

Chief Science Officer, Radformation, Inc.



Disclosures
• I am a cofounder, officer, and employee of Radformation, Inc.
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Motivation: Efficiency, Safety, and Quality

- Automation has the **potential** to:
 O Perform tasks in less time
 Reduce errors
 Increase quality and consistency
- Reaching that potential depends on the implementation...



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Motivation: Adaptive Planning

A study simulating adaptive planning for lung:

- Single adapt

 S0-65% of the benefit of Full adapt (i.e. Daily adapt) on normal tissue sparing and target dose escalation
- Weekly adapt
- 80-85% of the benefit of Full adapt
- 2-5x the physics/dosimetry resources per patient?

Dial C, Weiss E, Stebers JV, Hugo GD. Benefits of adaptive radiation therapy in lung cancer as a function of replanning frequency. Med Phys. 2016 Apr;43(4):1787. doi: 10.1118/1.4943564. PubMed PMID: 27036576; PubMed Central PMC/ID: PMC480B061.

- Randomized Phase 2 Trial: Nonspine Bone Mets, **12 or 16Gy x 1** vs **3Gy x 10**: SBRT: better local control rates @ 1 and 2 years No differences in treatment-related toxic effects or quality-of-life scores vs com
- Far less trouble for the patient (when time is particularly precious) • Per patient: 10x less time at the linac, but arguably more physics resources
- Enables higher patient throughput? Bottleneck now physics/dosimetry?
- Recent CMS Proposed RO Model aligns with this paradigm?

Nayven (PL Char SC, Char E, Konsil R, Liez Z, Zachari R, Sterk BY, Wahih JW, Hahr SM, Faller CD, Mon BS Birl JE, Safar R, Lin JP, Mart M O'Relly MS, Liez WG Single-Factoria Genoratics on Commissional Multitatrion Robatington To pha Meller / Index With Hendmannicky Monoreline Dev Restatace: Advantuses Place 27 Lin JUMA Dono. 2019 Age 25: doi:10.1001/jimmorci.2019.01272. [Ejub ahead or junt] PubMed PMID: 31021390; RadMed Cental PMCD: PMC4687911.









Scripting	
 Enormous power and flexibility but much higher barrier to entry Leaning to program? Like learning a new language, can be very frustrating Libt also very rewarding Lot's of great resources to help you learn If you can muster the motivation, time, and energy You will definitely encounter barriers A project that motivates helps alot General Advice: Divide and Conquer Break a task down into well-defined manageable units Explore the API & experiment 	RAD formation

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.//github.com/varianAFIs . E	xample projects are extre	nely nelprui
https://github.com/VarianAPIs		
Pinned repositories		
Varian-Code-Samples	VelocityEngine	C Pyesapi
Code samples for ESAPI and other Varian APIs and web services.	Python and C# Olents for Velocity Scripting API	Python interface to Eclipse Scripting API
●c≠ ★25 ¥28	● C++ ★3 ¥5	●Python ★20 ¥11
DICOM Communication 101	VarianAPIs othub io	
Demonstrates basic communication Varian DiCOM services daemon. Isotropanion reports chapter 4 in the book: Scripting RT Sor Physicists)	Varian Developer Community Home Page Source	







ClearCheck Constraint Checl	< Results	5 Dec 5 1 4 7 10	fation Nur 1 8 -3 1 6 -9 -20	40er 122 1 5
School of Medidine • Manual Constraint Reporting:			e 1: Constrai	nt iency.
0 2% had >1% error	Treatment Site	Automated	Manual	Time Savings
0 2/0 Had + 1/0 CHOI	Head&Neck	1.9	4.6	2.7
0 0.6% had >10% error	Lung Tune GMRY	1.8	4.3	2.5
 ClearCheck Constraint Reporting: 	Brain	2.6	4.2	1.6
0 0 errors	Esophagus	1.6	6.2	4.6
	Parcreas Research (Million N	1.9	4.6	2.7
 Large decrease in time for definition, 	Anal Ca	2.0	6.5	45
evaluation, and documentation of				
constraints				
Burmekter, J.W. et al., Implementation of an Automation Tool for Treatment Planning Constraint Designation and Plan Evaluation, International Journal of Radiation Oncology • Biology • Physics, Volume 102, Issue 3, eS34 - eS35	Table 2: Auton	nated and manu times in mir	al constrain nutes	nt evaluation







