Exercise class – Ex1

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Setup of exercise classes

Exercises are due ~ 2 weeks after they are handed out!

Part 1: discuss previous exercise sheet

- One student will present their solution

- Discuss common difficulties / faults

- Answer questions

Part 2: introduce next exercise sheet

- Explain general idea

- Hints

- Answer questions

Goal of this class

The coursework within this class aims at implementing the major components of a treatment planning system for radiotherapy. This primarily amounts to:

- A pencil beam dose calculation algorithm

- An optimization method to generate a treatment plan for intensity modulated radiotherapy
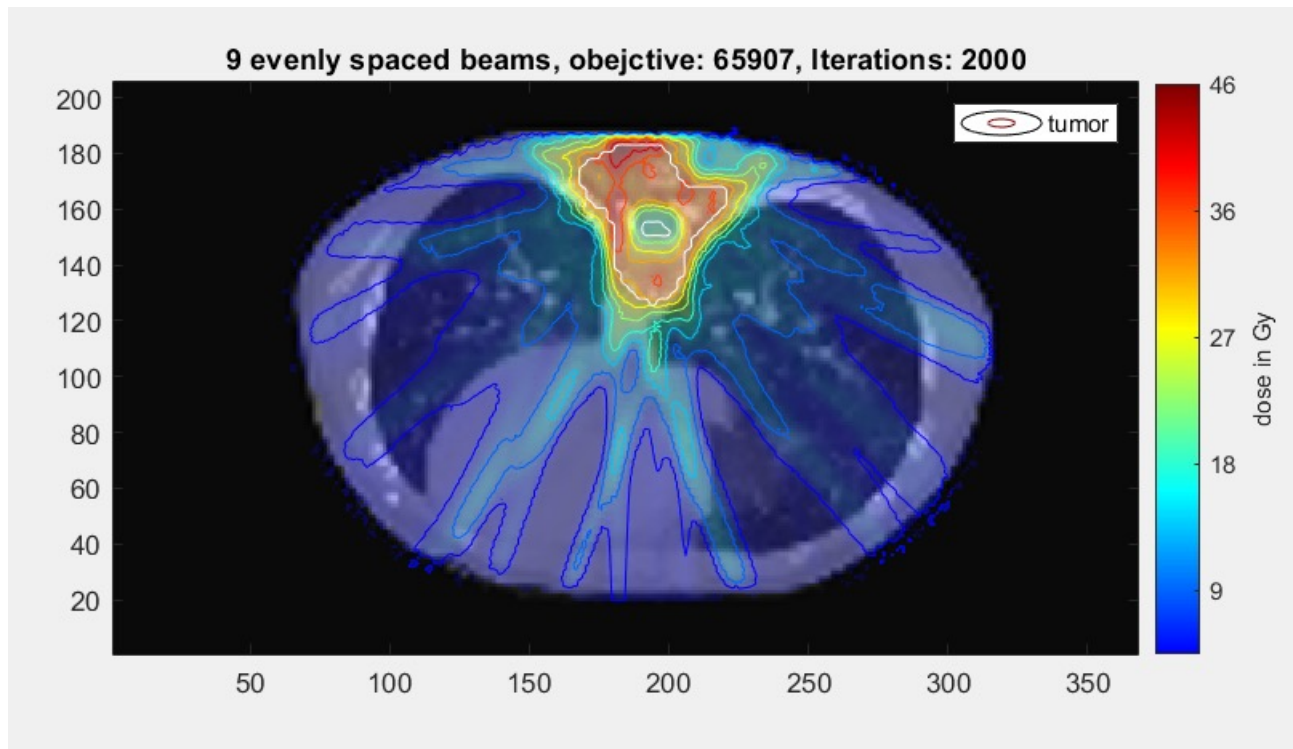
Implement a 2D treatment planning with **real** patient data!

Exercise 1 → Get started in Python

Starting from this year, we'll use **Python** instead of **MATLAB**!

You can submit your solutions in the format you prefer:

- Python script

- Jupyter Notebook

- Short description of your code (if needed)

→ I'd recommend **Jupyter Notebook / JupyterLab**

Exercise 1 → Get started in Python

There are several ways to install and manage Python:

1. Python.org installation + venv
   https://www.python.org/downloads/

2. Anaconda / Miniconda: widely used distribution for Python (and R)
   https://www.anaconda.com/download

3. uv: new, fast Python package manager
   https://docs.astral.sh/uv/

Note: highly recommended to always use a virtual environment to keep projects isolated and avoid version conflicts.

Exercise 1 → Get started in Python

Provided is a Matlab structure called TPlan (for 'Treatment Plan') with the following fields:

- ct - one slice of the CT of a patient with a tumor surrounding the spinal cord

- voi - containing the volumes of interest, ie. a segmentation of the patient into different organs

- voinames - the names of the organs contained in voi

- voxelsize - the size of one image pixel in mm

Assignment 1

Write a function that displays the CT image together with the contour of the tumor, the spinal cord, and the esophagus.

Hint: You can use the function `imshow` to display the CT image and `contour` to display the organs. Both functions are available in the Matplotlib library.

A python function for loading the MATLAB structure into a python dictionary is provided.

What we expect!