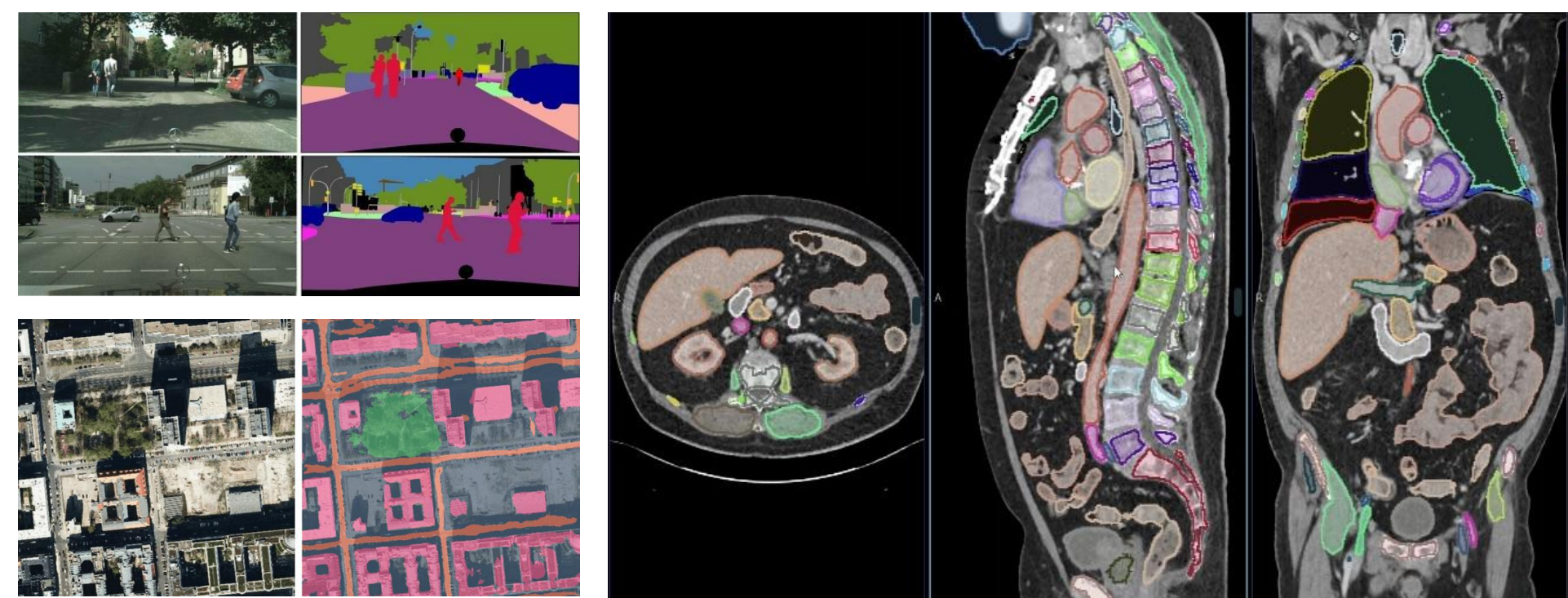


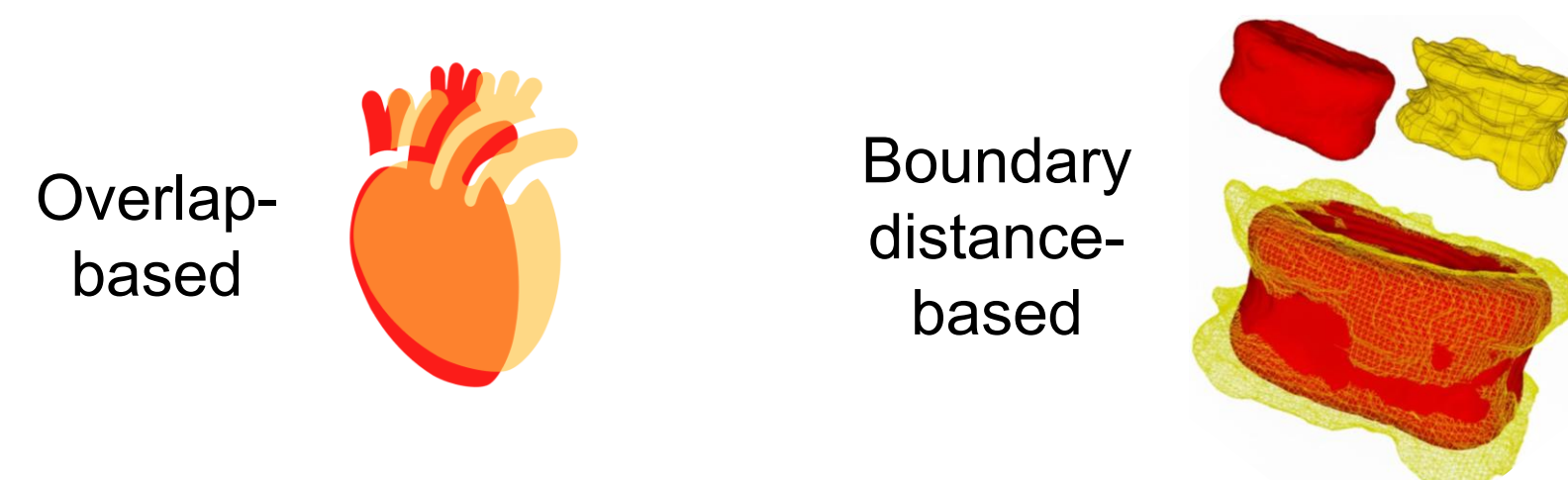
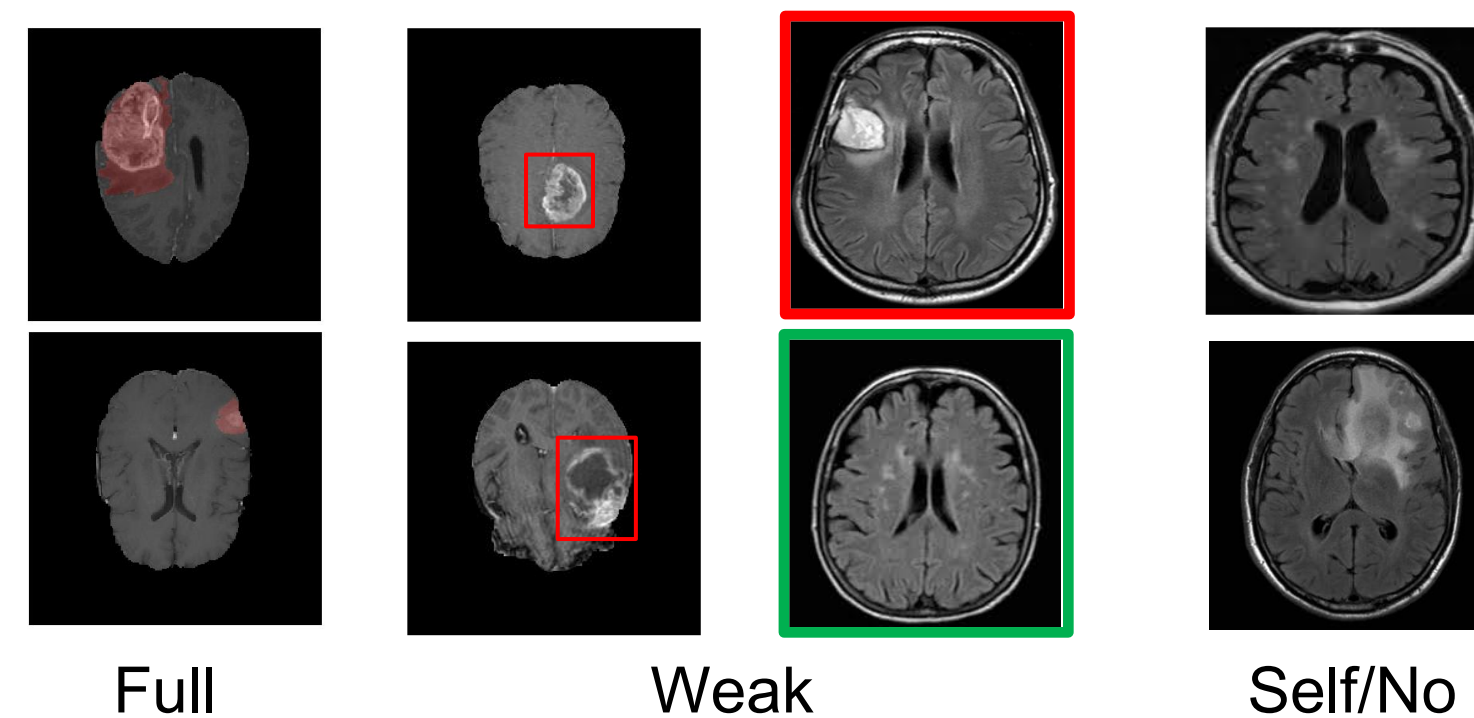
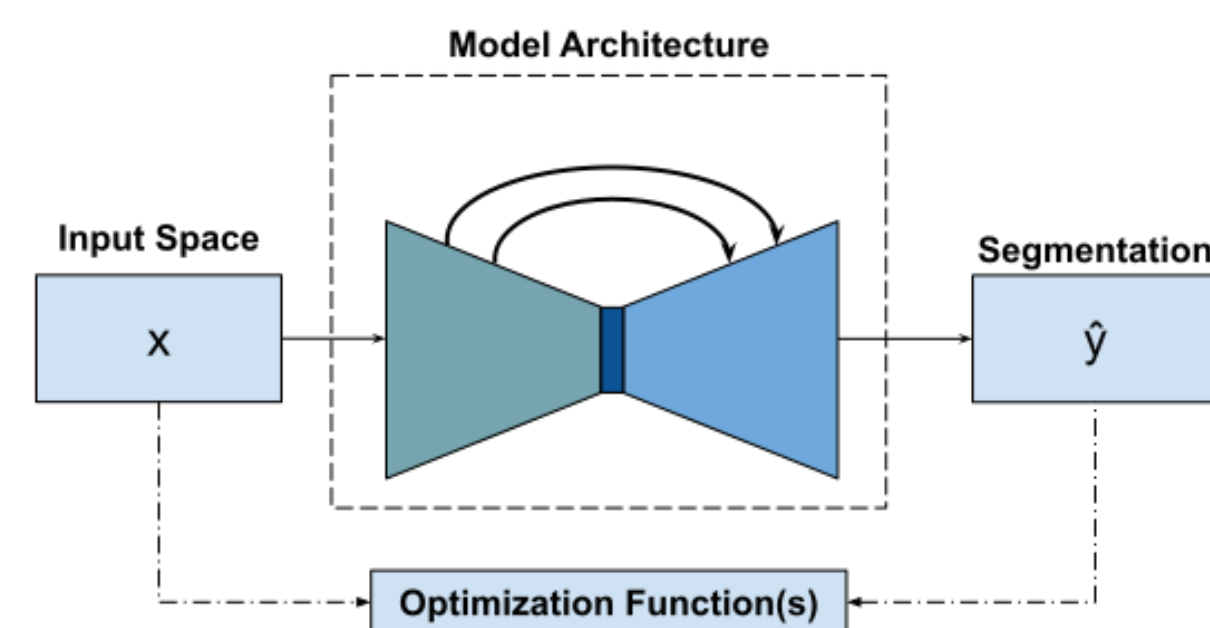
IMAGE SEGMENTATION

Partitioning an image into multiple segments or regions, such that, given an image I , each pixel/voxel v_i is assigned a label L_i .


 Deep Learning for
Image Segmentation

 Supervision
Levels

Evaluation



CONTRIBUTION

Survey of **250+ papers** on deep learning-based semantic segmentation of natural & medical images.

- **Springer AI Review journal** (2024 IF: 13.9).
- **1000+ citations** (October 2025).



KEY OBSERVATIONS

Architecture

- U-Net-like **encoder-decoder** models & skip connections.
- **Attention** mechanisms.
- **Multi-scale** representations.

Training

- **Synthesis-based** augmentation.
- **Weak** supervision.
- **Multi-task** learning paradigms.

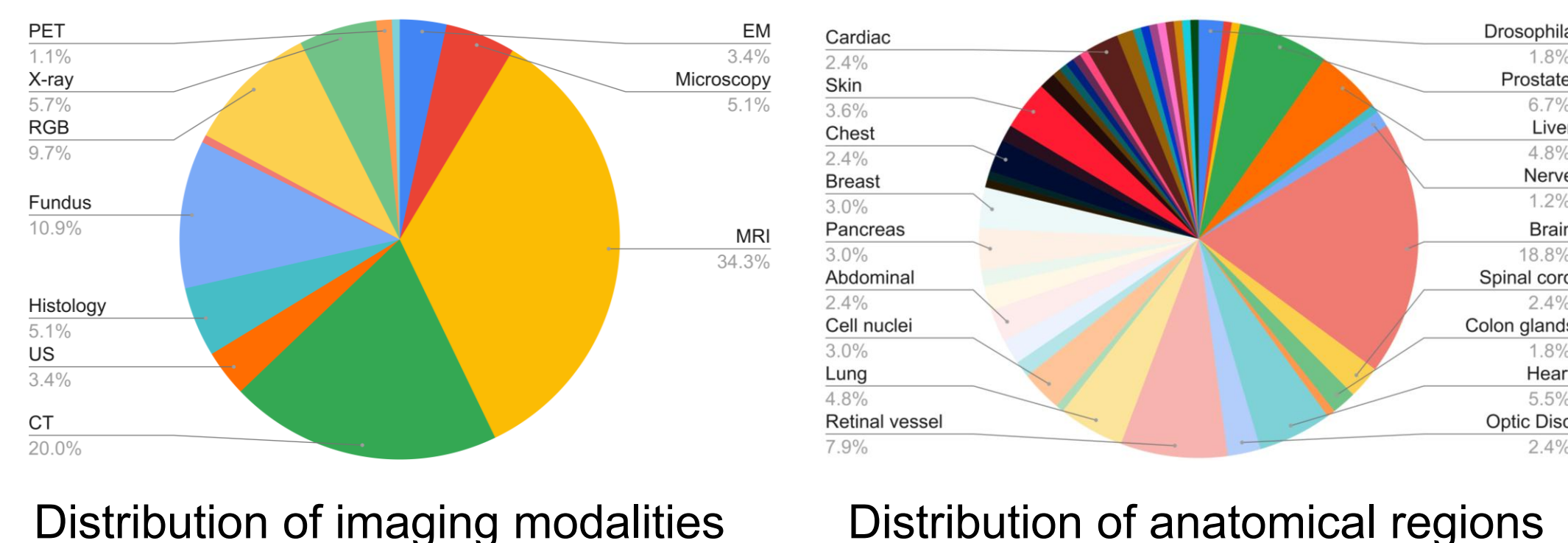
Loss

- (Soft) **Dice Loss**.
- **Uncertainty-aware** losses.
- **Hybrid** combinations of loss functions.

Domain-specific

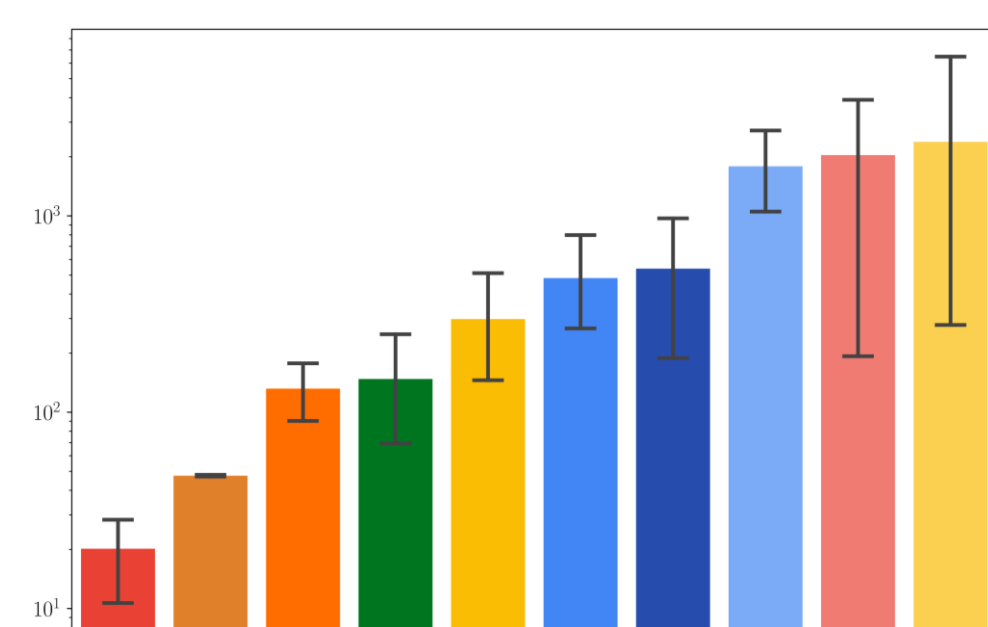
- Integrating **clinical priors**.
- **3D** volumetric segmentation.
- **Public challenges**-driven progress.

MEDICAL IMAGE SEGMENTATION: TRENDS IN RESEARCH AND COMPETITIONS

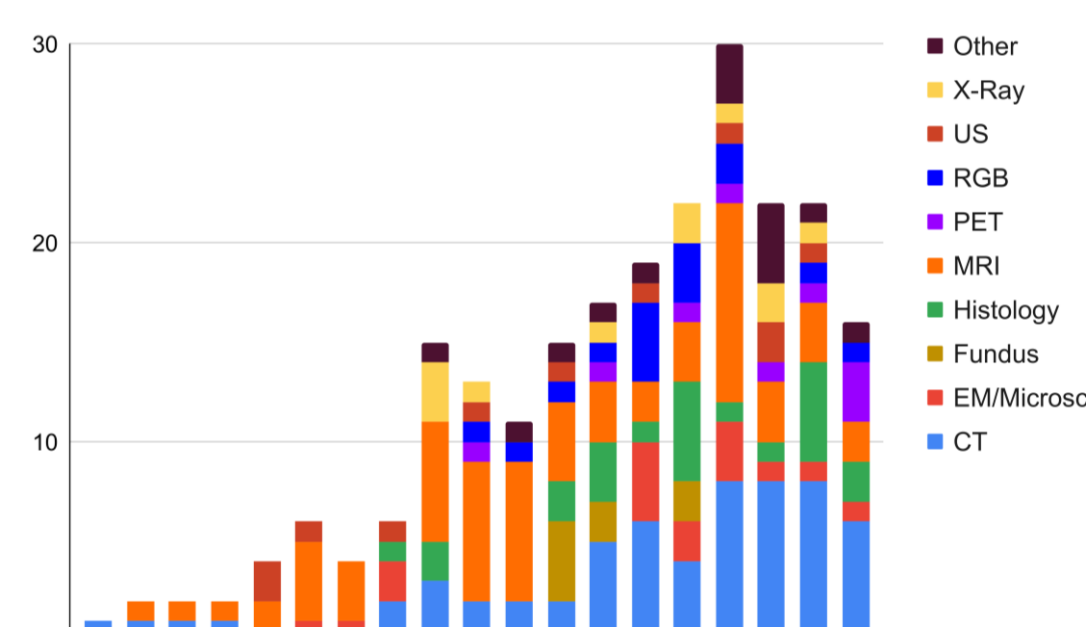


Distribution of imaging modalities

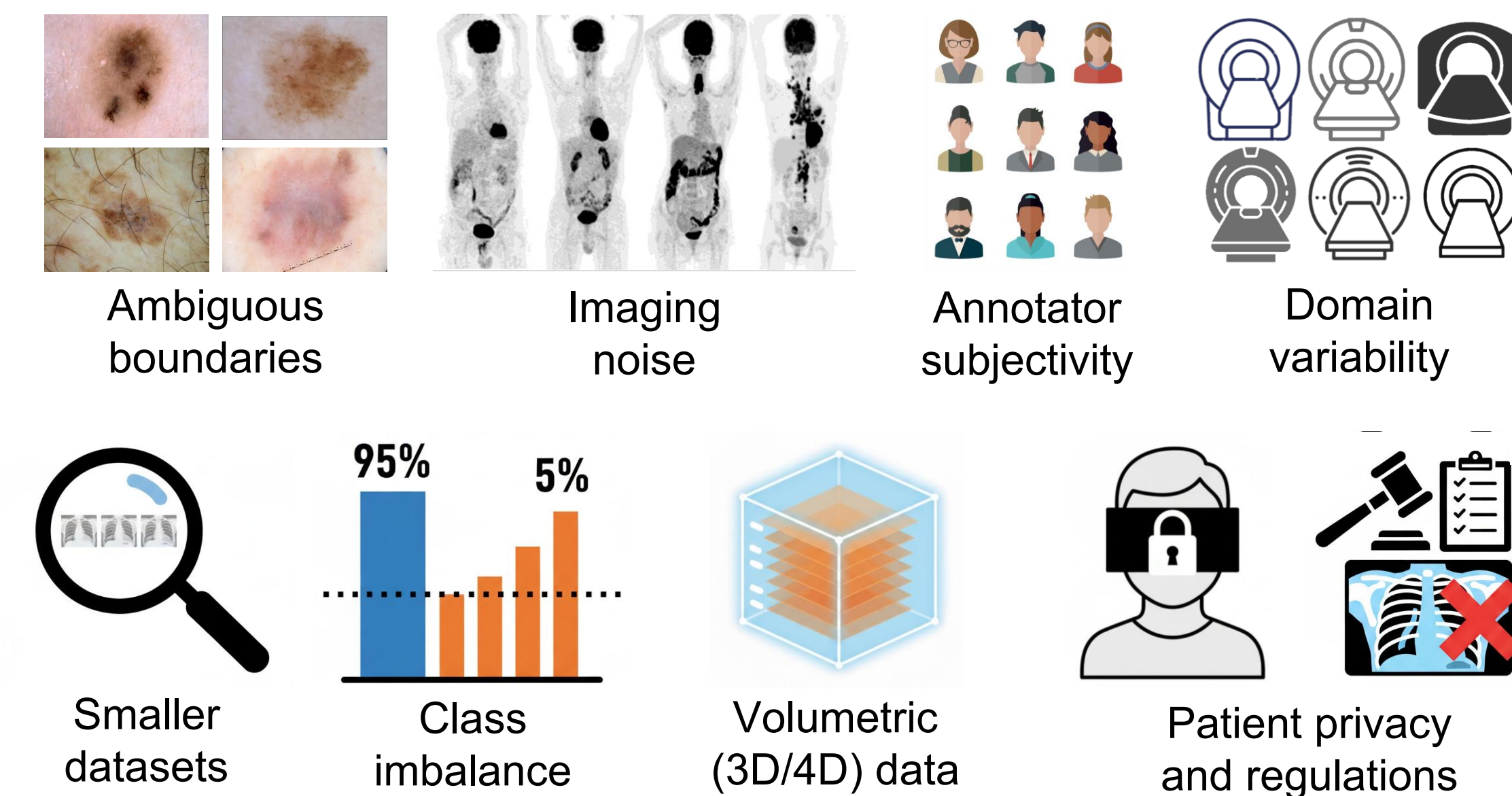
Distribution of anatomical regions



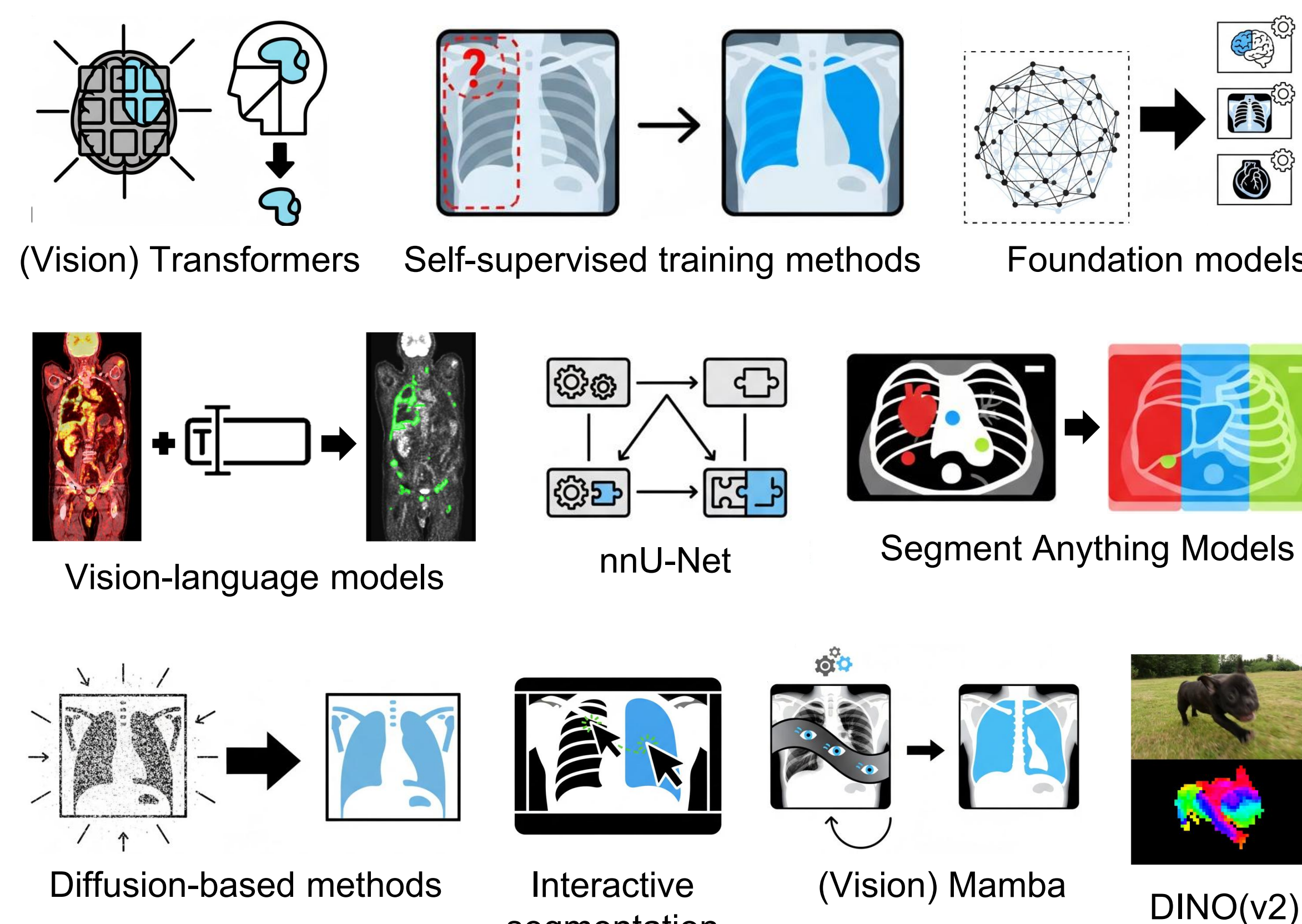
Dataset sizes across modalities


 Modalities in competitions
(<https://grand-challenge.org/>)

WHY IS MEDICAL IMAGE SEGMENTATION HARD?



RECENT ADVANCES SINCE THIS REVIEW


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