2026 JOINT AAPM | COMP MEETING
JULY 19–22 | VANCOUVER, BC

Quantitative Evaluation of Radiomics Reproducibility in Deep Learning and ASIR CT Reconstructions: A Phantom Study

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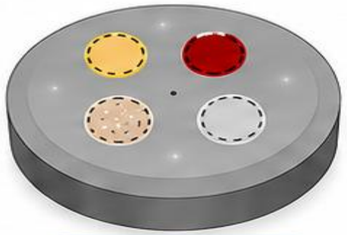
1 DATA ACQUISITION

ADVANCED ELECTRON DENSITY PHANTOM SCANNED ON GE REVOLUTION APEX



PHANTOM INSERTS

- ADIPOSE ($\rho_e \approx 0.95$)
- BLOOD ($\rho_e \approx 1.02$)
- BRAIN-EQ / SOFT TISSUE ($\rho_e \approx 1.04$)
- CORTICAL BONE ($\rho_e \approx 1.55$)

SYSTEMATIC VARIATIONS (ONE PARAMETER AT A TIME)

- **kVp VARIATION**: 80, 100, 120, 140 kVp
- **NOISE INDEX (NI) VARIATION**: 5, 10, 15, 20, 25
- **SLICE THICKNESS (ST) VARIATION**: 0.625, 1.25, 2.5, 5.0 mm

ALL OTHER PARAMETERS KEPT CONSTANT

2 RADIOMICS FEATURE EXTRACTION

CT IMAGES RECONSTRUCTED WITH TWO METHODS

DEEP LEARNING (DL)

ADAPTIVE STATISTICAL ITERATIVE RECONSTRUCTION (ASIR)

STANDARDIZED RADIOMICS PIPELINE (PyRadiomics v3.x)

93 FEATURES EXTRACTED PER VOLUME

FEATURE CLASSES:
FIRST ORDER, GLCM, GLDM, GLRLM, GLSZM

3 FEATURE EVALUATION

REPRODUCIBILITY QUANTIFIED USING COEFFICIENT OF VARIATION (CV)

$$CV = \frac{\sigma}{\mu} \times 100\%$$

σ: STANDARD DEVIATION
μ: MEAN

CALCULATED FOR EACH FEATURE ACROSS VARIATIONS OF EACH ACQUISITION PARAMETER

STABILITY CLASSIFICATION

- **STABLE**: CV < 5%
- **ACCEPTABLE**: 5% ≤ CV ≤ 10%
- **UNSTABLE**: CV > 10%

GLOBAL REPRODUCIBILITY EVALUATED USING MEDIAN AND MEAN CV OVER ALL FEATURES

4 FEATURE COMPARISON (DL vs ASIR)

kVp VARIATION

METRIC	ASIR	DL
MEDIAN CV (%)	1.77	0.76
MEAN CV (%)	3.19	2.32
STABLE FEATURES (CV < 5%)	76	84
UNSTABLE FEATURES (>10%)	5	3

NOISE INDEX (NI) VARIATION

METRIC	ASIR	DL
MEDIAN CV (%)	3.06	1.59
MEAN CV (%)	4.70	2.78
STABLE FEATURES (CV < 5%)	70	84
UNSTABLE FEATURES (>10%)	12	5

SLICE THICKNESS (ST) VARIATION

METRIC	ASIR	DL
MEDIAN CV (%)	18.13	13.55
MEAN CV (%)	30.42	23.51
STABLE FEATURES (CV < 5%)	15	15
UNSTABLE FEATURES (>10%)	65	68

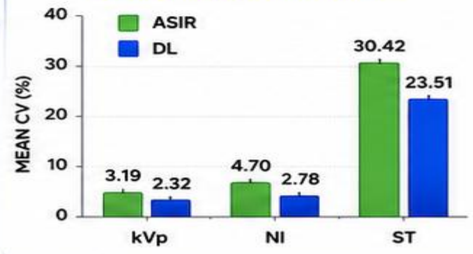
SLICE THICKNESS REMAINS THE PRIMARY SOURCE OF VARIABILITY FOR BOTH METHODS.

5 RESULTS SUMMARY

KEY FINDINGS

- DL reconstruction shows lower median and mean CV compared to ASIR across all parameters.
- Higher number of stable features and fewer unstable features with DL, especially for NI variation.
- Slice thickness is the dominant source of variability for both methods.

MEAN CV (%) COMPARISON



CONCLUSION

Deep learning reconstruction significantly improves CT radiomics reproducibility relative to ASIR across clinically relevant variations in kVp, NI, and ST, providing a more reliable platform for quantitative CT radiomics and reproducible imaging biomarkers.