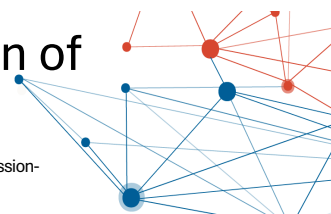


Artificial Intelligence for auto-segmentation of organs in pelvic radiotherapy planning

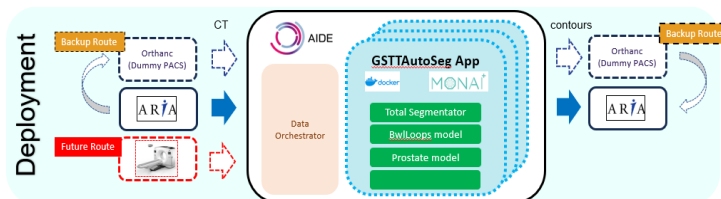
L Ribeiro, C Thomas, M Alqarni, A Mistry, T Roberts, K Morrison, S Vivekanandan, V Manik, V Harris, A Winship, I White, B Taylor, S Mission-Yates, T Guerrero-Urbano



The Problem

Contouring of healthy tissue and tumour volumes is an essential component of radiotherapy treatment planning to maximise therapeutic dose to target organs whilst minimising radiation to organs at risk (OAR). This contouring is currently performed manually on planning CT scans prior to starting radiotherapy.

At Guys Cancer Centre there are 320 complex plans per month on average. These plans are created by consultant clinical oncologists with an average prostate plan taking 29 minutes and an average cervix and nodes plan taking 50 minutes. This results in a significant amount of clinical time spent contouring.



The Project

Deployment of an artificial intelligence based auto-segmentation solution for CT scans in pelvic radiotherapy planning. The solution was developed in-house and based on nnU-net architecture trained on local scans and contours. These models were then deployed on the AIDE platform. After auto-segmentation, a clinician will edit the contours as necessary prior to final approval.

Two models were developed:

1. Prostate model - contours prostate, rectum, bladder, penile bulb, and femoral heads
2. Bowel model - contours small and large bowel, sigmoid, rectum, and bladder

Development of a model for MRI scans - this will improve the accuracy of the contours as the prostate is difficult to delineate on CT scan. As radiotherapy planning requires Hounsfield units for dosing, this will be combined with a separate AI solution to create synthetic CT scans based on MRI scans.

Prostate

00:29:17 → 00:14:00

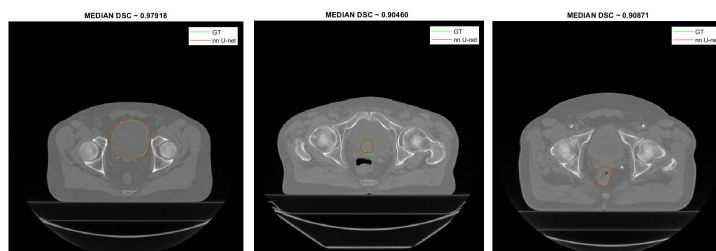
Cervix + Nodes

00:50:00 → 00:10:00

AI based auto-segmentation for pelvic radiotherapy has led to a significant reduction in clinical time spent contouring

Key Milestones

- Initial timing analysis to establish baseline timings for creating clinical prostate contours
- Prospective clinical evaluation of deployed AI model. Primary outcome measures are time to edit and qualitative evaluation with Likert scale. Currently running.
- Clinical data collection for patient demographics and oncological metrics (Age, PSA, Gleason score, Staging)
- Data curation including manual contouring for prostate MRI model and post-brachytherapy CT model
- Ethics and information governance approval for expansion to development of contours for pelvic nodes in prostate



Next steps

- Complete clinical roll out across all consultants
 - Ongoing training for currently excluded patients (e.g. hip prosthesis)
 - Expansion to other treatment sites
- Retrospective evaluation of MRI model + SynthCT
- Evaluation of TotalSegmentator for use in pelvic lymph node radiotherapy

