Hands-on Planning with matRad – HitriPlus Clinical School

Exercise 1 – photon IMRT

1. Load the Liver Patient (LIVER.mat). If you installed the standalone, you find the patient in the subfolder application/phantoms of your installation path.
2. Look at the anatomy, explore matRad's user interface and visualization settings (e.g., turn off some of the helper structures in the structure view).
3. Define an irradiation geometry for **photon** IMRT with 5 – 9 gantry angles (for example 0 72 144 216 288 – you need to set a similar amount of couch angles). Set the **number of fractions** to 15.
4. Start dose influence calculation ("**Calc. Influence Mx**")
5. Start inverse dose optimization ("**Optimize**") and analyze the resulting dose distribution. You can check out the dose-volume histogram by clicking "**Show DVH/QI**".
6. Modify the optimization problem. Add additional objectives to spare OARs (Table "**Objectives & constraints**"), and take care of organ overlap.
7. Re-optimize, analyze, and compare results (dose & DVH).
8. Simulate a patient shift: Uncheck "auto." Next to the isocenter box, and add +5mm in x/y. Then click "**Recalc**" and analyze the resulting dose distribution.

Exercise 2 – proton IMPT

1. Recheck the "auto." button next to isocenter to reset the isocenter position.
2. Define one to three **proton** beams (e.g., gantry angles of 0° and 220°)
3. Calculate dose influence ("**Calc. Influence Mx**") and optimize the dose ("**Optimize**")
4. Analyze the result (dose & DVH)
5. Simulate the same shift as in Exercise 1, step 7. Is there a difference between how tumor coverage changes between protons and photons?

Exercise 3 – carbon IMPT

1. Recheck the "auto." button next to isocenter to reset the isocenter position.
2. Switch the modality to **carbon** ions, keep your proton beam arrangement.
3. Calculate dose influence ("**Calc. Influence Mx**") and optimize the dose ("**Optimize**").
4. Analyze the resulting RBE-weighted dose, physical dose, and biological parameters.
5. Change radiosensitivity of the tissue, e.g., in the PTV ("**Set Tissue**")
6. Recalculate dose for the same plan with the changed radiosensitivity (Important: use "**Recalc**")
7. Analyze and compare your results.