Data Augmentation

Medical Image Augmentation Techniques

Original

Chest X-ray

Geometric Transforms

Rotation ±15°

H-Flip

Scale 0.8-1.2×

Elastic

Intensity Transforms

Brightness ±20%

Contrast ±30%

Gamma 0.8-1.2

Gaussian Noise

Advanced

MixUp

λ=0.7 + λ=0.3 = Mixed

Linear interpolation of samples

CutMix

+ =

Patch replacement strategy

Test-Time Augmentation

Avg

Multiple augmented predictions → Ensemble
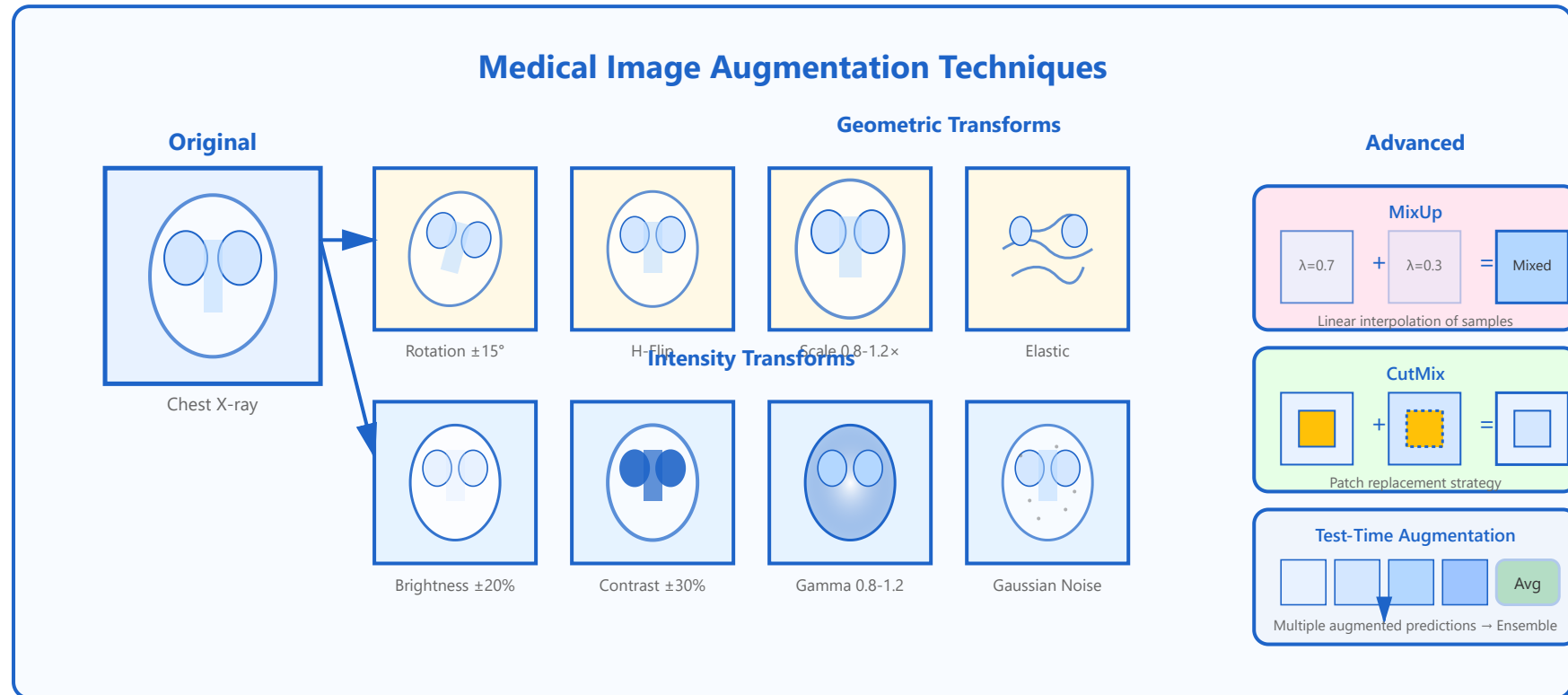
Geometric Transforms

Rotation, flipping, scaling, elastic deformations. Must respect anatomical constraints

Intensity Transforms

Contrast adjustment, brightness, gamma correction. Simulates different scanner protocols

MixUp/CutMix

Medical-Specific

Mixing training examples. Creates synthetic samples for better generalization

Domain knowledge augmentation: simulating pathology, artifacts, different imaging protocols

Test-Time Augmentation

Multiple predictions on augmented test images. Ensemble for improved robustness