Gaydos, Travis L.; Heckman, Nancy E.; Kirkpatrick, Mark; Stinchcombe, J. R.; Schmitt, Johanna; Kingsolver, Joel; Marron, J. S.

Visualizing genetic constraints. (English) [Zbl 1288.62101]

Summary: Principal Components Analysis (PCA) is a common way to study the sources of variation in a high-dimensional data set. Typically, the leading principal components are used to understand the variation in the data or to reduce the dimension of the data for subsequent analysis. The remaining principal components are ignored since they explain little of the variation in the data. However, evolutionary biologists gain important insights from these low variation directions. Specifically, they are interested in directions of low genetic variability that are biologically interpretable. These directions are called ‘genetic constraints’ and indicate directions in which a trait cannot evolve through selection. We propose studying the subspace spanned by low variance principal components by determining vectors in this subspace that are simplest. Our method and accompanying graphical displays enhance the biologist’s ability to visualize the subspace and identify interpretable directions of low genetic variability that align with simple directions.

MSC:
62H25 Factor analysis and principal components; correspondence analysis
92D15 Problems related to evolution
62A09 Graphical methods in statistics
65C60 Computational problems in statistics (MSC2010)

Full Text: DOI arXiv Euclid

References:


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