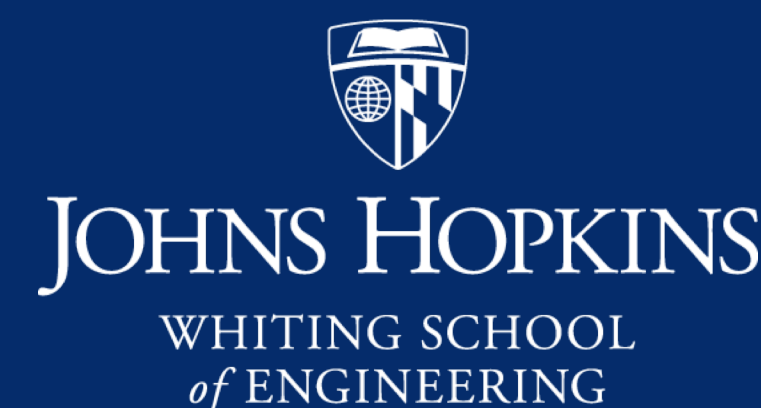


User Interface for Refined Dose-Toxicity Analysis in Radiotherapy

Computer Integrated Surgery II
Spring, 2018

William Franceschi, Santiago Appiani, Alaleh Azhir
Mentors: Dr. Todd McNutt, Pranav Lakshminarayanan



Introduction

- Oncologists and radiologists need quick and informative ways of analyzing radiotherapy dose-distribution data.
- This data can be coupled with toxicity or organ function data to make models or to predict patient outcomes.
- Currently, the basic segmentation tools available are:
 - Limited in function
 - Difficult for specialist without computer skills

The Problem

- The current tools available to oncologists and radiologist for morphologic dose-toxicity analysis are limited in functionality and in their ease of use.
- This greatly limits the options for analysis and slows down the process of learning about how location specific dose distributions affect patient outcomes.

The Solution

- We proposed making a web-based user interface to make several tools accessible to the specialists.

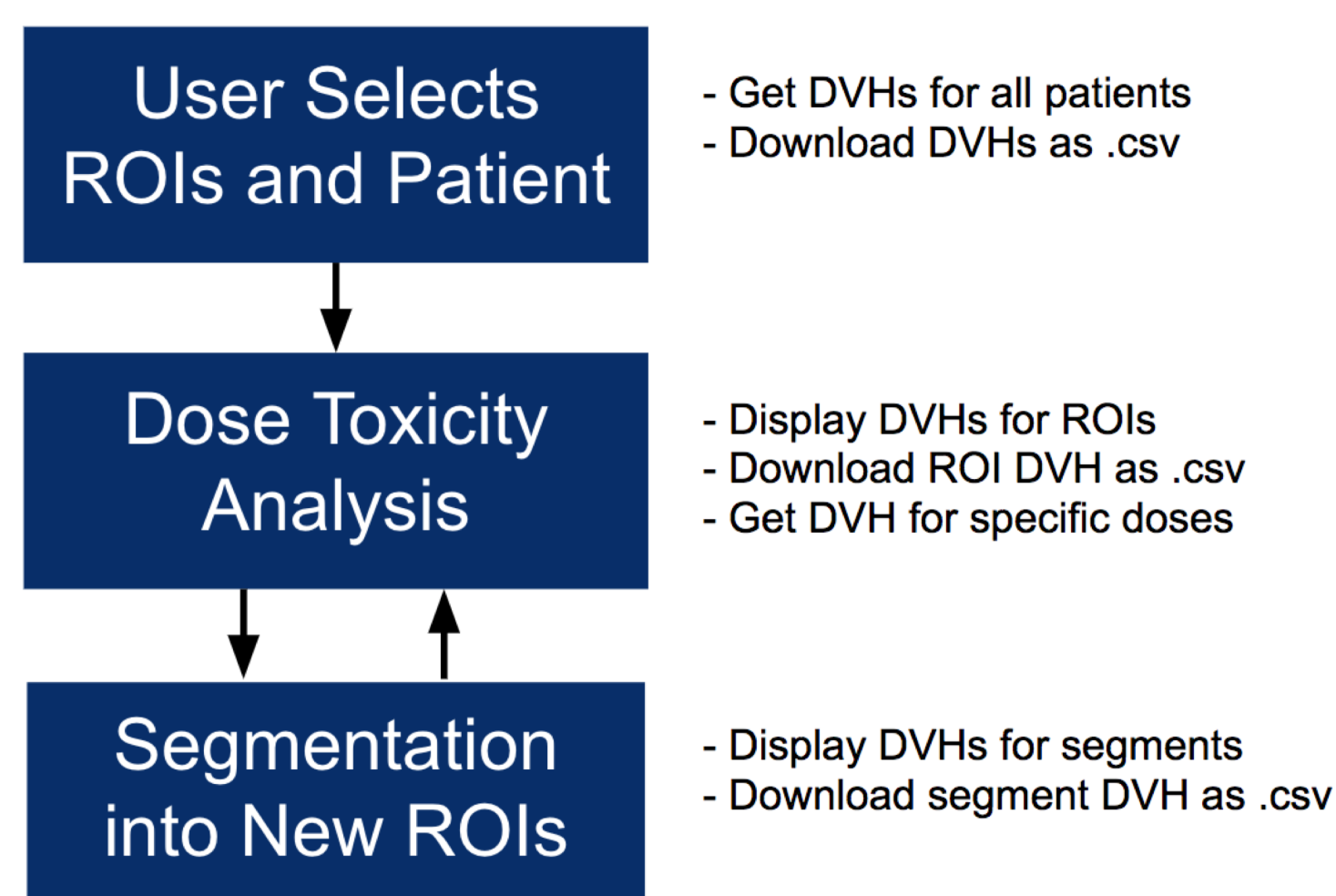


Figure 1 - Workflow. High level view of UI workflow. First, the user selects patient and dose grid. Second, the user can view DVH for selected ROIs. Third, the user chooses a segmentation tool. Finally, the user can view the DVH for the new segments

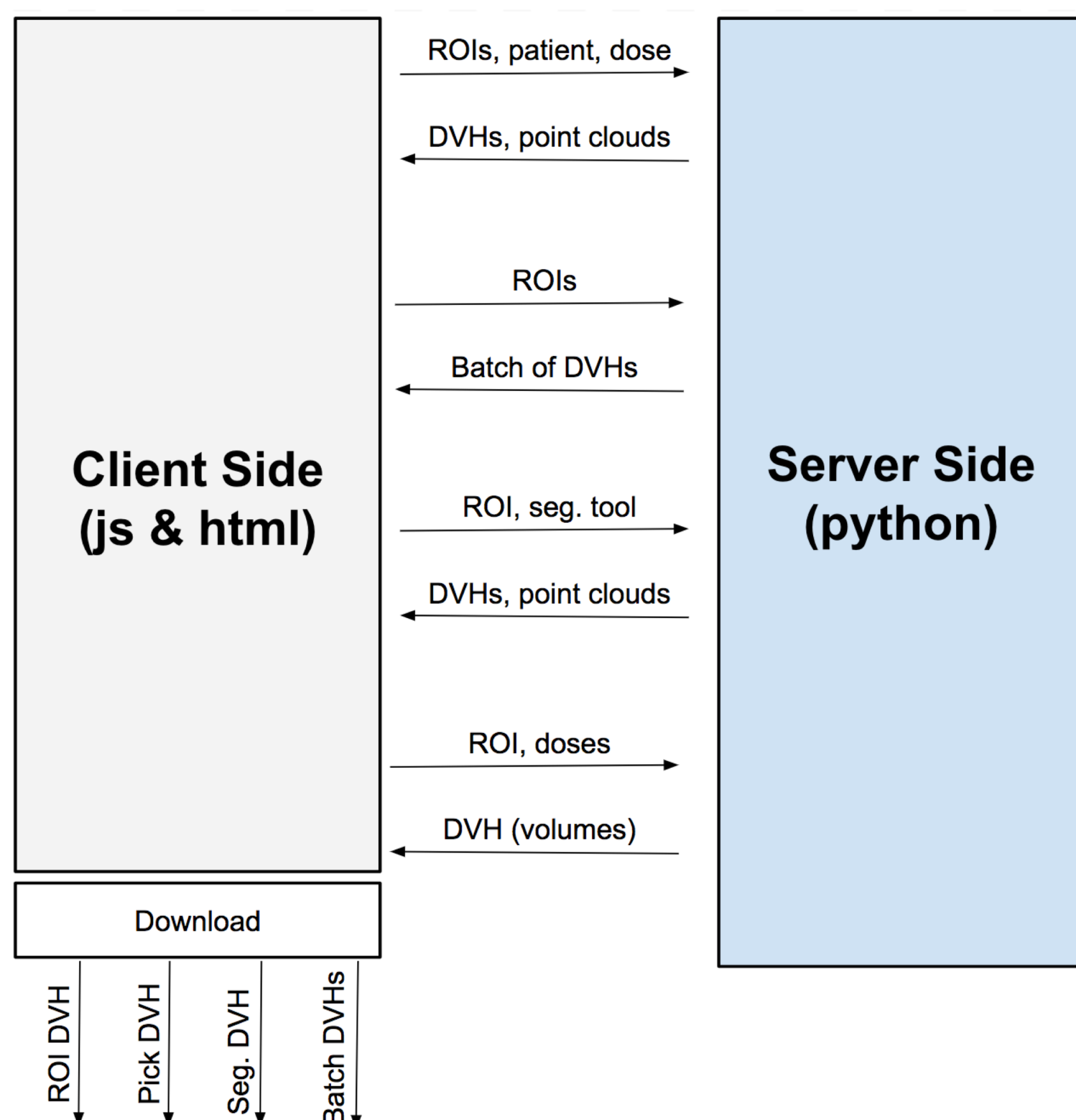


Figure 2 - Code Communication. Client side and server side communication. The data and download options are shown here. Server side, written in python, returns DVH and point cloud data when given necessary patient and dose information.

Results

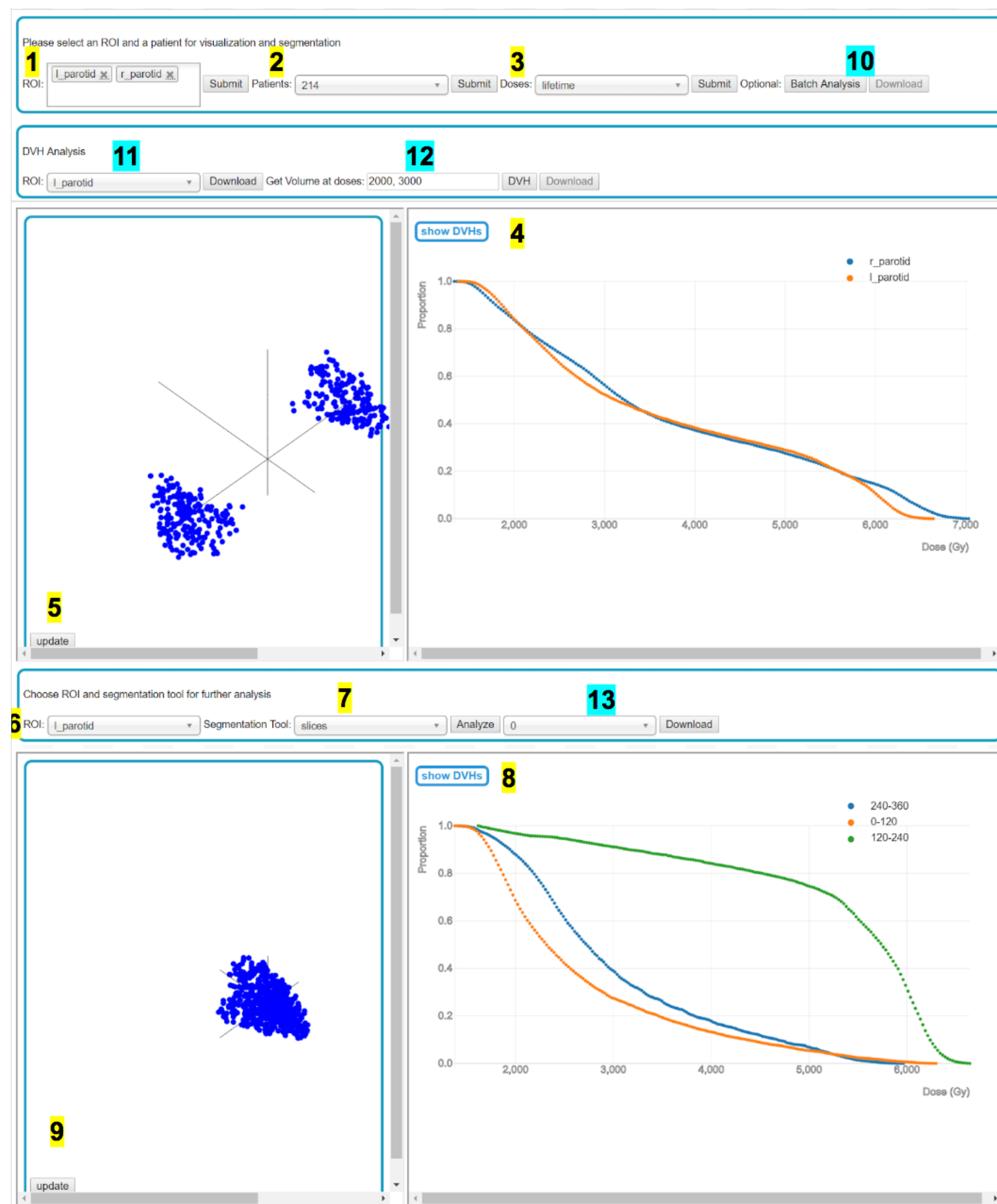


Figure 3 - Graphical Workflow. Full website is shown. Yellow number labels correspond to the core workflow, consisting of generating DVHs for selected ROIs, segmenting the selected ROI, and generating DVHs for segments. Blue labels correspond to auxiliary analysis and DVH download features. Each step is explained in detail in Figure 4.

Future Work

- Add additional features and segmentation tools to the user interface
- Setup the interface to run in a dedicated server
- Test the interface with oncologists and radiologists

Lessons Learned

- Software experience using D3, html, and JSON
- Communicating between client and server side

Credits

- Alaleh Azhir: Created the front end, visualization
- Santiago Appiani: Worked on front end, segmentation, data exporting
- William Franceschi: Setup server side, communication, segmentation and I/O on the front end.

Acknowledgements

- Thank you to our mentors Pranav and Dr. McNutt. They guided us through this process and helped us define our targets and how to approach them. They also provided the segmentation tools and the test data needed to build the interface.

