Co-Working with AI: Lessons Learned from Integrating AI into the Daily Clinical Workflow of a Large Academic Radiation Oncology Department

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Background/Problem Being Solved

Contouring organs at risk and targets is an essential workflow step for all patients receiving radiation therapy. This is historically a time-consuming task requiring clinical expertise, and suffers from intra- and inter-planner variability. Multiple FDA-cleared AI solutions have recently emerged to complete these tasks, but the integration of these systems into well-established workflows and informatics infrastructure, especially in geographically distributed large academic settings, is nontrivial. Simultaneously, the rapid maturation of open-source frameworks have greatly reduced the barriers to working in the AI space. Deployment of these solutions in a clinical environment requires careful consideration, and we share our lessons learned.

Intervention(s)

We developed custom infrastructure by building on open-source frameworks to allow for the large-scale deployment of both custom AI models and a commercial AI auto-segmentation tool, including locally hosted DICOM servers and inference applications, scripted extensions to clinical software interfaces, and tools for metric tracking.

Barriers/Challenges

AI models as a service offer impressive results but fail to completely navigate the "last mile" of robust clinical integration. Clinical integration introduced challenges such as commissioning, routing of patient data, user interfaces, clinical workflow integration, model tracking, feedback collection, and downtime contingency management.

Outcome

After one year, we have solved many challenges from the deployment of clinical AI auto-segmentation and stabilized at a >95% utilization rate, providing clinicians with contour estimates for most treatment locations and reaching >7800 individual clinical uses. We have established robust data collection and modified our workflows to ensure appropriate use of these tools. We have also successfully generalized our infrastructure to allow flexible deployment of future AI tools.

Conclusion/Statement of Impact/Lessons Learned

Our institution has successfully integrated clinical AI tools into our complex practice, reduced time for task completion, and established a robust in-house data infrastructure to track and deploy commercial and in-house AI models.

Synopsis

Developed a robust informatics infrastructure to deploy vendor and in-house AI solutions in our geographically distributed academic radiation oncology department, enhancing patient treatment planning workflows. We share our one year experience in implementation and outcomes.

Figure(s)

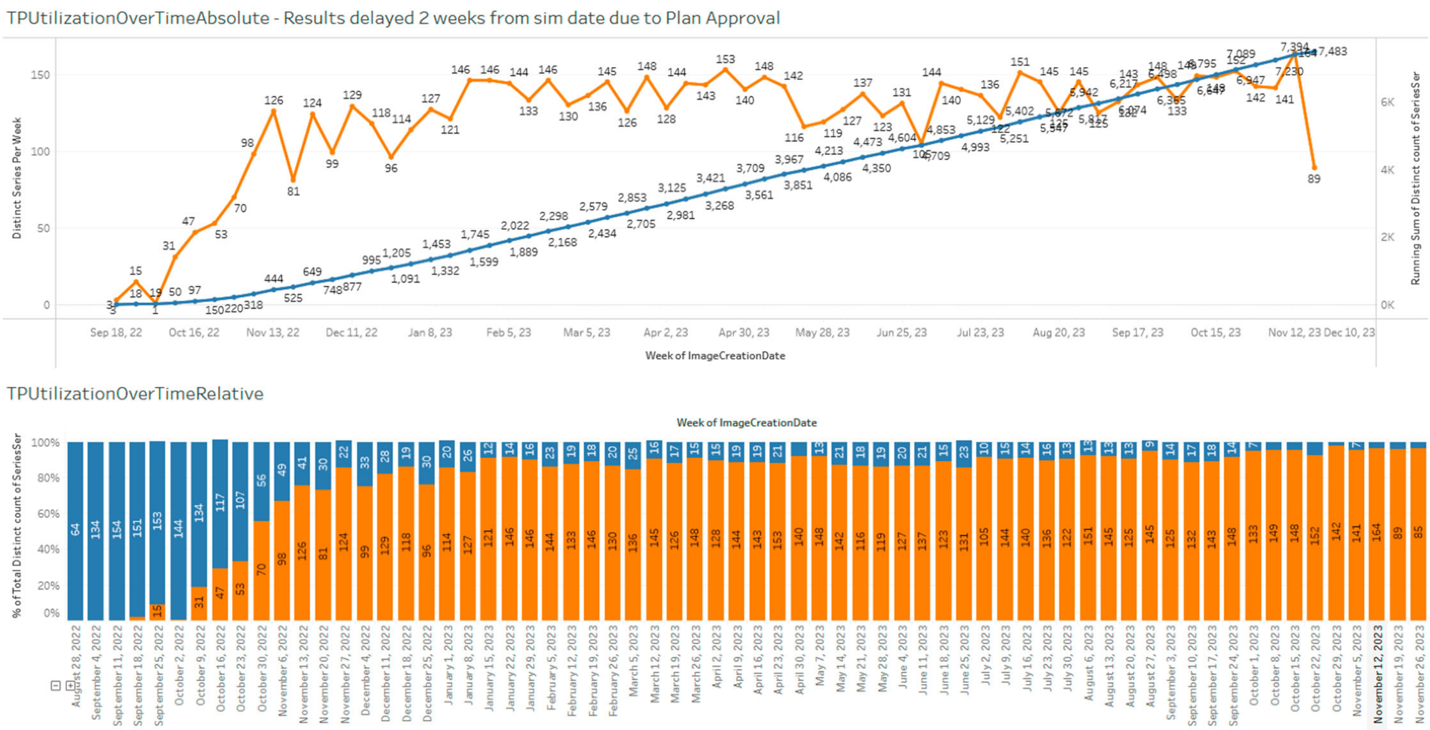

Figure 1. In this figure, the top subplot shows the number of distinct patient image series that used the commercial AI contouring tool. In the bottom subplot we show the percentage of patients that used AI generated contours as a part of the treatment planning process. We highlight our initial onboarding and uptake and our sustained use.

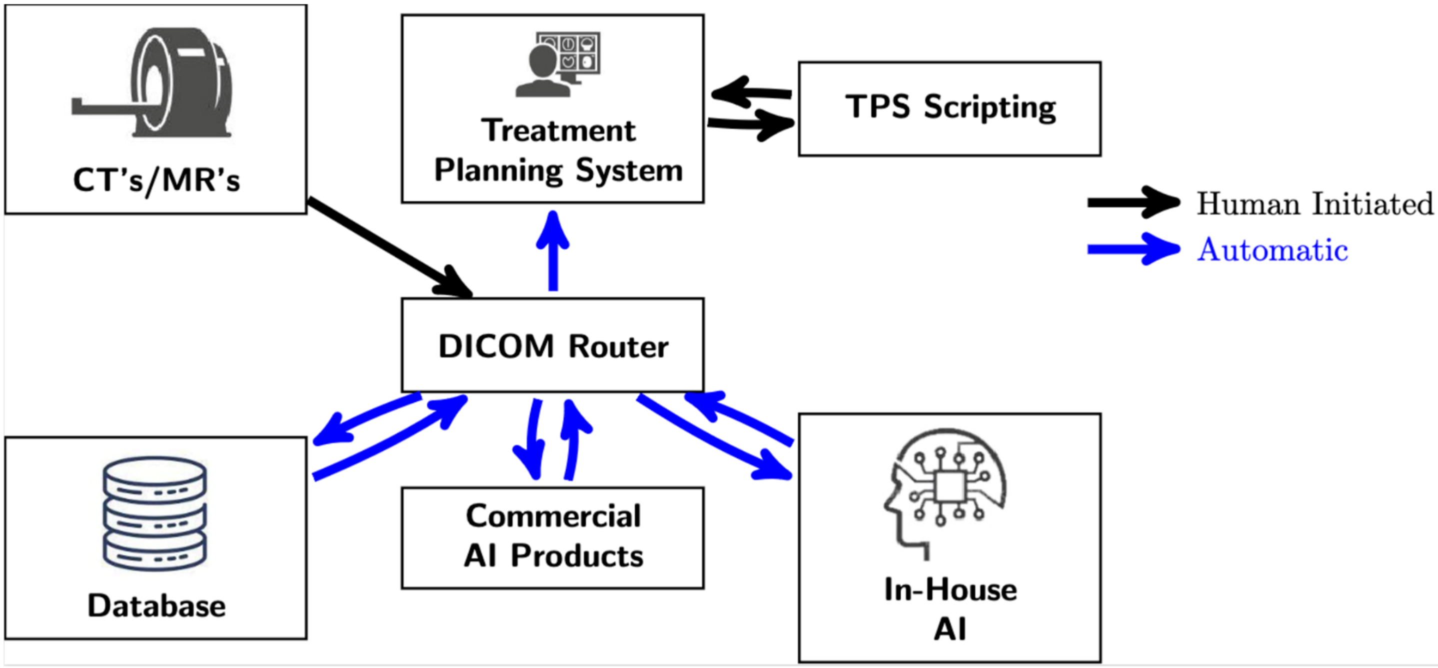

Figure 2. Diagram of the Informatics infrastructure built to deploy commercial and in-house AI models. Database is also included to capture performance metrics for ongoing analysis.

Keywords

Applications; Artificial Intelligence / Machine Learning; Clinical Workflow & Productivity; Communication Data Management; Emerging Technologies; Enterprise Imaging; Standards & Interoperability