# Apifix

Solving medical problems using deep learning

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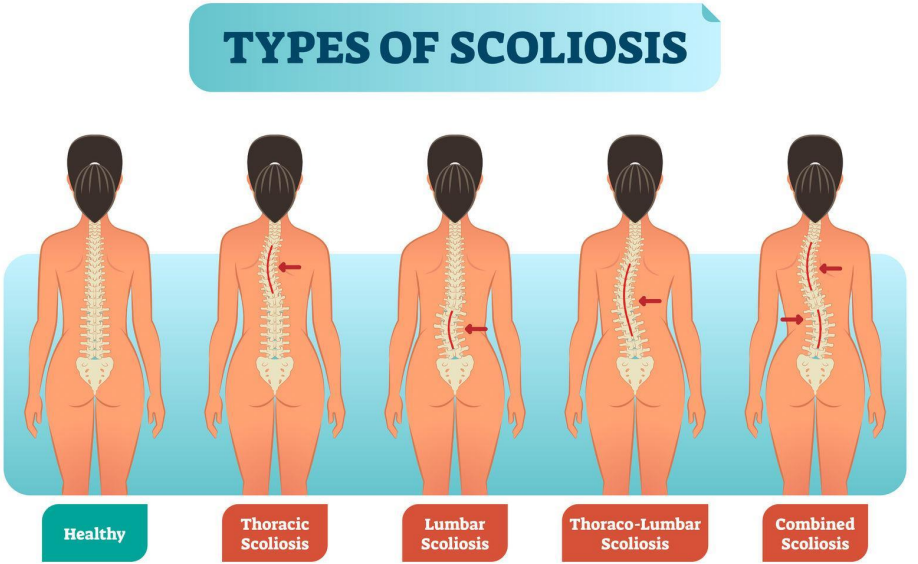
# About me

Alexandru Constantin ILIESCU

- Machine Learning experience:
  - 1st year of master in Machine Learning at Politehnica University Timisoara
  - Bachelor Thesis on High-Quality Point Clouds Generation
  - At CoreAI for approximately 3 months

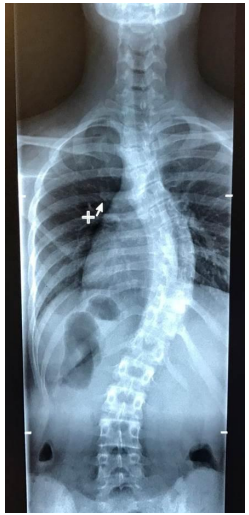
# Scoliosis

- is a sideways curvature of the spine
- about 3% of adolescents have scoliosis
- there are different types of scoliosis
- surgery may be needed in order to solve the problem



# Apifix and Scoliosis

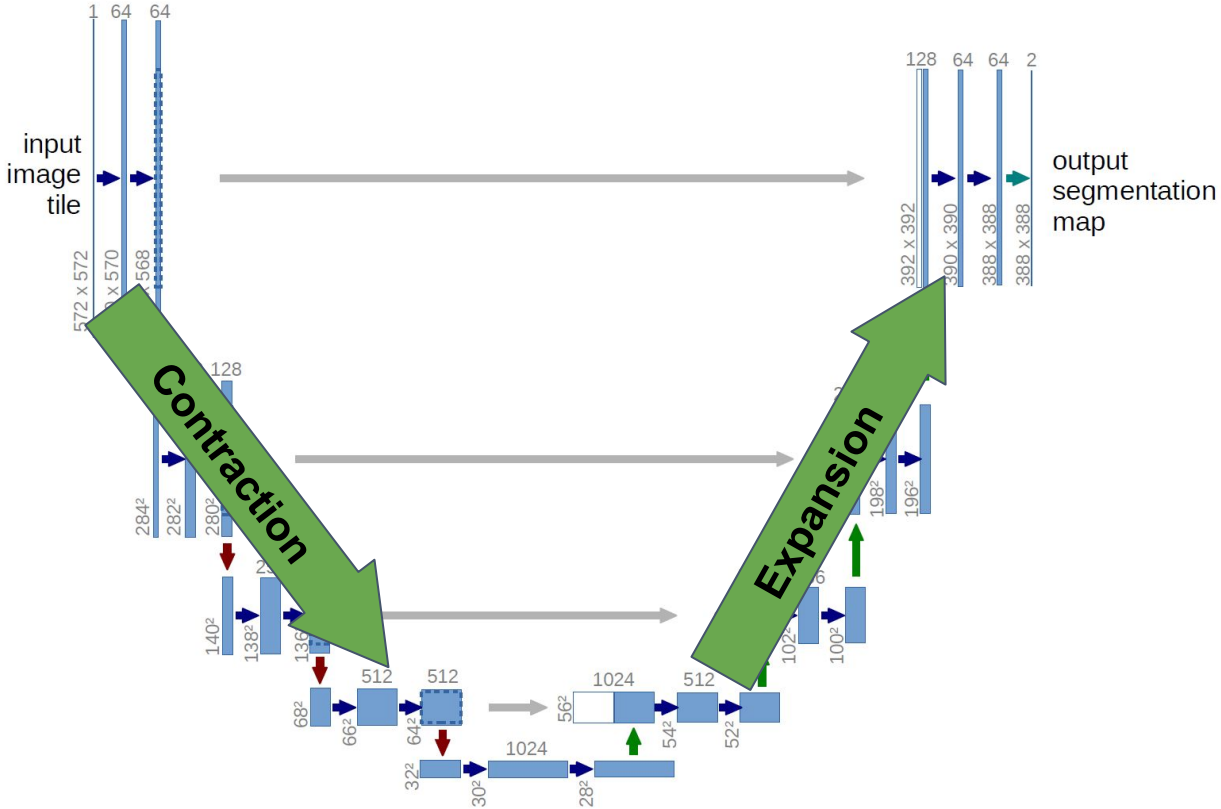
When surgery is needed, e metal rod is attached to the spine with screws, such that the fusion will work ok.



Apifix

- The angle of scoliosis of the patient
- Different measurements that are needed
- The positions of the screws needed for the metal rod

# Architecture of U-Net



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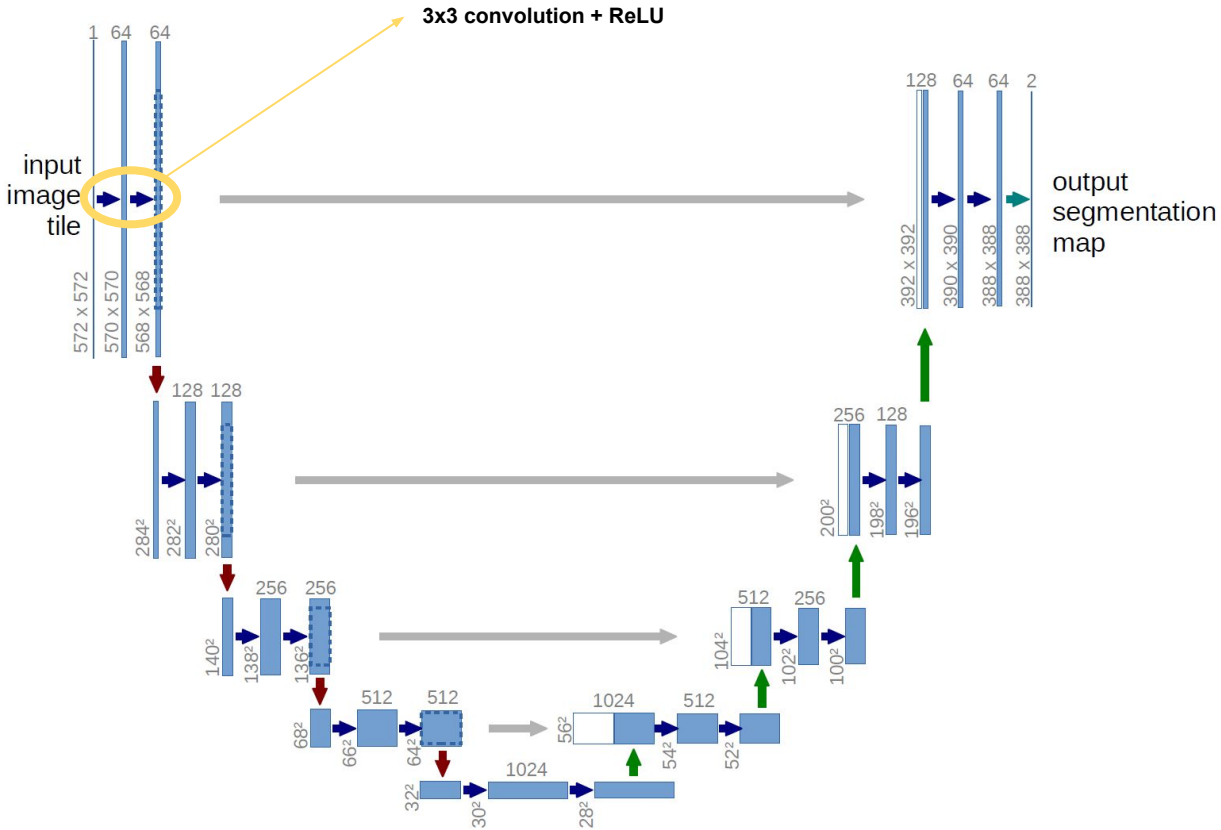

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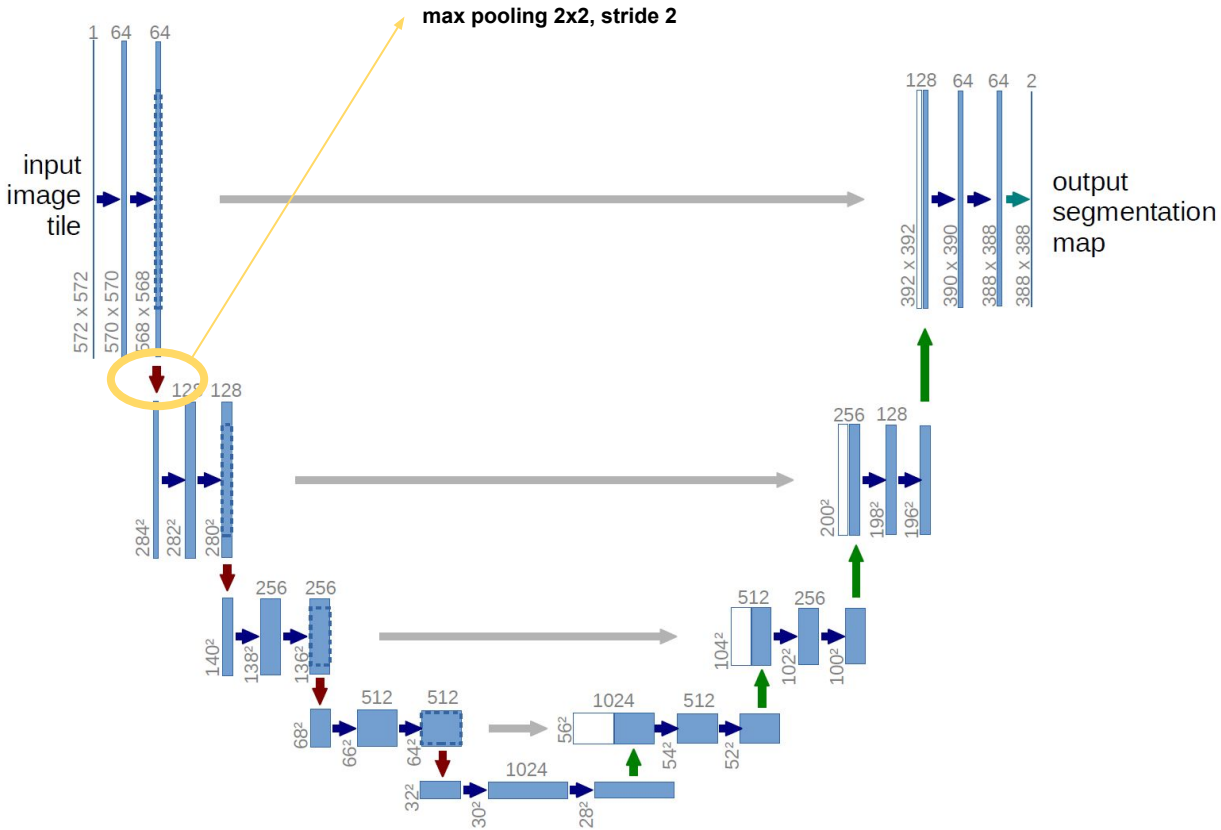

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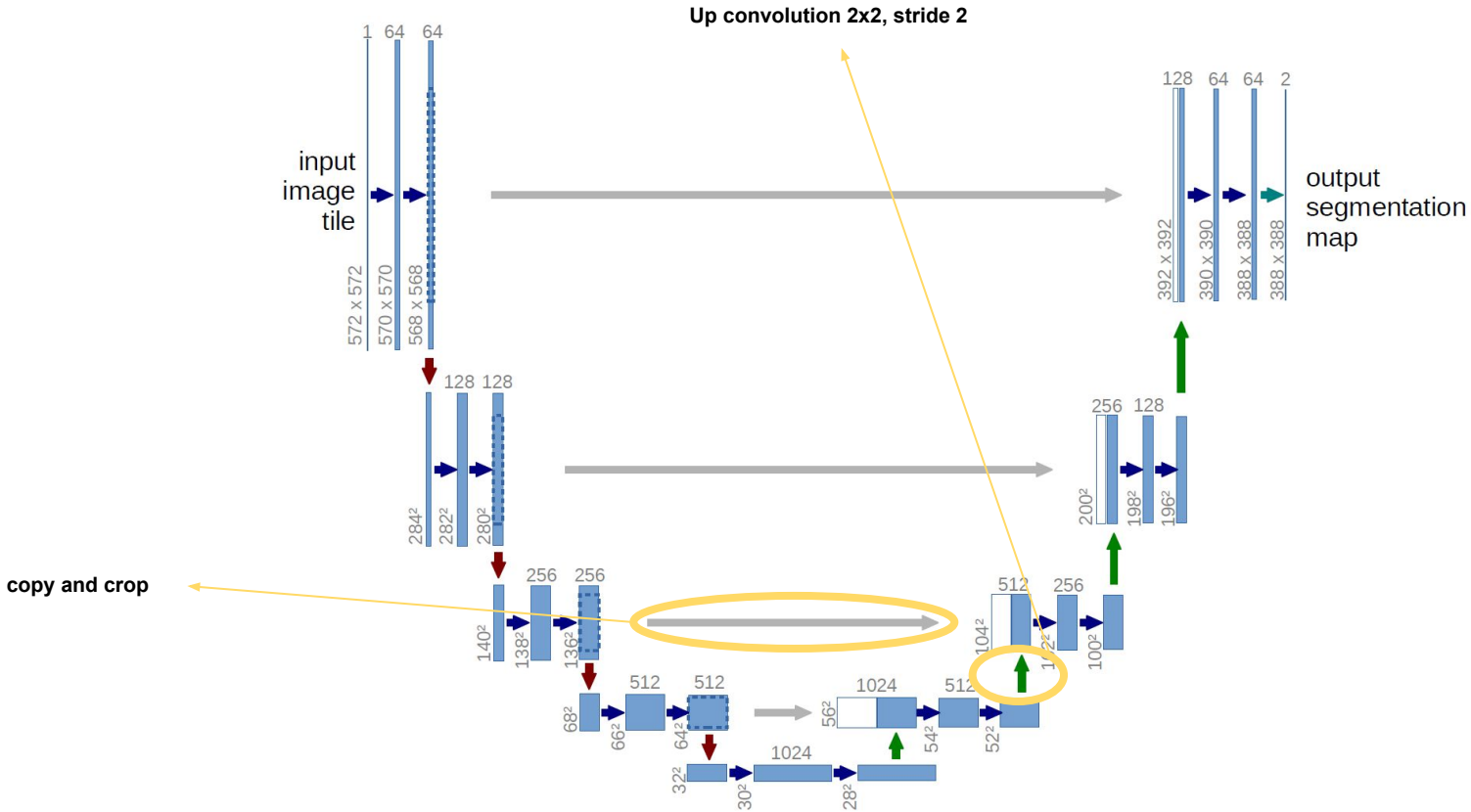
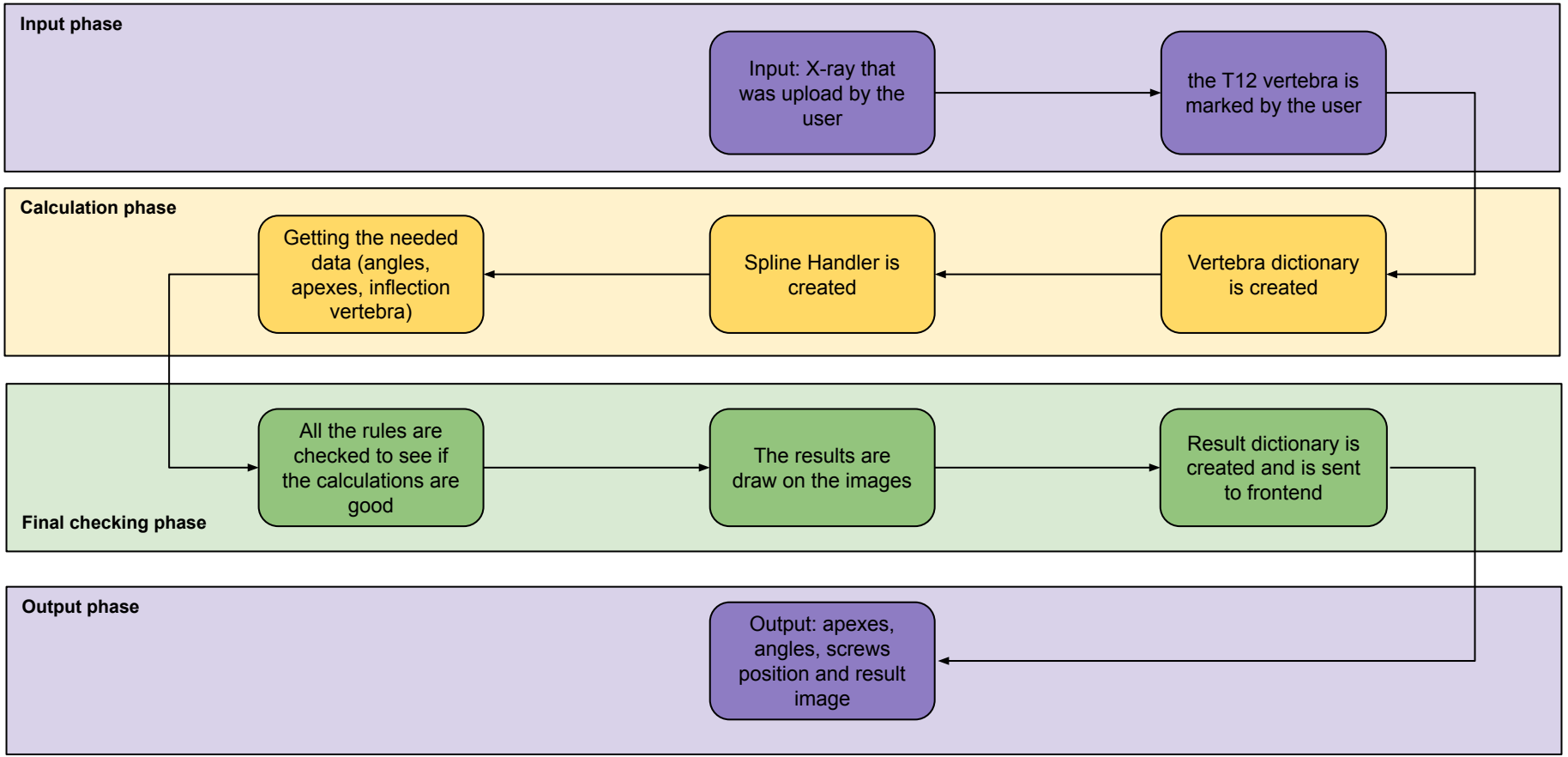
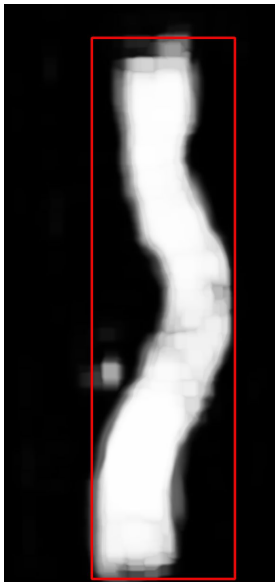


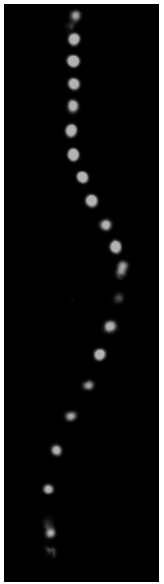
# Flow of the system



# Getting the vertebra data

- In order to use the image for getting the vertebra, a **local histogram equalization** is done
- This image is used for spine segmentation map and for calculating the bounding box of it
- Using the bounding box, the spine is cropped from the image
- The resulted image is used for getting the vertebra segmentation map
- This segmentation map is used for getting the vertebra data





# Dilation for improving the model

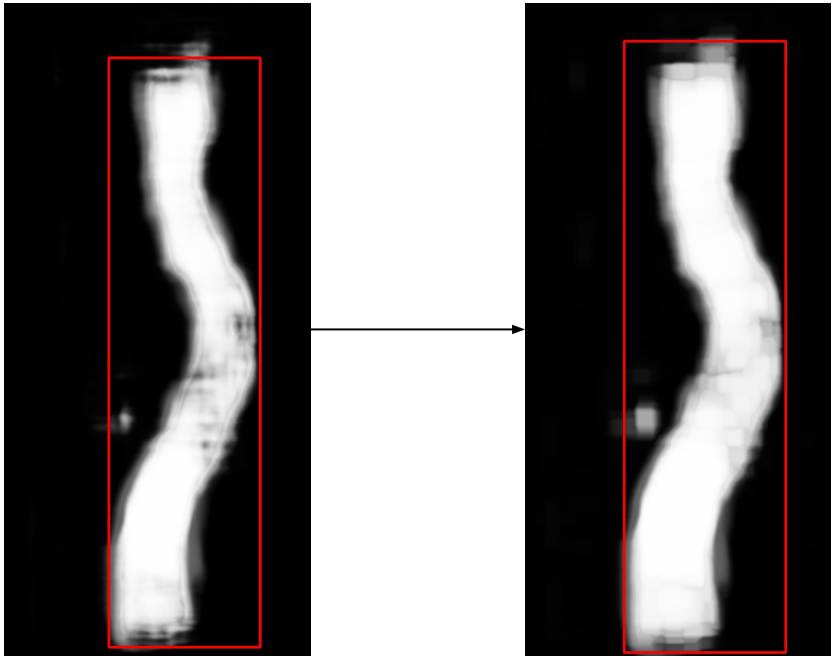
Bad quality for spine segmentation map

↓

Resulted measurements are bad and not useful

↓

Spine segmentation map with better quality



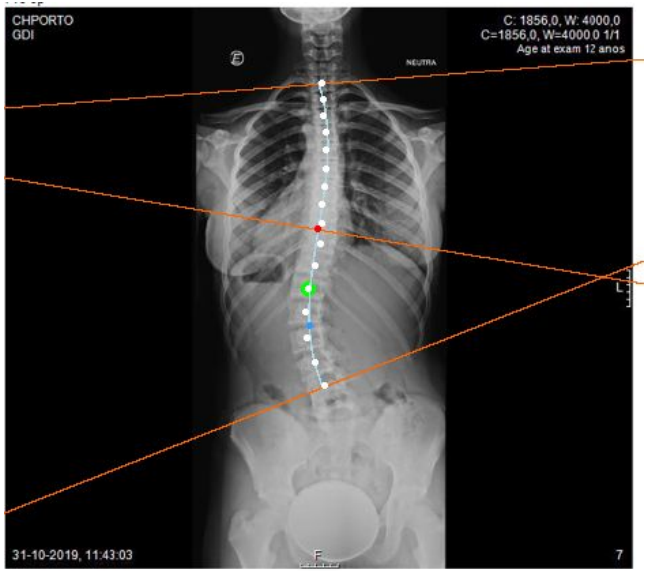
# Getting the final data

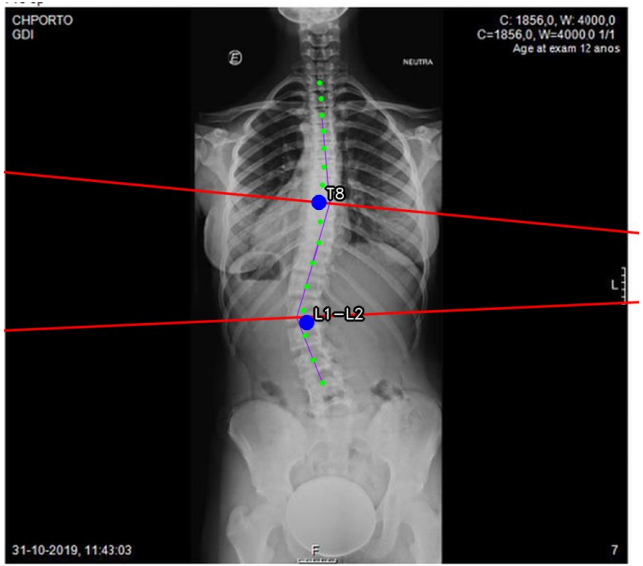
- We obtain the spline
- We calculate the inflection points, depending on the type of the scoliosis
- We calculate the angles, apexes
- Screws are placed according to the rules that we have to follow

$$\tan(\theta) = \frac{m_1 - m_2}{1 + m_1 m_2}$$

**angle = atan2(y2 - y1, x2 - x1)**

# Getting the final data



# Demo

# Q&A

# Thank you for your attention!