Performance Testing of Deep Learning and Auto-Segmentation Algorithms

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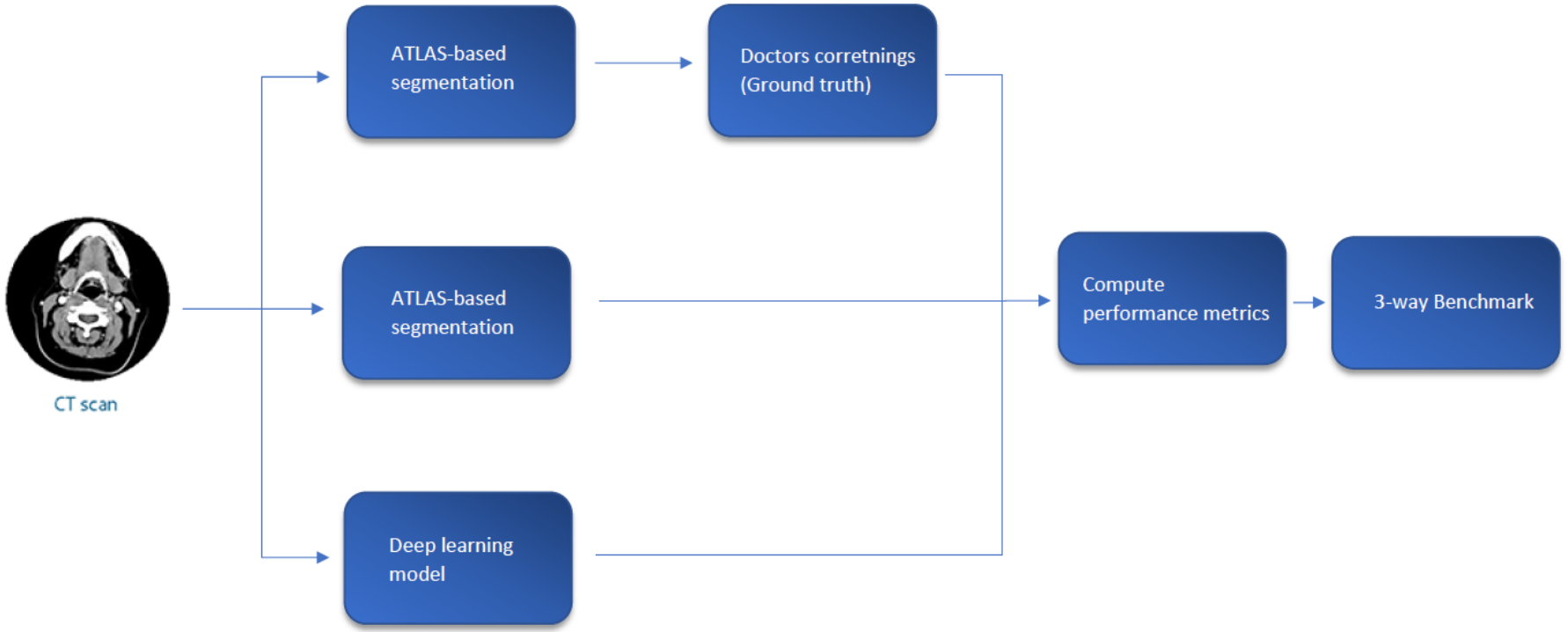
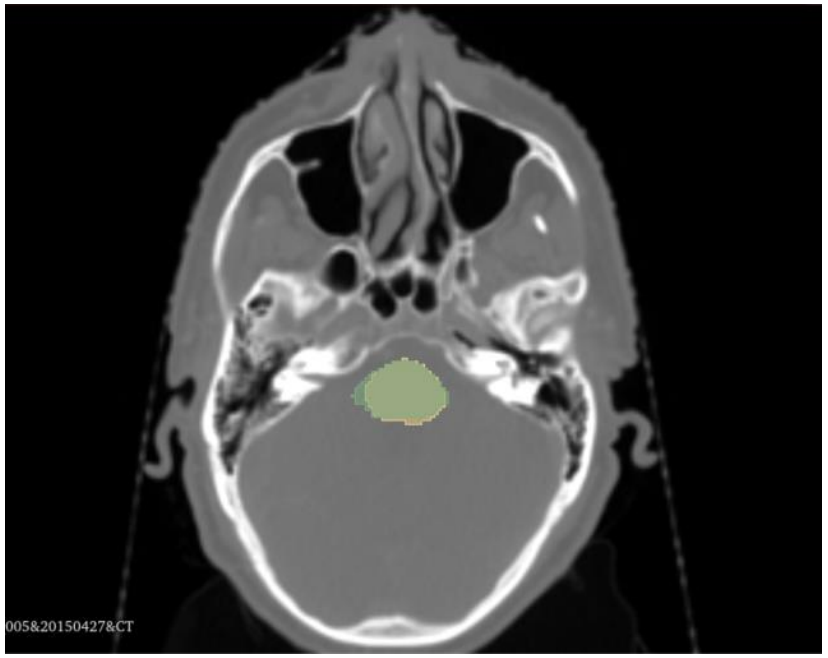
Problem description

- Investigate the difference in performance of autosegmentation algorithms for delineation of organs.
- Create a good performance measurement for benchmarking.



The data

- Database consisting of approx 800 patients treated for cancer at Aarhus Universitetshospital in the period 2005-2016
- Data consists of CT scans and the delineation of organs for each patient.
- Semi 3D pictures. Consist of slices varying from 2-3 mm. Put together in a stack they imitate a 3D picture.



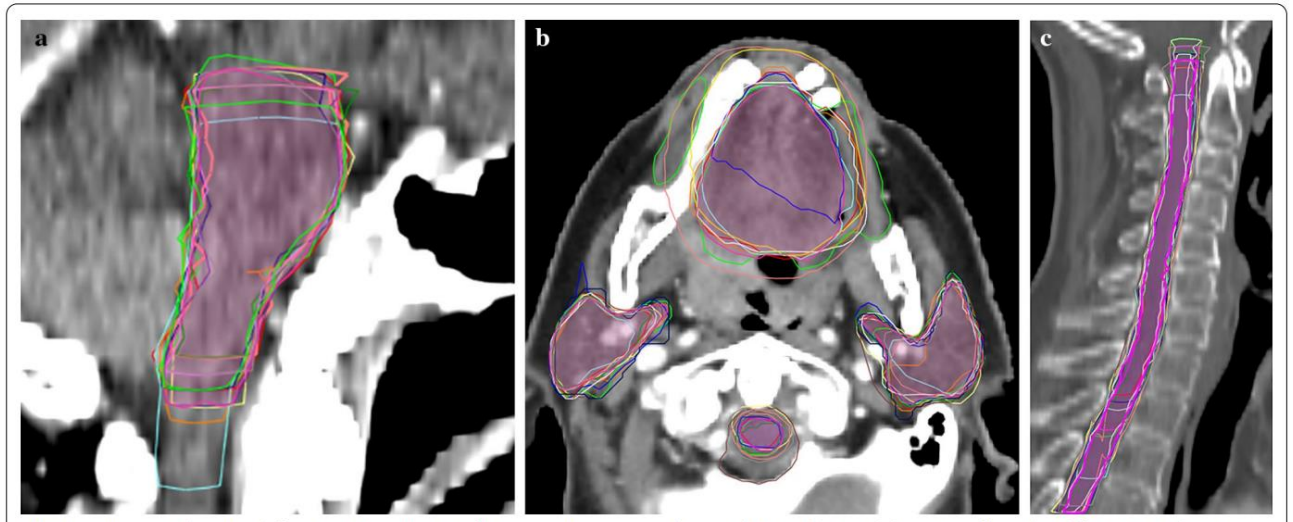
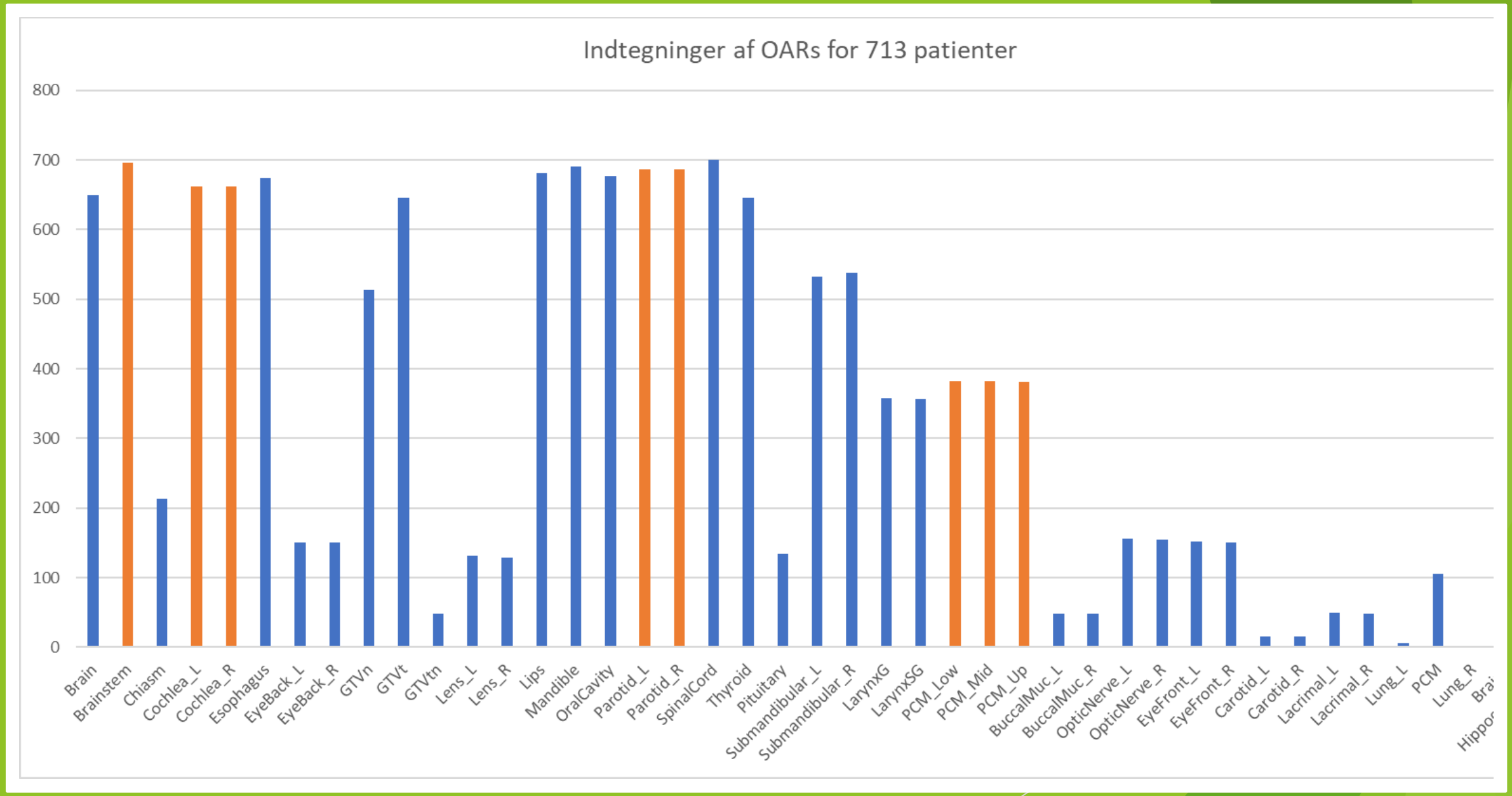


Fig. 3 CT images showing different OAR contours Reference contours according to the ICG (lilac) vs delineations from the different RO. **a** brainstem (sagittal plane): difference in cranial and caudal borders; **b** oral cavity, spinal cord and PG (axial plane): Inclusion of buccal mucosa (green contour) and teeth (orange and pink contours) by some RO. Variation in spinal cord and PG contours; **c** spinal cord (sagittal plane): difference in cranial and caudal borders. *ICG* international consensus guidelines, *PG* parotid glands, *RO* radiation oncologist


Indtegninger af OARs for 713 patienter
800
700
600
500
400
300
200
100
0
Brain
Brainstem
Chiasm
Cochlea_L
Cochlea_R
Esophagus
EyeBack_L
EyeBack_R
GTVn
GTVt
GTVtn
Lens_L
Lens_R
Lips
Mandible
OralCavity
Parotid_L
Parotid_R
SpinalCord
Thyroid
Pituitary
Submandibular_L
Submandibular_R
LarynxG
LarynxSG
PCM_Low
PCM_Mid
PCM_Up
BuccalMuc_L
BuccalMuc_R
OpticNerve_L
OpticNerve_R
EyeFront_L
EyeFront_R
Carotid_L
Carotid_R
Lacrimal_L
Lacrimal_R
Lung_L
PCM
Lung_R

What's next?

Short run

- Data processing/cleaning
  - E.g designing classes for data handling
- Understanding volume comparison measures
  - DICE, Hausdorff, Mean Surface Distance, Added Path Length

Long run

- Design benchmarking tools
- Benchmarking performance
- Visualization of results
  - Similarity plots
  - Organ delineation heatmaps
- Writing a scientific paper