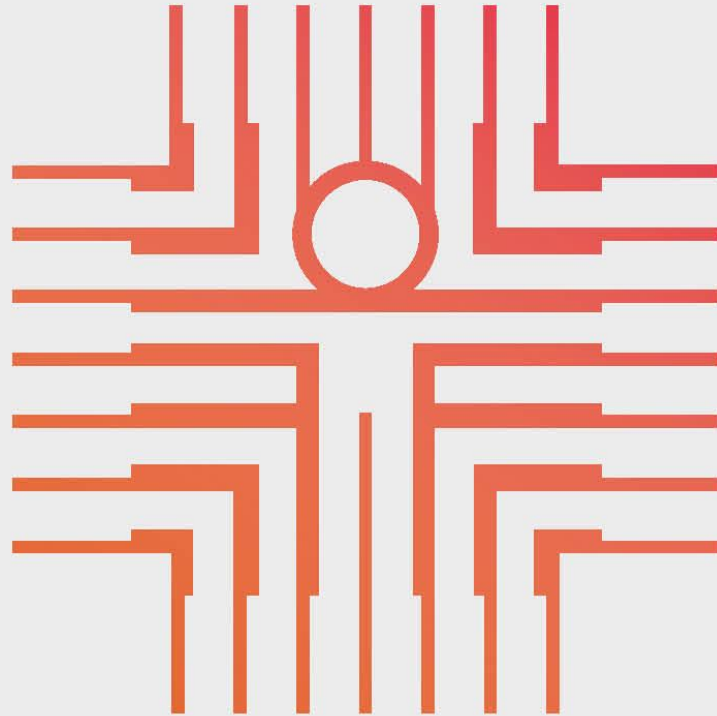


Machines as clinical partners – translational neuroimaging

Roland Wiest MD, Professor of Advanced Neuroimaging
Institute of Diagnostic and Interventional Neuroradiology, Inselspital



Disclosures

Related Funding:

CRSII5_180365 2/1/2019 – 1/31/2023

SNF SINERGIA Predict and Monitor Epilepsy After a First Seizure: The Swiss-First Study

CHE-TYS-18-11316 9/1/2018 – 8/30/2022

Biogen research

An automated tool for surface-based regional morphometry in individualized longitudinal assessment of RRMS patients on Natalizumab

320030L_170060 10/1/2017 – 5/30/2021

SNF Stroke treatment goes personalized: Gaining added diagnostic yield by computer-assisted treatment selection (the STRAY-CATS project)

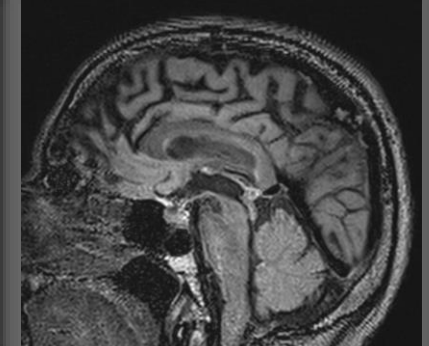
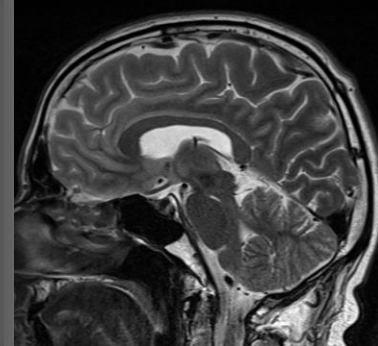
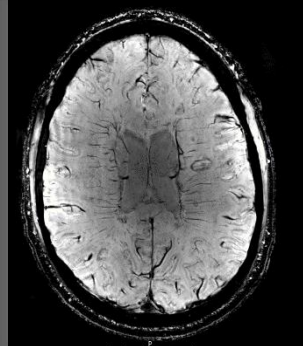
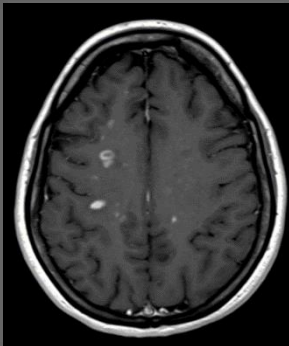
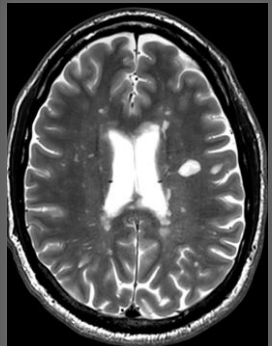
SPHN 2018DRI10 2/1/2020 – 12/31/2023

SPHN Driver Project Radiomics for comprehensive patient and disease phenotyping in personalized health (IMAGINE)

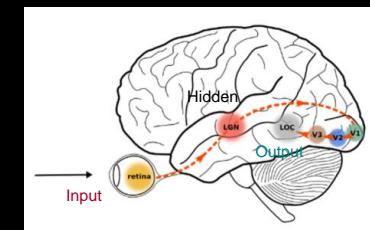
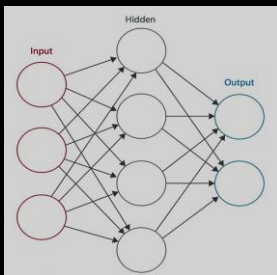
Innosuisse application 43087.1 IP-LS 2/1/2021 – 1/31/2024

Swiss innovation council Advanced Stroke Analytics Platform (ASAP)

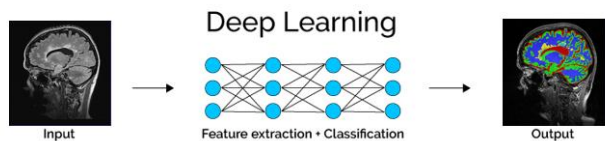
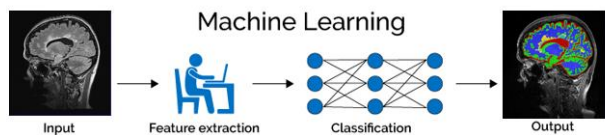
Use cases in Neuroimaging



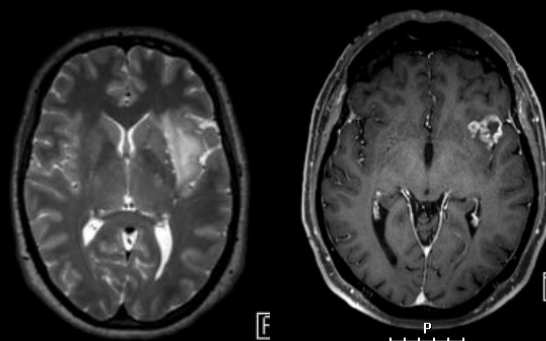
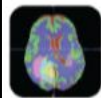
Man vs. machine



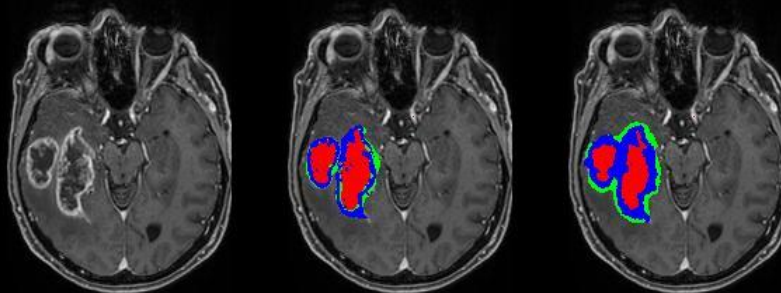
Preprocessing



Output

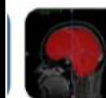


Classification

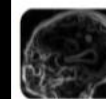


Segmentation

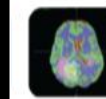
Layout



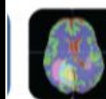
Checklist



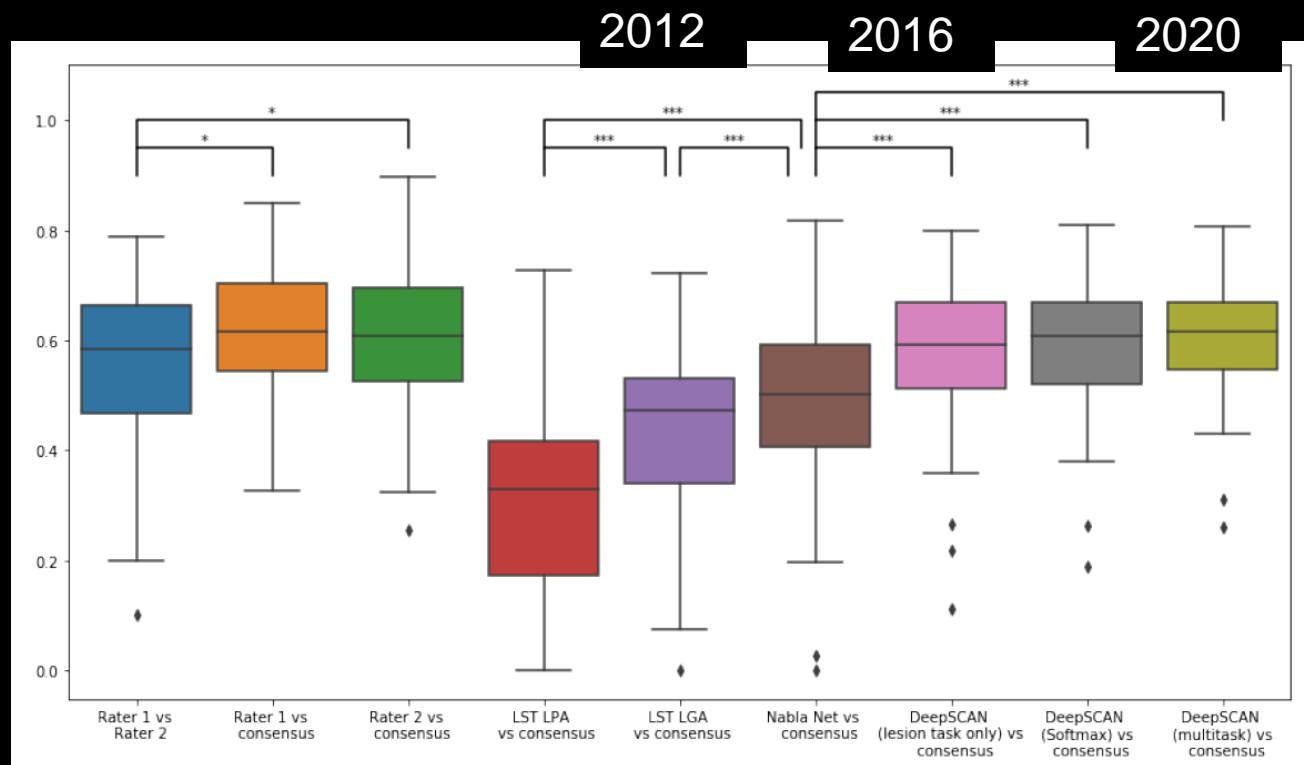
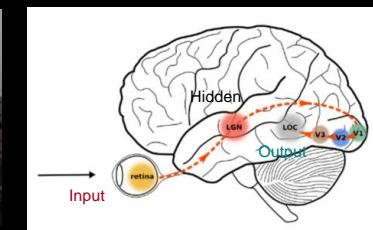
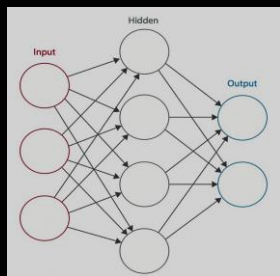
Metrics



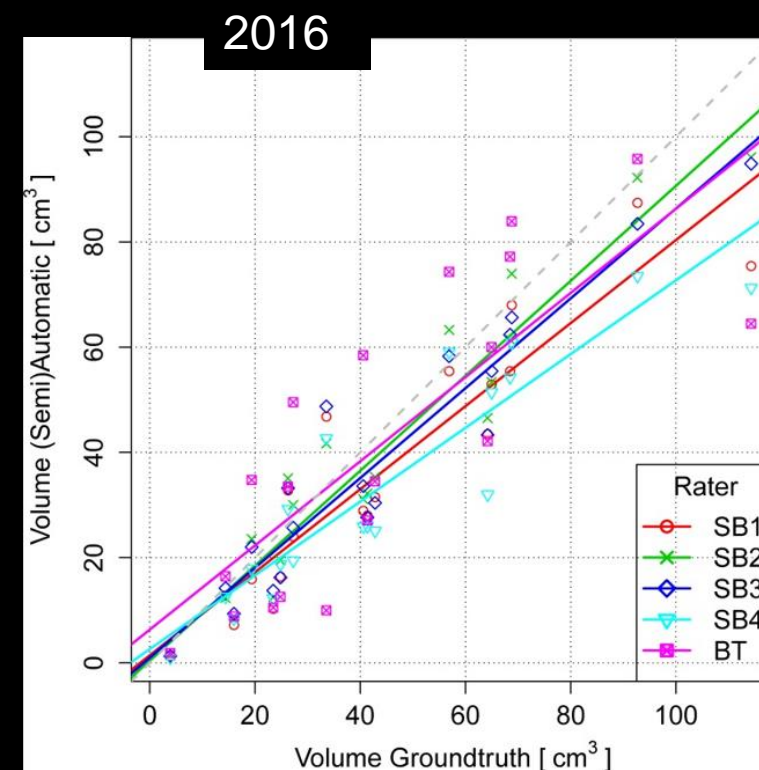
Decision



Man vs. machine



MS: White matter lesions

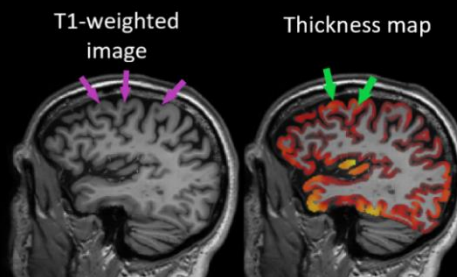
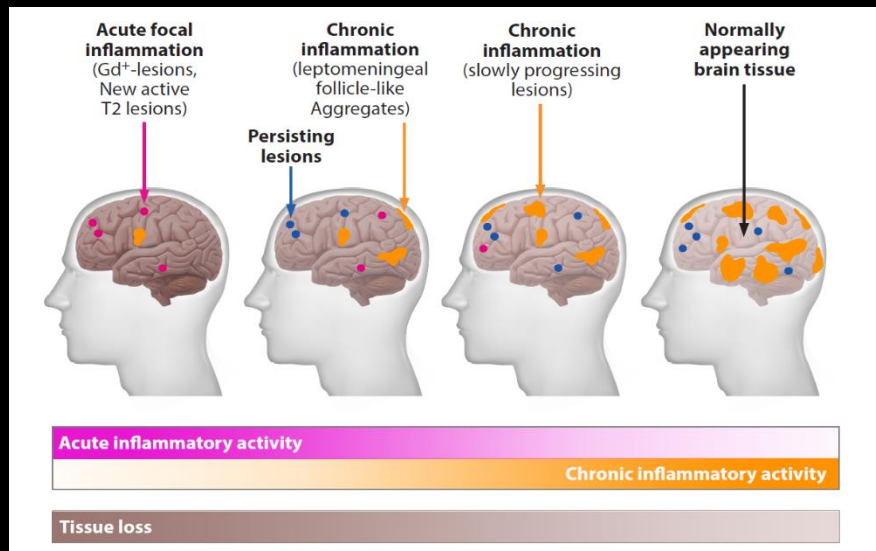
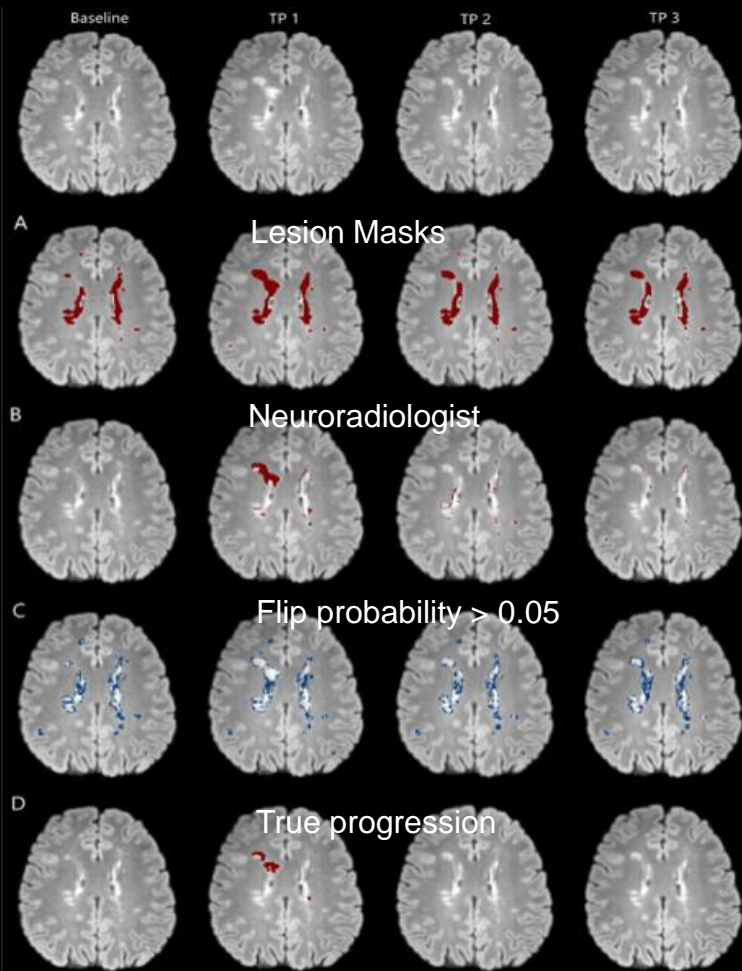


Glioma segmentation

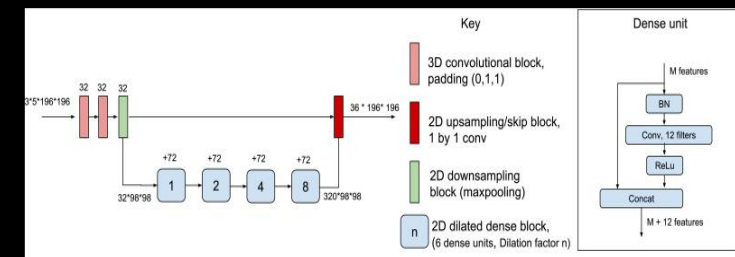


R. McKinley

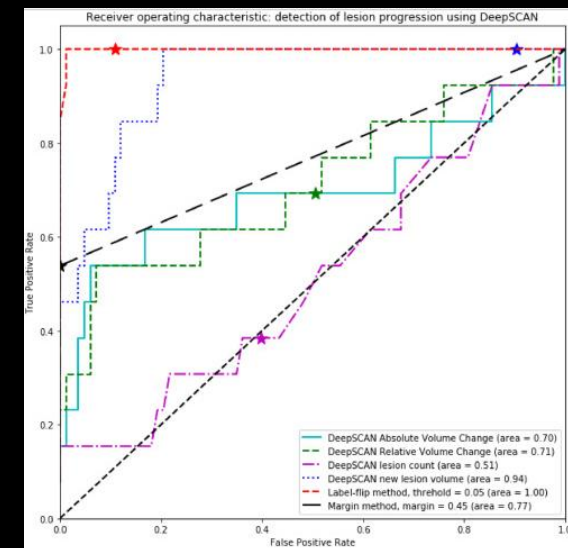
Goal: Preserve brain capacity



Lesion Detection / Quantification at TIC UHF MRI



«Deep SCAN MS» - CNN architecture



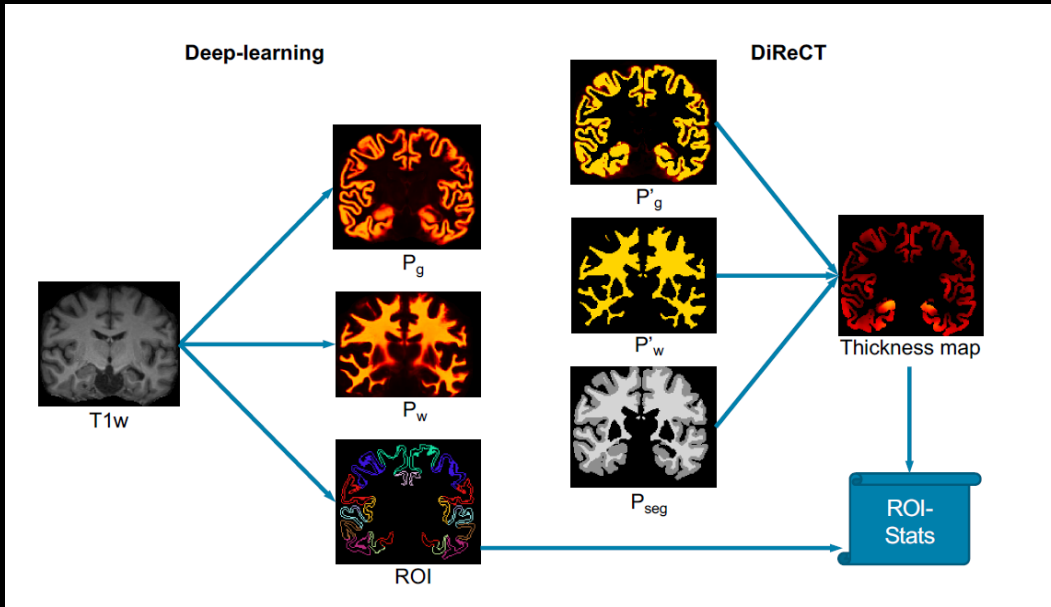
Datasets: Bern (122) Munich (53) Zurich (32)



Goal: Preserve brain capacity



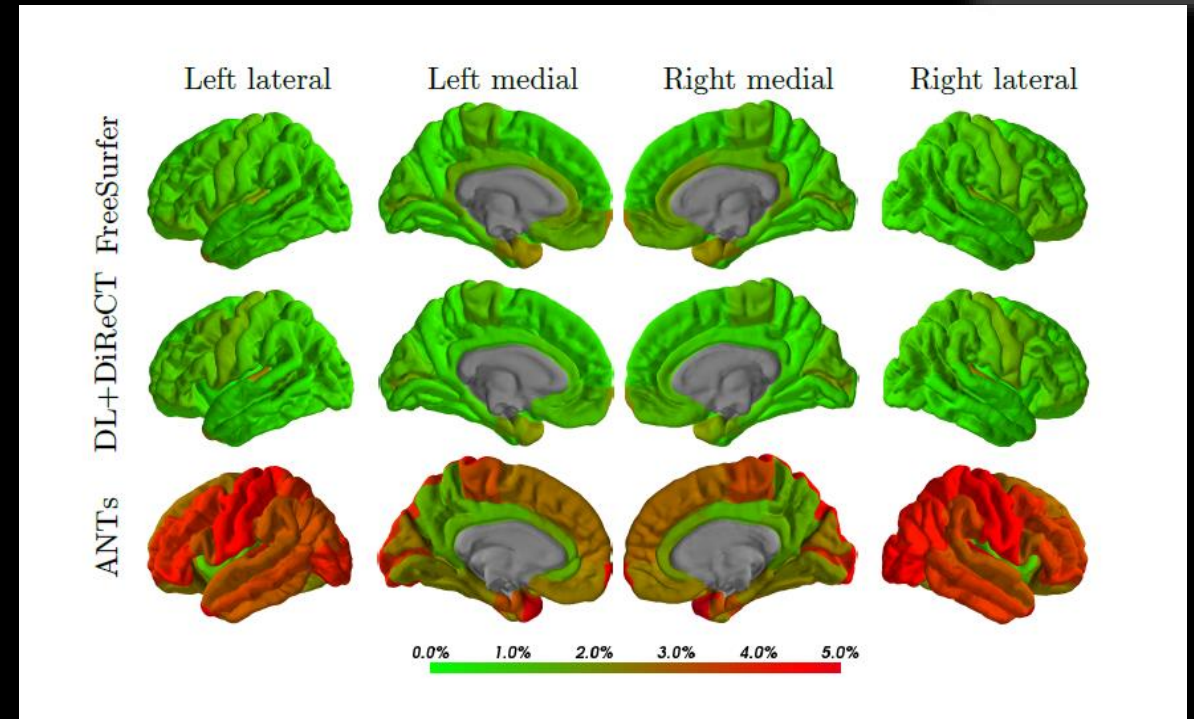
M. Rebsamen



Deep learning plus diffeomorphic registration based cortical thickness analysis (DL + DiReCT)

840 T1w training images from international datasets

96 output labels



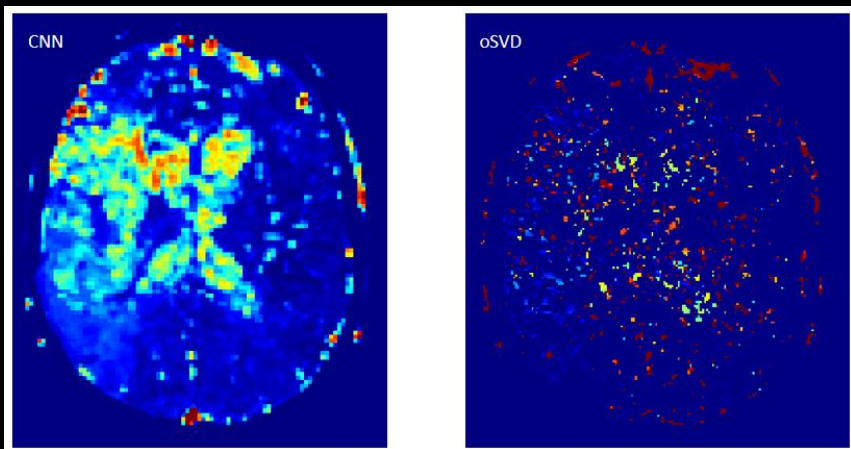
	HC	CDR=0.5	Dementia (CDR>=1)
FreeSurfer	-0.00711 (± 0.01164)	-0.02290 (± 0.02871)	-0.02020 (± 0.03076)
DL+DiReCT	-0.00815 (± 0.01444)	-0.02545 (± 0.03260)	-0.02290 (± 0.04069)
ANTs	-0.02039 (± 0.06500)*	-0.04383 (± 0.06308)*	-0.04983 (± 0.08488)
DL+DiReCT (FS parc.)	-0.00820 (± 0.01457)	-0.02538 (± 0.03287)	-0.02309 (± 0.04130)

Comparators: FREESURFER and ANTs

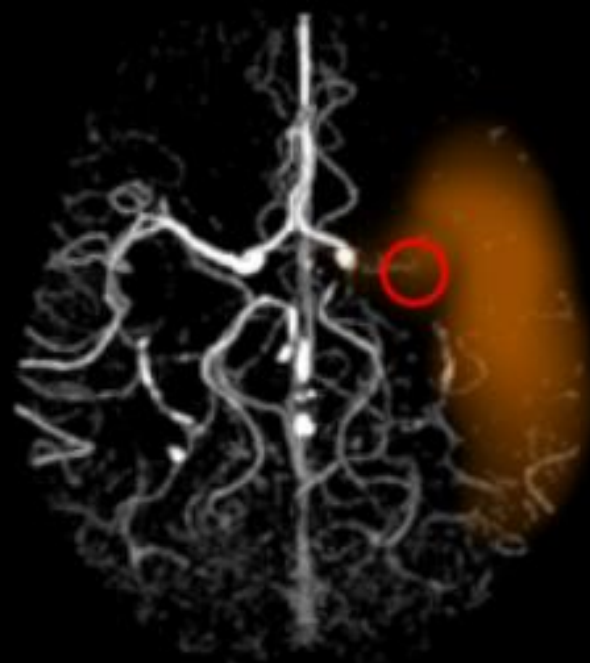
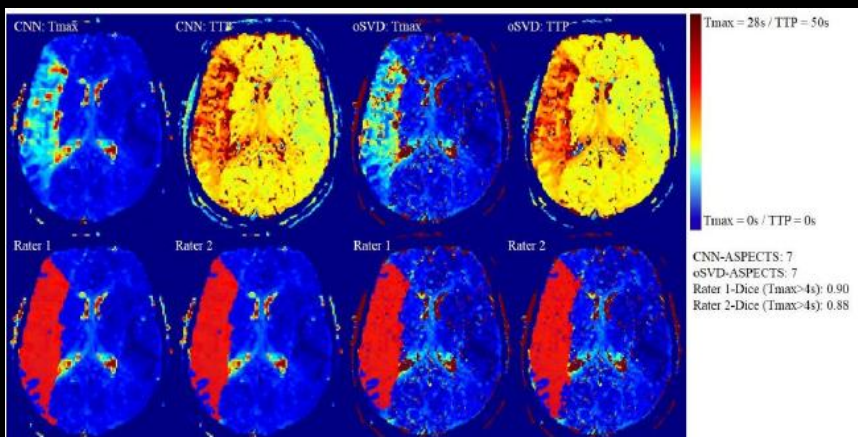


R. Meier

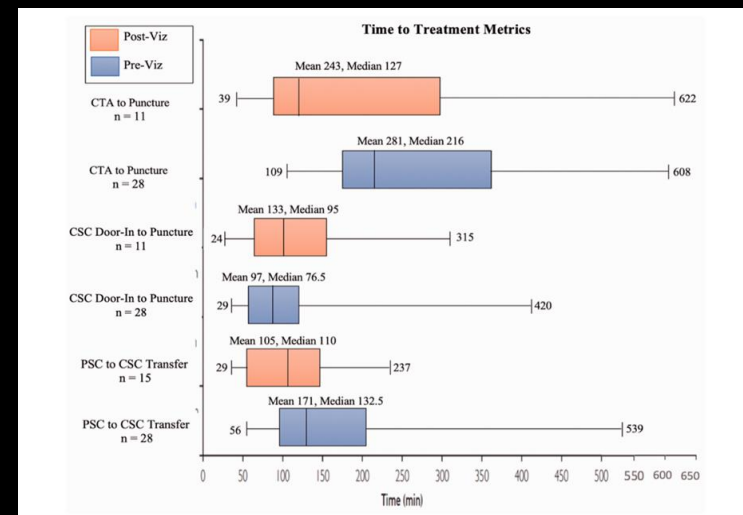
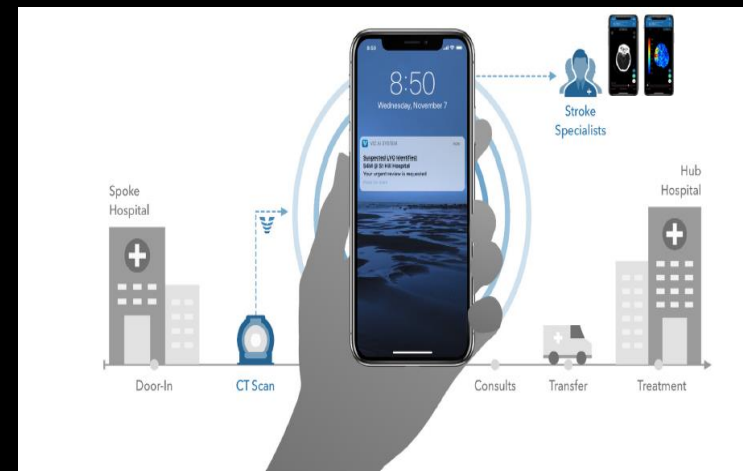
Goal: Saving brains



Neural-network derived perfusion maps



Results generated automatically by e-CTA.



Goal: Translational neuroimaging



Prof. Reyes



Stefan Bauer, PhD - 2009-2013
 "Medical Image Analysis and Image-based Modeling for Brain Tumor Studies"



Raphael Meier, PhD - 2013-2017
 "Towards Automatic Segmentation of Longitudinal Brain Tumor Imaging Data"



Alain Jungo, PhD - 2017-2020
 "Applications and Insights of Uncertainty Estimates in Automated Brain Tumor Segmentation"



Yannick Suter, PhD - 2017-2021
 "Advanced Machine Learning Technologies for Robust Longitudinal Radiomics and Response Assessment in Glioblastoma Multiforme"



Tobias Rothen, MSc - 2018
 "Modality Crawler: Using Deep Learning for Automated Brain MRI Sequence Classification"



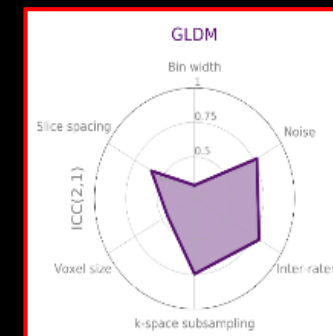
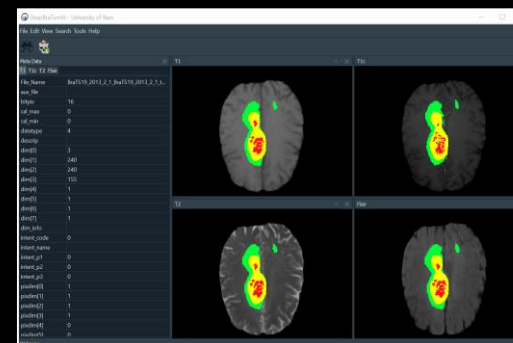
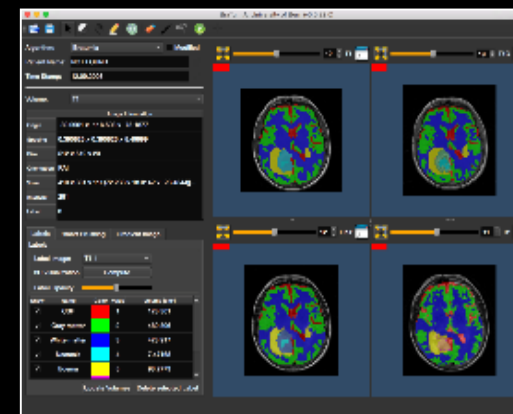
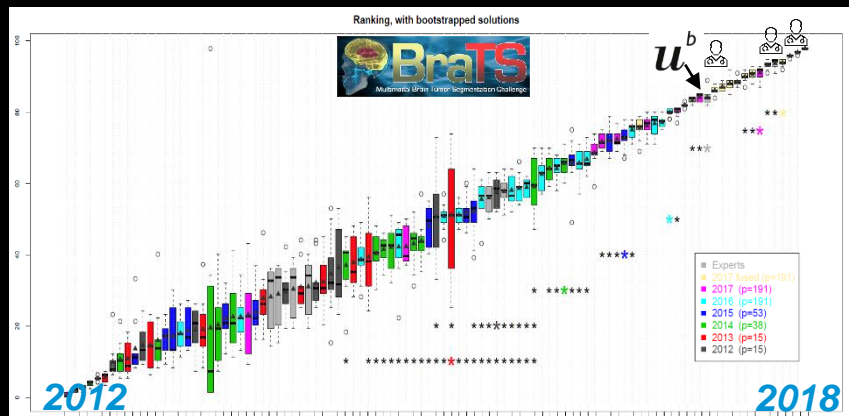
Michael Müller, MSc - 2019
 "Ensemble Learning Strategies for Accurate and Robust Brain Tumor Segmentation using Deep Learning Technologies"



Elias Rüfenacht, PhD student
 "Deep Learning-based Active Auto-segmentation System for Brain Tumoral and Organs of risk Tissues"

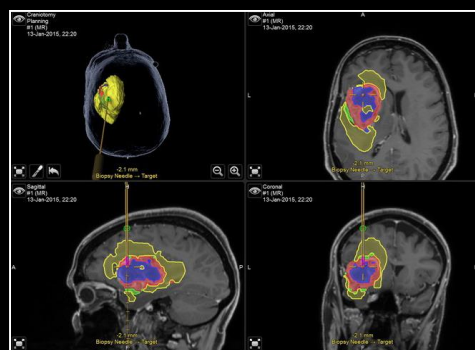


Robert Poel, PhD student
 "Radiotherapy Oriented Quality Control for Deep Learning based Fully Automated Segmentation of Intracranial Targets and Organs at Risk"

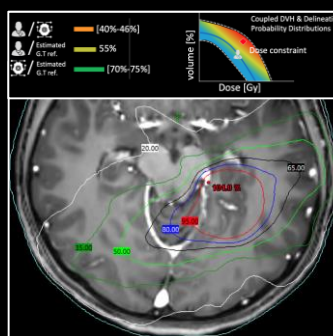
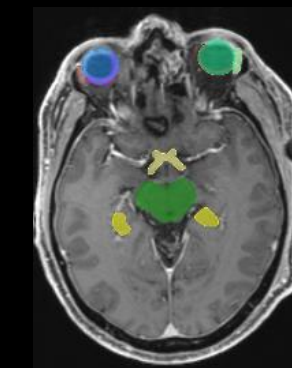


Automated Brain Tumor Segmentation Technologies

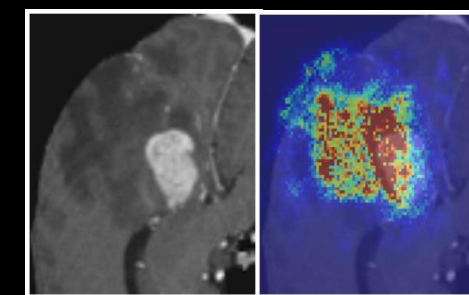
Robust Radiomics



Enhanced brain tumor biopsies



AI in Radiation Oncology Planning



Interpretability-Guided Medical Image Computing

Machines as clinical partners

Image optimization



Tissue segmentation



Decision support



Prediction of outcome



The journey continues with CAIM



Raphael Meier PhD



Richard McKinley PhD



PD Franca Wagner MD



Michael Rebsamen MSc



Arsany Hakim MD



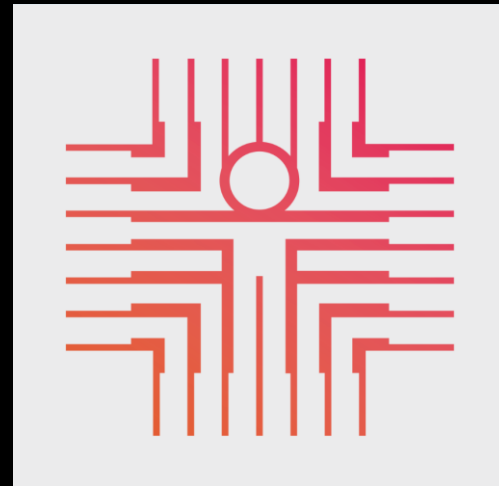
Johannes Kaesmacher MD/PhD



PD Christian Rummel PhD



Prof. Reyes & Team
Prof. Gralla & Team
Team MB Neuro Insel



Prof. Sznitman & Team
Prof. Mougiakakou
Prof. Leichtle
Prof. Zlobec
Prof. Shi



Team SCAN
Prof. Nolte & Team TIC

