

SEMINAR 1 (20 min): Markus/Aref

How to set up a FAIR workflow for multimodal rodent imaging data in a no-code environment of a translational stroke lab

SEMINAR 2 (25 min): Michał

An introduction to version control, Git, DataLad

SEMINAR 3 (15 min): Joanes

Working with robust data structure (BIDS) and containers (Docker / Apptainer)

HANDS-ON 1 (1 h): Michał (Aref, Markus, Joanes)

Data Management for Neuroimaging with DataLad

HANDS-ON 2 (2 hrs): Two breakout rooms:

*Breakout room (carpet) 1: Markus/Aref – **Mouse MRI processing using AIDAmri***

*Breakout room (carpet) 2: Gabriel/Joanes -- **Rodent functional MRI preprocessing with RABIES***

ANATOMICAL
INFORMATION (T2)

STRUCTURAL
INFORMATION (DTI)



FUNCTIONAL
INFORMATION (FMRI)

REFERENCE
ATLAS (ARA)

Processing Pipeline for Atlas-Based Imaging Data Analysis
of Structural and Functional Mouse Brain MRI (AIDAmri)

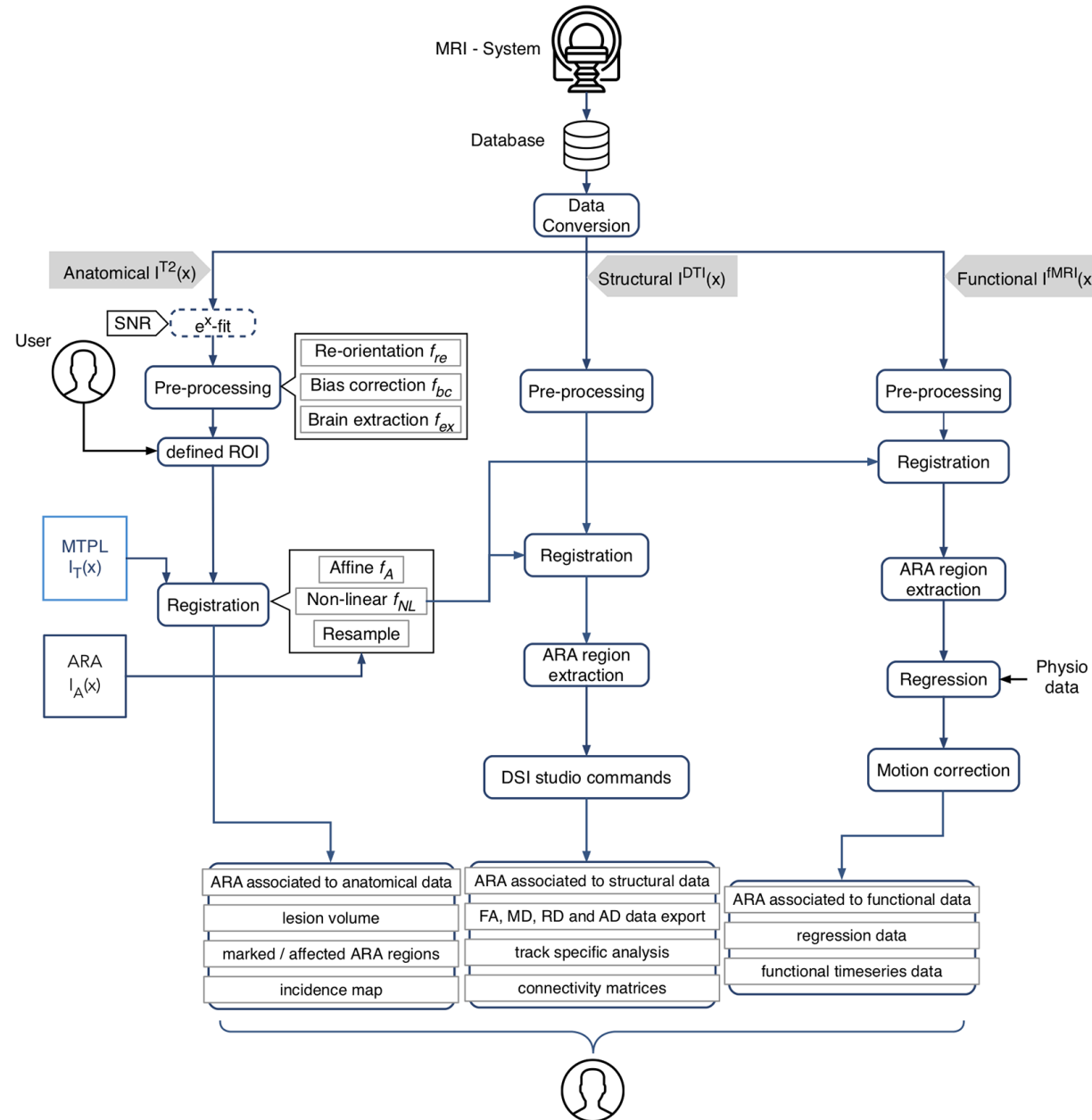
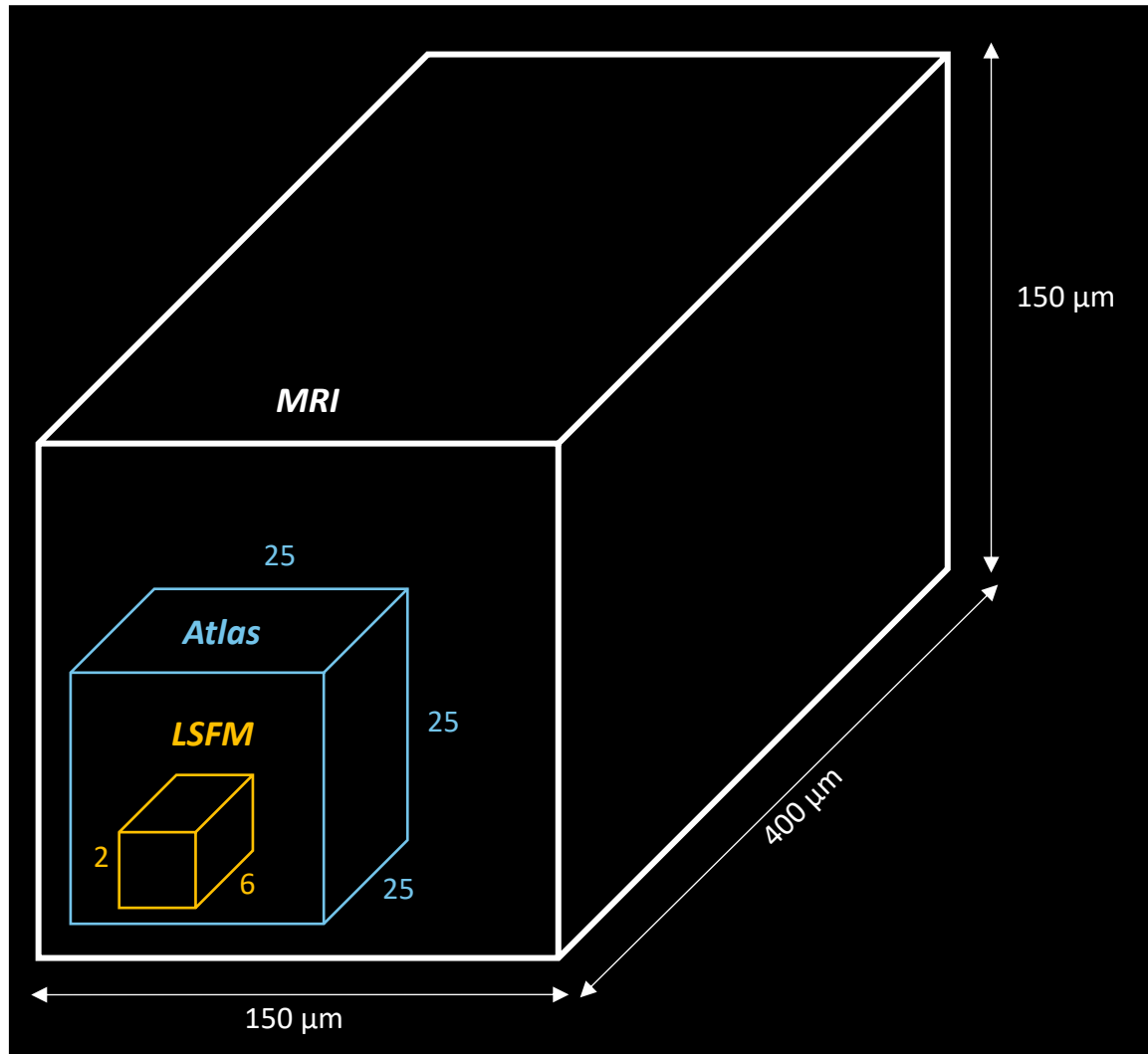
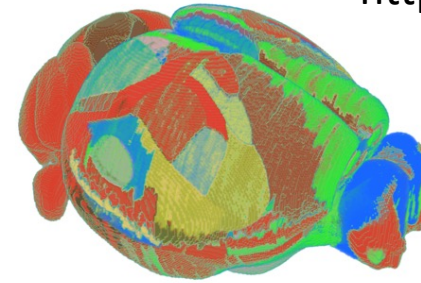


Image registration



<https://mouse.brain-map.org/>



Allen Brain Atlas
based on a population
average of 1675
specimens and
> 1000 numbered brain
regions

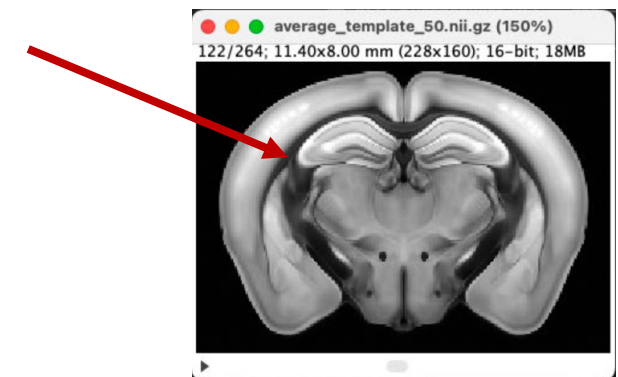
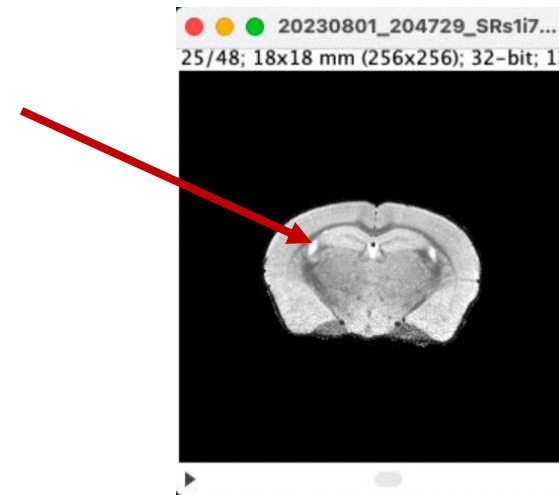
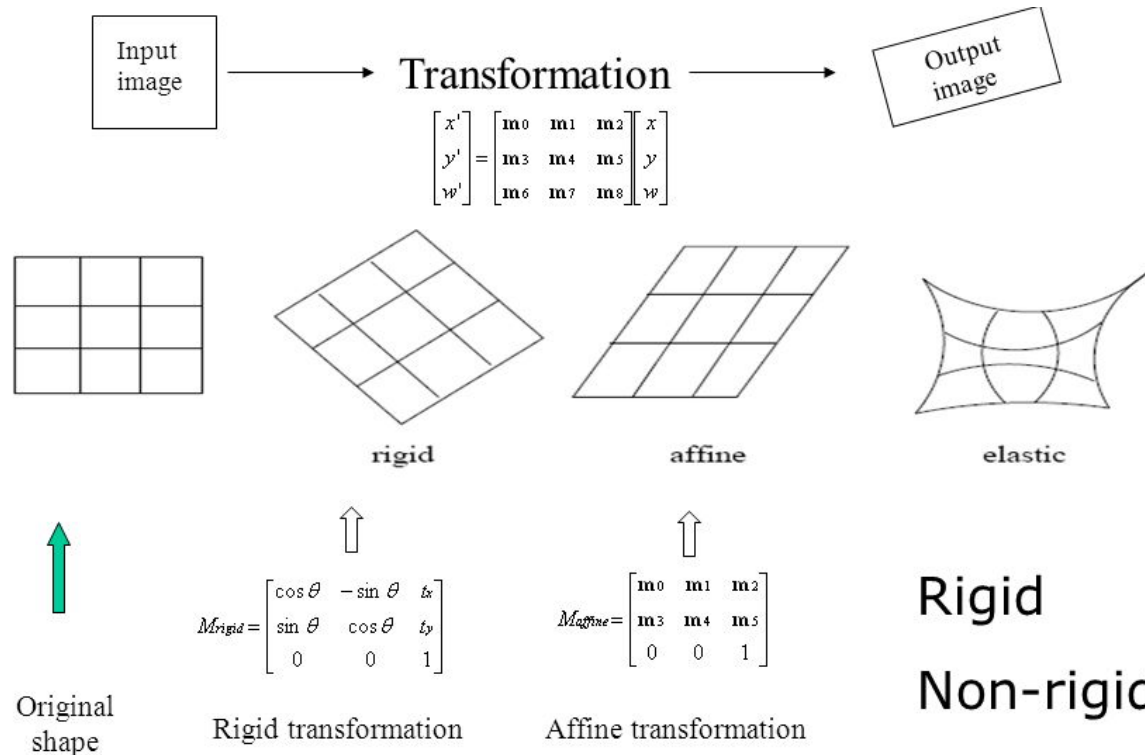


Image transformations



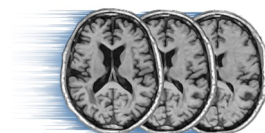
<https://tinyurl.com/5n7ez766>

ANTs
Advanced
Normalization Tools

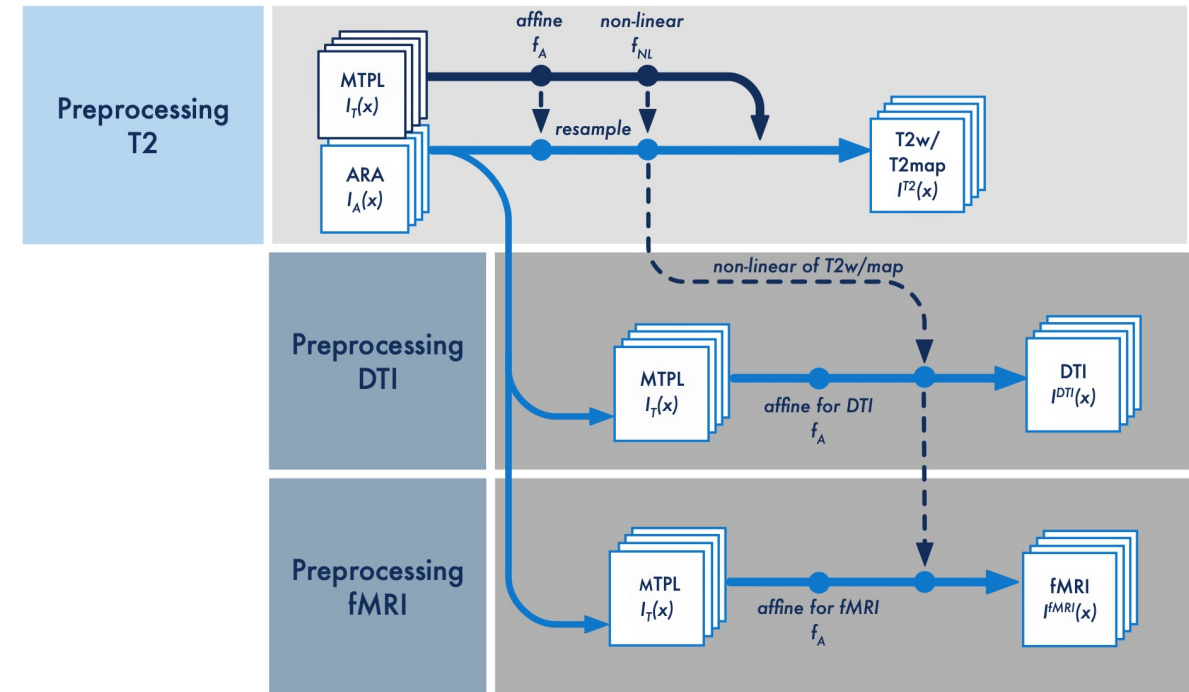


Help Login
FLIRT

NiftyReg



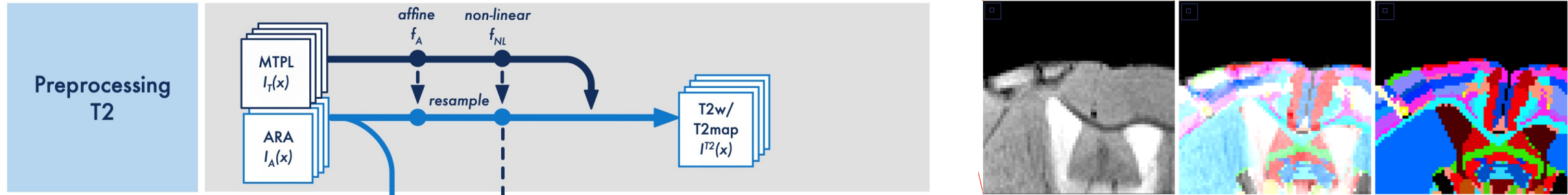
Atlas registration



Pallast et al. Front. Neuroinform. 2019

New solutions

Multi-**step** registration + **method-specific** atlas

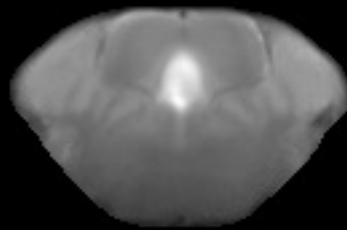


Mouse template (MTPL)

0.07 x 0.07 x 0.2 mm

48 slices

FOV 17.5 x 17.5 mm

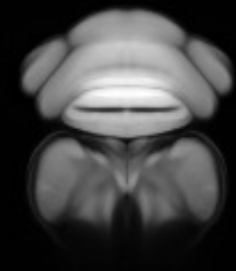


Allen Reference Atlas (ARA)

0.05 x 0.05 x 0.05 mm slices

264 slices

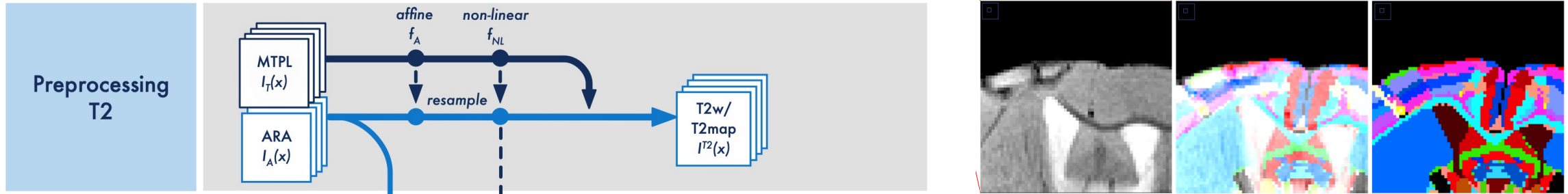
FOV 11.4 x 8.0 mm



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New solutions

Multi-**step** registration + **method-specific** atlas

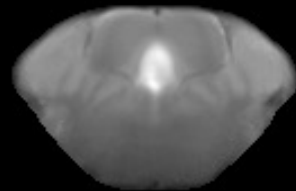


Mouse template (MTPL)

0.07 x 0.07 x 0.2 mm

48 slices

FOV 17.5 x 17.5 mm

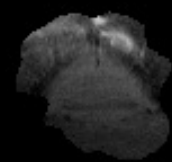


T2-weighted MRI

0.07 x 0.07 x 0.3 mm

48 slices

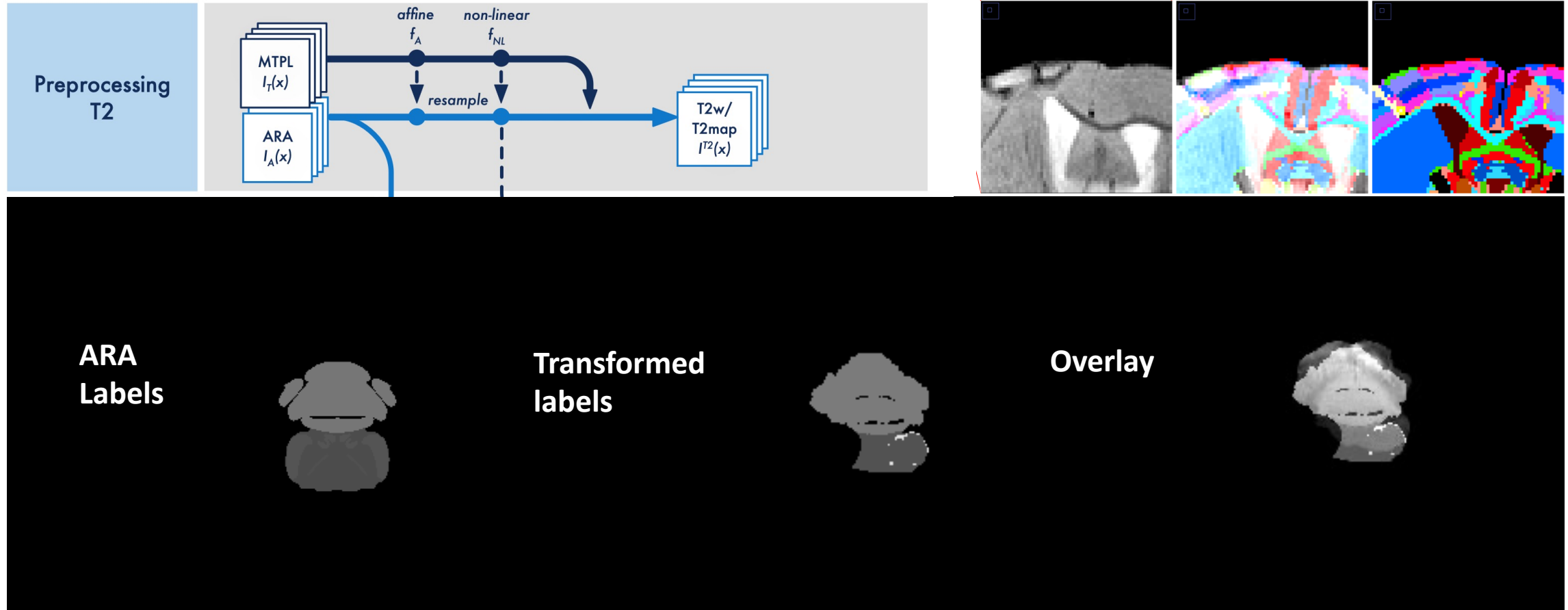
FOV 17.5 x 17.5 mm



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New solutions

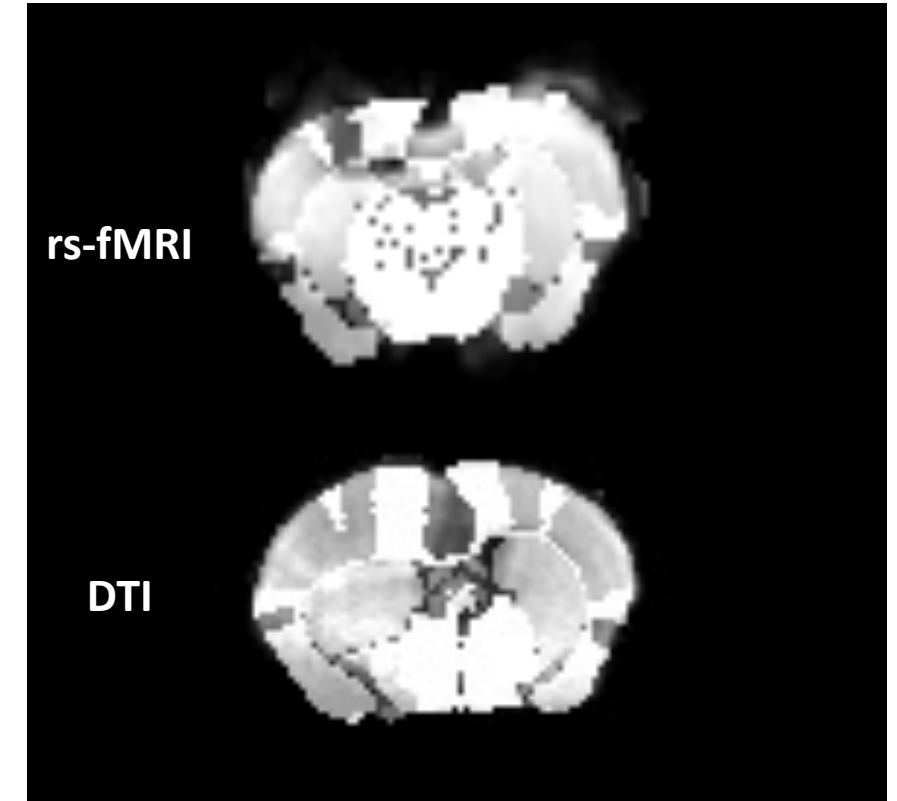
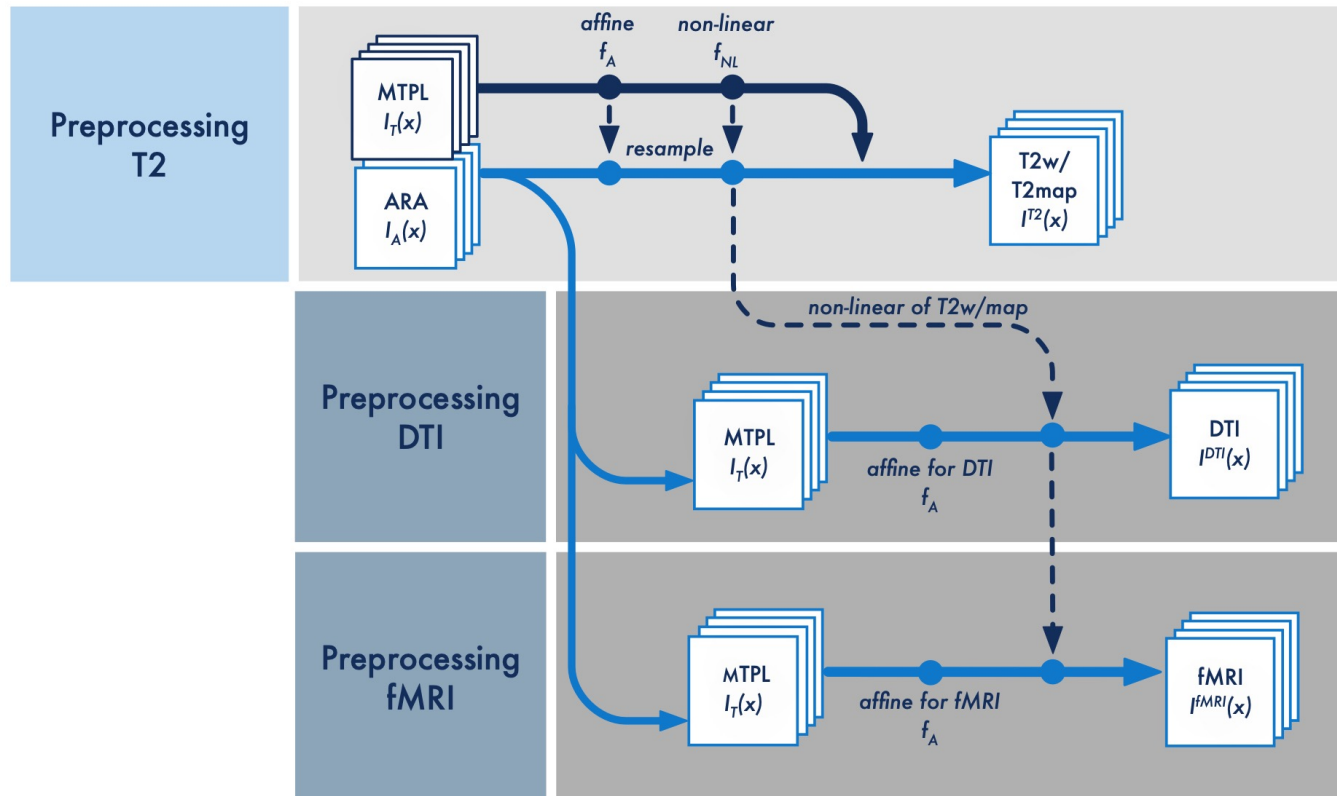
Multi-**step** registration + **method-specific** atlas

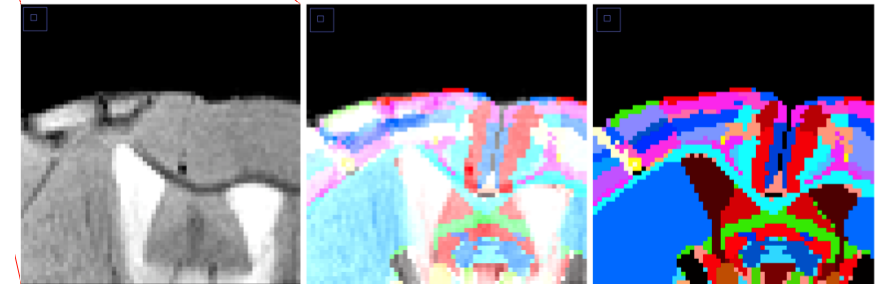
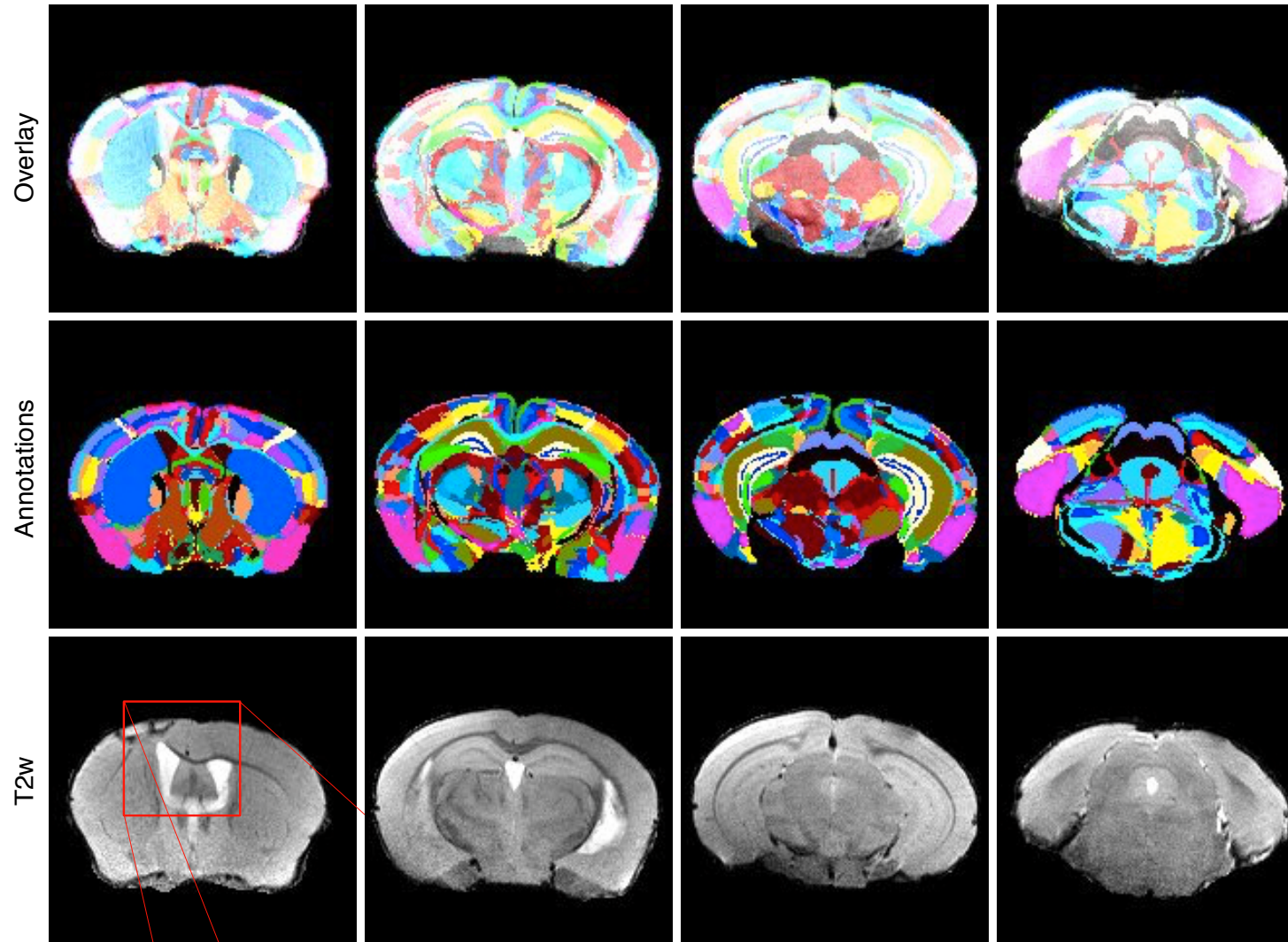


Pallast et al. Front. Neuroinform. 2019

New solutions

Multi-step registration





Pallast et al. Front Neuroinform 2019
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Where to find help?

Publication

frontiers

in Neuroinformatics

ORIGINAL RESEARCH

published: 04 June 2019

doi: 10.3389/fninf.2019.00042

Processing Pipeline for Atlas-Based Imaging Data Analysis of Structural and Functional Mouse Brain MRI (AIDAmri)

Niklas Pallast¹, Michael Diedenhofen², Stefan Blaschke¹, Frederique Wieters¹, Dirk Wiedermann³, Mathias Hoehn^{2,3}, Gereon R. Fink^{1,2} and Markus Aswendt^{1*}

¹Department of Neurology, Faculty of Medicine and University Hospital Cologne, University of Cologne, Cologne, Germany; ²In-vivo-MRI Laboratory, Max Planck Institute for Metabolism Research, Cologne, Germany; ³Cognitive Neuroscience, Institute of Neuroscience and Medicine (INM-3), Research Center Jülich, Jülich, Germany

Magnetic resonance imaging (MRI) is a key technology in multimodal animal studies of brain connectivity and disease pathology. In vivo MRI provides non-invasive, whole brain macroscopic images containing structural and functional information, thereby complementing invasive in vivo high-resolution microscopy and ex vivo molecular techniques. Brain mapping, the correlation of corresponding regions between multiple brains in a standard brain atlas system, is widely used in human MRI. For small animal MRI, however, there is no scientific consensus on pre-processing strategies and atlas-based neuroinformatics. Thus, it remains difficult to compare and validate results from different pre-clinical studies which were processed using custom-made code or individual adjustments of clinical MRI software and without a standard brain reference atlas. Here, we describe AIDAmri, a novel Atlas-based Imaging Data Analysis pipeline to process structural and functional mouse brain data including anatomical MRI, fiber tracking using diffusion tensor imaging (DTI) and functional connectivity analysis using resting-state functional MRI (rs-fMRI). The AIDAmri pipeline includes automated pre-processing steps, such as raw data conversion, skull-stripping and bias-field correction as well as image registration with the Allen Mouse Brain Reference Atlas (ARA). Following a modular structure developed in Python scripting language, the pipeline integrates established and newly developed algorithms. Each processing step was optimized for efficient data processing requiring minimal user-input and user programming skills. The raw data is analyzed and results transferred to the ARA coordinate system in order to allow an efficient and highly-accurate region-based analysis. AIDAmri is intended to fill the gap of a missing open-access and cross-platform toolbox for the most relevant mouse brain MRI sequences thereby facilitating data processing in large cohorts and multi-center studies.

Keywords: processing pipeline, MRI, atlas registration, stroke, preclinical neuroimaging

OPEN ACCESS

Edited by:
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Medicine, South Korea
Haining Zou,
Institute of Automation (CAS), China
Esther Agnes Papp,
University of Oslo, Norway

***Correspondence:**
Markus Aswendt
markus.aswendt@uk-koeln.de

Received: 23 December 2018
Accepted: 21 May 2019
Published: 04 June 2019

Citation:
Pallast N, Diedenhofen M,
Blaschke S, Wieters F,
Wiedermann D, Hoehn M, Fink GR
and Aswendt M (2019) Processing
Pipeline for Atlas-Based Imaging
Data Analysis of Structural and
Functional Mouse Brain MRI
(AIDAmri).
Front. Neuroinform. 13:42.
doi: 10.3389/fninf.2019.00042

Frontiers in Neuroinformatics | www.frontiersin.org 1 June 2019 | Volume 13 | Article 42

Manual

Sign up

Aswendt-Lab / AIDAmri

Public

<> Code

Issues

Pull requests

Actions

Projects

Security

...

< Files

master

...

AIDAmri / manual.pdf

Victor Vera Frazao

Updated manual and readme to 1.2, changed tagging n...

3 months ago

2.14 MB

Atlas-based Imaging Data Analysis pipeline
for functional and structural MRI Data
AIDAmri
v1.2

Code: Leon Scharwächter, Niklas Pallast, Michael Diedenhofen,
Victor Vera Frazão, Markus Aswendt

Manual: Leon Scharwächter, Niklas Pallast, Tim Fleiner,
Victor Vera Frazão, Markus Aswendt

Status: June 2023

Open Office Hours

via Zoom
each Thursday 4:30 pm

