

Hey all,

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.

TOP PICKS

Uncertainty Quantification and Likelihood-Free Inference / Imaging Physics and Reconstruction

- [Posterior Samplings are Missing Modalities Generators for Medical Image Translation](#) formulates missing-modality MRI generation as a **linear inverse problem** under a joint distribution and solves it via **posterior sampling with a flow matching model**. Rather than training separate source-target translation networks, the method learns a single joint prior over all modalities and reconstructs arbitrary missing ones at inference time by guiding the sampling trajectory to enforce measurement consistency with observed modalities. A many-to-one sampling strategy mitigates inter-modality error propagation in multi-target settings. This is a clean example of using **amortized inference** principles for image synthesis rather than empirical GAN/diffusion translation, and the downstream tumor segmentation results on BraTS suggest the synthesized images preserve clinically relevant structure.

Imaging Physics and Reconstruction / Industry-Relevant and Translational Work

- [BART Online Open-Source Sequence Toolbox for Computational MRI](#) extends the BART toolbox with a pulse-sequence development framework and a vendor-specific driver sequence that runs directly on clinical MRI scanners, enabling online parameter adjustment. The same sequence can be reproduced offline via the **Pulseseq format**, closing the loop between acquisition and **model-based reconstruction** in a single end-to-end open-source pipeline. Proof-of-concept demonstrations include quantitative T1 and joint water/fat R2*/B0 mapping with radial FLASH, with phantom and in vivo validation confirming online-offline consistency. This matters for anyone working on joint acquisition-reconstruction design who needs reproducible, scanner-integrated workflows rather than offline-only prototypes.

Imaging Physics and Reconstruction / Uncertainty Quantification

- [SWITi: Quantifying and Reducing Tiling Artifacts with Sliding Window Inner Tiling](#) addresses a practical but underappreciated problem: stitching artifacts in tiled predictions from **posterior-sampling** networks, where independent samples across tiles create seams that can be mistaken for biological structures. SWITi averages overlapping sliding-window predictions so discrepancies spread across shifted tile positions rather than accumulating at fixed seams, using no more tile samples than an MMSE estimate requires. The authors also introduce two **reference-free metrics** (Fraction of Rejected Tests and Artifact Severity) based on a per-tile permutation test comparing gradient distributions across seams versus surrounding content. Validated on fluorescence microscopy in 2D and 3D, this is a useful test-time tool for anyone deploying generative or probabilistic reconstruction models on large images.

Novel Architectures and Objectives for Imaging

- [Anatomy-Aware 3D Mesh Refinement of Pericardium Segmentations on Computed Tomography](#) introduces a model-agnostic post-processing framework that refines initial CT segmentations using **anatomical and geometric forces** derived from surrounding structures, rather than relying solely on image gradients. A 3D vector field iteratively pushes mesh vertices to anatomically plausible locations, balancing geometric regularization against anatomical context. The method shows greater improvement on weaker initial segmentations, making it particularly relevant for out-of-domain models or

limited-training-data scenarios. While the application is specific to pericardium delineation, the gradient-based, GPU-accelerated formulation is extensible to other anatomical structures where boundary contrast is poor.

Back tomorrow with more!

P.S. In the most recent submission window: physics.med-ph: 1 papers cs.CV: 90 papers