

CCLS Matchmaking

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24/06/2022



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Background

- Assistant professor at **LIACS**
- Background: developing methods for **CT reconstruction**
- Recent years: developing **machine learning** techniques
- Focus: Make them useful for **science**

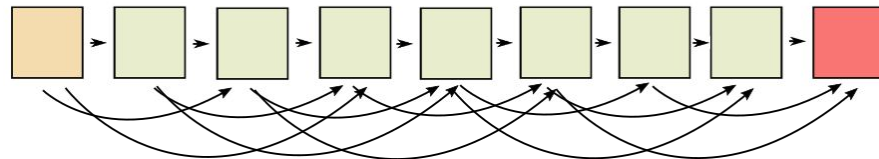


Large 3D/4D images

Limited training data

**Wide variety of
characteristics**

Mixed-scale dense CNN

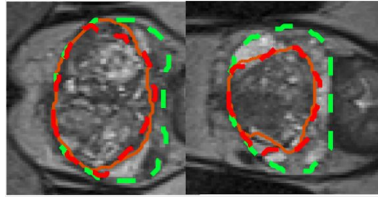


Advantages compared with existing CNNs:

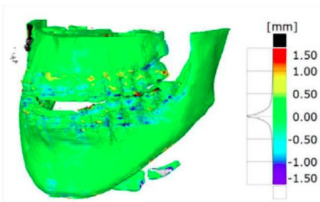
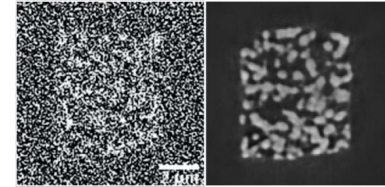
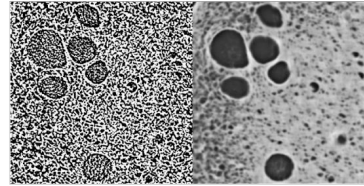
- No need for copying features
 - Requires less memory: can process **large images**
 - Requires fewer parameters: can train with **limited training data**
- Network can choose relevant connections during training
 - Adapts automatically: can handle **large variety of applications**

(Pelt & Sethian, *PNAS* 2018)

(Rundo et al, *Neurocomputing* 2019)

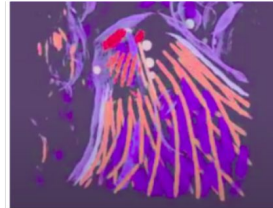


(Parkinson et al, *SPIE* 2018)



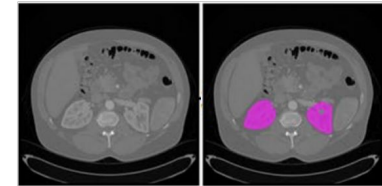
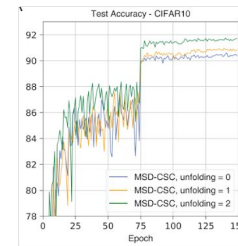
(Minnema et al, *Med Phys* 2019)

(Segev-Zarko et al, *Am. J. Trop. M.* 2019)

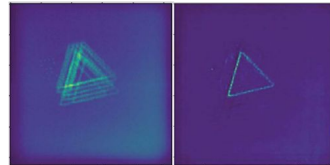


(Fleener et al, *J. Synchrotron Radiat.* 2020)

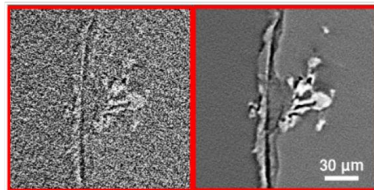
(Zhang & Zhang, *Natl. Sci. Rev.* 2020)



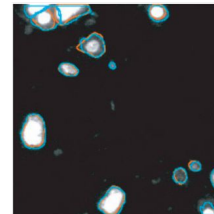
(Marie et al, *Sci. Rep.* 2020)



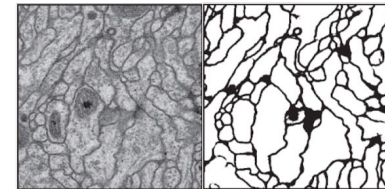
(Kulow et al, *J. Anal. At. Spectrom* 2020)



(Pelt et al, *J. Imaging* 2018)



(Thierbach et al, 2018)



(Pelt & Sethian, *PNAS* 2018)

Interests & current projects

- Looking for **nice applications** for AI in image tasks:
 - analysis, segmentation, denoising, artifact removal, ...
- Some current projects:
 - Analysis of cryo-EM images (IBL and Stanford)
 - Analysis of cervical microscopy images (Cambridge)
 - Denoising and improving synchrotron images (ESRF)
 - 3D analysis of inner-ear images (Fraunhofer)