

Digital Image Basics

Pixel and voxel concepts

2D picture elements, 3D volume elements

Bit depth

8-bit (256 levels), 16-bit (65,536 levels)

File formats

TIFF, PNG (lossless), JPEG (lossy)

Compression methods

Lossless vs lossy tradeoffs

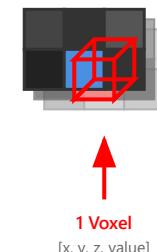
Metadata standards

EXIF, OME-TIFF for scientific imaging

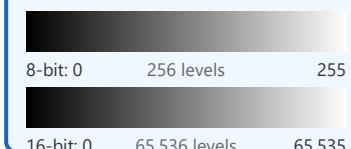
Pixel (2D)



Voxel (3D)



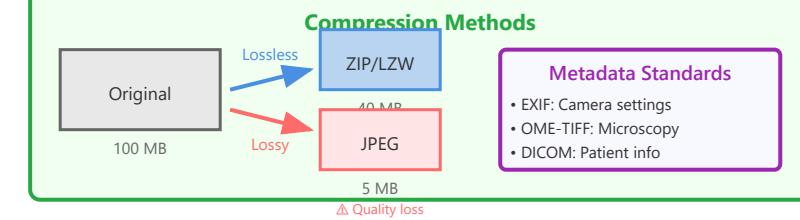
Bit Depth



File Format Comparison

Format	Compression	Use Case
TIFF	Lossless	Scientific
PNG	Lossless	Web/Analysis
JPEG	Lossy	Web/Display
DICOM	Both	Medical

Compression Methods



Metadata Standards

- EXIF: Camera settings
- OME-TIFF: Microscopy
- DICOM: Patient info