R code for the IG PID for Multivariate Gaussian systems

These notes describe how to use the package R to compute the IG PID for Gaussian systems. The output for the numerical examples in the paper[1] was produced using version 3.6.3 of R within RStudio (2022.07.2), both of which can be downloaded from http://cran.r-project.org.

A script for running Examples 1 and 2 is available in the folder IG_IDEP_MMI, in the file, IGscript.R. Once R is loaded, the user is required to set a working directory and then to load the functions that are contained in the file, IGFuns.R.

Commands given in IGscript.R can then be run by copying and pasting them into R and running them or by selecting and running them in RStudio. Data used in examples 1& 2 in the paper are provided in this file.

The folder IG_IDEP_MMI contains the definitions of three functions, given as follows, as well the folder IdepFuns which contains code to run the Idep and Immi PIDs.

Function	Inputs	Outputs
IG_GaussU_pqr	p, q, r	IG PID (univariate)
IG_GaussM_Dat	sizes, mat	IG PID (multivariate)
IG_GaussM_PQR	sizes, P, Q, R	IG PID (multivariate)

where

- p is the correlation between X_1 and X_2

- q is the correlation between X_1 and X_3

- r is the correlation between X_2 and X_3

- sizes is a numeric list containing the values n_1, n_2, n_3

- mat is a (symmetric) positive definite covariance or correlation matrix

- P is the $n_1 \times n_2$ matrix of cross-correlations between $\mathbf{X}_1$ and $\mathbf{X}_2$

- Q is the $n_1 \times n_3$ matrix of cross-correlations between $\mathbf{X}_1$ and $\mathbf{X}_3$

- R is the $n_2 \times n_3$ matrix of cross-correlations between $\mathbf{X}_2$ and $\mathbf{X}_3$

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[1] A partial information decomposition for multivariate Gaussian systems based on information geometry by Jim W. Kay (*submitted*)