# LABORATORY OF BIOPHYSICS

Application of robust phasor analysis to large MRI data from biological samples

Magnetic Resonance Imaging (MRI) is used extensively for non-invasive diagnostics in medicine. Over the years, numerous methods have been developed for obtaining good contrast images which are suitable for analysing specific tissues or conditions. Recently, more in-depth analyses of the imaging data are being used, where multiple images of the same area are recorded to add extra information that cannot be obtained from a single image. These methods are known as quantitative MRI (qMRI), and are used to establish, for example, diffusion or relaxation (T_1 or T_2) properties for each pixel in the image. Often, these qMRI data sets show exponentially-decaying signals, which need to be fitted to extract characteristic life-times. When these decays are multiexponential, they are hard to analyse, and one has to decide *a priori* on the number of exponentials to be used when fitting the data, while this information is not accessible before the analysis.
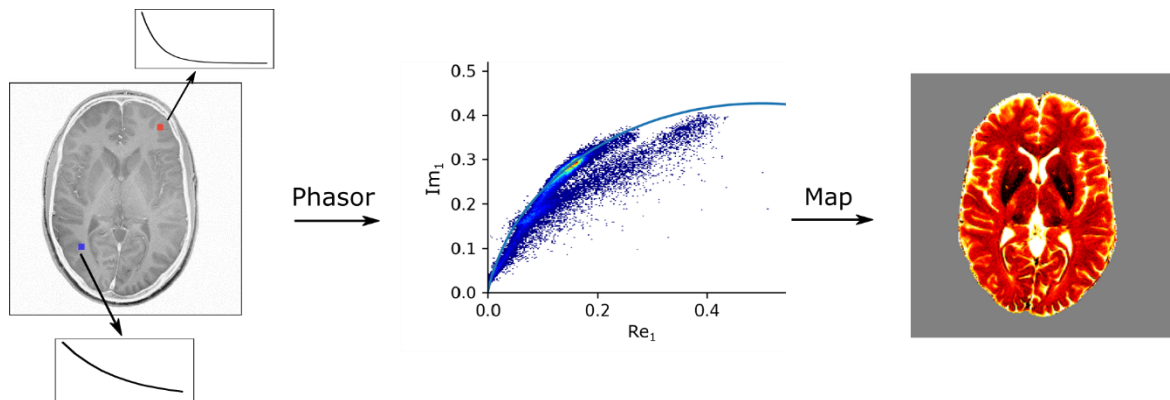
To circumvent this issue phasor analysis, a method well known for the study of lifetime fluorescence data, has recently been applied for the first time by our group at BIP to MRI data processing. In phasor analysis, a plot is made that unravels the characteristics of the decays for the full MRI data set, *i.e.* for all pixels at once. Creating this plot relies on Fourier transform, that makes no assumptions on the multi-exponential character of the data. As there are a lot of similarities between different pixels in an image, the phasor plot will unravel the occurrence of trends in the data. Using this information, a more detailed and accurate description of these data is possible.

This project is part of the 4TU "Precision Medicine" program, and consists of applying the phasor method to biological/medical data, investigating improvements to the phasor method, and implementing machine learning methods for big-data analysis of medical data. Test data can be recorded on the in-house NMR machines. Medical data come from several partners within the consortium. Data analysis is done using in-house developed scripts (Python).

Further information:

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