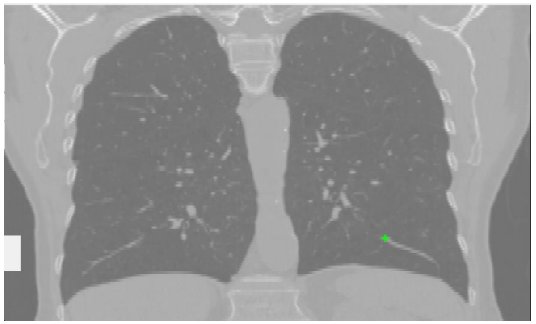
MAIA



MIRA: Final Project 2021

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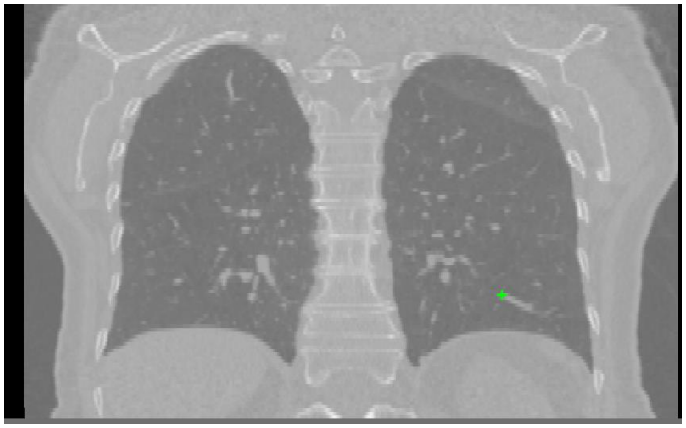
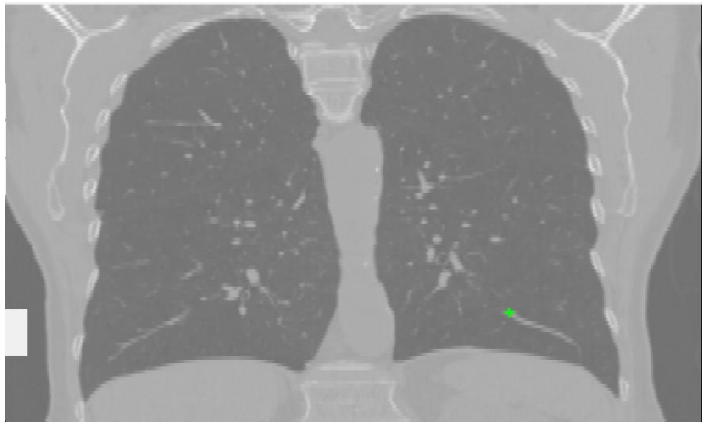
Final Project. Challenge!

- Image registration of chest CT volumes: 4DCT DIR-Lab Challenge (https://www.dir-lab.com/)
  - COPD (Chronic obstructive pulmonary disease)
  - Mevislab / ITK / Matlab / Python / Elastix





- Evaluaton Criteria
  - Accuracy, TRE
  - Methodology
  - Computational time

Final Project

- Data with landmark annotations (300 landmarks per case).
  - 4 cases to “train”. Intensity images plus landmark points.
  - Matlab files to load the (raw) images and view the images and landmarks
  - Raw image format. Load with Matlab or with ITK Snap
  - Careful with the orientation (especially with Z axes!).
- Data given the day of the challenge
  - 2-3 new 4DCT cases, intensity volumes **with only** moving landmarks (no fixed!).
  - We will evaluate online.
- Aim
  - Register the 3D CT lung images
  - Evaluate using TRE (3D Euclidean distance between transformed landmarks).

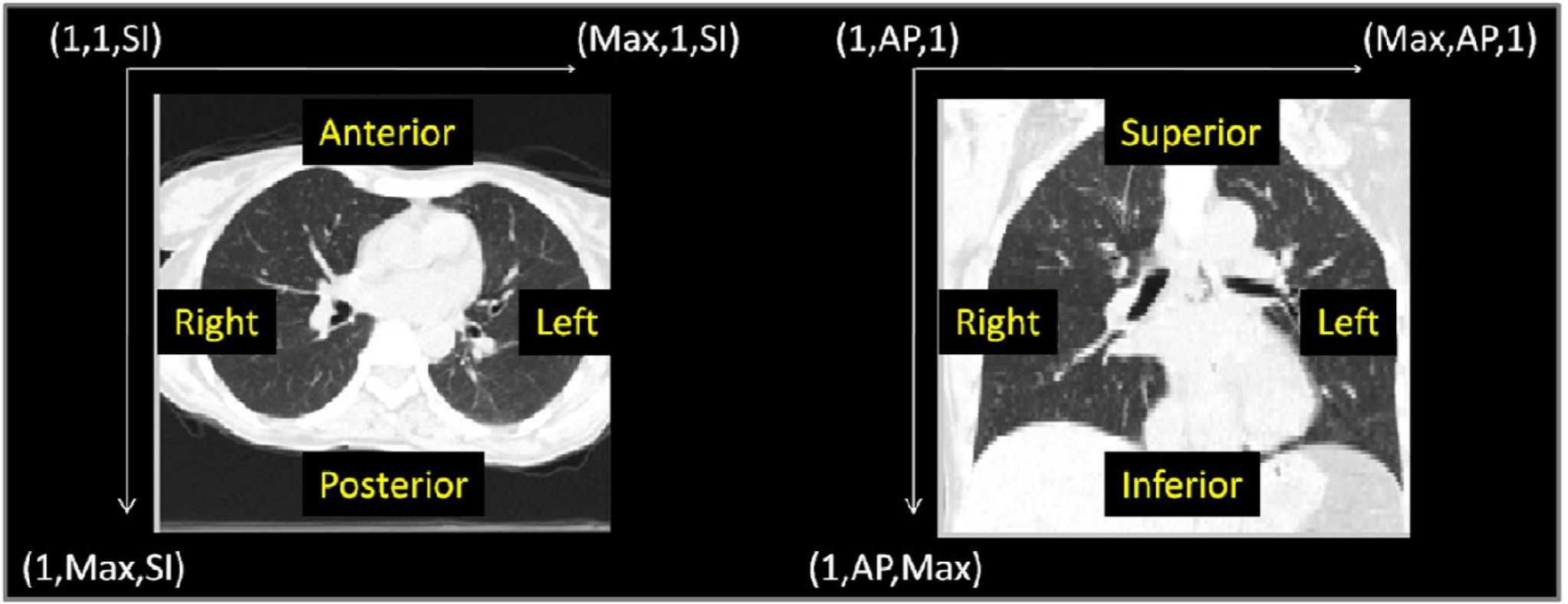
Dataset

4D CT | COPDgene

Table 1b. Reference Datasets - COPDgene. Each case is identified according to the given label. The image dimensions are given in voxel units, and the voxel dimensions are given in millimeters. The "# Features" column designates the total quantity of unique landmark features identified for each case. For the 4DCT images, the full point set is identified between the maximum inhalation and exhalation component phase images. Additionally, a subset of 75 features has been propagated onto each of the expiratory phase images (i.e., T00, T10, T20, T30, T40, and T50). The "Displacement" column shows the mean (and standard deviation) displacement of the complete primary feature set.The entries in the "# Repeats" column are formatted as (N_m / N_{obs}), where N_m is the number of repeat registration measurements performed by each of N_{obs} independent observers. The "Observers" column shows the combined mean (and standard deviation) repeat registration error for the set of N_{obs} data sets. Please see the references cited below for more information.

Label	Image Dims	Voxels (mm)	# Features	Displacement (mm)	# Repeats	Observers (mm)
COPD1	512 x 512 x 121	0.625 x 0.625 x 2.5	773	25.90 (11.57)	150/3	0.65 (0.73)
COPD2	512 x 512 x 102	0.645 x 0.645 x 2.5	612	21.77 (6.46)	150/3	1.06 (1.51)
COPD3	512 x 512 x 126	0.652 x 0.652 x 2.5	1172	12.29 (6.39)	150/3	0.58 (0.87)
COPD4	512 x 512 x 126	0.590 x 0.590 x 2.5	786	30.90 (13.49)	150/3	0.71 (0.96)
COPD5	512 x 512 x 131	0.647 x 0.647 x 2.5	1029	30.90 (14.05)	150/3	0.65 (0.87)
COPD6	512 x 512 x 119	0.633 x 0.633 x 2.5	633	28.32 (9.20)	150/3	1.06 (2.38)
COPD7	512 x 512 x 112	0.625 x 0.625 x 2.5	575	21.66 (7.66)	150/3	0.65 (0.78)
COPD8	512 x 512 x 115	0.586 x 0.586 x 2.5	791	25.57 (13.61)	150/3	0.96 (3.07)
COPD9	512 x 512 x 116	0.664 x 0.664 x 2.5	447	14.84 (10.01)	150/3	1.01 (2.54)
COPD10	512 x 512 x 135	0.742 x 0.742 x 2.5	480	22.48 (10.64)	150/3	0.87 (1.65)

Dataset


(1,1,SI)
(Max,1,SI)
Anterior
Right
Left
Posterior
(1,Max,SI)
(1,AP,1)
(Max,AP,1)
Superior
Right
Left
Inferior
(1,AP,Max)

Final Project. Challenge!

- Dates:
  - 26/11/21: Introduction to the FP
  - 10/12/21: FP follow-up
  - 21/12/21: FP follow-up
  - 12/01/22 (TBC): FP Challenge day.
- Attendance is compulsory.
- Submission
  - Code and executable.
  - Report in paper format (latex).
- Evaluation Criteria
  - Accuracy, Robustness, Methodology, Computational time

Final Project - Suggestions

- KISS
- Make sure you understand image format (dimensions), landmarks and reference systems.

- Compute landmark errors without registration and make sure matches the ones in

https://www.dir-lab.com/Results.html

- Be careful on image formats / orientations!
- Use Matlab help functions (to see landmark errors).
- Use existing known software ITK-Snap, Elastix, etc for visualization and deforming points.

Final Project. Evaluation

- Good coding practice 10%
  - Correct and clear programming, use of functions/objects, templates, etc and consistent code and comments.
- Methodology 25%
  - Methods used are well justified, sound and clear.
  - Know the limitations (when does it fail).
- Evaluation and results 20%
  - Accuracy. Sensitivity and specificity. Dice Similarity coefficient
  - Computational time
- Report 45%

Final Project