A comparison of multi-response prediction methods

Raju Rimal, Trygve Almøy and Solve Sæbø

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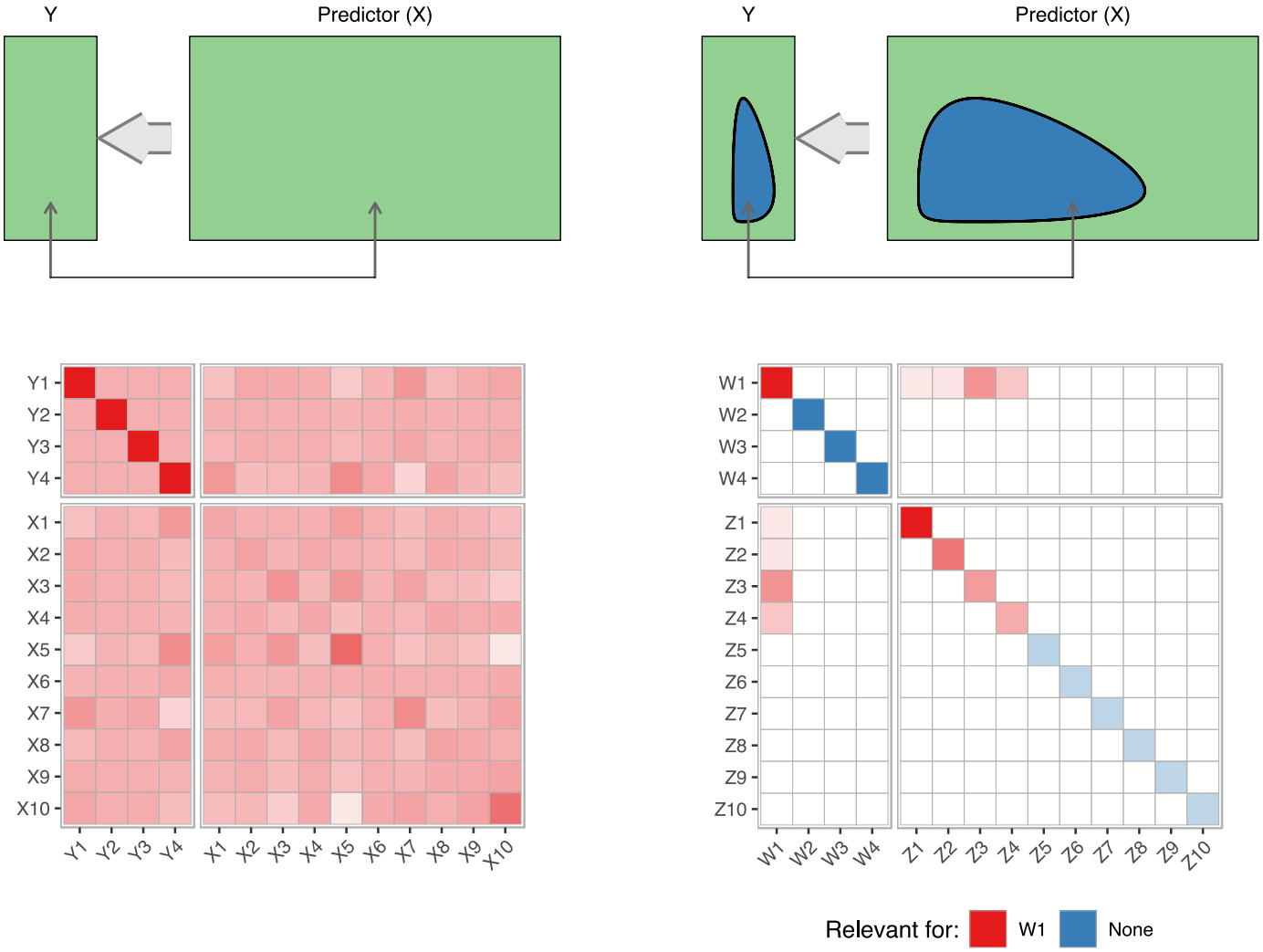
https://therimalaya.github.io/SSC16

Linear Model

Relevant and Irrelevant Space



Methods

- PCR
- PLS1
- PLS2
- Xenv
- Senv

Principal Component Regression (PCR)

Partial Least Squares

Modeling individual response separately (PLS1)

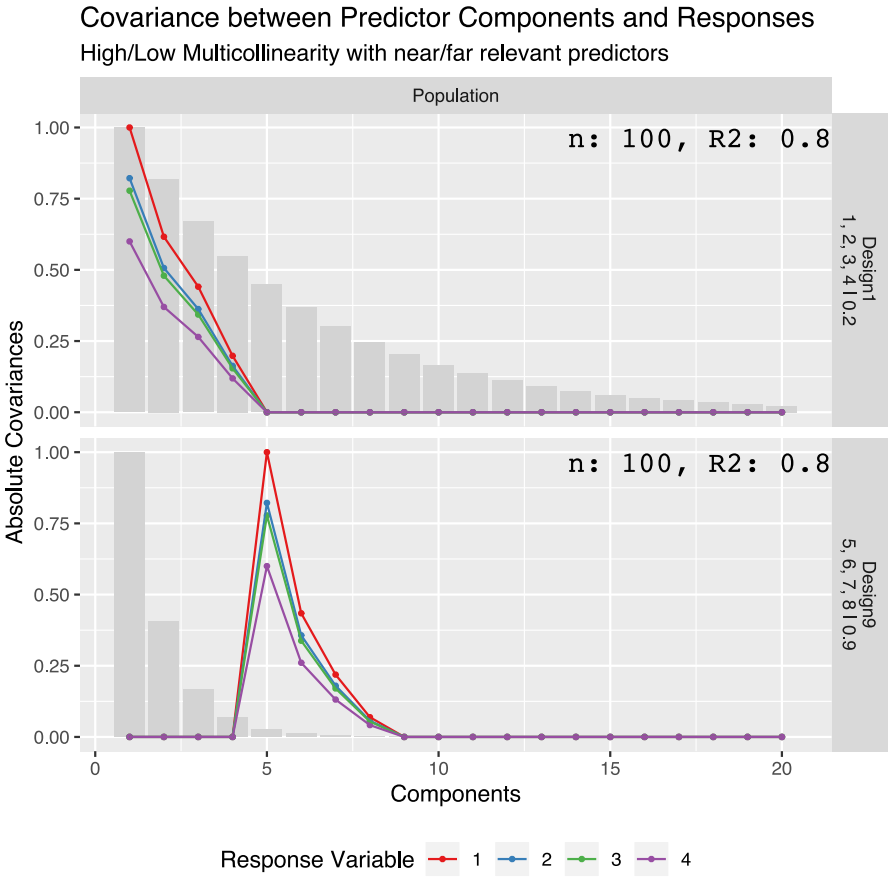
Modeling all responses together (PLS2)

Envelopes

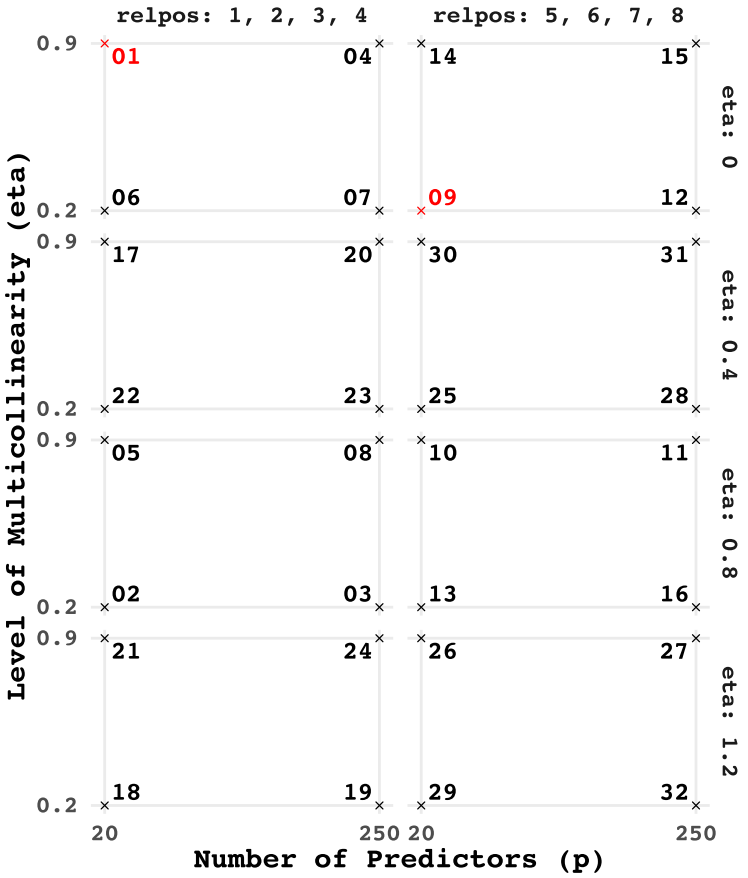
Envelopes in Predictor Space (Xenv)

Simulteneous Envelopes (Senv)

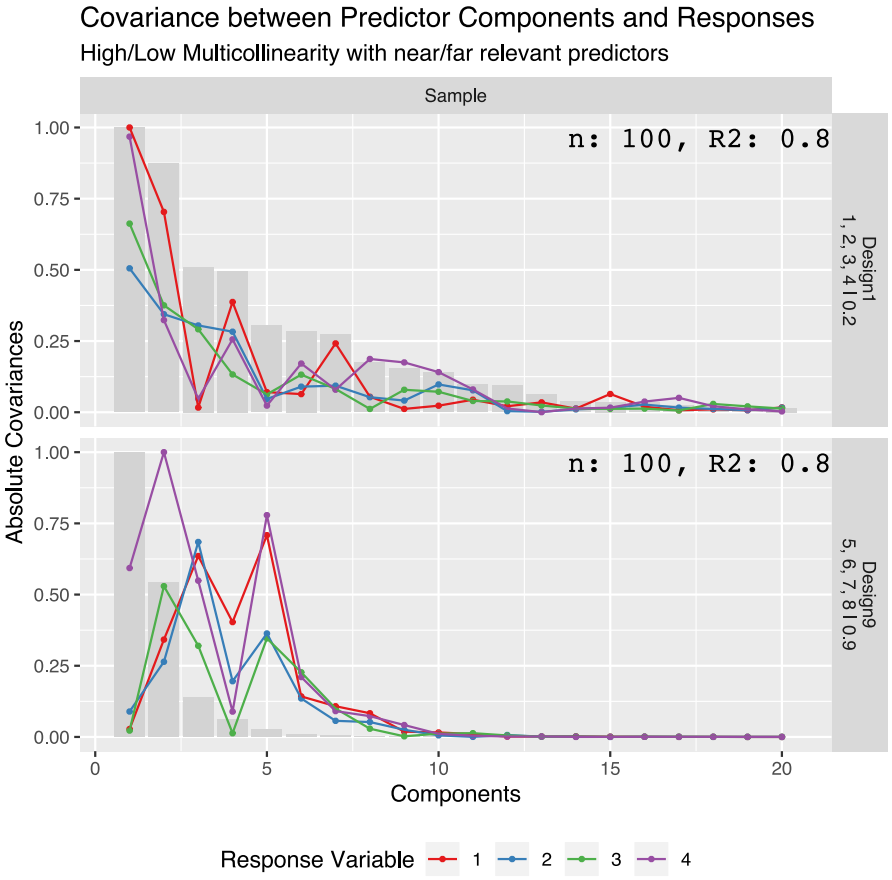
Simulation



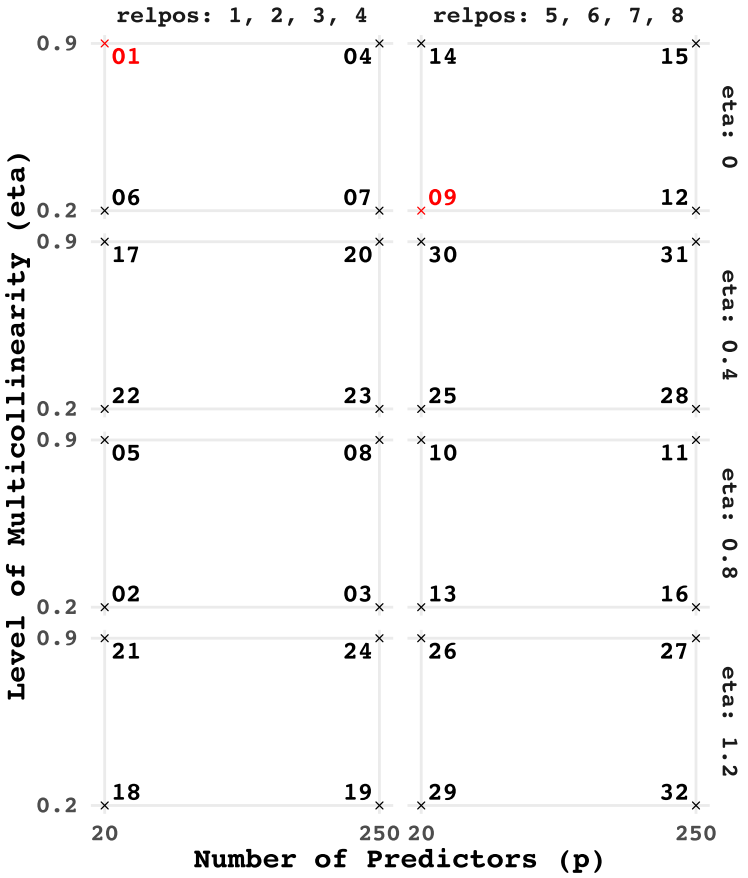
Experimental Design



Simulation



Experimental Design



Data for Analysis

Data for Further Analysis

Response can be Average Miniumum Error or
Avg. Number of Components used to obtain Minimum Error

Factors						Y1	Y2	Y3	Y4
Level of Multicollinearity gamma: 0.2 and 0.9	Level of Response Correlation eta: 0, 0.4, 0.8 and 1.2	Methods PCR, PLS1, PLS2, Xenv and Senv	Number of Components 0, 1, 2, ..., 10	Number of Predictors p:50 and 250	Position of relevant predictor components relpos: 1, 2, 3, 4 and 5, 6, 7, 8	Min. Prediction Error (Min. Components) Corresponding to Response Y1	Min. Prediction Error (Min. Components) Corresponding to Response Y2	Min. Prediction Error (Min. Components) Corresponding to Response Y3	Min. Prediction Error (Min. Components) Corresponding to Response Y4

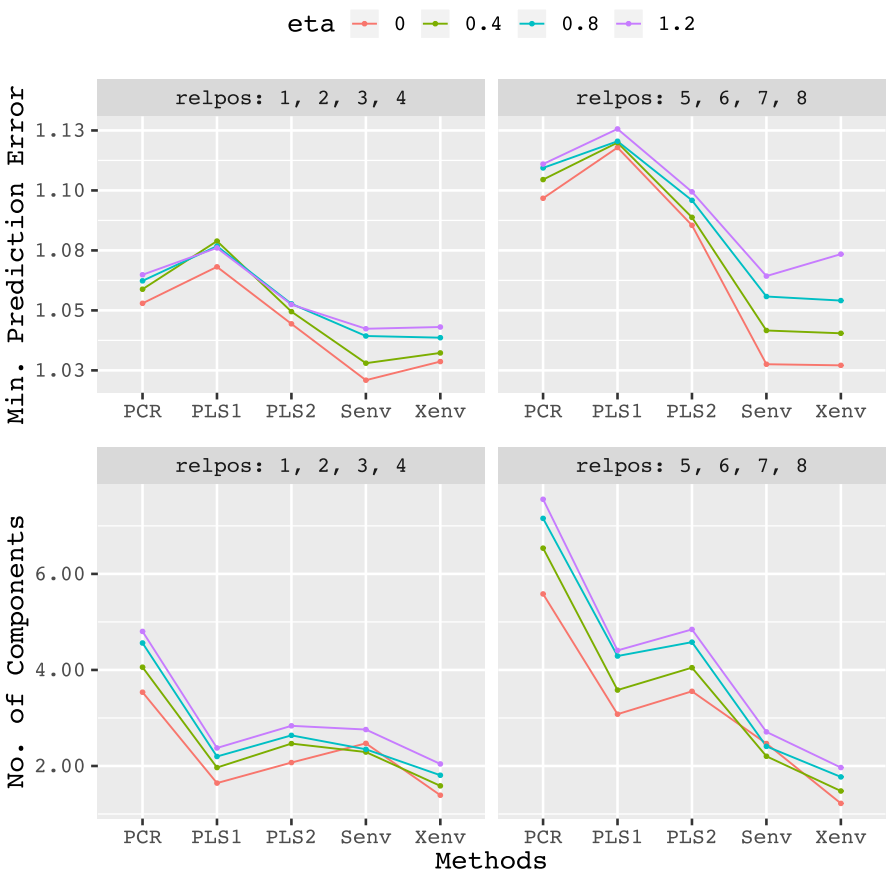
Error Model

$$\texttt{Pred. Error} \sim (\texttt{p} + \texttt{relpos} + \texttt{gamma} + \texttt{eta} + \texttt{Methods})^3$$

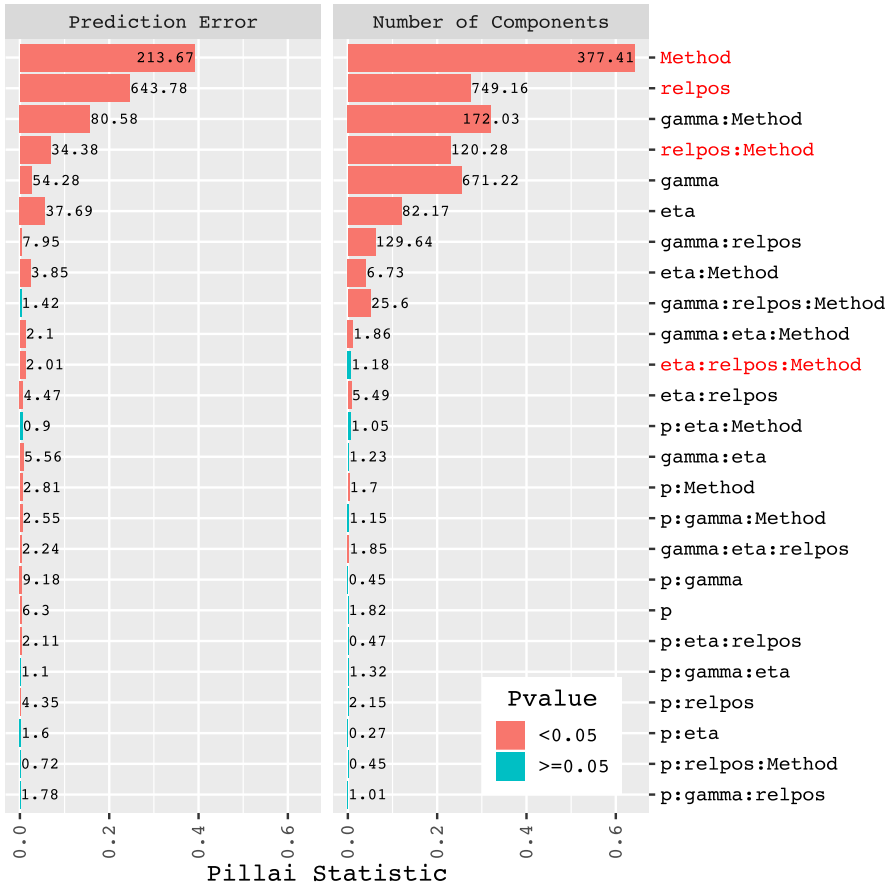
Component Model

$$\texttt{Min. Components} \sim (\texttt{p} + \texttt{relpos} + \texttt{gamma} + \texttt{eta} + \texttt{Methods})^3$$

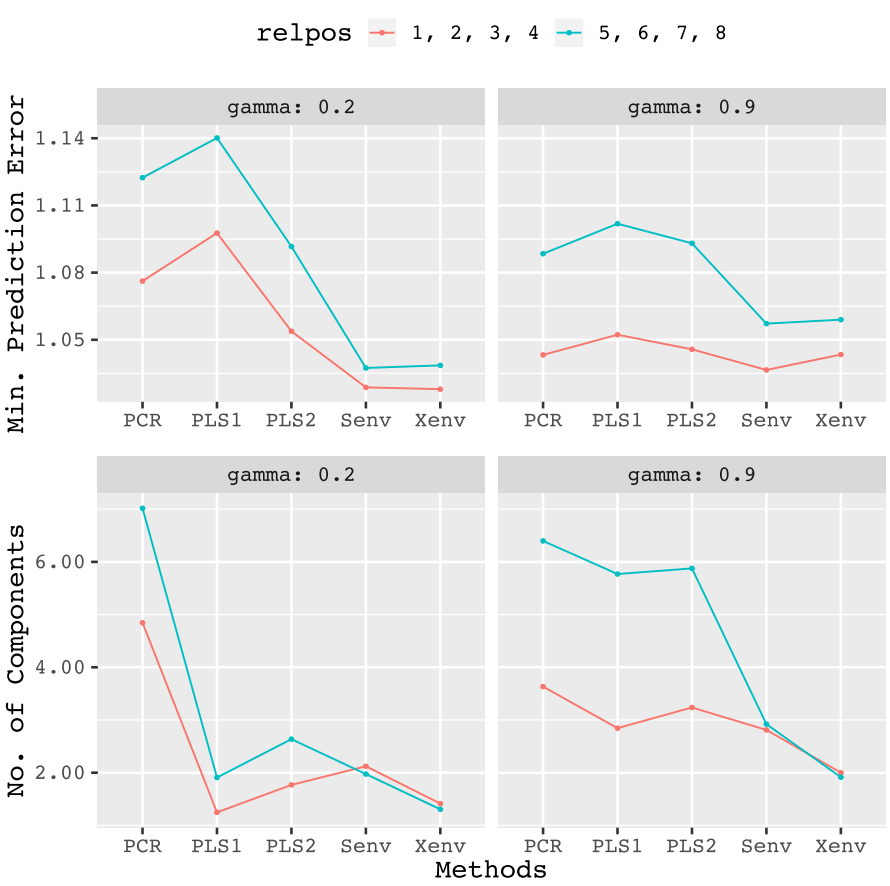
Prediction Error



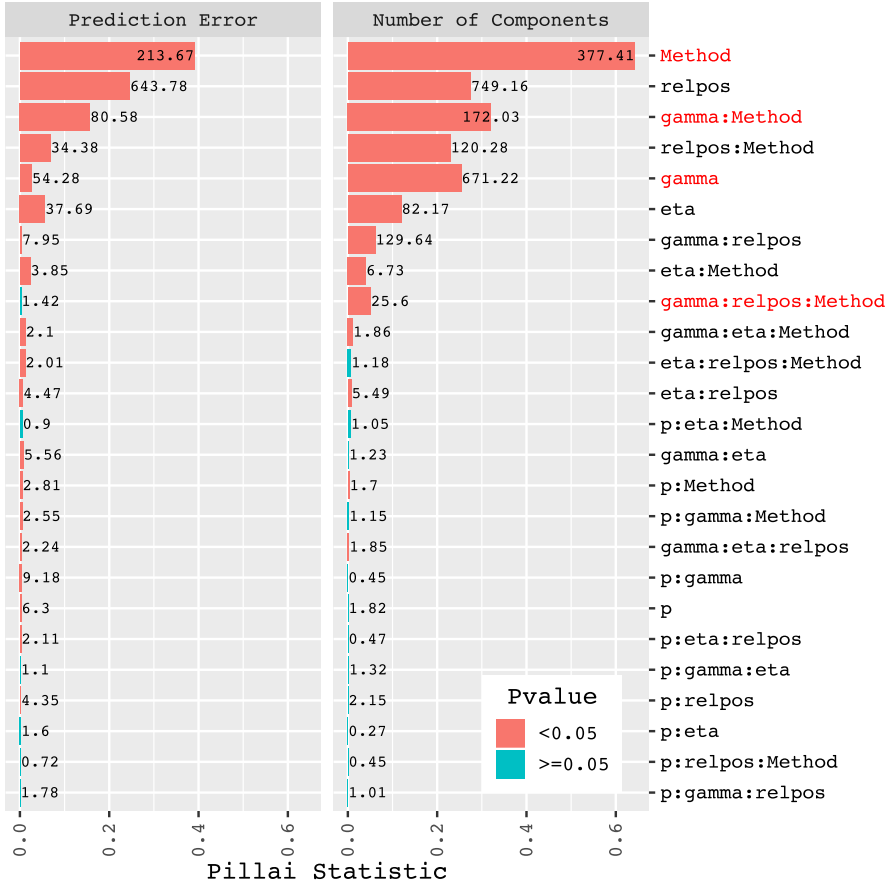
Manova



Prediction Error



Manova



Supervisors

Solve Sæbø

NMBU

Trygve Almøy

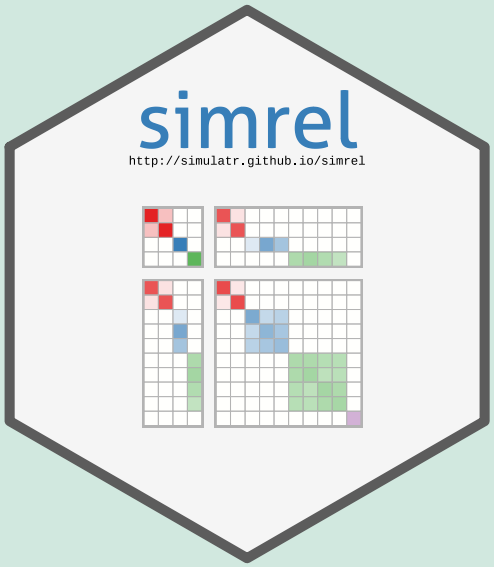
NMBU

BioStatistics

Norges miljø- og biovitenskapelige universitet

References

R-package: `simrel`



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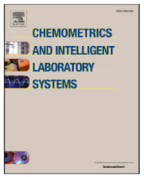

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Raju Rimal [a,*], Trygve Almøy [a], Solve Sæbø [b]

[a] Faculty of Chemistry and Bioinformatics, Norwegian University of Life Sciences, Ås, Norway
[b] Norwegian University of Life Sciences, Ås, Norway