FRIEDRICH-ALEXANDER
UNIVERSITÄT
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TECHNISCHE FAKULTÄT

Status Masterarbeit

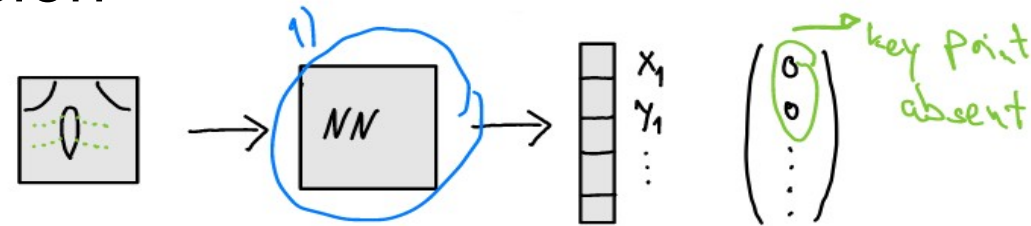# Topics

Network Overview + Training Plan
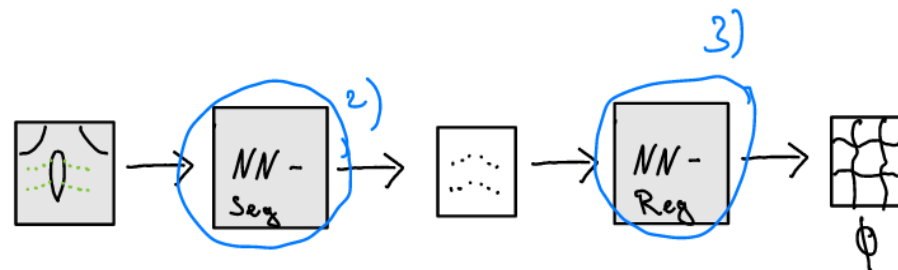
Segmentation
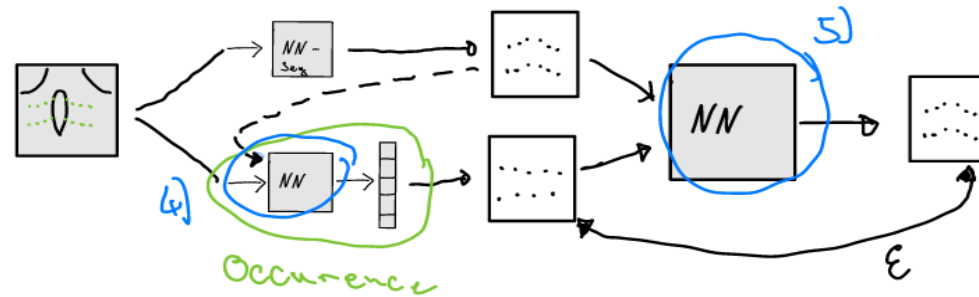
Euclidean Distances

Literature

Anmeldung

VPN-Zugang

Network Overview

1) Supervised Regression

2) Supervised Nonrigid Registration

Network Overview

4+5) Unsupervised Nonrigid Registration (intensity-based)

6) Supervised Euclidean (label-based)
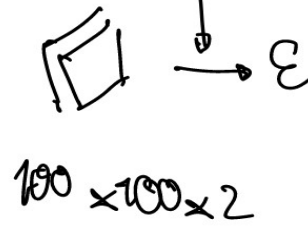
Network Overview - Plan

Network	Training	Network	Train Size	Epochs	Batch Size	Feature Maps	Image Size	Loss	Score	Score Value	Note
1_localization	1	EffnetB0	1	3000	1	-	384x384	MSE	MAPE		
	2	EffnetB0	1	3000	1	-	384x384	MSE	MAPE		No Dropout
	3	EffnetB0	168	300	16	-	384x384	MSE	MAE		No Preprocessing
	4										
2_segmentation	1	Unet	168	300	8	32	384 x 384	Dice	IoU	0.6775	
	2	Unet	168	300	8	48	384 x 384	Dice	IoU	0.682908	
	3	Unet	168	300	2	32	768x768	Dice	IoU	0.82590663	
	4	Unet	168	300	2	48	768x768	Dice	IoU	0.85105634	
3_diffeomorphism	1										
	2										
4_occurence	1										
	2										
5_semi_diffeomorphism	1										
	2										
6_euclidean	1		1	100	1	16	112x112	custom	custom		
	2		1	100	1	32	112x112	custom	custom		

Segmentation

- Four trainings were carried out investigating in the image size and the amount of feature maps in the first level of the Unet. Sufficient results could be obtained for a fine resolution of the image. Peak finding can now be conducted.

Segmentation mask after 300 epochs

y   y_pred

Euclidean Distances
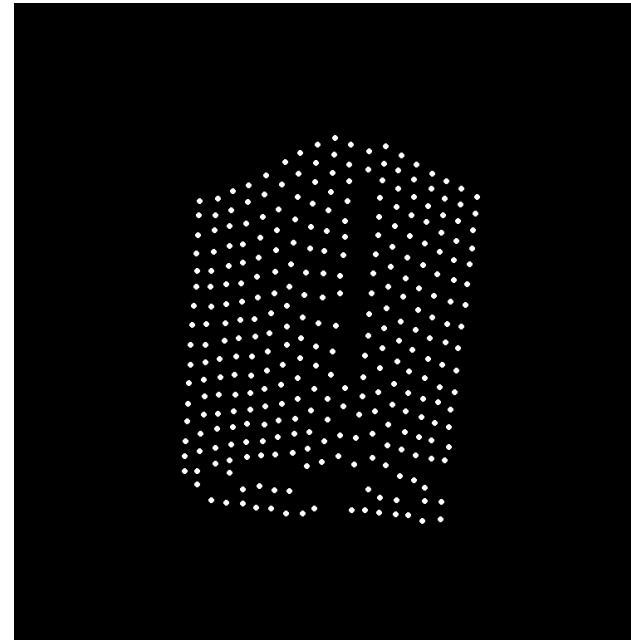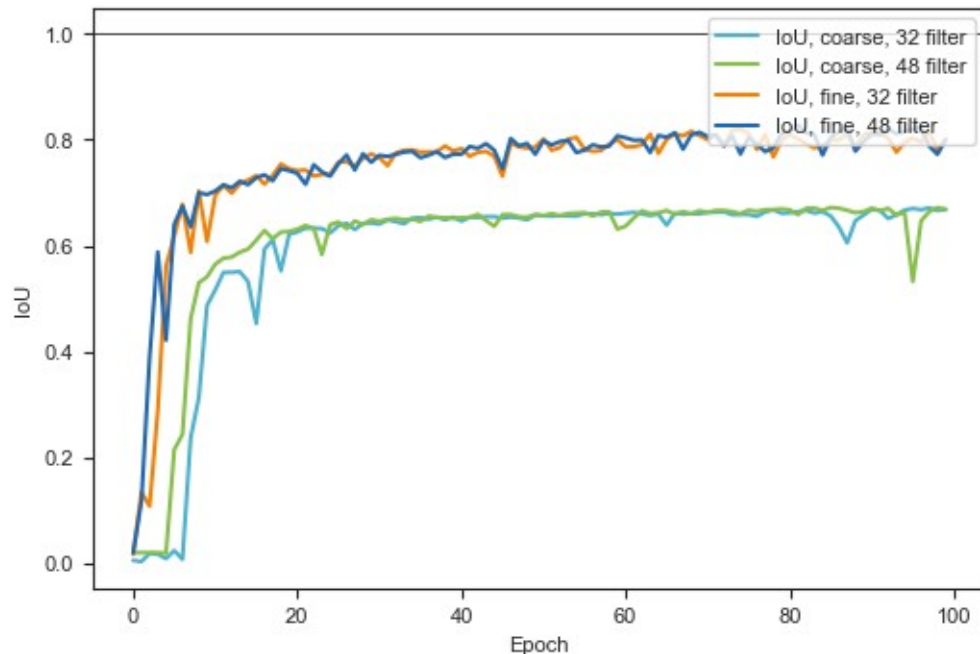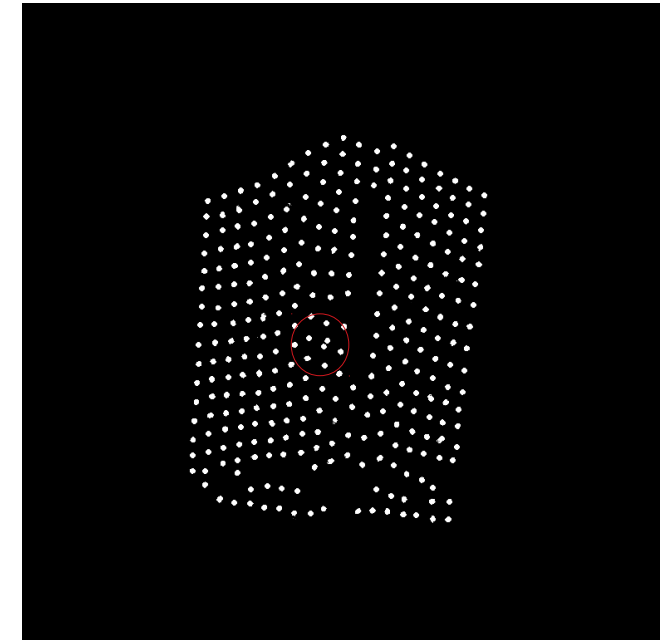
- A Network was setup that takes a moving and a fixed image as input and predicts the displacement field in x and y direction. A loss is defined based on the prediction and labels, that are the known key points in moving and fixed image.

- The network was overfitted until no further decrease in loss was expected.

- Displacement fields looks feasible. Results are not yet sufficient. Therefore further investigation is necessary.
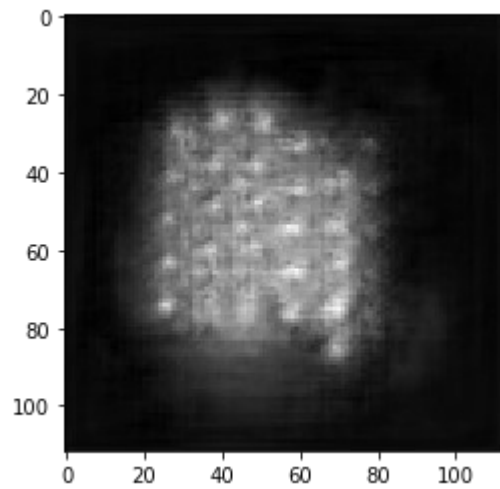
x-displacement
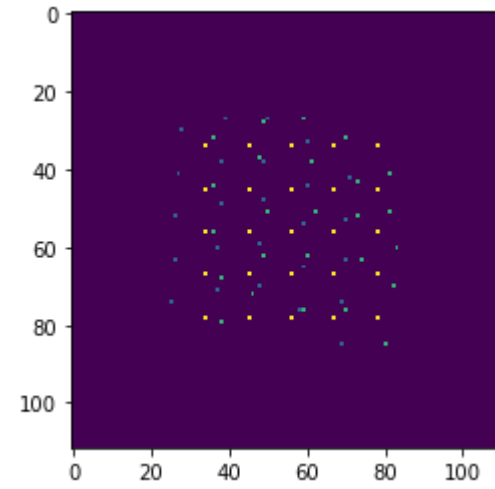
key points

Blue → Moving
Yellow → Fixed
Green → Warp

Literature

- The survey

[8] A. Sotiras, C. Davatzikos, and N. Paragios, "Deformable medical image registration: a survey," *IEEE transactions on medical imaging*, vol. 32, pp. 1153–1190, July 2013.

is comprehensive and describes the state of the art (600 citations). It was read and summarized in **two** pages in the master thesis.

- For network 2) we need to improve the registration quality. Following methods could be used:

 * SyN (intensity based + spatial)

 * B-spline (correspondence)

 * Thin-Plate Spline Robust Point Matching (spatial + correspondence)

- Next paper:

[16] H. Zhu, B. Guo, K. Zou, Y. Li, K.-V. Yuen, L. S. Mihaylova, and H. Leung, "A Review of Point Set Registration: From Pairwise Registration to Groupwise Registration," *Sensors*, 2019.