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Welcome

Welcome to TRABIT

In recent decades, medical imaging techniques such as computed tomography, ultrasound, and especially magnetic resonance imaging have gained a central role in the clinical management of disorders of the brain. A fundamental bottleneck in translating the wealth of information contained in medical images into optimized patient care is the lack of patient-specific computational tools to help analyze and quantify the torrent of acquired imaging data.

The "Translational Brain Imaging Training Network" (TRABIT) is an interdisciplinary and intersectoral joint effort of computational scientists, clinicians, and the industry in the field of neuroimaging. Its aim is to train a new generation of innovative and entrepreneurial researchers to bring quantitative image computing methods into the clinic, enabling improved healthcare delivery to patients with brain disease.

https://trabit.eu

Upcoming Event
June 2019

Computational Magnetic Resonance Brain Imaging Summer School at EPFL

In the context of TRABIT, we organize a Computational Magnetic Resonance Brain Imaging Summer School. It will last five days from Monday June 24th till Friday June 28th. We have a quite intense program, filled with amazing Invited Speakers, and brilliant young PhD students.

Our aim is to train young researchers in both a deep understanding of computational neuroimaging methods together with the clinical needs and constraints arising in the treatment of brain disorders.

The school is also open for PhD students in Switzerland. The selection of the students will be done on the basis of a CV and motivation letter. There are 15 open participation slots.

http://trabit2019.epfl.ch/

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Recent Events

Training and Workshop for TRABIT PhD Students

The first TRABIT training school was held in Munich in the first week of October 2018. The program consisted of 4 days of courses and seminars and in one day of meetings with the program officer. The week was both fun and educational. The 15 PhD students learned about interesting topics in medical imaging and met the other students from the TRABIT network and some of their supervisors, coming from all around the world.

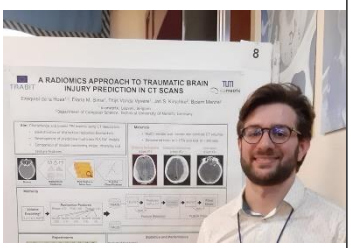
https://trabit.eu/index.php/blog/518-first-trabit-summer-school

In addition, the first of two TRABIT workshops was held in Copenhagen in February 2019. During this workshop, the PhD students had intensive hands-on training courses on ITK and MeVisLab which facilitates the quick development of clinical application prototypes and supports testing of functional prototypes in clinical settings.

https://trabit.eu/index.php/blog/530-first-trabit-summer-school

Recent TRABIT Publications

TRABIT Publications



The following publications are first-authored by an ESR of TRABIT.

L. Canalini et al. Segmentation-based registration of ultrasound volumes. CARS 2019

E. de la Rosa et al. A Radiomics Approach to Traumatic Brain Injury Prediction in CT Scans. ISBI 2019.

F. La Rosa et al. Shallow vs deep learning architectures for white matter lesion segmentation in the early stages of multiple sclerosis. MICCAI Brainlesion Workshop 2018

T. Yu et al. Robust T2 Relaxometry with Hamiltonian MCMC for Myelin Water Fraction Estimation. ISBI 2019

T. Yu et al. : Robust Biophysical Parameter Estimation with a Neural Network Enhanced Hamiltonian Markov Chain Monte Carlo Sampler. IPMI 2019

https://trabit.eu/index.php/results

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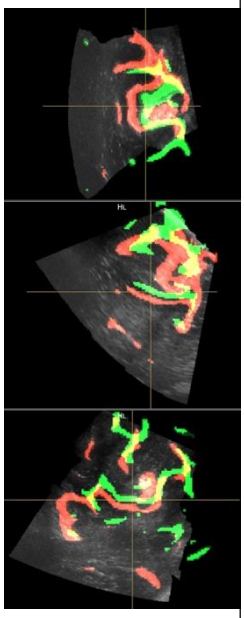
Short Report
ESR 11

Segmentation-based Registration of Ultrasound Volumes



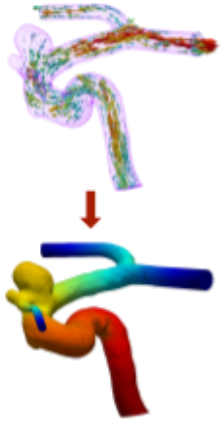
In image-guided surgery for glioma removal, neurosurgeons usually plan the resection on images acquired before surgery and rely on them during the intervention. However, after the surgical procedure has started, the planning based on the pre-resection imaging is not reliable anymore due to brain shift caused by modifications of brain anatomical structures and imprecisions in the neuronavigation system.

Luca Canalini is working on a segmentation-based method to register ultrasound volumes acquired before, during and after resection. After having trained a convolutional neural network to segment anatomical structures in ultrasound volumes obtained before resection, he uses it to segment related structures in other phases of the surgical procedure. Finally, the obtained masks are used to register volumes acquired at different stages. Results and further details can be found in his accepted conference paper.

https://trabit.eu/index.php/results

Short Report
ESR 12

Blood Flow Analysis using 3D Phase-Contrast (PC) MRI

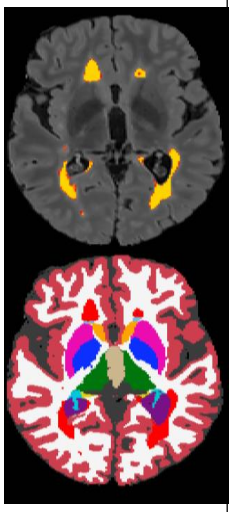


For clinical intervention and therapeutic planning in neurovascular diseases, medical doctors rely on local quantitative characterization of blood flow dynamics. 3D PC MRI is an imaging modality which allows us to acquire a point-wise, in-vivo measurement of the instantaneous velocity of blood flow. Thus acquired velocity fields present the valuable image basis to derive non-invasive hemodynamic biomarkers.

Suprosanna Shit is working on developing fast and accurate pressure inference scheme from local blood flow velocity fields. The underlying physical process is modeled with the help of a novel neural network that learns to solve fluid flow dynamics and infer pressure from it. He is also working on super-resolution of the measured flow field to achieve stable and reliable numerical estimation of hemodynamic metrics such as pressure and wall shear stress.

Short Report
ESR 3

Simultaneous Segmentation of White Matter Lesion and Brain Tissue for Multiple Sclerosis

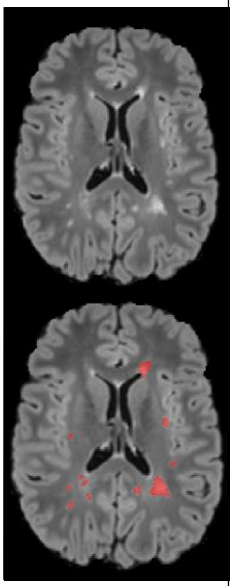


Multiple Sclerosis (MS) is a neurodegenerative and inflammatory disease of the central nervous system and the leading cause of neurological disability in young adults worldwide. MS results in demyelination of the nerve fibers and is characterized by the formation of lesions in the brain and a general loss of brain tissues (atrophy).

Stefano Cerri is working on a segmentation-based method for simultaneously segmenting white matter lesions and different anatomical brain structures on MS subjects. The method is a generative model based on Gaussian Mixture Models, a brain atlas and a Variational Autoencoder that can adapt to different contrasts and different scanners.

Short Report
ESR 2

Automatic segmentation of Multiple Sclerosis white and gray matter lesions



Manual annotations of experts on MRI images are currently considered the clinical gold standard for MS lesion identification. However, this task is time-consuming and prone to inter and intra-observer variations.

Francesco La Rosa is developing deep learning-based methods to automatically detect and segment MS brain lesions. In particular, patch-based convolutional neural networks are specifically tailored to segment these structures. He considers multiple conventional MRI contrasts, commonly acquired in clinics, to segment white matter lesions. Furthermore, advanced MRI sequences are also analyzed in order to detect lesions in the gray matter, much smaller than white matter lesions and showing a lower contrast with the surrounding tissues. Additional details on his methodology can be found in his accepted conference paper.

https://arxiv.org/abs/1809.03185

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