

Data are not only ubiquitous in society but are increasingly complex in both size and dimensionality. Dimension reduction offers researchers and scholars the ability to make such complex, high-dimensional data spaces simpler and more manageable. This Element offers readers a suite of modern unsupervised dimension reduction techniques along with hundreds of lines of R code to efficiently represent the original high-dimensional data space in a simplified, lower-dimensional subspace. Launching from the earliest dimension reduction technique principal components analysis and using real social science data, I introduce and walk readers through application of the following techniques: locally linear embedding, t-distributed stochastic neighbor embedding (t-SNE), uniform manifold approximation and projection, self-organizing maps, and deep autoencoders. The result is a well-stocked toolbox of unsupervised algorithms for tackling the complexities of high-dimensional data so common in modern society. All code is publicly accessible on Github.

#### About the Series

The Elements Series Quantitative and Computational Methods for the Social Sciences contains short introductions and hands-on tutorials to innovative methodologies. These are often so new that they have no textbook treatment or no detailed treatment on how the method is used in practice. Among emerging areas of interest for social scientists, the series presents machine learning methods, the use of new technologies for the collection of data and new techniques for assessing causality with experimental and quasi-experimental data.

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