**Instructions**

**To create the data used in the simulation studies**

1. All the scripts are available in the SimulatedData folder.
2. First run the script, “CholeskyDecomp\_p25\_n25\_AR2\_prior\_FFN.m”. The functions that the script needs to run are available in the NecessaryFunctions folder. This script makes the prior.mat file that’s needed to run the simulation.
3. The other simulation combinations are run similarly using the corresponding names of the scripts.

**To run the simulation study in the paper using the Bayesian nonparanormal method,**

1. All the scripts are available in BayesianNonparanormalFunctions folder.
2. First run the script, “CholeskyDecomp\_p25\_n25\_AR2\_HS.m”. The functions that the script needs to run are available in the NecessaryFunctions folder. This script runs the Bayesian nonparanormal method for the horseshoe method and creates the mat file with the estimated matrices for all the hyperparameter settings. Model selection is not performed in this script.
3. To run the script to not do the transformation using the horseshoe method, “CholeskyDecomp\_p25\_n25\_AR2\_HS\_notransform.m”. Model selection is not performed in this script.
4. Second run the script, “CholeskyDecomp\_p25\_n25\_AR2\_SS.m”. The functions that the script needs to run are available in the NecessaryFunctions folder. This script runs the Bayesian nonparanormal method for the Bernoulli-Gaussian method and creates the mat file with the estimated matrices for all the hyperparameter settings.
5. To run the script to not do the transformation using the Bernoulli-Gaussian method, “CholeskyDecomp\_p25\_n25\_AR2\_SS\_notransform.m”.
6. Third run the script, “CholeskyDecomp\_p25\_n25\_AR2\_VB.m”. The functions that the script needs to run are available in the NecessaryFunctions folder. This script runs the Bayesian nonparanormal method for the Variational Bayesian method and creates the mat file with the estimated matrices for all the hyperparameter settings.
7. To run the script to not do the transformation using the Variational Bayesian method, “CholeskyDecomp\_p25\_n25\_AR2\_SS\_notransform.m”.
8. Fourth, to do model selection for the horseshoe method, run the script, “CholeskyDecomp\_p25\_n25\_AR2\_HS\_final.m” and the no transformation, run “CholeskyDecomp\_p25\_n25\_AR2\_HS\_notransform\_final.m”
9. Third, the parameter estimation and structure learning boxplots were created with the script, “CholeskyDecomp\_Boxplot\_Edges\_p25\_n25.m” and “CholeskyDecomp\_Boxplot\_Loss\_p25\_n25.m”. For no transformation, “CholeskyDecomp\_Boxplot\_Edges\_p25\_n25\_notransform.m” and “CholeskyDecomp\_Boxplot\_Loss\_p25\_n25\_notransform.m”

**To run the simulation study in the paper using the nonparanormal and BDGraph methods,**

1. All the scripts are available in the Nonparanormal folder.
2. For the BDGraph method, run the script, “BDGraph\_p25\_n25\_AR2.R” for the p=25 n=25 sparsity = AR(2) simulation combination. This script runs the Bayesian copula graphical model method and does the model selection.
3. For the nonparanormal method, run the script, “Frequentist\_p25\_n25\_AR2.R” for the p=25 n=25 sparsity = AR(2) simulation combination. This script runs the truncated nonparanormal method and does the model selection.
4. The other simulation combinations are run similarly using the corresponding names of the scripts.

**Create the Data for the Simulation Tables**

1. All the scripts are available in the SimulationTables folder.
2. Run the script, “CholeskyDecomp\_Boxplot\_Edges\_table.R” in order to pull together the data to construct the boxplots for all of the methods considered.

**To run the Real Data Example**

1. The script is available in the RealDataExample folder. The data, “Bsplines\_paper\_realdata\_initialdata.mat” is available in this folder. The original dataset is available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC545783/
2. To run the Bayesian nonparanormal method for horseshoe on the dataset, run, “RealData\_CholeskyDecomp\_HS\_Wille.m”
3. To run the Bayesian nonparanormal method for Bernoulli-Gaussian on the dataset, run, “RealData\_CholeskyDecomp\_SS\_Wille.m”
4. To run the Bayesian nonparanormal method for Variational Bayesian on the dataset, run, “RealData\_CholeskyDecomp\_VB\_Wille.m”
5. Third, to run the Bayesian copula method on the dataset, run, “RealData\_BDGraph\_Wille.R”.
6. Fourth, to run the nonparanormal method on the dataset, run, “RealData\_Frequentist\_Wille.R”.
7. Fifth, to create the graphs, run, “BayesNonpar\_RealData\_Graphs.m”.

**Additional Dependencies**

* MATLAB Symbolic Toolbox
* MATLAB Optimization Toolbox
* MATLAB Statistics and Machine Learning Toolbox
* HMC Exact: <https://github.com/aripakman/hmc-tmg>
* B-splines: <https://www.mathworks.com/matlabcentral/fileexchange/27374-b-splines?focused=5252160&tab=function>
* Matrix inverse: <https://www.mathworks.com/matlabcentral/fileexchange/34511-fast-and-accurate-symmetric-positive-definite-matrix-inverse-using-cholesky-decomposition>
* Nearest positive definite matrix: <https://www.mathworks.com/matlabcentral/fileexchange/42885-nearestspd>
* Gauss Quadrature: <https://www.mathworks.com/matlabcentral/fileexchange/26737-legendre-laguerre-and-hermite-gauss-quadrature?focused=5147547&tab=function>
* R and MATLAB read/write package: <https://cran.r-project.org/web/packages/R.matlab/index.html>
* Huge package: <https://cran.r-project.org/web/packages/huge/index.html>
* Xtable: <https://cran.r-project.org/web/packages/xtable/index.html>
* Real Data example: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC545783/>
* Circular graphs: <https://www.mathworks.com/matlabcentral/fileexchange/48576-circulargraph>