Bachelor's Thesis:
An educational web platform for MRI with BART

Institute of
Biomedical Imaging
Stremayrgasse 16/3
8010 Graz

Overview

The Berkeley Advanced Reconstruction Toolbox (BART) is a free and open-source image-reconstruction framework for Computational Magnetic Resonance Imaging. It is developed mainly at the Institute of Biomedical Imaging.

We aim to provide an educational platform to explore MRI with BART directly in the browser. The goal of this thesis is to assist in the development of the browser-based BART environment, in which a curated list of tutorials for a simple introduction to BART will be provided. The thesis will be based on several core technologies.

First, Webassembly is a system which permits running code at near-native performance in modern webbrowsers. BART is already compiled and tested for webassembly automatically within our continuous integration pipeline.

Second, JupyterLite is a JupyterLab distribution that runs entirely in the browser. The core advantage of JupyterLite is that no central server is required to run reconstructions, as all computation happens on the client. BART has already been ran from a JupyterLite notebook, but more work is needed here to automate the build process.

Third, view is an image viewer provided with BART which has been successfully ran in a (normal) Jupyter notebook. Here, additional work is needed to port this to JupyterLite.

The thesis is geared towards people who are already quite experienced with Linux, and actually enjoy debugging obscure computer problems. Still, a solid grasp of MRI will be needed in the end, to provide meaningful content.

Specific Tasks

- Getting familiar with BART usage and build
- Run BART from a JupyterLite Notebook
- Integrate interactive data viewer
- Create interactive web page

Recommended Knowledge

- git
- podman/docker containers
- C or C++ programming
- Modern web technologies, especially emscripten/webassembly

Contact

Philip Schaten, MSc
E-Mail: philip.schaten@tugraz.at