

DANSKE KRÆFTFORSKNINGSDAGE 2022

Kunstig intelligens i strålebehandlingen

Christian Rønn Hansen
Hospitalsfysiker
Odense Universitetshospital
Danish Center for Partikel Terapi

#DKD2022
#SamarbejdeOmKræft



@christian_roenn

Strålebehandling

- Over halvdelen af kræftpatienter modtager strålebehandling
- Hver eneste patient får en individuel tilpasset behandlingsplan



Strålebehandlingsforløb



Simulering

Indtegning

Multiple
behandlinger



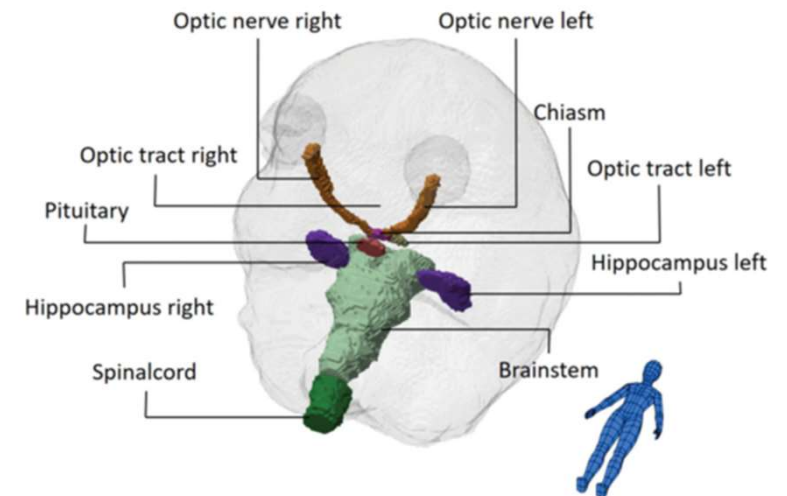
Billede fusion

Dosis
planlægning

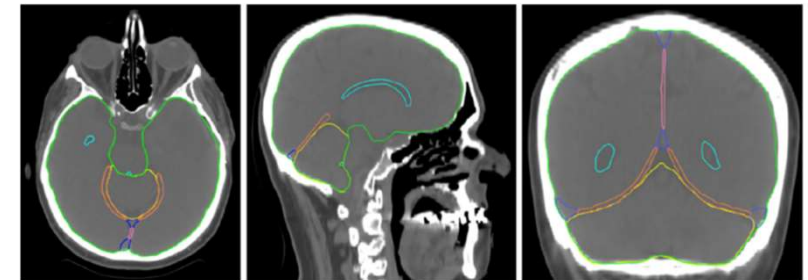
Stort potentiale for kunstig intelligens (AI)

Indtegning

- Kræftområdet indtegnes
- Det normale væv indtegnes



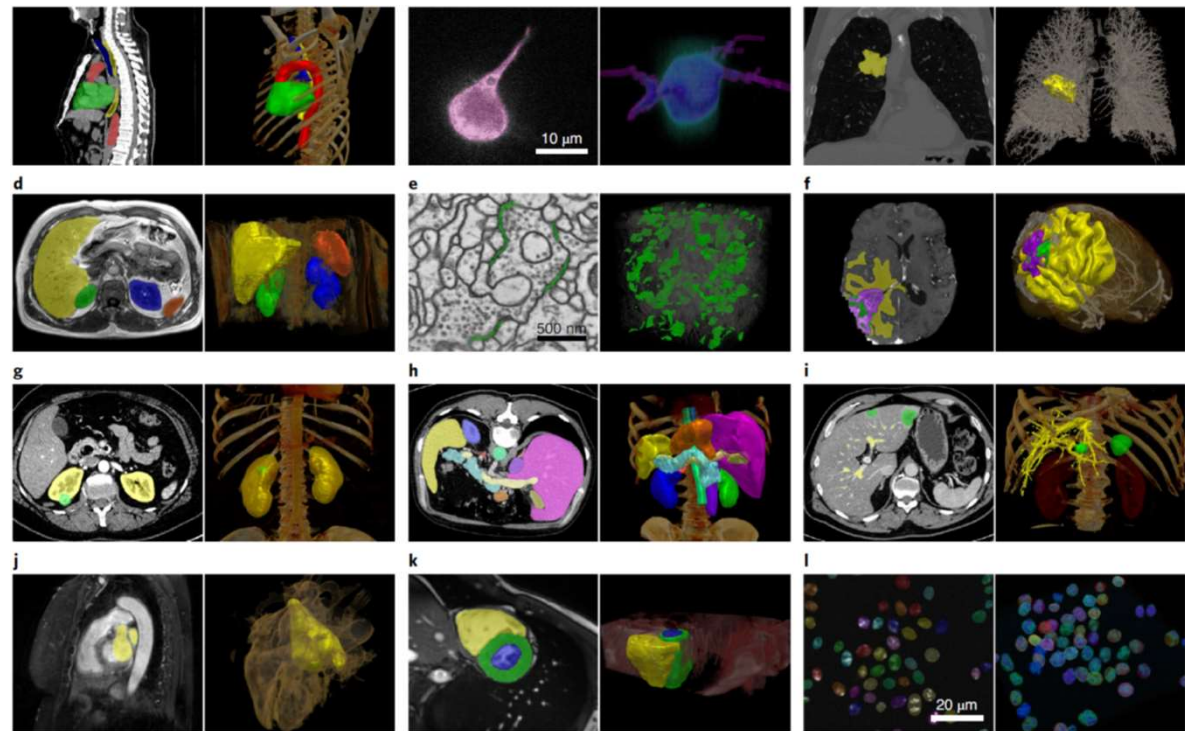
Lorenzen et al. 2021 Acta Oncol



Shusharina et al. 2020 R&O

Kunstig intelligens (AI)

- Computere kan lære at indtegne medicinske billeder
- Tegner computeren rigtigt?
- Hvad er en rigtig indtegning?



Isensee et al. 2021 Nature Methods

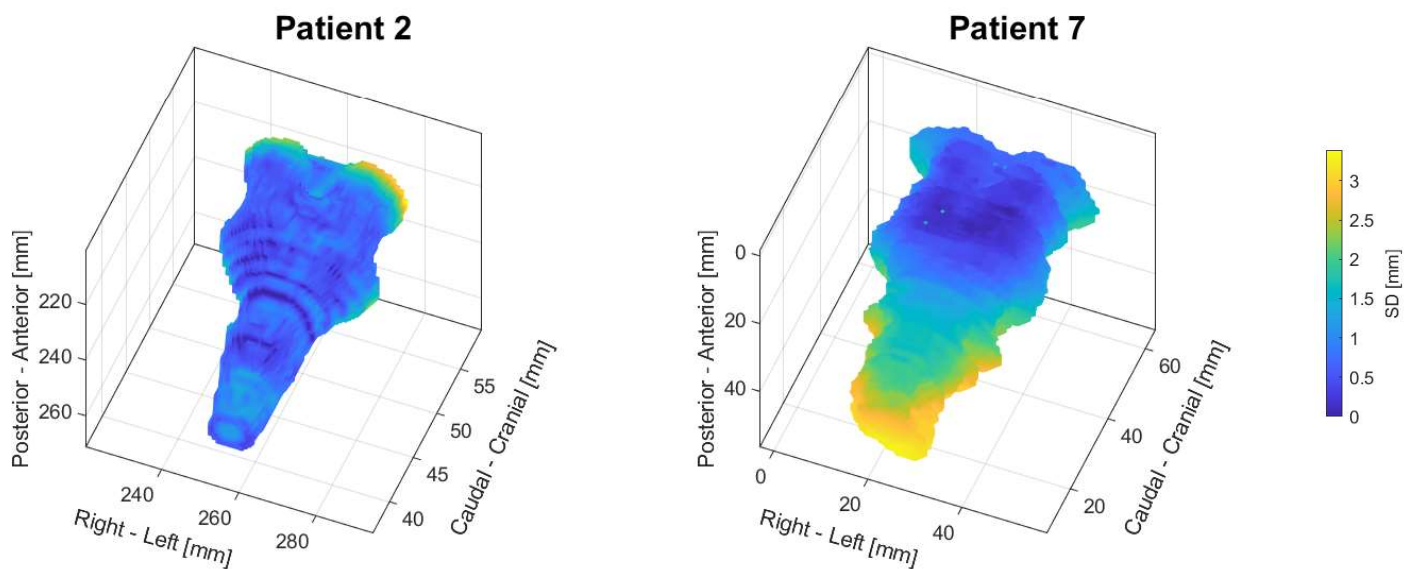
DCCC Workshops

- Definition/guidelines
- Indtegningsvariation mellem læger
- Forskellige DMCG'er
 - Hjernen og hoved & hals
 - DNOG og DAHANCA
 - Hjertestrukturer
 - DOLG, DBCG og DEGC
 - Bækkenorganer
 - DACG, DABLACA, DCCG, DAPROCA, DATECA

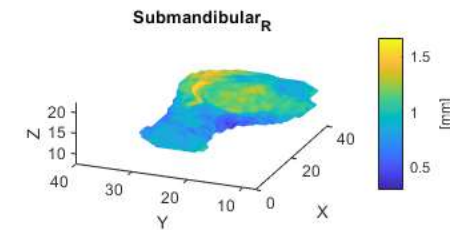
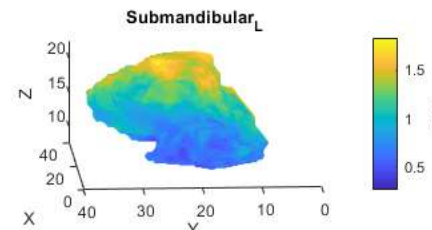
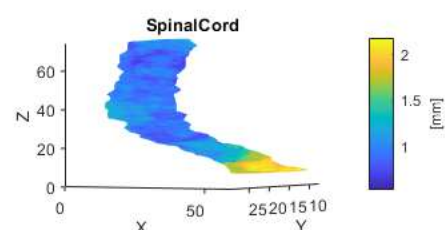
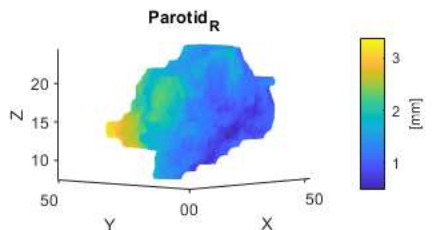
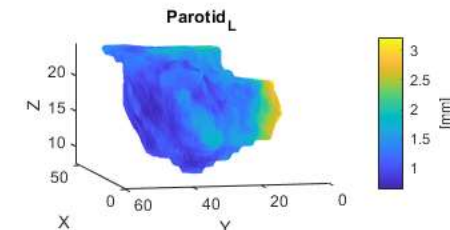
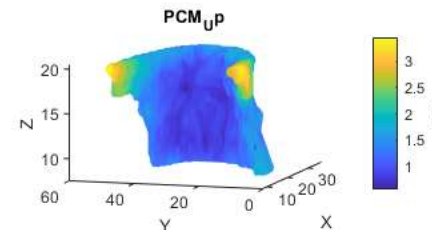
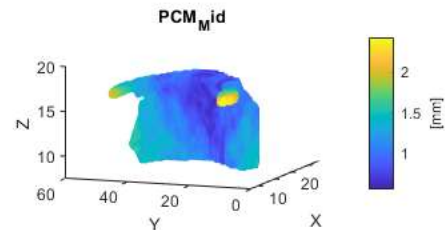
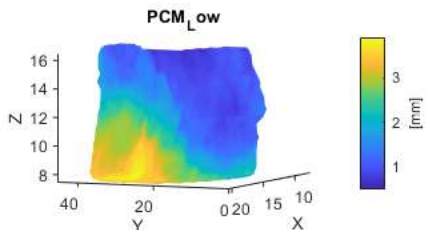
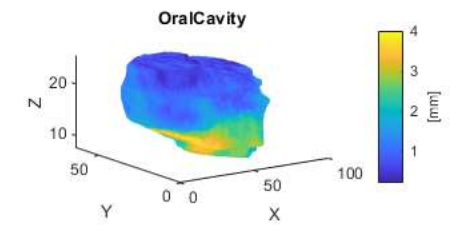
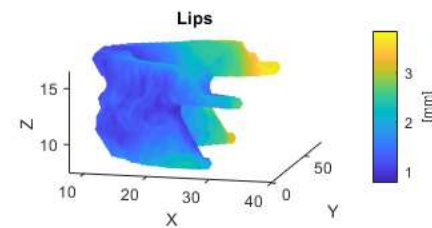
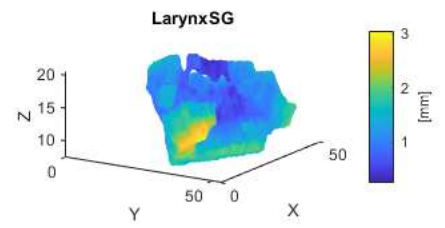
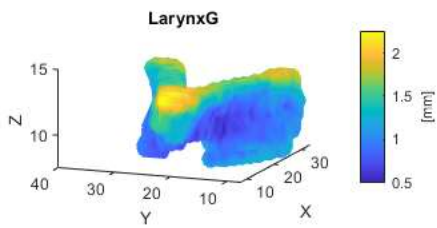
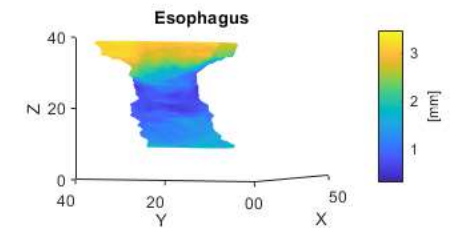
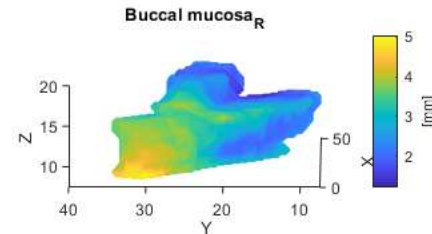
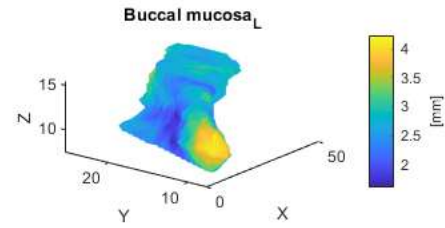
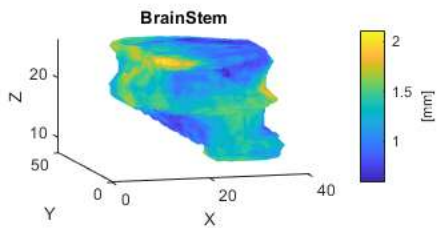


Indtegningsvariation

Patient-specifik overfladevariation blandt eksperter

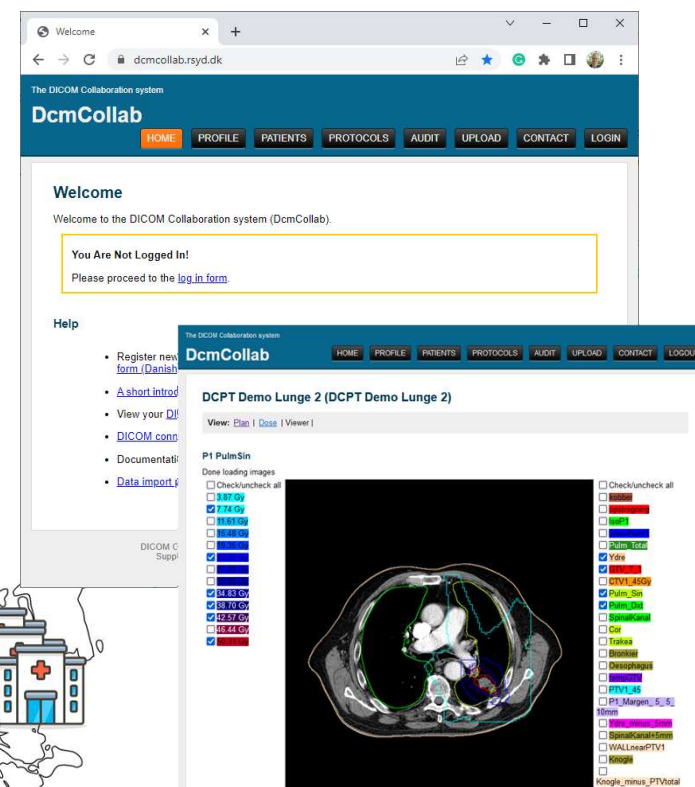
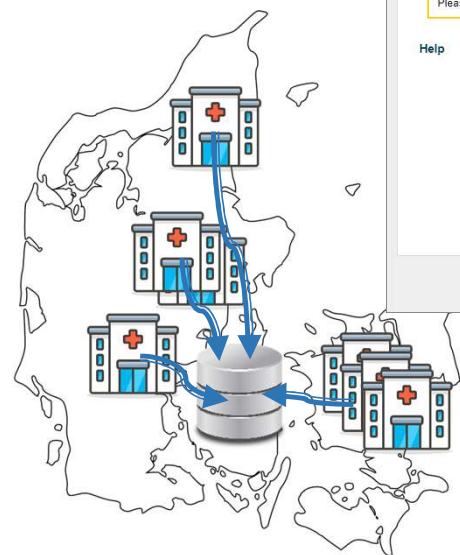


Hoved og hals-organer

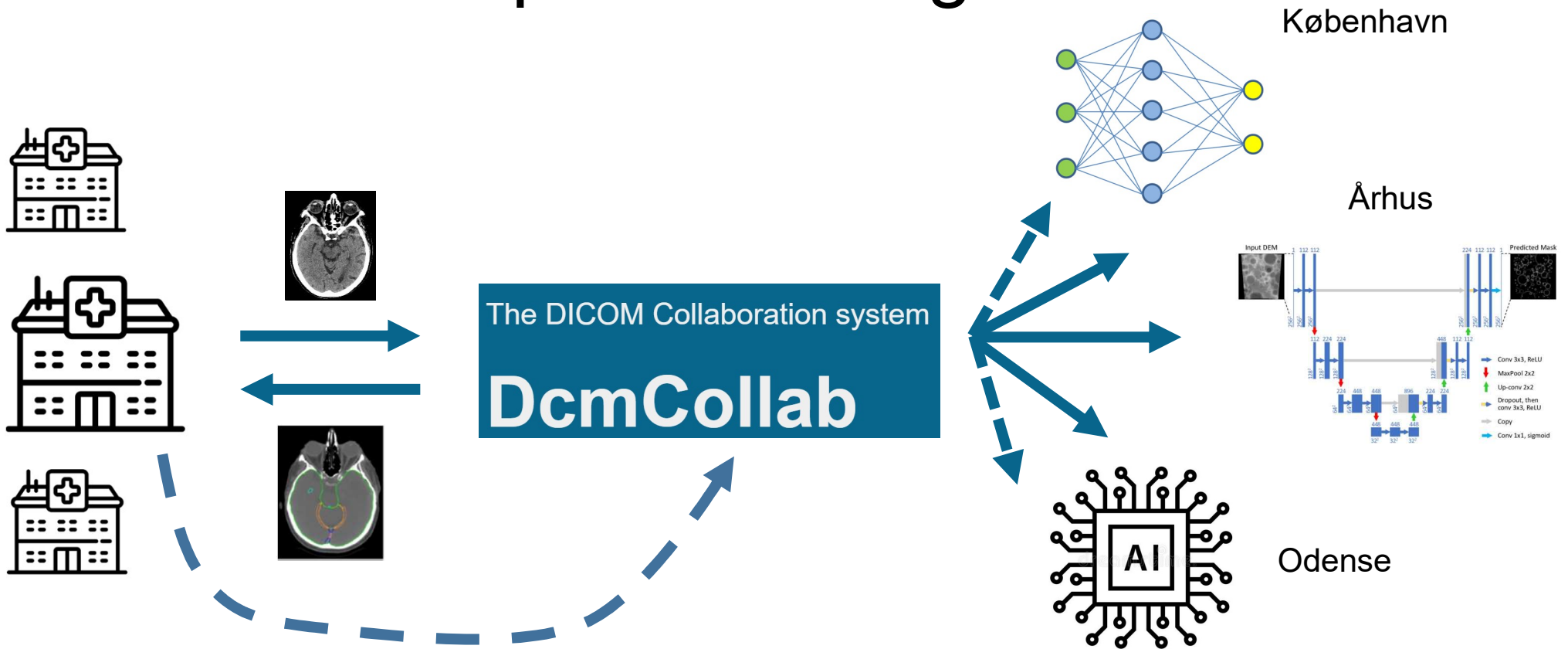


National dosisplan-bank (DcmCollab)

- Sundhedsdatanettet
- Strålebehandlingsplaner
 - Medicinske billeder
 - Indtegninger af kræft og organer
 - Strålebehandlingen
 - Stråledosis



Portal for AI implementering



AI projekter i Danmark

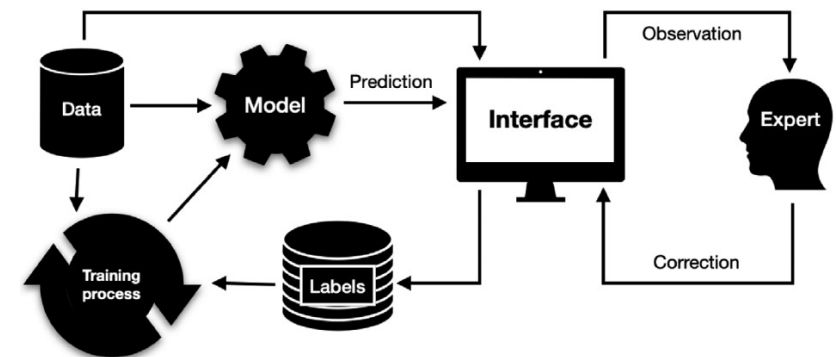
- Indtegning af kræft i hjertet i København

RESEARCH ARTICLE

MEDICAL PHYSICS

RootPainter3D: Interactive-machine-learning enables rapid and accurate contouring for radiotherapy

Abraham George Smith^{1,2} | Jens Petersen^{1,2} | Cynthia Terrones-Campos^{2,3} |
Anne Kiil Berthelsen^{2,4} | Nora Jarrett Forbes^{1,2} | Sune Darkner¹ | Lena Specht² |
Ivan Richter Vogelius^{2,5}



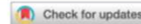
AI projekter i Danmark

- Indtegning af kræft i hoved og hals i Århus

ACTA ONCOLOGICA
2021, VOL. 60, NO. 11, 1399–1406
<https://doi.org/10.1080/0284186X.2021.1949034>



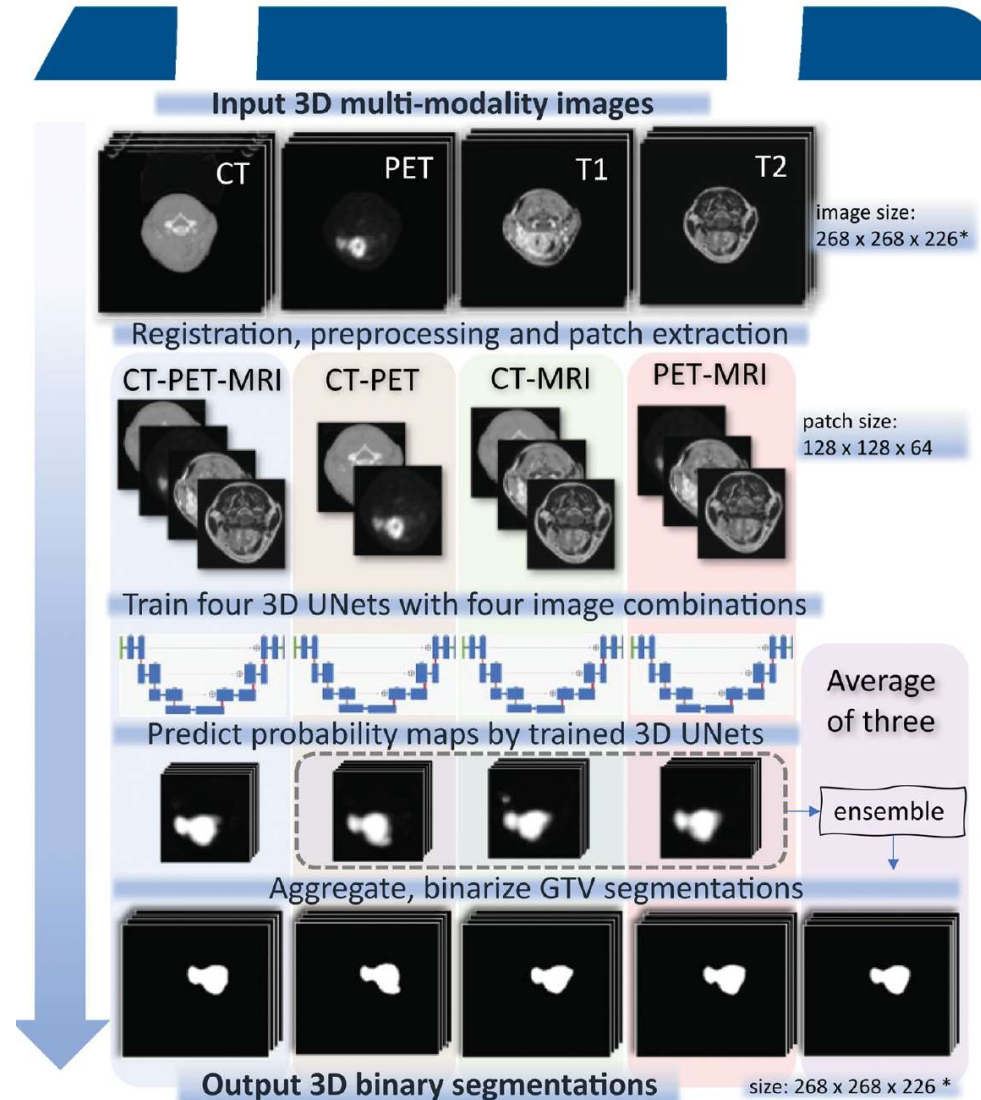
ORIGINAL ARTICLE



Comparing different CT, PET and MRI multi-modality image combinations for deep learning-based head and neck tumor segmentation

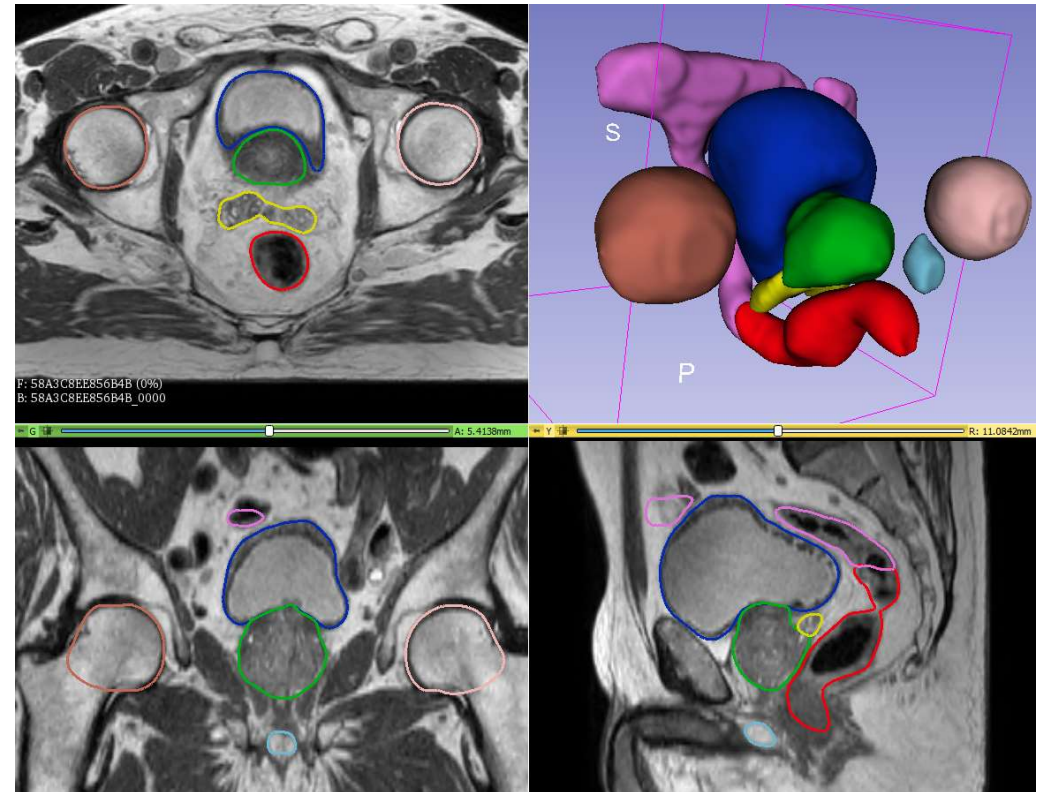
Jintao Ren^{a,b,c} , Jesper Grau Eriksen^{a,d} , Jasper Nijkamp^{a,b,*} and Stine Sofia Korreman^{a,b,c,*}

^aDepartment of Clinical Medicine, Aarhus University, Aarhus, Denmark; ^bDanish Centre for Particle Therapy, Aarhus University Hospital, Aarhus, Denmark; ^cDepartment of Oncology, Aarhus University Hospital, Aarhus, Denmark; ^dDepartment of Experimental Clinical Oncology, Aarhus University Hospital, Aarhus, Denmark



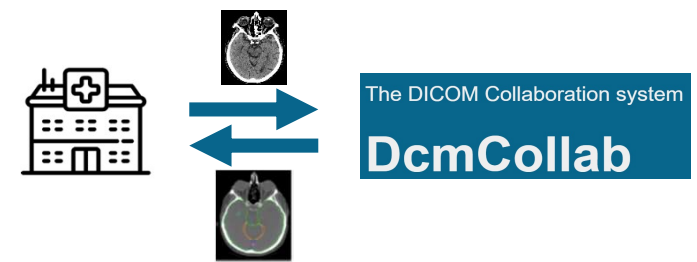
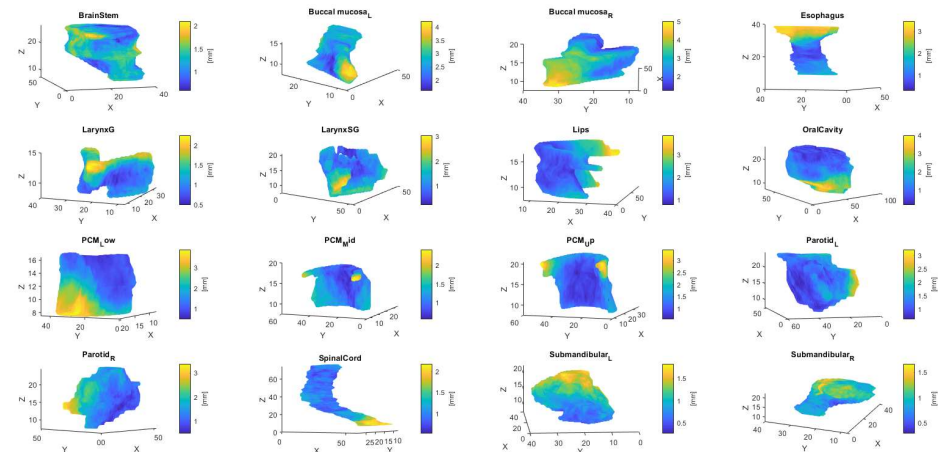
AI projekter i Danmark

- Indtegning af bækkenorganer i Odense
- Regionalt AI projekt (BRAIN)
- Adaptiv strålebehandling



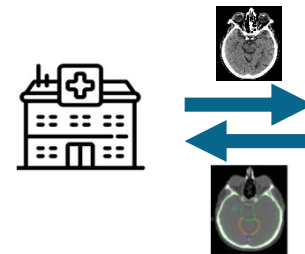
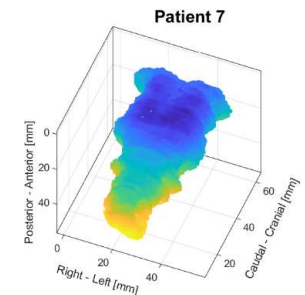
AI arbejde fremtiden

- Indtegninger af
 - Organer
 - Kræften
 - Højrisikoområder
- Kvalitetssikring af indtegnning
- Adaptiv behandling
- Planlægning af strålebehandling



Budskab

- Kunstig intelligens skræddersyet til strålebehandling
- National plan-bank gør alle AI ekspertviden tilgængelig for alle kræft patienter i hele landet
- Højner ensartetheden på tvær af landet
- DMCG eksperternes viden benyttes til alle patienter



The DICOM Collaboration system
DcmCollab