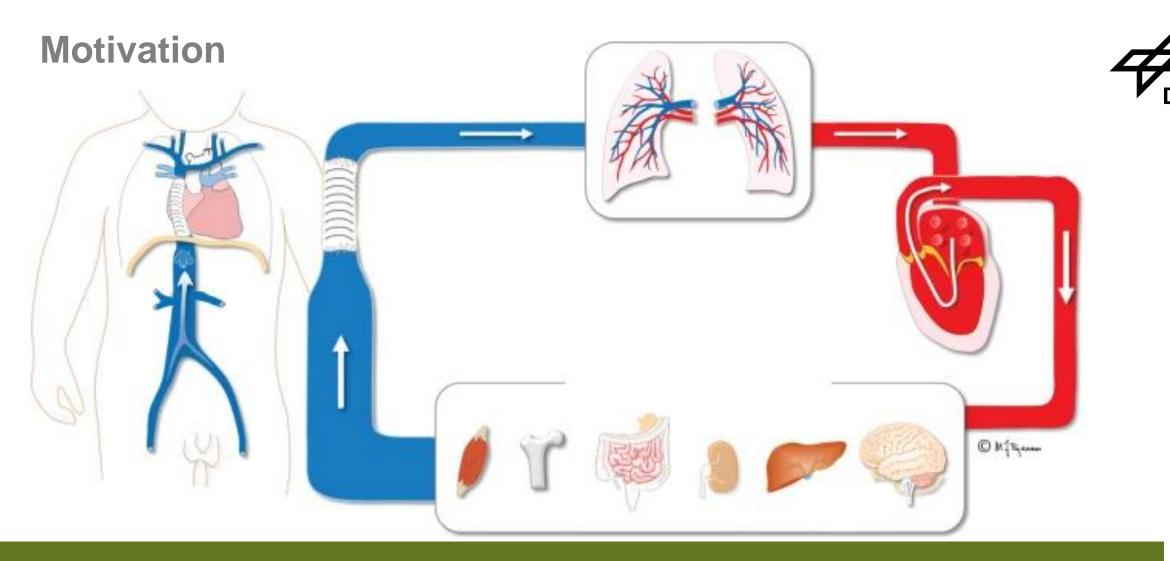
AUTOMATED CARDIAC REALTIME MRI EVALUATION

WAW ML 8 – Nov. 9th 2022





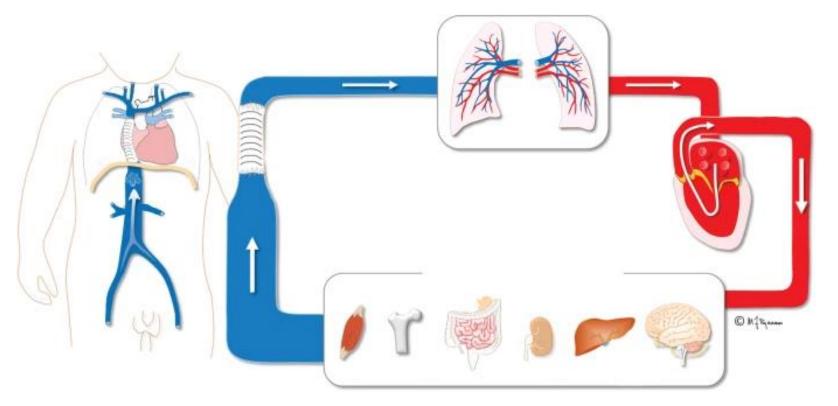
Long-term improvement of diagnostics and therapy for children and adolescents with only one heart chamber

Lange et al. 2020 Imaging of complications following Fontan circulation in children — diagnosis and surveillance, Pediatric Radiology

Motivation



 How does breath effect vital parameters of patients with only one heart chamber?



Enable research on vital parameters like the stroke volume and blood flow by **reliable** automated evaluation of realtime MRI

Philipp Rosauer, Institute for Software Technology

Lange et al. 2020 Imaging of complications following Fontan circulation in children — diagnosis and surveillance, Pediatric Radiology

CHALLENGES



- Limited amount and diversity of labeled data
- Various data origins
- Evaluation pipeline based on images only
- Anomalies in images
- Heart and breath phases are not aligned



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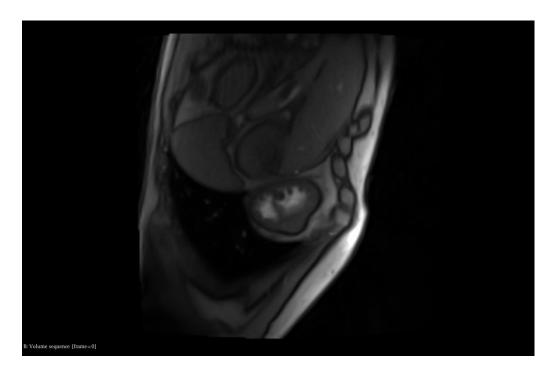


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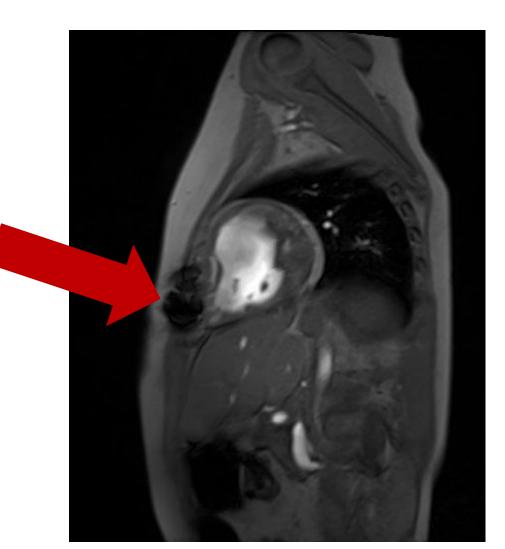
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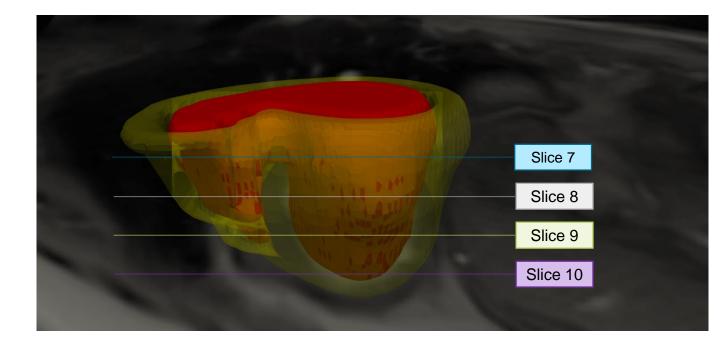


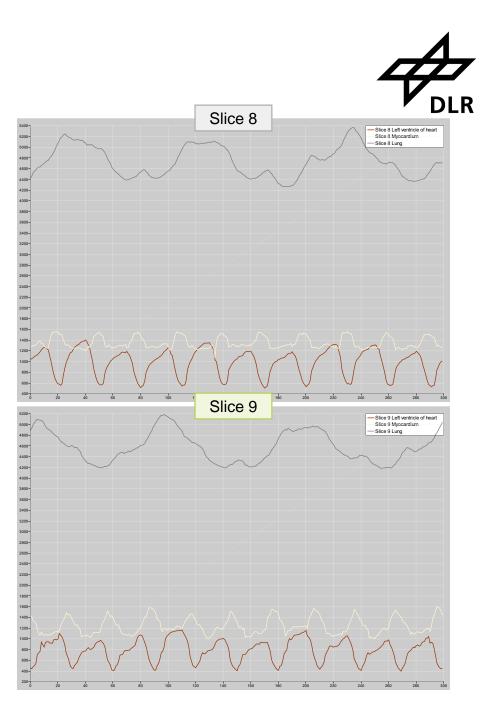


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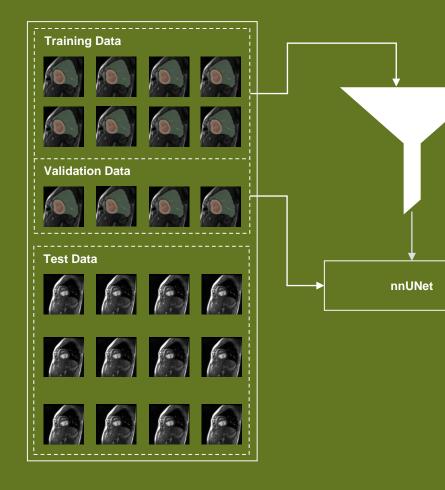


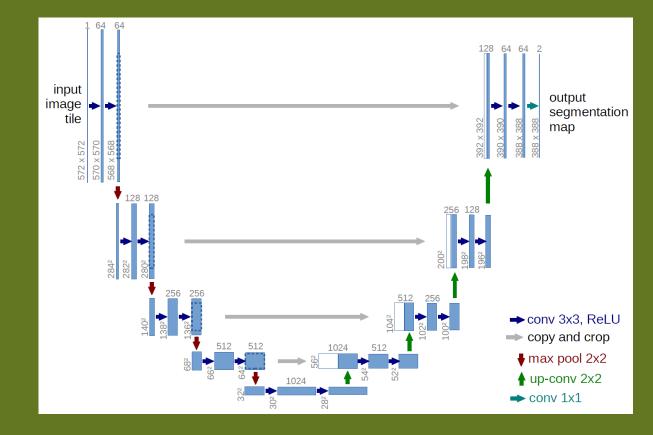


WORKFLOW

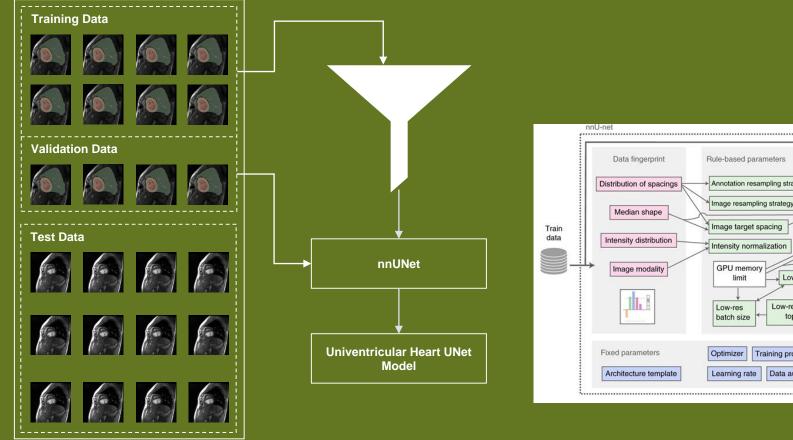
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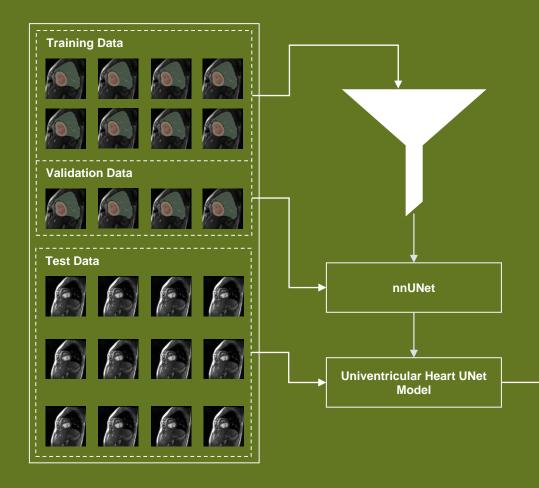


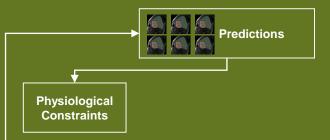
Ronneberger, Olaf, Philipp Fischer, and Thomas Brox. "U-net: Convolutional networks for biomedical image segmentation." International Conference on Medical image computing and computer-assisted intervention. Springer, Cham, 2015.

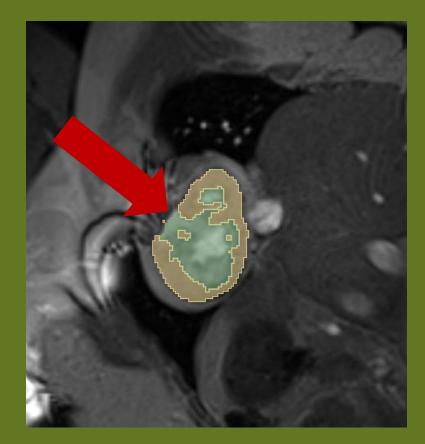


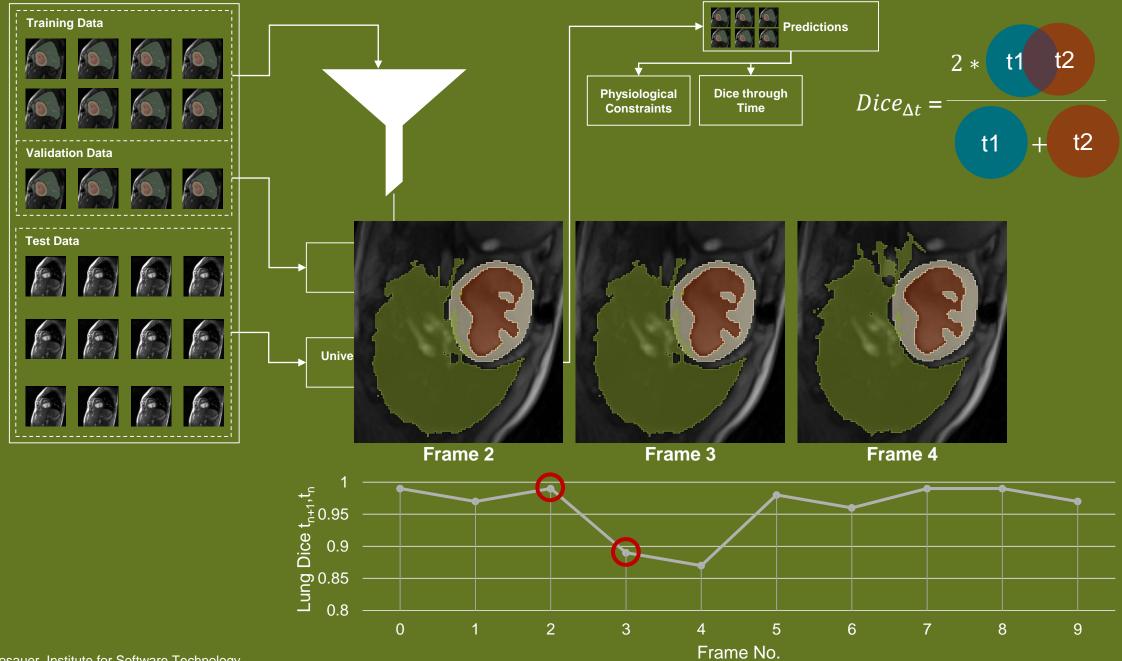
Test data Empirical parameters Median Cascade Annotation resampling strategy Ensemble resampled trigger selection shape Image resampling strategy 0 Patch size Configuration of post-processing Batch size Prediction Network topology Network training Low-res patch size (cross-validation) Low-res shapes or 2D Low-res network target spacing topology Pipeline fingerprint . Optimizer Training procedure Inference procedure 12 3DC -----Learning rate Data augmentation Loss function

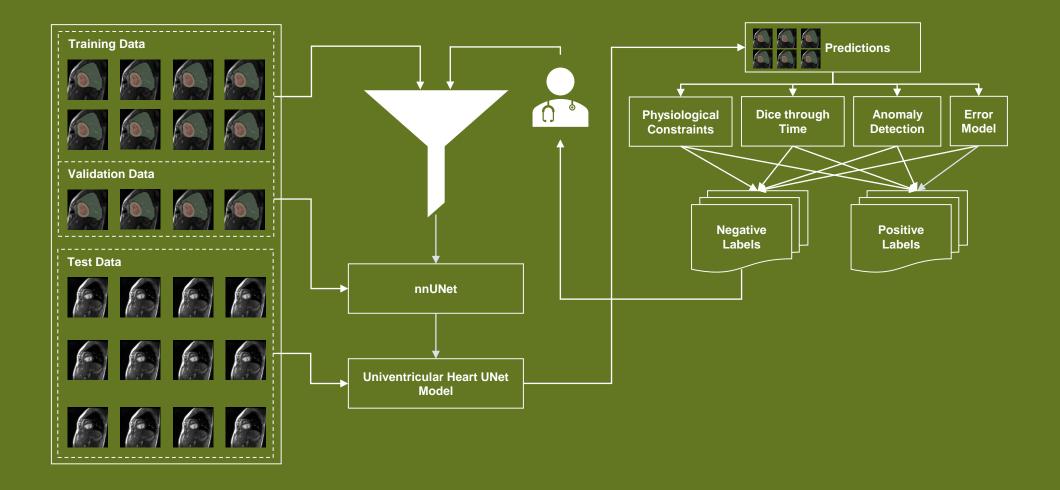
Isensee, F., Jaeger, P.F., Kohl, S.A.A. et al. nnU-Net: a self-configuring method for deep learning-based biomedical image segmentation. Nat Methods 18, 203–211 (2021).

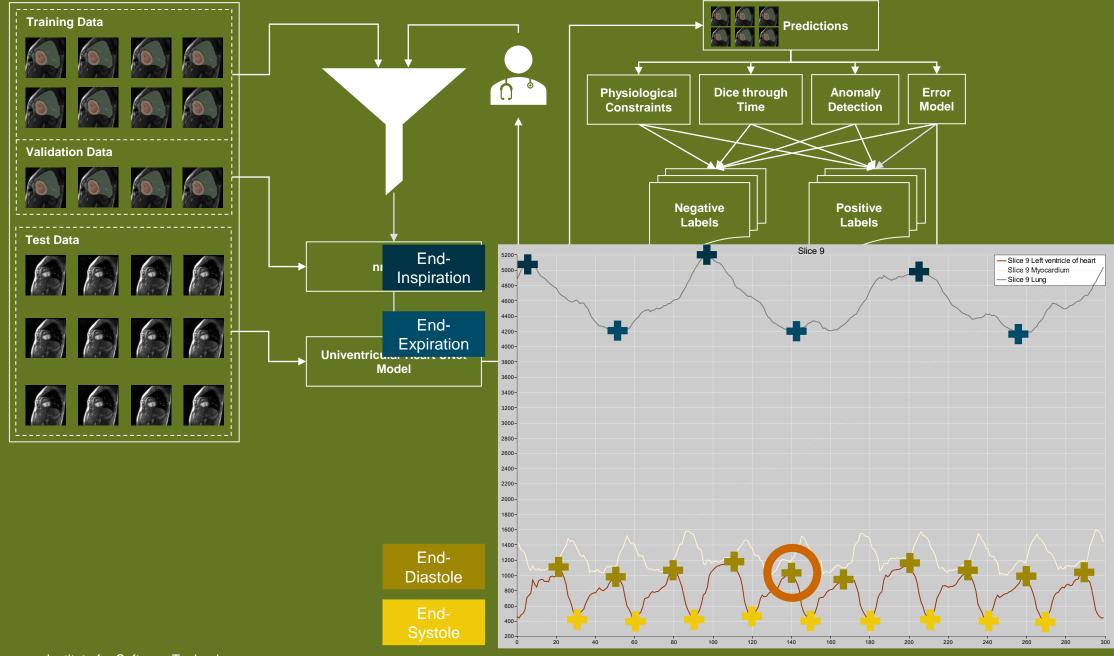


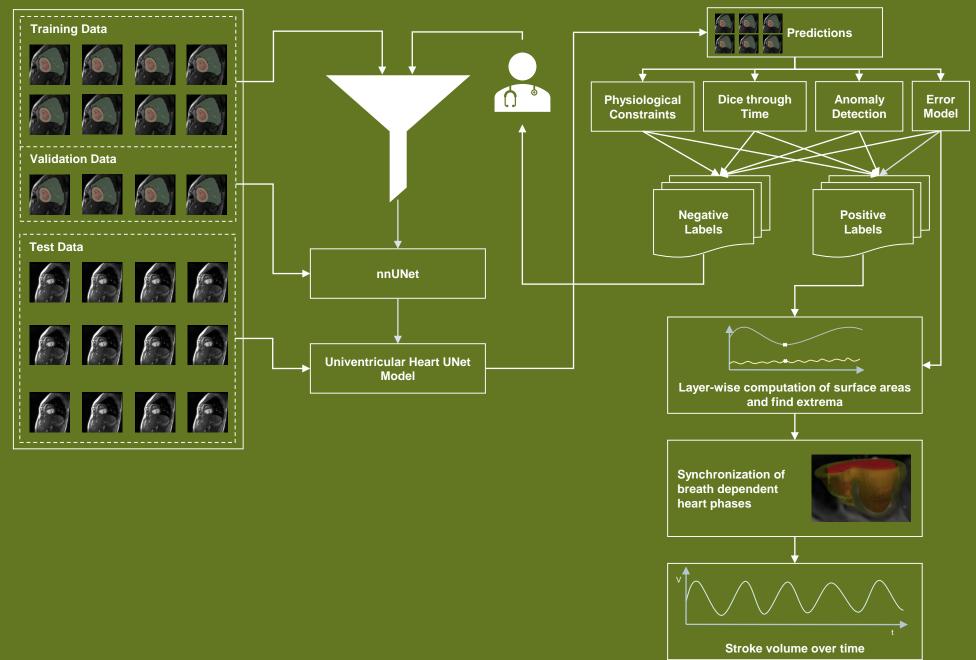












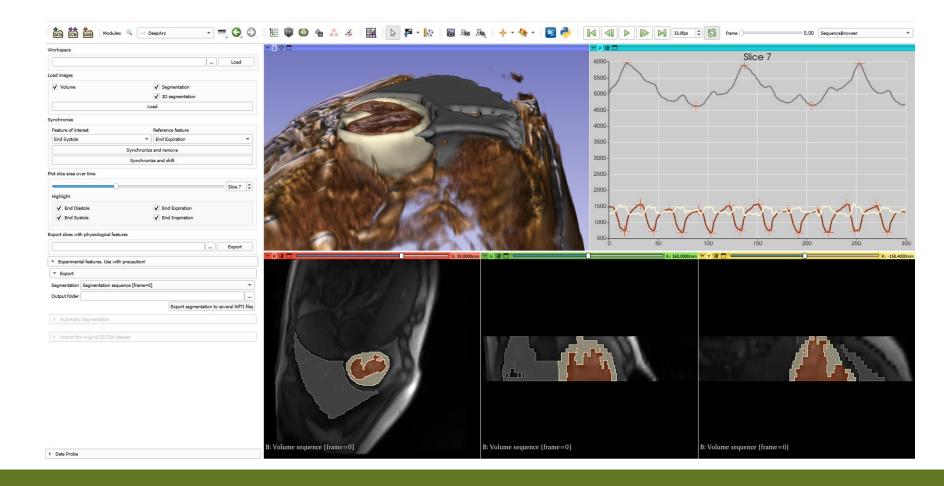
DEPLOYMENT

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Deployment





Development of a PoC - Plugin for "3D Slicer"

 Goal: Implement entire workflow, including "expert-in-the-loop" part in one software

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Kudos to the team and supporters:

Anna Wendler¹, Wadim Koslow¹, Angelina Händeler¹, Laurin Kerkloh¹, Jonas Weber¹, Felix Terhag¹, Alexander Rüttgers¹, Darius A. Gerlach², Anja Bach², Alex Hoff², Jens Tank², Christopher Hart³, Fabian Isensee⁴, Sebastian Ziegler⁴

1 Institute for Software Technology, DLR 2 Institute of Aerospace Medicine, DLR 3 Department of Pediatric Cardiology, UkBonn 4 Division of Medical Image Computing, DKFZ

001100010101110010100 11110100110 101110101010001 **THANK YOU FOR YOUR ATTENTION!** 01011010000001111001

Imprint



Topic: Automated Cardiac Realtime MRI Evaluation

- Date: 09.11.2022
- Author: Philipp Rosauer
- Institute: Institute for Software Technology
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