

MEDICAL IP

# ASME-CIE Hackathon 2022

**Hackathon Problem 1:  
Segmenting Medical Images toward Digital Twin in Healthcare**

08. 13. 2022

# Organizers & Mentors

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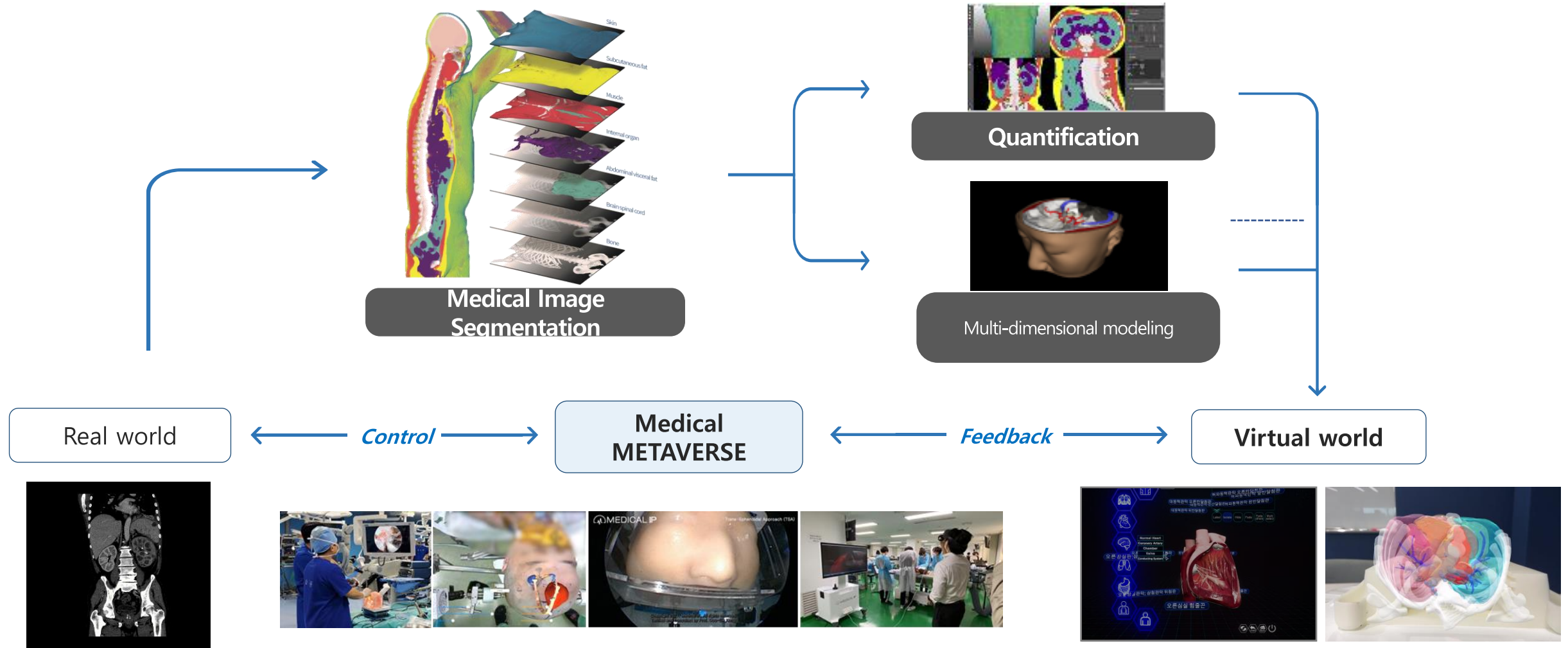
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**Hyunwoong Ko, PhD**



Assistant professor  
School of Manufacturing System  
s and Networks  
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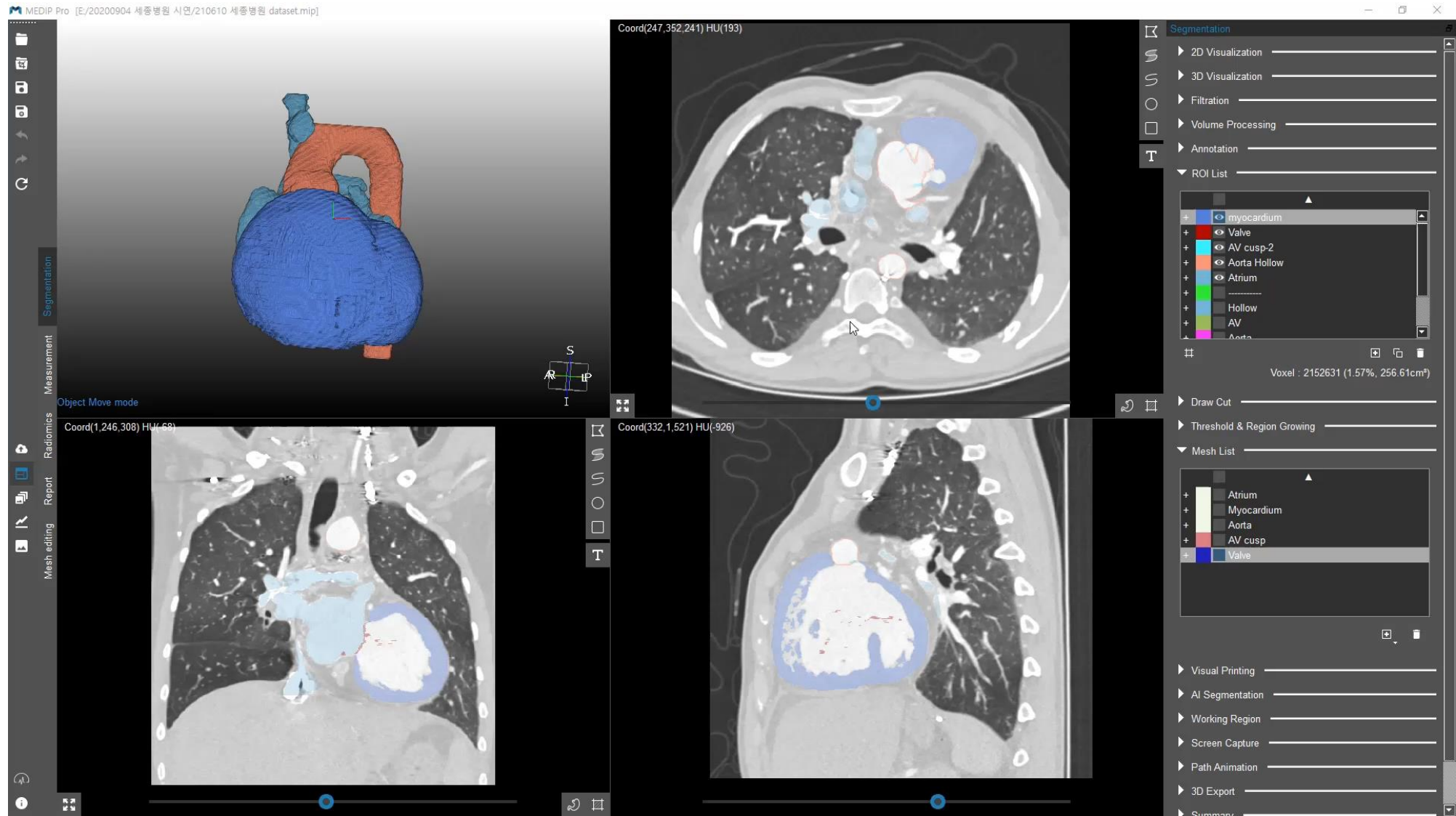
# Applications of digital twin in medical domain





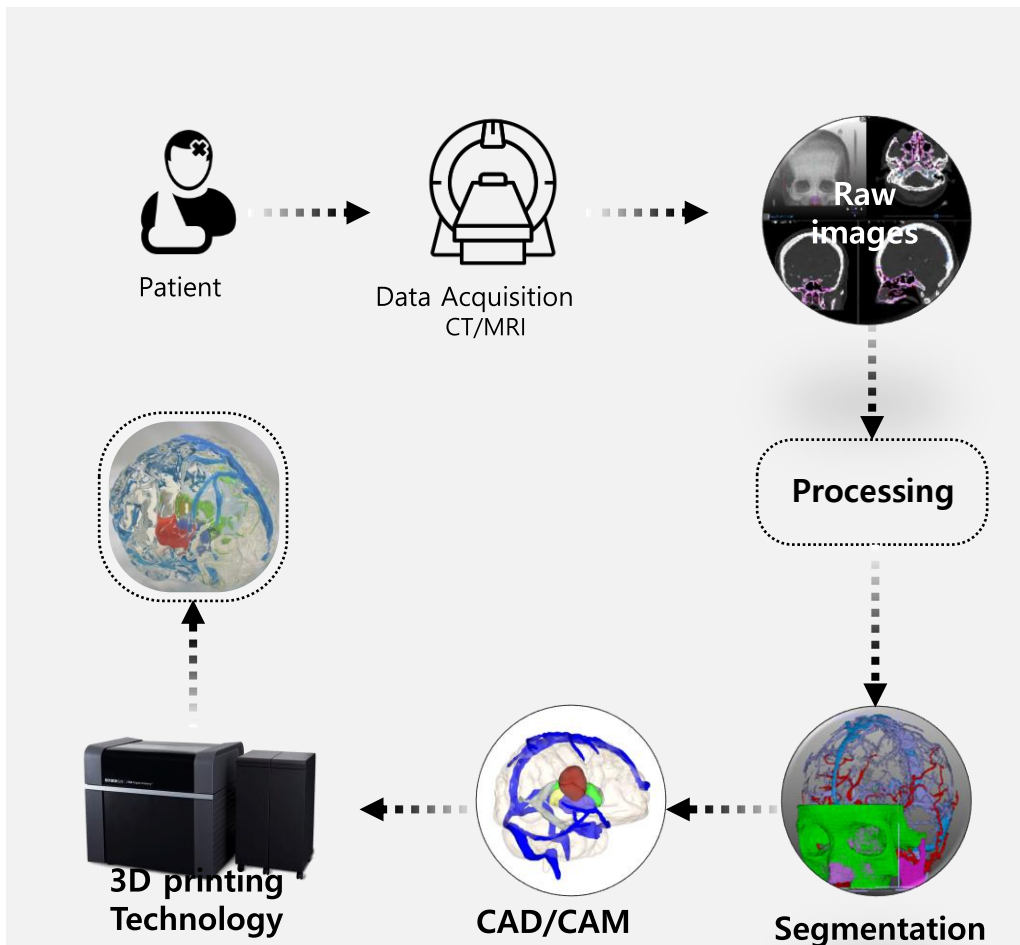


# Applications of digital twin in medical domain





# Consideration of Medical 3D Printing

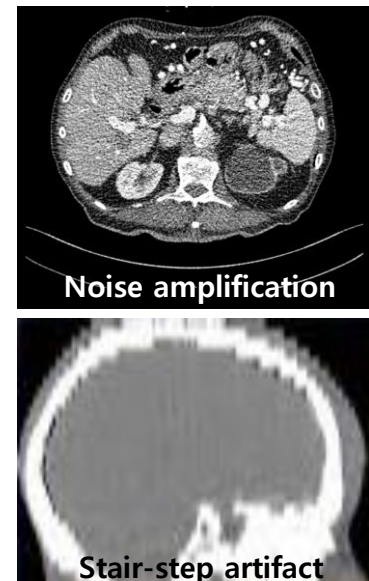


## Consideration of Medical 3D Printing

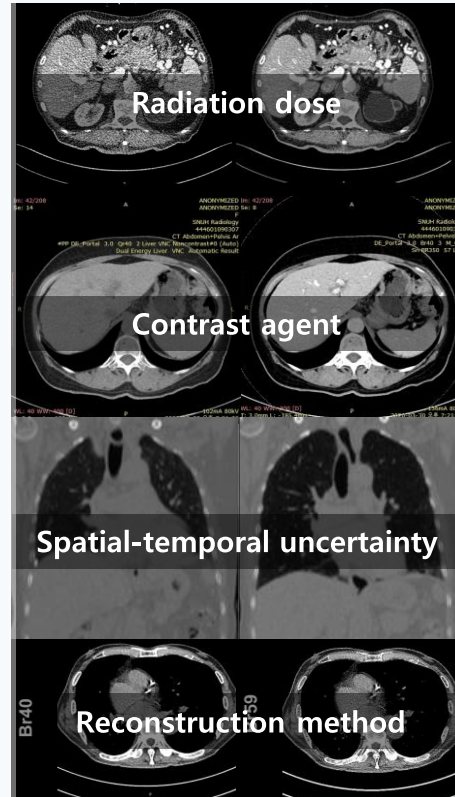
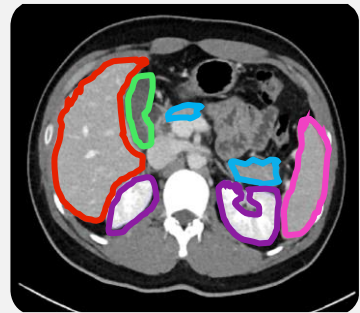
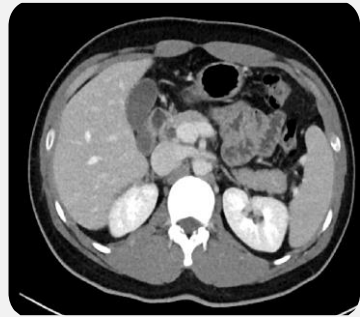
Precision (Spatial)	Speed of production	
Safety of patient	Cost	Texture reality

To reduce the radiation exposure,

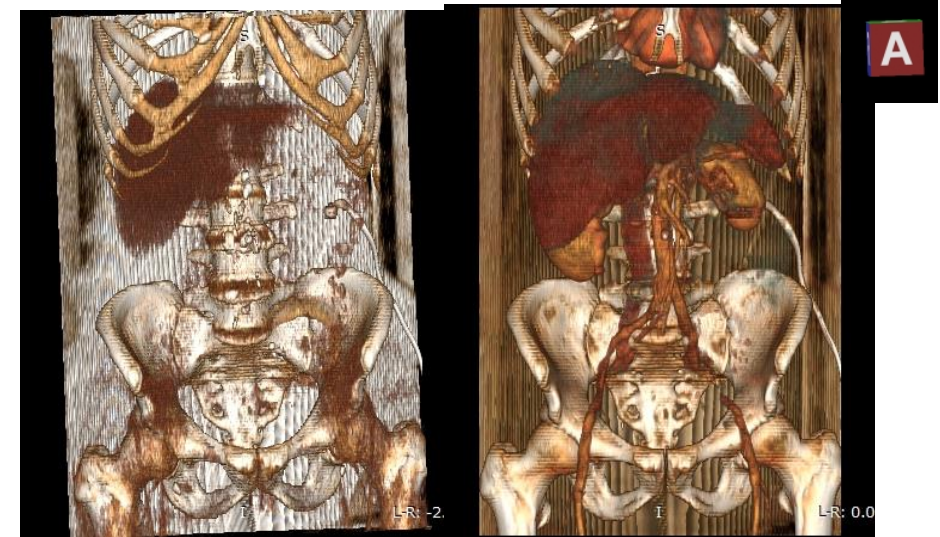
- Tube current modulation, mA (*decrease*)
- X-ray tube peak potential, kVp (*decrease*)
- Pitch speed (*increase*)
- Slice thickness (*thicker*)



# Consideration of Medical 3D Printing



⋮

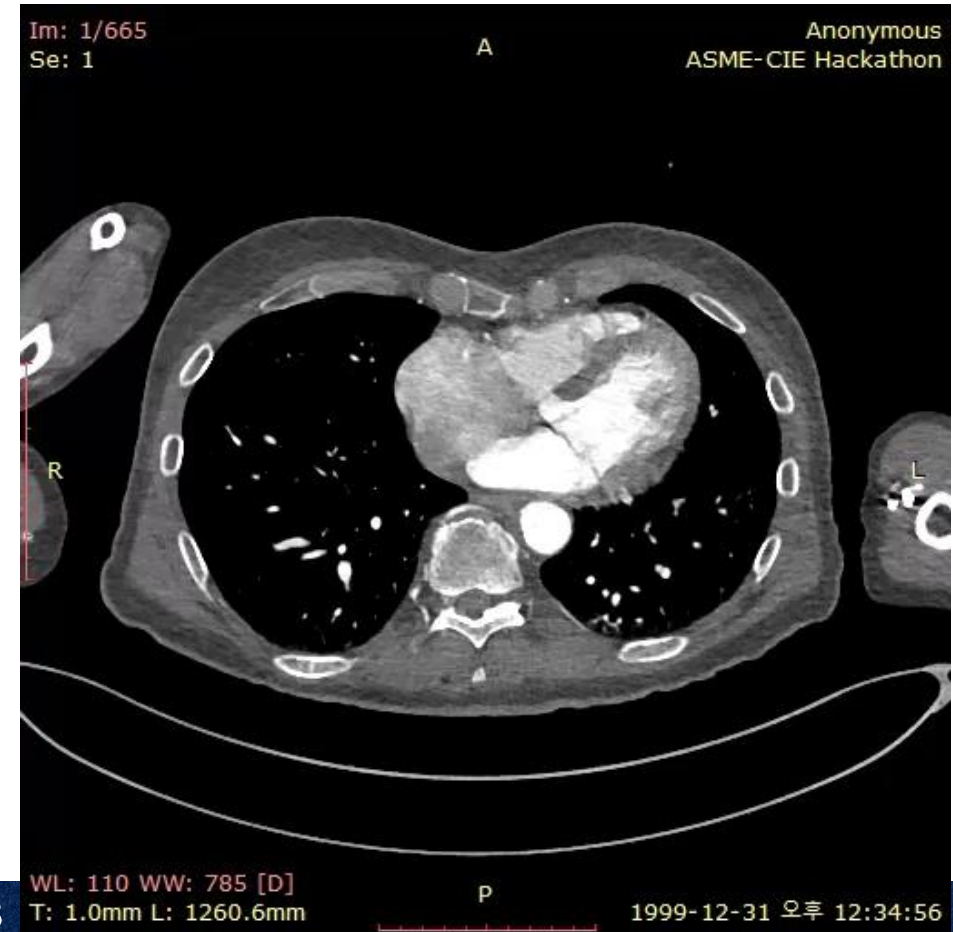
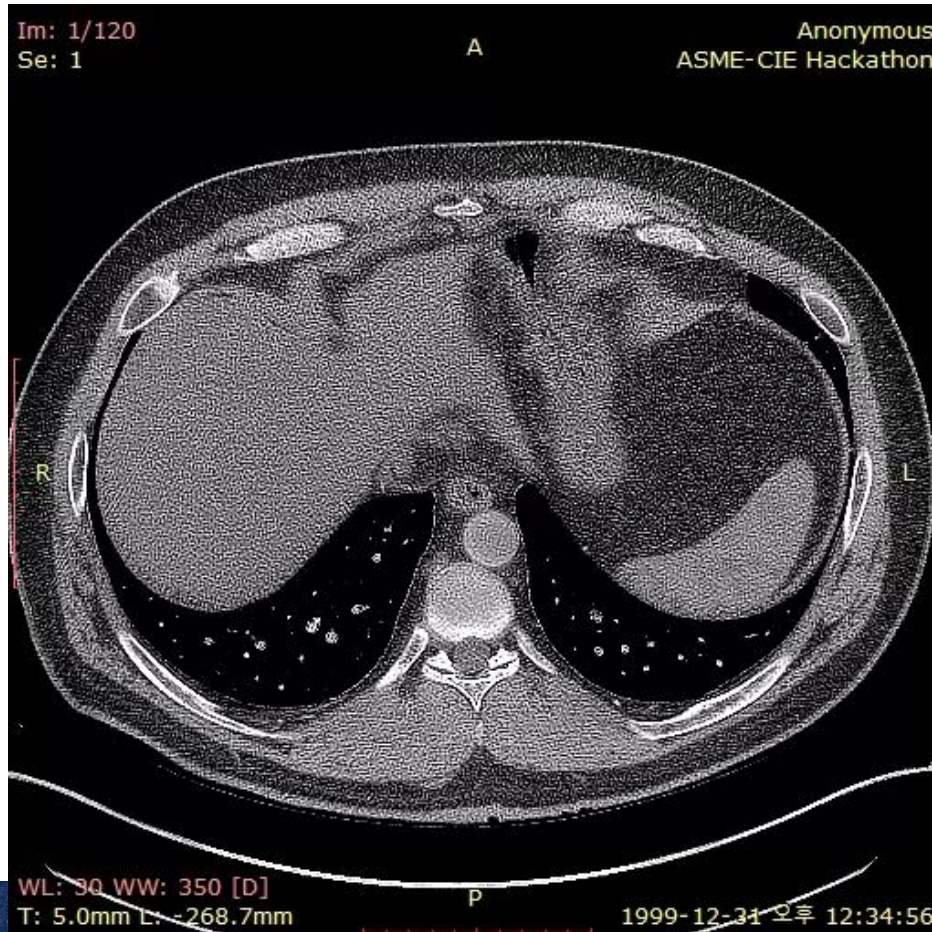




# Hackathon Problem 1 - Graphical Illustration with Target and Reference Data

If Image A (56-years-old patient's CT data) and Image B (another patient's CT data) have a sample scan protocol (i.e., slice thickness, radiation dose, contrast-agent-enhancement, and reconstruction methods (e.g., kernel and reconstruction algorithm)), find the following from the 56-years-old patient's CT image set?

Test Data:  
Data of 56-  
years-old  
patient

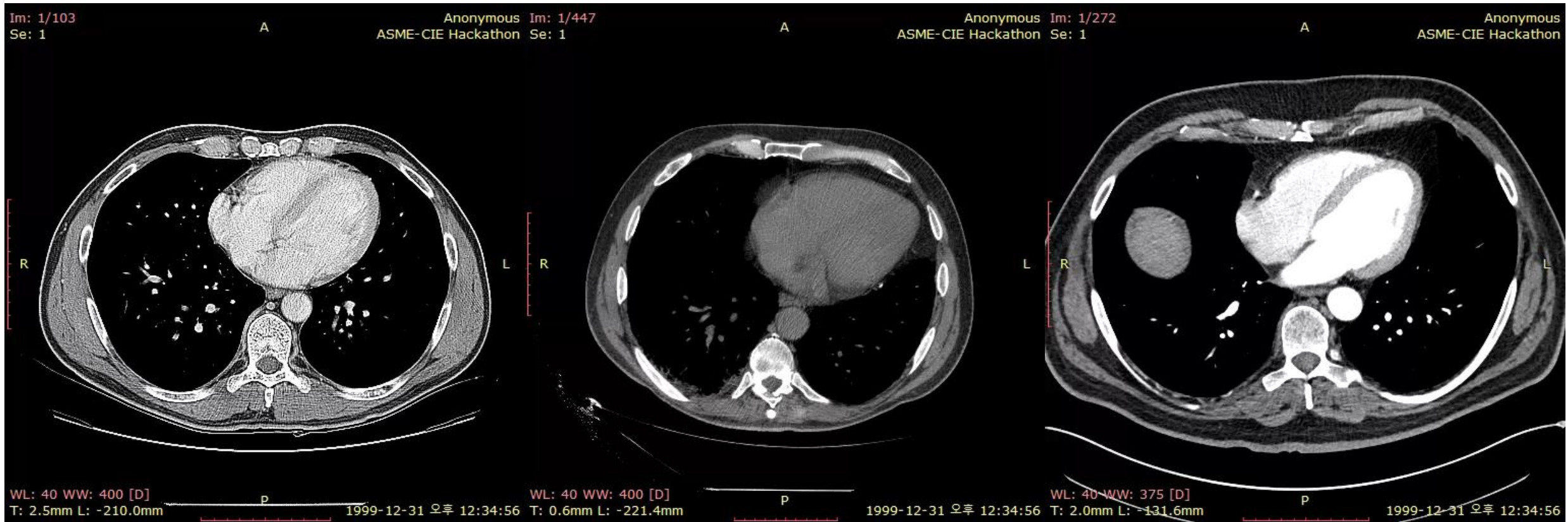


Reference  
Data



# Hackathon Problem 1

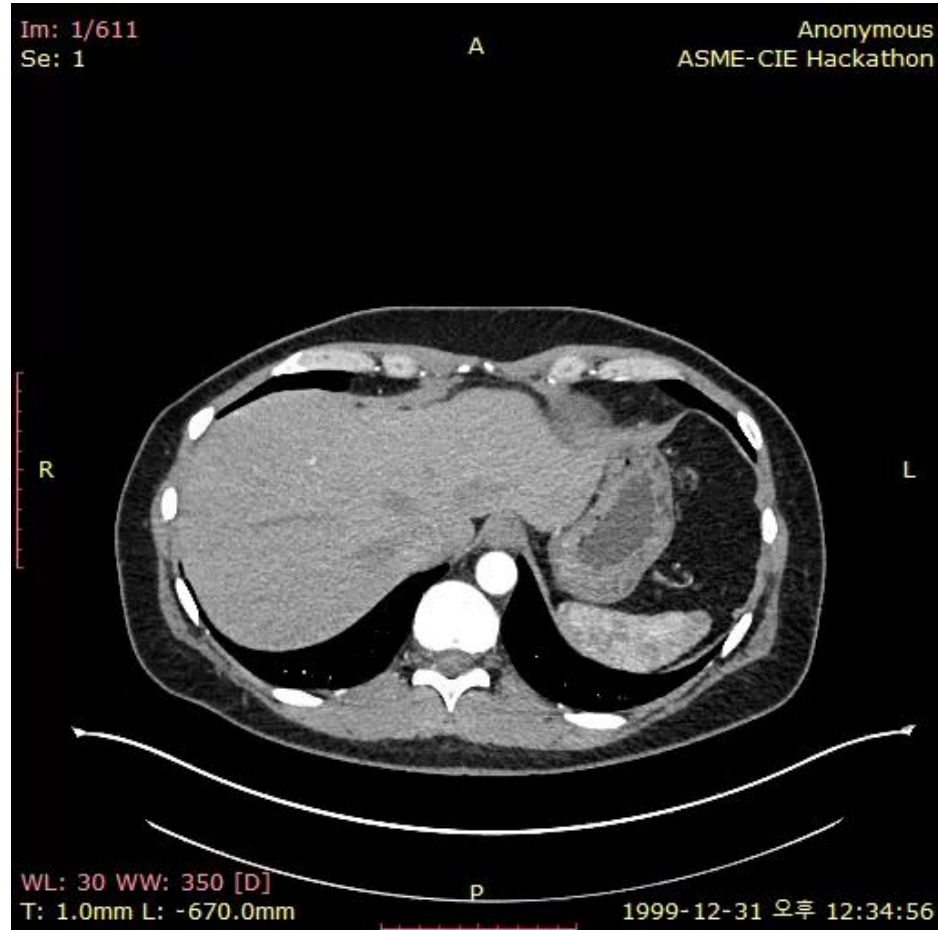
(Location: Link '[Training Data](#)' → '220806\_Hackathon\_Dataset.zip.' → 'Data' folder)



The number of datasets: 140 cases of CT images (70 patients, 2 cases per patient)

# Hackathon Problem 1

(Location: Link '[Training Data](#)' → '220806\_Hackathon\_Dataset.zip.' → 'Segmentation' folder)



The number of datasets (CT image and segmentation mask): 60 cases (another 60-patient group. 1 case per patient)



# Hackathon Problem 1 - Submission

Hackathon Problem 1 (Location: Link '[Test Data](#)')

Region of Interest (ROI)	Volume (mm <sup>3</sup> )	Mean **HU	Brief description of the solution method
Right Kidney			
*RCC			

\***Renal cell cancer (RCC)**, also called kidney cancer or renal cell adenocarcinoma) is a disease in which malignant (cancer) cells are found in the lining of tubules (very small tubes) in the kidney.

\*\***Hounsfield units (HU)** are a dimensionless unit universally used in CT scanning to express CT numbers in a standardized and convenient form. Hounsfield units are obtained from a linear transformation of the measured attenuation coefficients

1. A detailed word document
  - i. Submission table
  - ii. A description of the brainstorming process
  - iii. A summary of any other approach attempted
2. The presentation slides
3. Any supplementary file to support your report

# Judges

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# ASME-CIE Hackathon 2022

Hackathon Problem 1: Toward segmentation and optimization  
of medical images for digital twin in healthcare

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