DOI: https://doi.org/10.36094/sc.v92.2026.Context_Based_Quantum_Ispired_Image_Encoding.Konar.209

ARTICLE

Sci. and Cult. 92 (3–4) : 209-212 (2026)

CONTEXT BASED QUANTUM-INSPIRED IMAGE ENCODING: RECONSTRUCTION, FIDELITY, STABILITY AND CLASSIFICATION TRADE-OFFS

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Quantum-inspired image encodings offer compact visual representations, but their utility for lung histopathology is unclear. This study evaluates Amplitude, FRQI, NEQR, QBIP, and Hybrid-NEQR+RAE on lung carcinoma WSI patches, assessing reconstruction, perceptual stability, and classification. Amplitude achieves PSNR > 45 dB, Hybrid-NEQR+RAE ≈ 43 dB with stable sharpness, exposure, colour, and noise metrics. While NEQR and QBIP deliver the best diagnostic separation with macro-F1 ≈ 49% and 47%,Hybrid-NEQR+RAE collapses to ≈ 22% F1 due to class bias. Confusion matrices confirm that high-fidelity hybrid reconstruction suppresses discriminative variance. The study highlights that medical diagnosis demands task-aware quantum encoding.