




Article

# Dataset Reduction Techniques to Enable SVD Analysis

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**Abstract:** Performing an SVD analysis on large datasets can be time consuming and costly. Often, techniques exist to arrive at the same output, or at a close approximation, which require far less effort. This article looks at several such techniques and at the inherent scale of the structure within the data. When the values of a dataset vary slowly, e.g. in a spatial field of temperature over a country, there is a high level of autocorrelation and the structure of the field has a large scale. Datasets need not have a high resolution to describe such fields. Using generated *Gaussian Random Fields* with various levels of autocorrelation, we examine rank decomposition, coarsening and approximate SVD procedures. This article outlines when certain techniques can be useful and makes predictions about the error incurred in the approximate techniques based on the level of autocorrelation of the input datasets. Finally, these techniques and predictions are verified using real-world geospatial datasets.

**Keywords:** Singular value decomposition, autocorrelation, data reduction, coarsening, approximate SVD, Gaussian Random Fields

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## Abbreviations

The following abbreviations are used in this manuscript:

|      |  |
|------|--|
| MDPI | Multidisciplinary Digital Publishing Institute |
| DOAJ | Directory of open access journals              |
| TLA  | Three letter acronym                           |
| LD   | linear dichroism                               |

## Appendix A

### *Appendix A.1*

The appendix is an optional section that can contain details and data supplemental to the main text. For example, explanations of experimental details that would disrupt the flow of the main text, but nonetheless remain crucial to understanding and reproducing the research shown; figures of replicates for experiments of which representative data is shown in the main text can be added here if brief, or as Supplementary data. Mathematical proofs of results not central to the paper can be added as an appendix.

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## References

1. Author1, T. The title of the cited article. *Journal Abbreviation* **2008**, *10*, 142-149, DOI.
2. Author2, L. The title of the cited contribution. In *The Book Title*; Editor1, F., Editor2, A., Eds.; Publishing House: City, Country, 2007; pp. 32-58, ISBN.

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