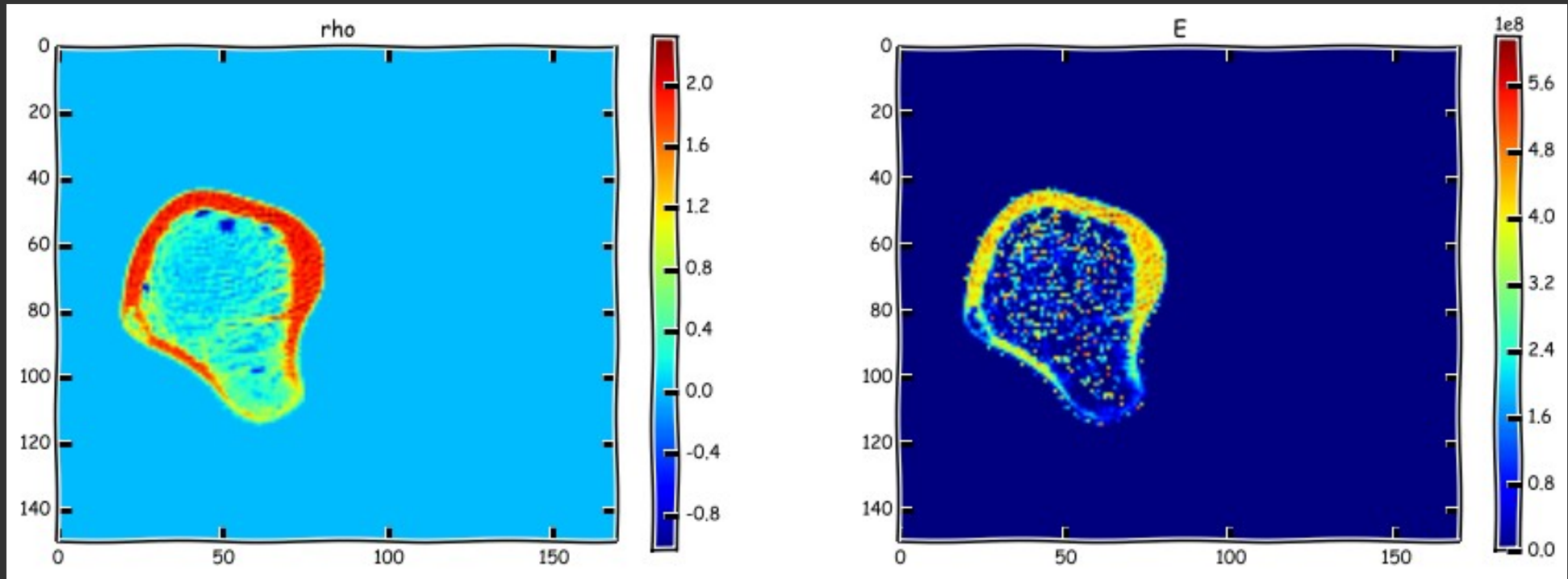
# COOL PYTHON STUFF

- BONE  
SECTIONS



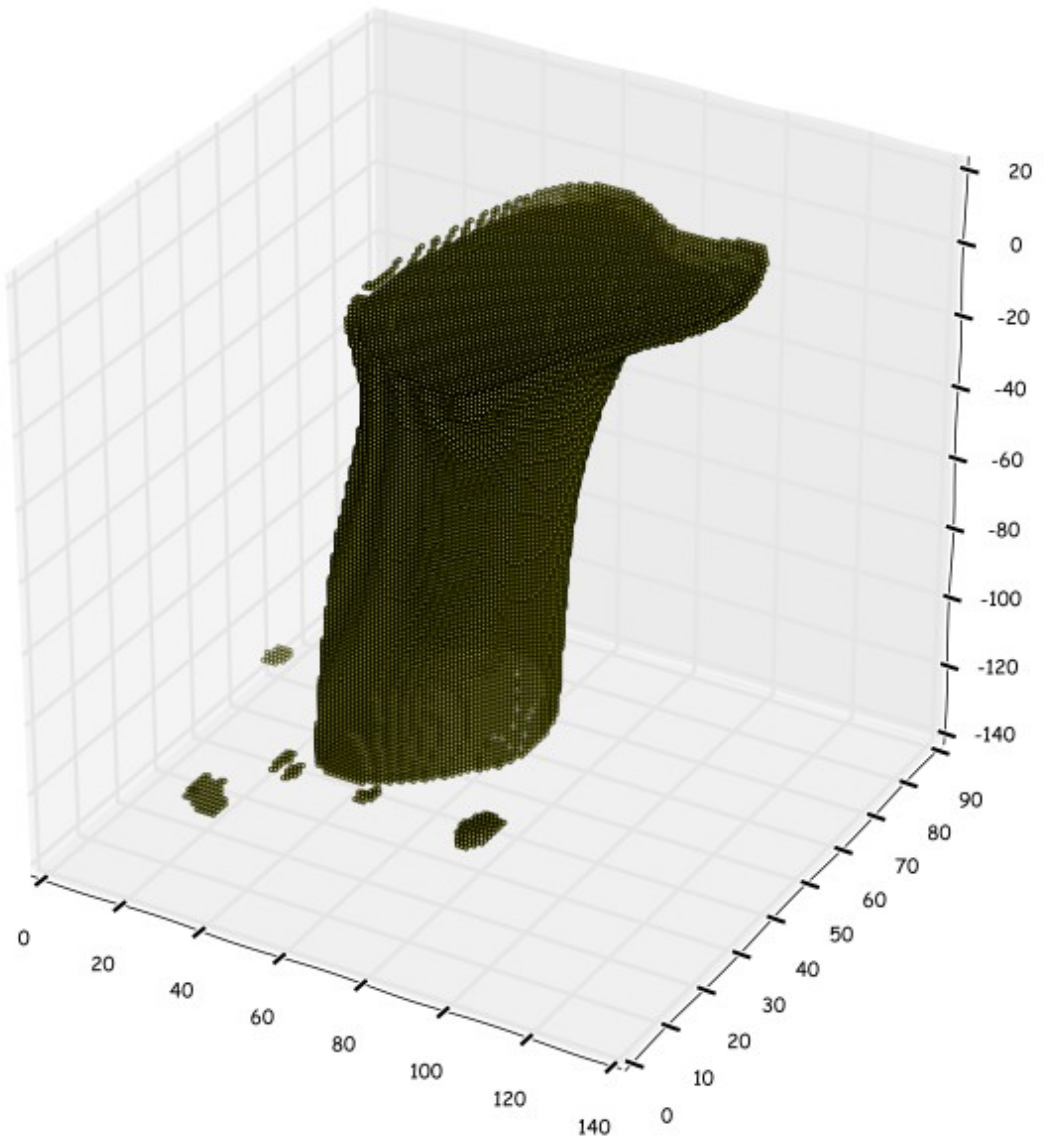
# RESULTS

- DISTRIBUTION OF MECHANICAL PROPERTIES



# RESULTS

- ENJOY  
3D MODEL



# FUTURE WORKS

- MAKE IT ACCURATE
- MAKE IT FAST
- WRITE SOFTWARES

THANKS FOR YOUR ATTENTION

A SPECIAL THANKS TO

**DR. MAJID MIRZAEI**

BEST SUPERVISOR EVER



QUESTIONS?



QUESTIONS?