Hey there,

Here is what's been going on in medical physics and related areas the last 24 hours. Here's what you folks might find interesting today:

Imaging Physics and Reconstruction - Splat-based Metal Artifact Reduction in Cone-Beam CT via Polychromatic Modeling: This paper introduces a physics-inspired, self-calibrating method for metal artifact reduction in CBCT by integrating a polychromatic X-ray projection model, material-dependent attenuation profiles, and system response modeling into a Gaussian Splatting framework. It eliminates the need for manual metal masks or strong prior assumptions by jointly optimizing reconstruction parameters and X-ray spectral characteristics during training. As the first splat-based method for reducing beam hardening in CBCT, it offers a computationally efficient and practical route to artifact correction that outperforms state-of-the-art approaches on both synthetic and real-world datasets.

Radiotherapy and Hadron Therapy - 4$π$ Planning for the Reduction of Predicted Hematologic Toxicity Risk in Cervical Cancer Radiotherapy: This study combines radiomic features from planning CTs with clinical and dosimetric data to train machine learning models for predicting acute hematologic toxicity (HT). It applies the top-performing model to evaluate HT risk reduction achievable with non-coplanar (4$π$) radiotherapy compared to conventional coplanar VMAT. The 4$π$ planning significantly reduces doses to the bone marrow and other pelvic organs at risk, which the predictive model translates into a 23% reduction in predicted HT risk, demonstrating a strong integration of automated treatment planning and toxicity prediction.

Uncertainty Quantification and Likelihood-Free Inference - Reliability analysis for BraTS-GoAT segmentation: a controlled robustness study of deep-ensemble uncertainty: This work provides a rigorous evaluation of deep-ensemble uncertainty and calibration for brain tumor segmentation under controlled synthetic corruptions acting as a proxy for acquisition shift. The authors find that while single-model confidence stays flat as accuracy degrades, inter-member disagreement rises steeply and serves as a more sensitive case-level indicator of acquisition shift. The study offers an honest reliability comparison for clinical deployment, highlighting that while ensemble disagreement detects distribution shift, its per-voxel error localization weakens as severity grows.

Novel Architectures and Objectives for Imaging - Inference-Time Orthogonal Seeding Enables Geometry-Aligned 3D Organ Segmentation for Slice-Propagation Methods: This paper tackles the bottleneck of dense voxel-level annotation in 3D medical image segmentation by enhancing label-free slice propagation. Instead of propagating from a single axial seed, the authors use three orthogonal seeds (axial, coronal, and sagittal) and fuse their propagated labels. They demonstrate that inference-time seed geometry, specifically orthogonality, drives performance improvements rather than explicit three-axis training. This geometric approach significantly improves surface distance metrics and reduces error accumulation, effectively leveraging volumetric geometry without requiring complex architectural changes.

Until the next announcement!

P.S. In the most recent submission window: physics.med-ph: 2 papers cs.CV: 100 papers