Deep learning for automatic quality control

6 month Internship for an M2 student during the school year 2018-2019
CENIR, ICM, Paris 13

The CENIR is the MRI acquisition facility at the ICM with 2 MRI 3T scanners. We optimize the acquisition parameters and propose advanced pre-processing pipeline to improve data quality
http://www.cenir.org/

Context

Results in neuroimaging studies heavily depend on the quality of the acquired data. For instance, subject motion will bias the cortical thickness evaluation. Quality control (QC) is thus a critical step but today it still mostly relies on visual inspection of the data. We propose to work towards a fully automated QC procedure of structural MRI acquisitions, based on deep learning networks.
The CENIR (Center for Neuro-Imaging Research) is the MRI acquisition platform at ICM. With two 3 Tesla MRI scanners since almost 10 years, we have acquired around 20 000 subjects. This allows us to address this question in a large-scale database.

Subject

Image formation in MRI is well-defined by solving the Bloch-Torrey equation. This gives us the possibility to precisely simulate MR images as well as the most common MR artifacts. Starting from very good quality data, we propose to simulate different artifacts and train a deep network to learn a quantification of those artifacts, and their correction. Predictions from the networks will then be tested on the whole database.

This is an opportunity to work on the fundamentals of Magnetic Resonance Images acquisition and to develop deep learning techniques in the context of medical imaging.

Skills

- Python programming
- Image processing
- Experience in deep learning
- Autonomy and appetite to learn
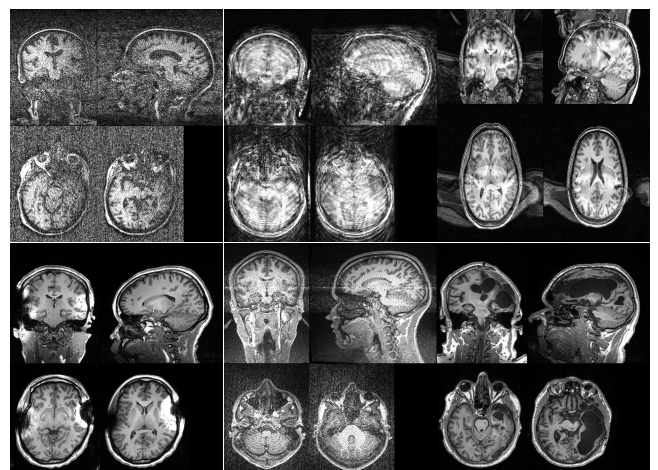
Contact
Romain Valabregue, CENIR, ICM, Paris
romain.valabregue@icm-institute.org