

## PERMUTATION-BASED PREVALENCE INFERENCE USING THE MINIMUM STATISTIC

This is an implementation for Matlab of the method proposed by Carsten Allefeld, Kai Grger and John-Dylan Haynes, ‘Valid population inference for information-based imaging: From the second-level *t*-test to prevalence inference’, *NeuroImage* 2016. In that paper the method was introduced as a way to perform population inference for classification accuracy and other information-like measures and called ‘permutation-based *information* prevalence inference using the minimum statistic’. Since it can equally well be applied to other first-level summary statistics, the method is here generically referred to as ‘permutation-based prevalence inference using the minimum statistic’, or ‘prevalence inference’ for short.

The main user interface is given by the function:

```
prevalence(ifn, P2, alpha, prefix)
```

It takes a two-dimensional cell array of image filenames as input, which reference MR images of a given test statistic in several subjects (rows) and under several first-level permutations (columns), where the 1st column has to be based on the original (unpermuted) data. Results of prevalence inference are written to several image files. SPM functions are used to read and write image files, which therefore has to be installed. Images can be read in NIfTI and Analyze format as well as zipped NIfTI, and are written as NIfTI files.

To perform the actual analysis, prevalence calls the function:

```
[results, params] = prevalenceCore(a, P2, alpha)
```

It can also be used directly, for input data that do not have the form of image files. The function provides a simple graphical display of the analysis results, which is updated while more second-level permutations are generated. This function has no external dependencies.

For more information on input and output parameters, use `help prevalence` and `help prevalenceCore` under Matlab.

The script `prevalenceTest` tests the implementation using smoothed images of cross-validated classification accuracy, derived from the data acquired by Cichy, Chen & Haynes (2011). The script can also serve as an example of how to use prevalence.

`prevalencePtoZ` is a utility that converts the p-value images generated by prevalence into z-value images.

This software was developed with SPM8 under Matlab R2015a, but later versions should work, too. It is copyrighted © 2016 by Carsten Allefeld and released under the terms of the GNU General Public License, version 3 or later.