spmR: an R package for fMRI data analysis based on the SPM algorithms.

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Although several R packages for fMRI are available, the spmR package is unique in that it is capable to mimic the results of the widely used SPM package (http://www.fil.ion.ucl.ac.uk/spm). For standard fMRI analyses as well as for studying brain connectivity networks (Dynamic Causal Modeling), the spmR package can be used as a plugin replacement for SPM, yielding exactly the same results. This is important if the Matlab environment is not available (for example in high-performance computing environments), yet SPM comparable results are highly desirable. The R environment is ideal to run large-scale simulation studies. This in contrast to SPM, which is mainly GUI based.

If the fMRI analysis is just a part of a larger pipeline, access to a dedicated R package for fMRI is enormously convenient. spmR is more than just a port of SPM to R. Instead of copying and translating the original Matlab code of SPM, we tried to exploit the R language as much as possible to obtain elegant, clean, and maintainable code. While a large portion of the SPM source code was written to implement statistical routines, we could often use the built-in functionality of R, leading to a huge reduction in code size. At the same time, the names of the functions and the structure of the central SPM.mat file have been largely retained, so that SPM users should have little difficulty using the spmR package instead.

During the presentation, we will demonstrate how spmR can be used for analyzing typical fMRI datasets. Using a single-subject dataset, we show how easy it is to define an experiment, and to run a standard mass-univariate analysis with spmR. Perhaps most important for SPM users, we compare the results with the output of SPM. For example, we compare the estimated F-values in a SPM{F} map for a random selection of voxels. The values computed by spmR are identical to the ones computed by SPM. Next, we illustrate how convenient spmR is when it is used as part of a larger simulation study. We show an example of a real-world simulation script, where a complete pipeline (including data generation, pre-processing, activation detection, and finally estimating a Dynamic Causal Model) is repeated a large number of times.