

AI Summer School 2024

Medical Imaging Informatics

University of Pittsburgh

Introduction to Medical Image Annotations

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Learning Objectives

After completing this lecture, you should be able to:

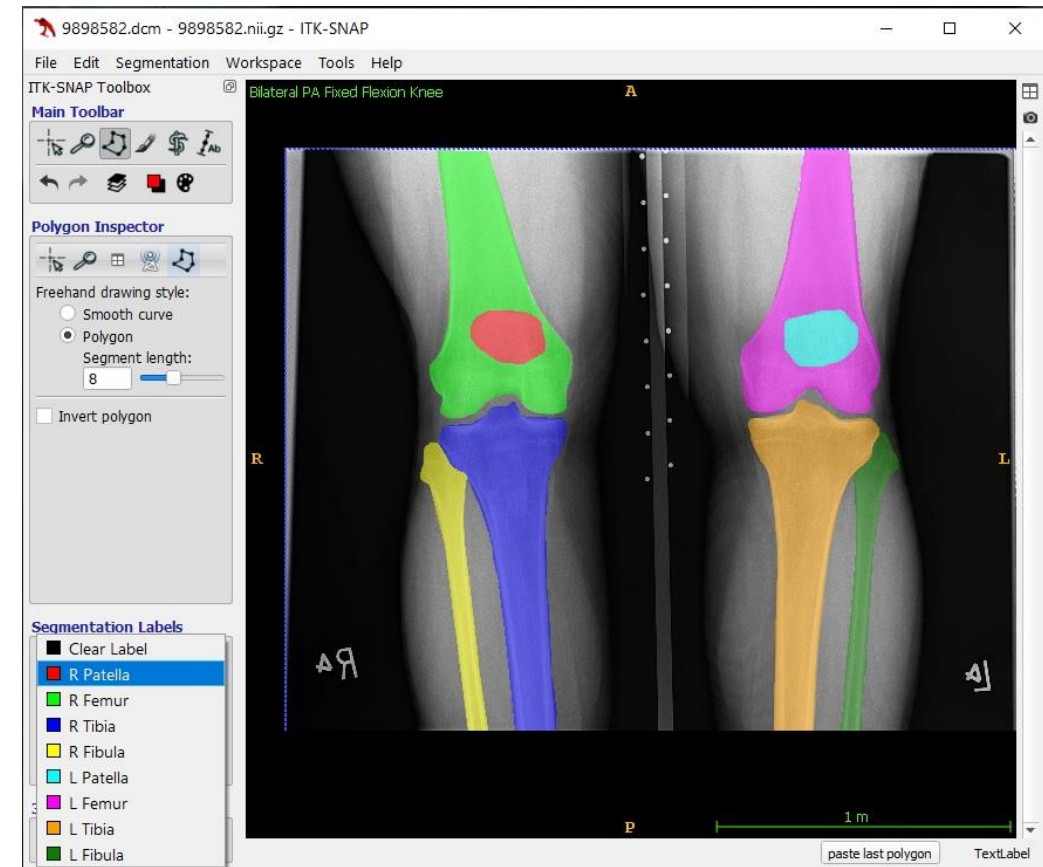
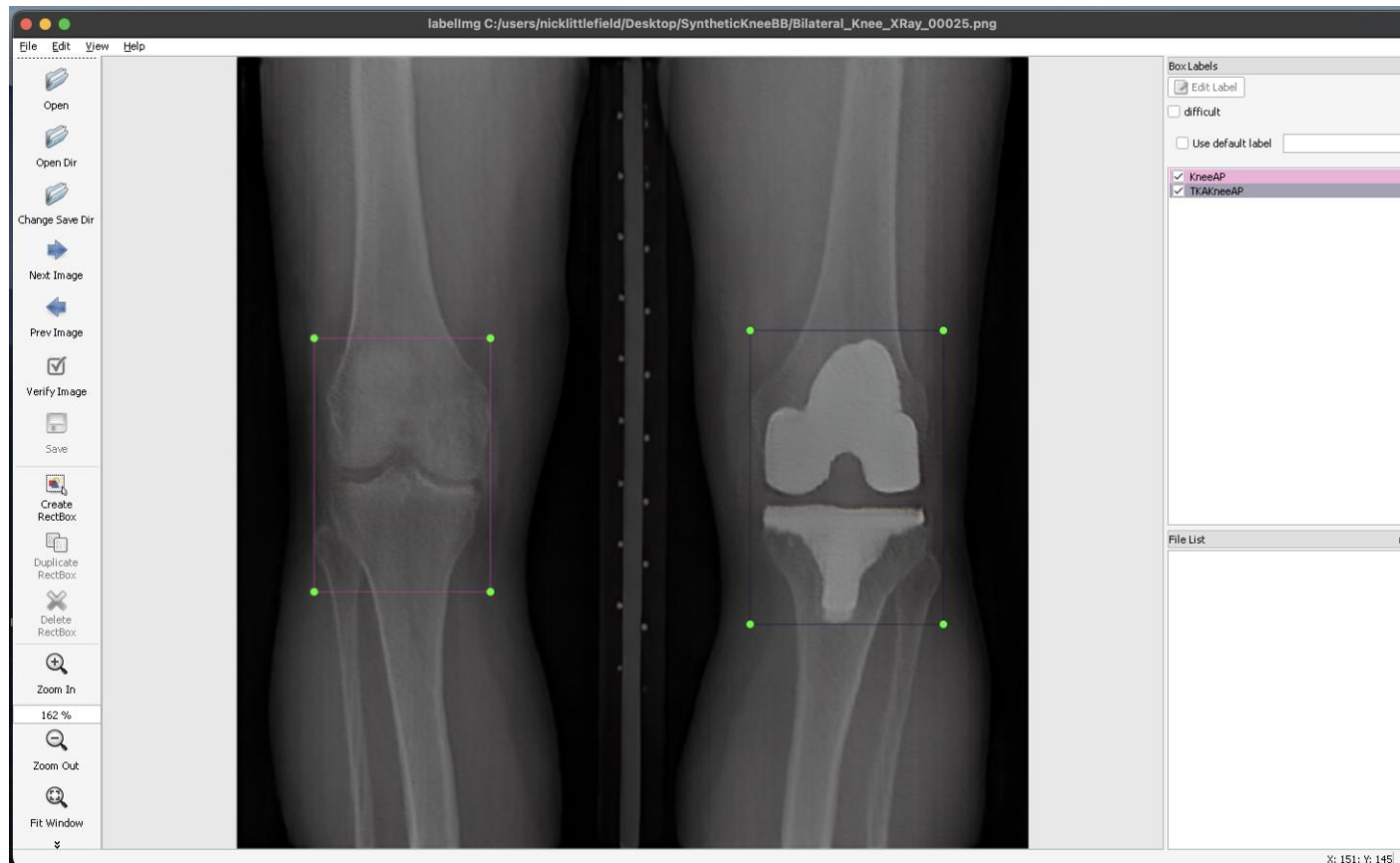
- Explain the overall process of medical image annotation
- Understand the different types of annotations
- Understand the primary steps in bounding box annotation for object detection
- Understand what tools are used for bounding box annotation

Outline

- Medical Image Annotation: What and Why?
- Types of Annotations in Medical Imaging
- Annotation Pipelines
- Challenges
- Labelling

Medical Image Annotation: What and Why?

- **Medical image annotation** is the process of labeling medical images to highlight specific features, structures, or abnormalities.
- Aids in training AI models, improving clinical decision support, research and development



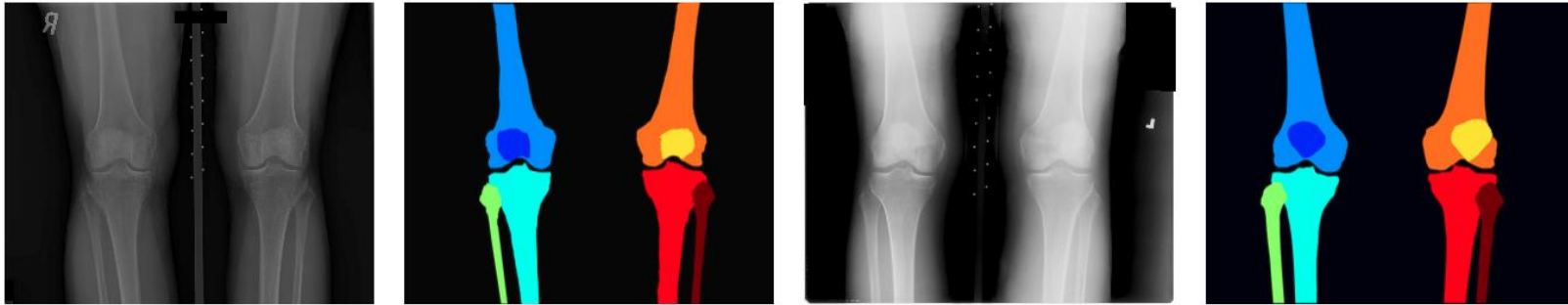
Types of Medical Image Annotation

- There are multiple types of medical image annotations:
 - Object Detection
 - Segmentation
 - Classification

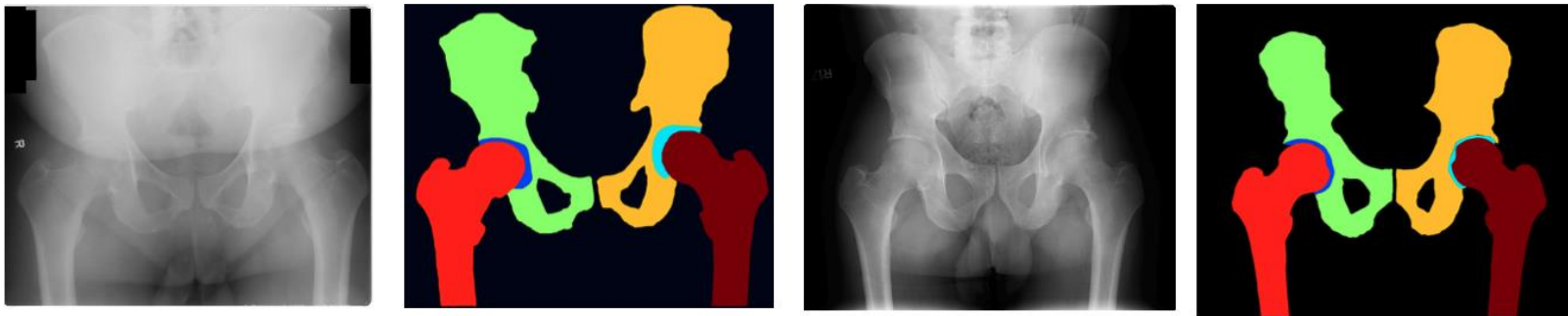
Student Activity: What are some example scenarios where you could use each type of annotation?

Types of Medical Image Annotation: Segmentation

- Outlines the boundaries of different structures (organs, tissue, bony anatomy)



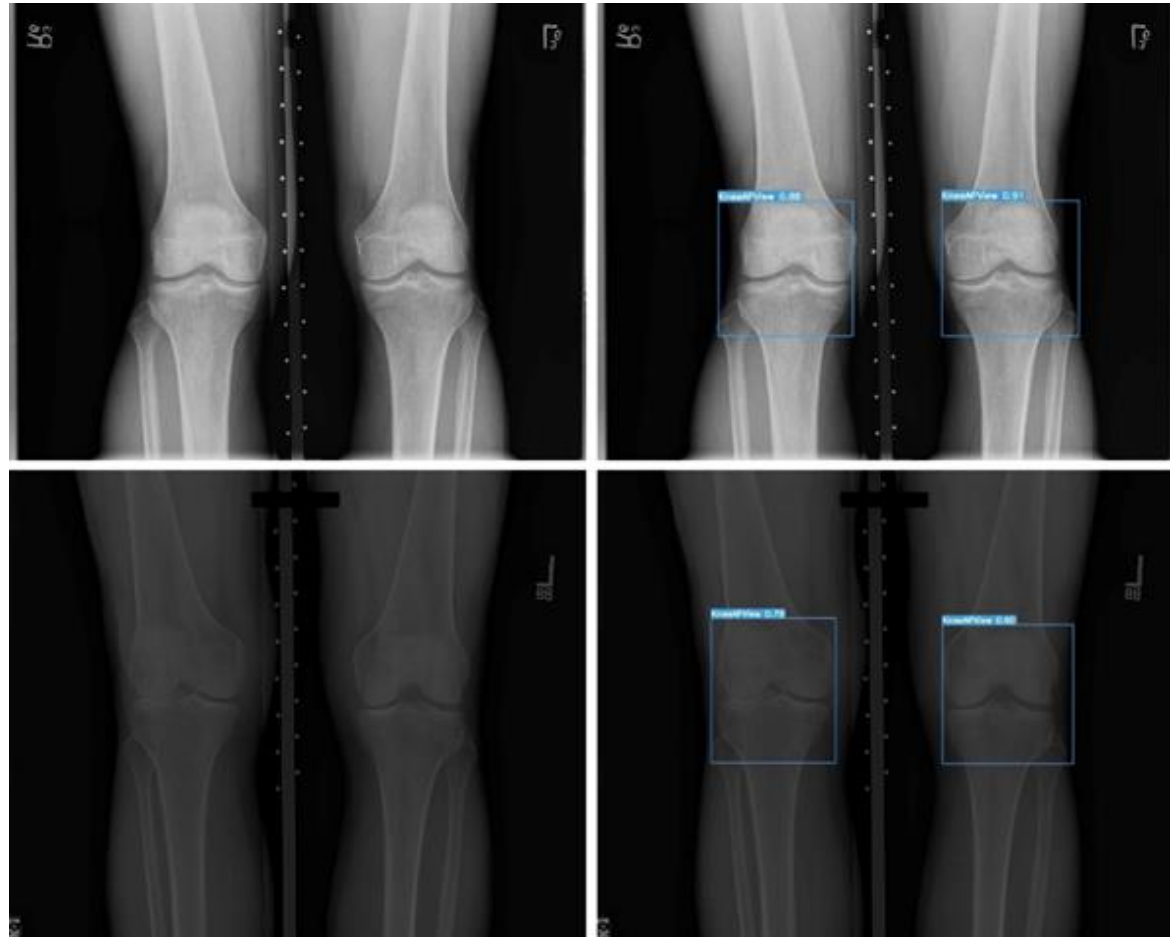
(a)



(b)

Types of Medical Image Annotation: Object Detection

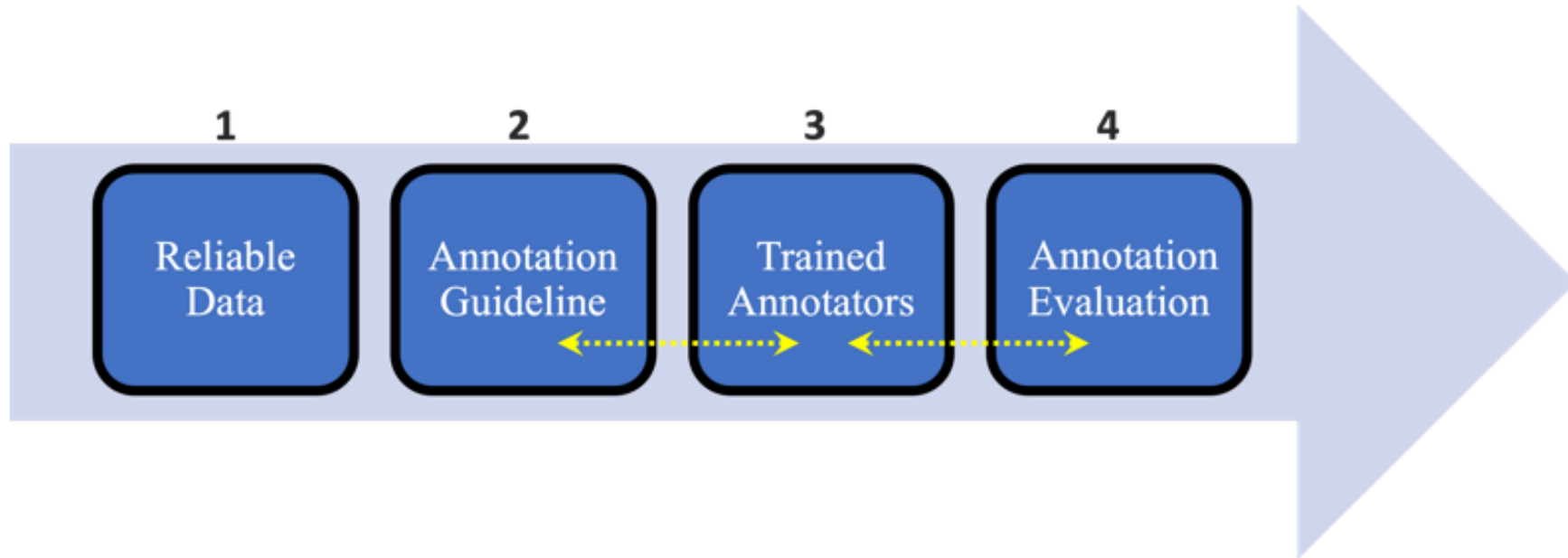
- Identifying and localizing regions of interest that contain specific objects
- Examples:
 - Cells in microscopic image
 - Knee joint area,
 - Brain tumors
 - Lung nodules



Types of Medical Image Annotation: Classification

- Assigning labels or categories to images based on the content of the image
- Examples:
 - benign vs. malignant brain tumors
 - lung cancer screening – benign, pre-cancerous, malignant,
 - fracture types – simple, compound, ...

Typical Annotation Pipeline



Challenges with Medical Image Annotations

- Accuracy and precisions of annotations: Annotations need to be precise and highly accurate to train AI models
- Consistency of the annotations: different annotators can have varying interpretation of the same image
- Time consuming and costly: Detailed annotations take extensive amount of time
- Complexity of medical images: images have different modalities, quality, and can contain artifacts

Tools for Object Detection Annotations: Labelling

- Lightweight and easy-to-use image annotation tool for labeling bounding boxes for object detection in images
- Generates XML file containing the class of an object and the bounding box coordinates for the **upper left** and **lower right corners**



Thank you!

Questions!

