

3D Medical Imaging

2D vs 2.5D vs 3D Approaches

Memory Usage:
2D: ~1GB | 2.5D: ~3-5GB | 3D: ~8-27GB

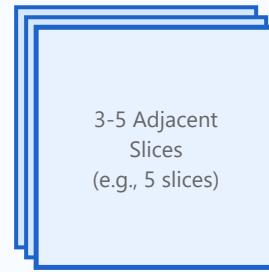


Single
2D Slice

2D CNN
Conv2D

✓ Fast. Low Memory

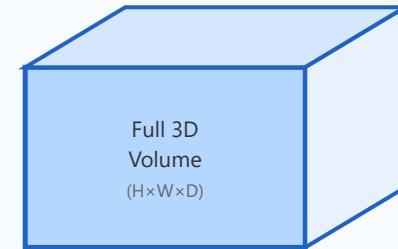
2.5D Multi-Slice | 3D: ~8-27GB



2D CNN
Multi-channel input

✓ Limited 3D Context

3D Volumetric



3D CNN
Conv3D

✓ Full 3D Context

2.5D vs 3D Approaches

2.5D: Multi-slice input. 3D: Full volumetric processing.
Tradeoffs in memory and context

Memory Constraints

3D convolutions require 8-27x more memory. Careful batch size and patch size selection

Patch-Based Methods

Process small overlapping 3D patches. Enables processing of large volumes

Sliding Window

Inference strategy for large volumes. Overlapping predictions with smoothing

Volumetric Networks

3D ResNet, V-Net, 3D U-Net. Leverage full 3D context for better accuracy