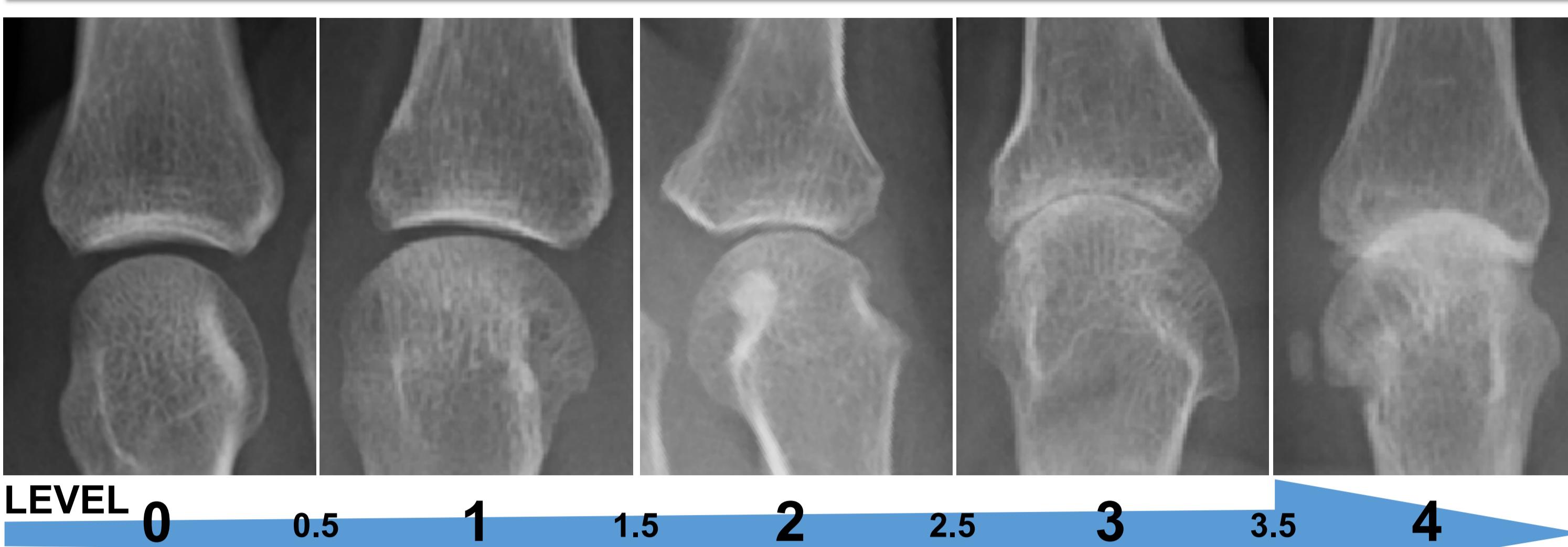


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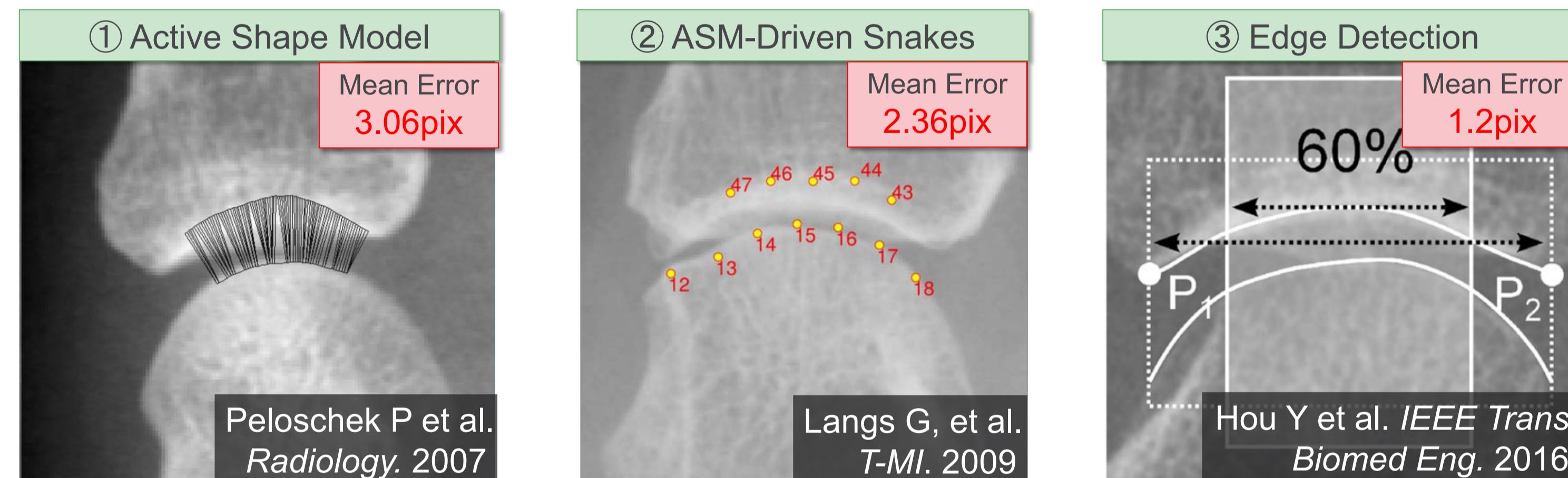
1. Background

- The change of joint space is an important indicator to judge the stage of **Rheumatoid Arthritis (RA)**.
- RA progression can be greatly reduced by early intervention.



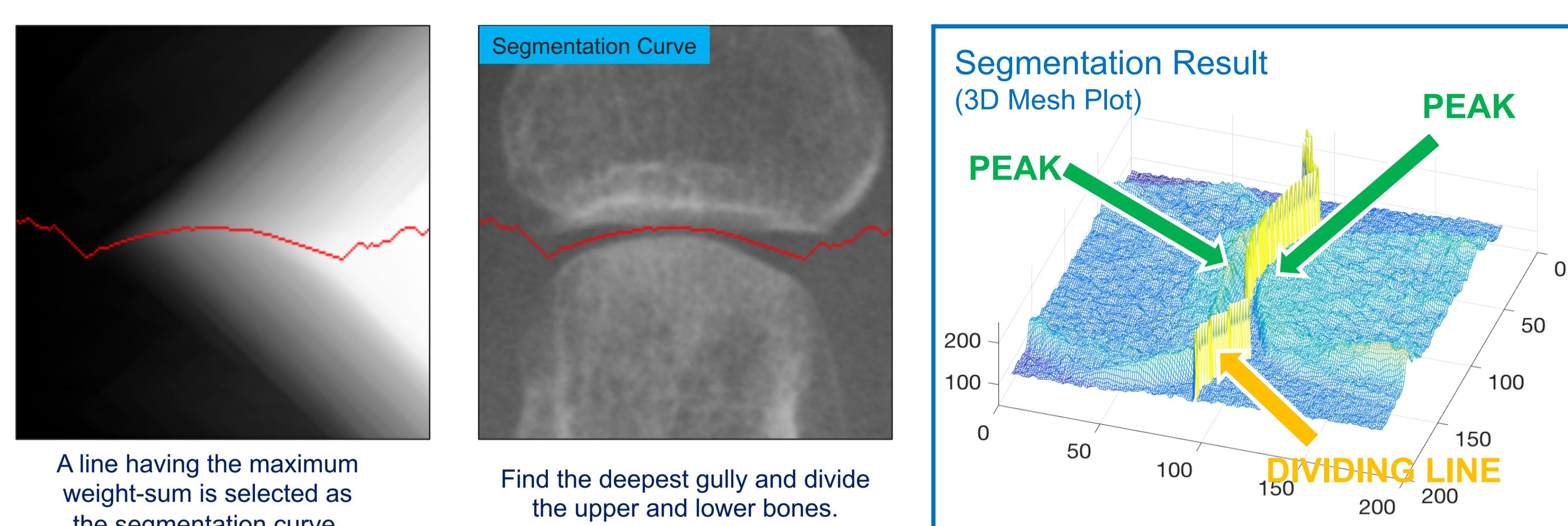
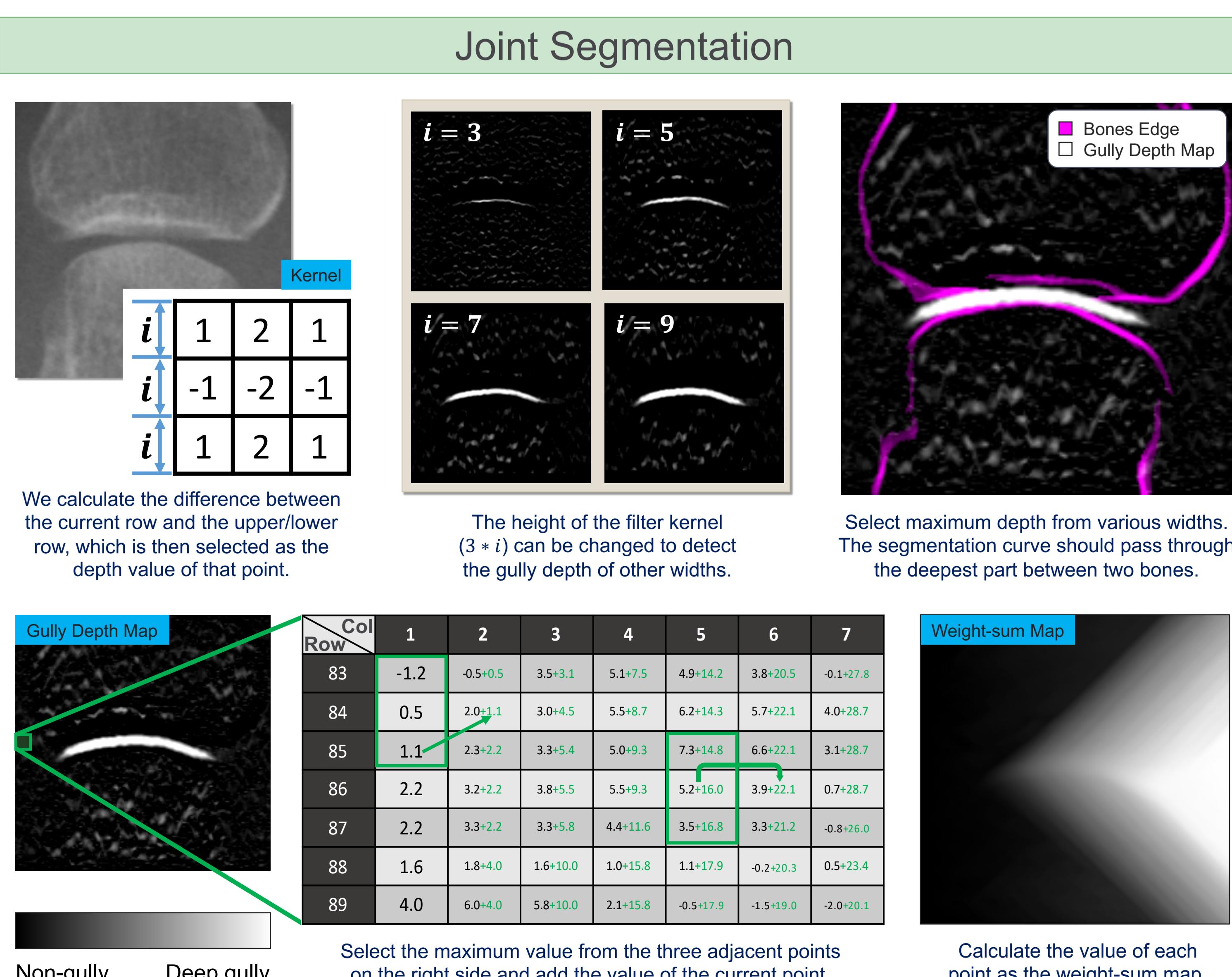
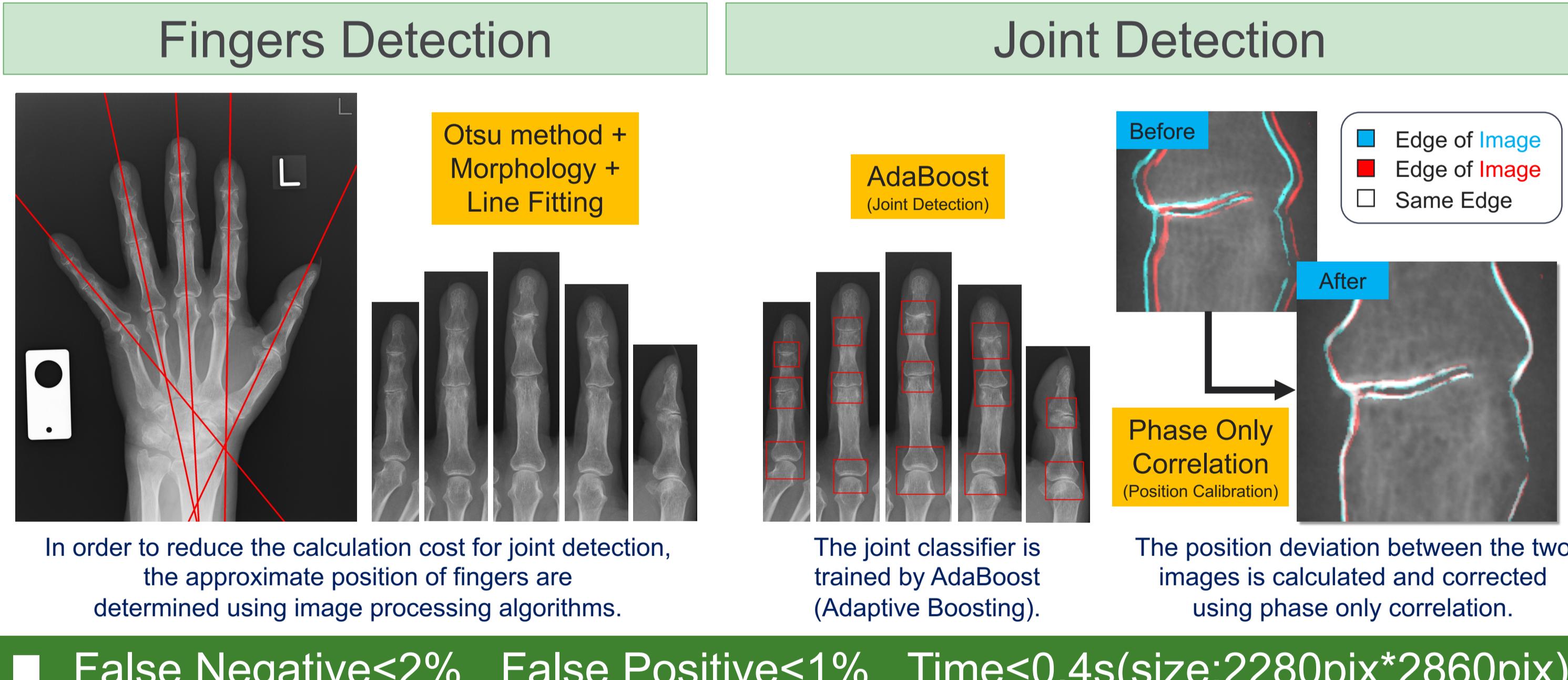
- Any subtle change of joint space is **difficult to detect by human eye**, and is **tedious**.
- A system for **automatic detection** of joint space change with high accuracy is necessary.

2. Research Status

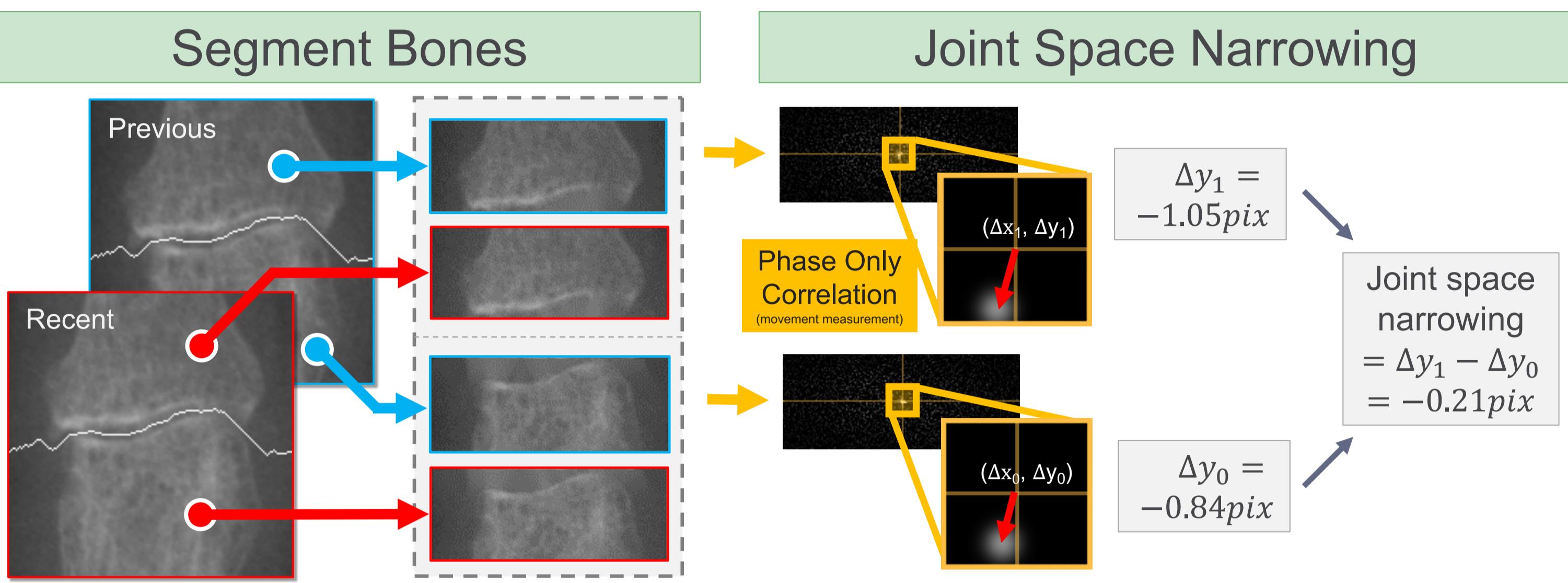


- Past studies computed joint space width by detecting edges.
- Drawback of these edge detection methods are pixel-level errors, and difficulties in determining edges accurately.

3. Methodology



- We propose an algorithm to segment joint images so that the movement of the upper and lower bones can be detected separately.



- From these steps, we can calculate the progression of JSN according to the vertical movements of the upper and lower bones.

4. Materials

Phantom Parameters

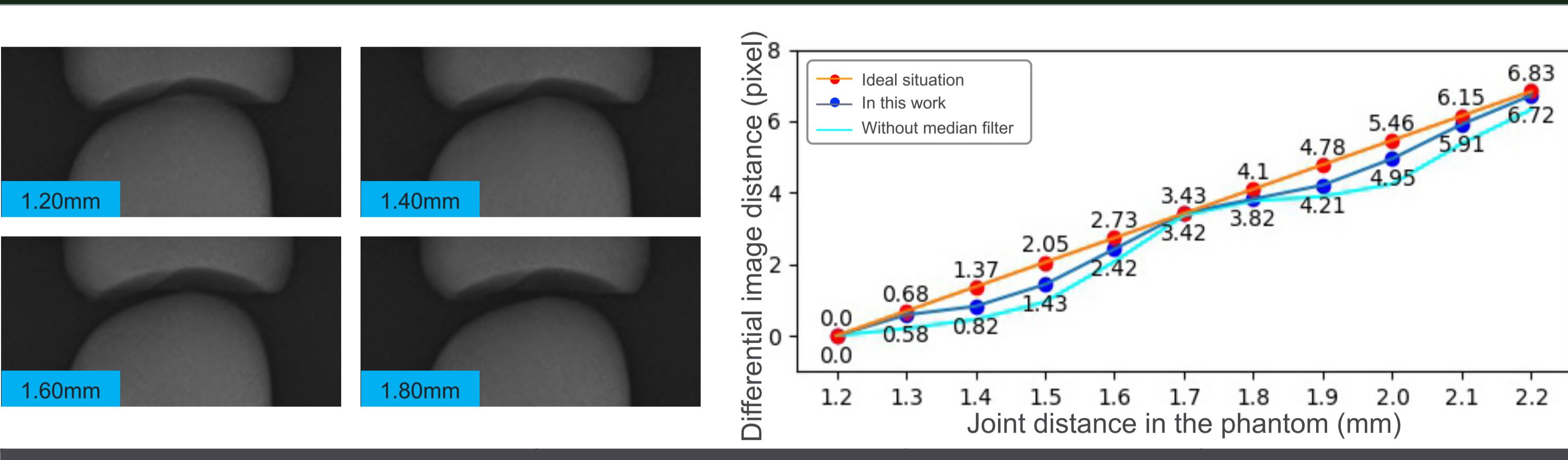
TMA Powder : Epoxy Adhesive	1 : 1.2
TMA Powder	Temperature 1370 K
	Particle Size $\leq 106\text{ }\mu\text{m}$
	CT Value 340 HU

Imaging Parameters

X-ray Instrument	FUJIFILM CALNEO smart C47
Tube voltage	50 kV
Tube current	100 mA
Exposure Time	20 msec
Source to Image	100 cm

- For the statistical analysis of our algorithm, we prepared test images using imaging phantom of the MCP joint.

5. Experiments



- Comparing with other works, JSN estimation is more accurate using our method.

6. Conclusion

- We propose a high-accuracy joint space narrowing (JSN) progression detection algorithm based on phase only correlation (POC) method.
- Our method is automated, using a sequence of radiographic image we can detect JSN progression.
- Our method can detect sub-pixel progression of JSN.