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4D-Model-based estimators for real-time respiratory motion during lung cancer radiotherapy treatment

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LINAC-integrated real-time 3D imaging is the missing puzzle needed for safe dose escalation in lung cancer treatments, particularly when tumors are near toxicity-sensitive healthy structures. Machine learning and its development pace are promising in approximating or even predicting the motion patterns in individual patients based on available 2D cineMR scans. Accurate predictons about future positions of targets and structures at risk in several milli-seconds, create an interval for action level decisions e.g. shutting off the beam or even adapting the beam intensities on the fly. However, rigorous evaluation, often reliant on human observers, remains a challenge due to the complexity and amount of multimodal 2D cine, 3D, and 4D scan data of the mediastinal lung region.
We investigate the accuracy of biomechanically-driven computational patient models to bring structure and coherence in this complex 4D data puzzle, promising to replace extensive delineation or landmark annotation necessity for every single patient. Beginning with ribcage motion, we establish, visualize, and evaluate the digitally reconstructed 4D anatomy.

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Session Classification: Thematic Session: Data Acquisiton / Image Format - part III

Track Classification: Data Acquisition & Image Formation (focus on real-time imaging): Thematic focus: Data Acquisition & Image Formation