Z. Burda
Jagiellonian University, Marian Smoluchowski Institute of Physics and Mark Kac Complex System Research Center
e-mail: zdzislaw.burda@uj.edu.pl
J. Kornelsen
National Research Council of Canada, Institute for Biodiagnostics, Winnipeg, Calgary, Canada
e-mail: Jennifer.Kornelsen@nrc-cnrc.gc.ca
M. A. Nowak
Jagiellonian University, Marian Smoluchowski Institute of Physics and Mark Kac Complex System Research Center
e-mail: nowak@th.if.uj.edu.pl
U. Sboto-Frankenstein
National Research Council of Canada, Institute for Biodiagnostics, Winnipeg, Calgary, Canada
e-mail: Uta.Sboto-Frankenstein@nrc-cnrc.gc.ca
B. Tomanek
National Research Council of Canada, Institute for Biodiagnostics, Winnipeg, Calgary, Canada
e-mail: Boguslaw.Tomanek@nrc-cnrc.gc.ca
J. Tyburczyk
Jagiellonian University, Faculty of Physics, Astronomy and Applied Computer Science
e-mail: jacek.tyburczyk@uj.edu.pl

Random Matrix approach to fMRI data

We apply random matrix techniques to analyse correlations in Human Brain fMRI data. We reconstruct correlations between different regions of brain. These regions are selected either by purely geometrical voxel position or by physiological a classification given by Brodmann's areas. We analyse spectral properties for covariance matrices and compare the results to some classical results from random matrix theory including Marcenko-Pastur eigenvalue density for Wishart matrices. These result provide us with reference points - a sort of a null hypothesis. We also perform graph theoretical analysis of correlation matrices applying ideas of threshold graphs. Such graphs are constructed using the idea of metric space that is constructed from the correlation matrix for the set of vertices representing different voxels or Bordmann's areas. A threshold graph is a graph between vertices whose distance in this metric space is smaller than a given threshold.