Hands-On Treatment Planning with matRad

1st Exercise – First steps on the TG119 phantom – photons vs. protons vs. carbon ions

1. Load the TG119 phantom via the Load *.mat button (**TG119.mat**)
2. Set radiation modality to **Photons** and define one beam angle (**gantry angle**)
3. Trigger dose calculation viabutton („**Calc. Influence Mx**“)
4. Start inverse optimization by clicking on („**Optimize**“) and analyze the resulting dose distribution.
5. Save the optimization result via („**Save to GUI**“). Next, show the DVH by („**Show DVH/QI**”).
6. Change the radiation modality to: **Protons** and leave the beam angles unchanged
7. Repeat steps 3-5 and compare the dose distributions on the basis of photons and protons.
8. Try to define a *better* photon treatment plan by defining more beam angles (e.g.equidistant beam angle spacing [0, 72, 144, 216, 288]).
9. Repeat steps 3-5 until the dose distribution is deemed satisfying and compare results.
10. Change optimization objective to improve the photon treatment plan.

Use Table („**Objectives &constraints**“) and add for instance a hard constraint (e.g. maximal dose for the core structure or minimal dose for the outer target structure).

1. Repeat steps 3-5 and compare results.
2. Optional: Increase lateral Bixel Width parameter to e.g. 20mm and repeatsteps 3-5

2nd Exercise – Carbon ion treatment plan for a liver patient

1. Load the liver patient case via the Load *.mat button (**LIVER.mat**)
2. Based on your experiences of exercise one, define your own photon treatment planwith approx. 4-5 beam directionsas well as your own proton treatment plan with one beam from e.g. 315°. (Hint: Use „**visualize plan / beams**” to trigger a beam angle visualization).
3. Analyze the differences of the optimized treatment plans. Don’t forget to save (**“Save to GUI**“).
4. Create a carbon ion treatment with the exact same settings as used for the proton treatment plan – What difference can now be observed? (calculation time / dose distribution / biologicaland physical dose).

3rd Exercise – Treatment planning uncertainties

1. Load a head patient case (**HEAD_AND_NECK orALDERSON.mat**)
2. Add three proton beam angles on your own.
3. Calculate and optimize the dose („**Calc. Influence Mx**“ & „**Optimize**“).Analyze the result (dose& DVH) andsave it („**Save to GUI**“).
4. Simulate a patient positioning error:
   Remove the hook at the auto iso-center checkbox and define a new iso-center thereby introducing an offset.
5. Recalculate the dose based on the previously optimized pencil beam intensitiesby clicking on the button („**Recalc**“). Do not perform a new optimization.
6. Analyze and compare the resulting dose distribution. What changed ?