

CRC/TRR 135

Cardinal mechanisms of perception: Prediction, Valuation, Categorization

Perception is one of the most fundamental functions of our mind as it provides the primary source of information about our surrounding world. Our senses enable us to take up information from the environment, while perception is the process by which this information is interpreted, a "making sense of the senses".

The aim of the DFG funded collaborative research center CRC/TRR 135 – comprising 20 interdisciplinary research groups at Justus-Liebig-University Giessen (JLU) and Philipps-University Marburg (UMR) – is to understand perception across a wide range of domains in terms of three underlying principles: Prediction, Valuation and Categorization.

To obtain a comprehensive understanding of these cardinal mechanisms, we deploy a unique combination of human behavioral experiments, physiology and modeling. The goal is to delineate the cardinal mechanisms behaviorally, to identify their underlying neural substrates and to explain their functions with computational models.

NOWA: Aims and objectives

Neuroscientific Workflow Assistance (NOWA)

In order to enhance reproducibility of all steps in the lifecycle of a scientific study, from planning experiments to publishing data, this infrastructure project aims at creating an organizational and technological framework, supporting workflows along the entire data lifecycle. With NOWA, we follow a novel approach to set this into practice.

We ...

- ... aim at documenting all steps of the research process.
- ... optimize processes by looking at both technical and organizational aspects.
- ... re-use existing open standards and tools.
- ... collaborate closely with university computer centers, university libraries and Research Data Management Service teams at JLU and UMR.

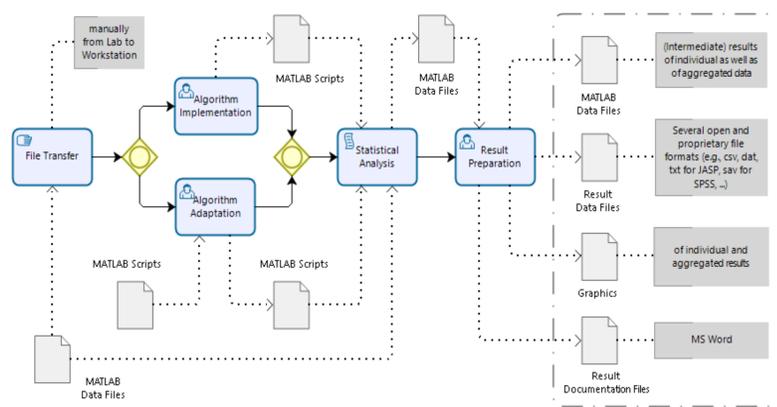
As the CRC/TRR 135, this infrastructure project started in 2018 and runs for four years.

Analytical part: Data Management Plans and Workflow Evaluation

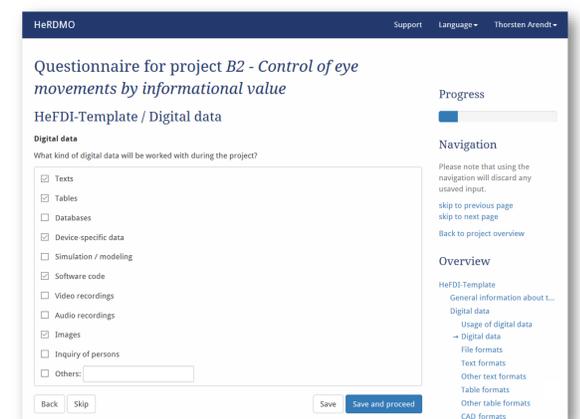
We document and discuss data mgmt and technical workflows of all research projects within CRC/TRR 135.

Aims:

- Empirically gathering, documenting and evaluating current experimental procedures and workflows.
- Developing and establishing standardized workflows and data management policies.
- Developing research data management plans, e.g. using the open research tool RDMO (Research Data Management Organiser).



Example sub process (data analysis workflow subsequent to data acquisition in experiments) modelled using open modeling language BPMN (Business Process Model and Notation)



User interface of the RDMO installation at HeFDI (Hessische Forschungsdateninfrastruktur) used for developing data management plans

Technical part: A Software Toolset for Workflow Assistance

Designing and setting-up experiments

- experimental set-up
- scripts for experimental procedures
- stimuli
- model set-up

Collecting primary data

- experimental parameters
- primary data

Processing data

- scripts for processing data
- processed data
- implementing models

Analyzing data

- scripts for data analysis
- analyzed data
- data visualizations

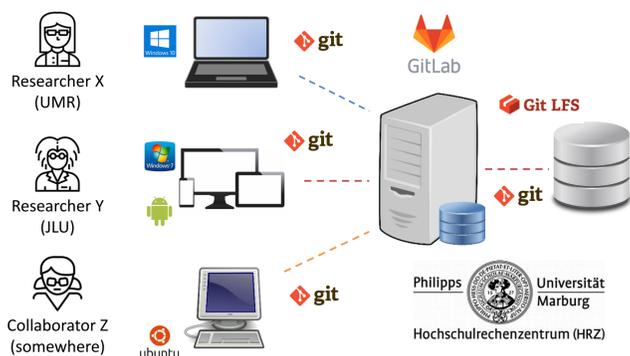
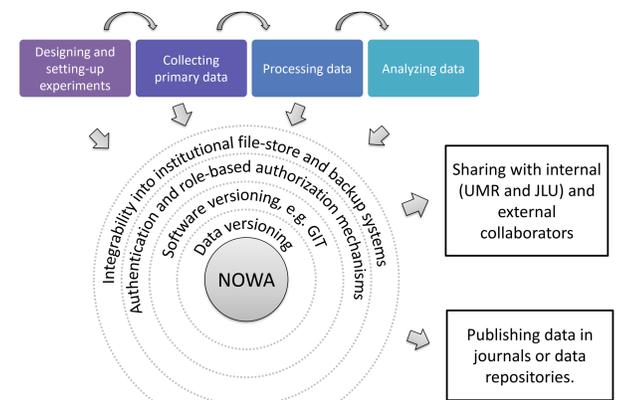
We develop NOWA based on existing software tools for documenting the research process.

Aims:

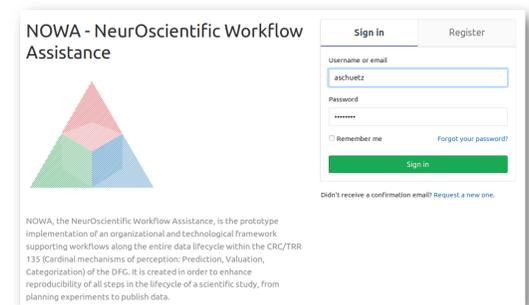
- Specifying requirements and defining use cases.
- Selecting an existing tool as the core element.
- Adding other existing discipline-specific and universal data management tools in a modular architecture.

Our first prototypical implementation ...

- ... uses existing open technologies and concepts that are approved in software engineering: Git, Git LFS (Large File Storage) and GitLab.
- ... enables collaborative and distributed research as well as research data versioning.
- ... is directly integrated into the institutional infrastructure.



Architecture of the NOWA prototype implementation for distributed research



Login screen of the NOWA prototype web interface based on GitLab

Further Working Packages

- Training:** We will establish regular training to raise awareness for data management and foster the use of NOWA.
- Real-time support service:** From mid 2020 on, we will offer real-time support service for pilot studies.
- Prepare Roll-Out:** We will develop a concept for roll-out of NOWA within the entire CRC/TRR 135.

Long Term Perspective

- Ensure interoperability of the workflow assistance with relevant data repositories, infrastructures and standards.
- Publish the workflow assistance as open source software to foster further community-driven development.
- Advance institutional services for neuroscience research at Justus-Liebig-University Giessen, Philipps-University Marburg, and possibly beyond.