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## Visual exploration of high-dimensional data using dimensionality reduction

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# PROPOSITIONS

accompanying the thesis

## VISUAL EXPLORATION OF HIGH-DIMENSIONAL DATA USING DIMENSIONALITY REDUCTION

*with Applications in Astronomy*

by

YOUNGJOO KIM

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1. Dimensionality reduction methods are lenses that allow us to see beyond the limit of three dimensions in the form of visual abstraction.  
*- Chapter 1*
2. The visual separation of clusters in multidimensional projections supports the exploration and analysis of high-dimensional data.  
*- Chapters 2 & 3 & 5*
3. No single dimensionality reduction method can guarantee visual cluster separation for all data sets and problems.  
*- Chapters 2 & 4*
4. Sharpened dimensionality reduction enhances the visual cluster separation of high-dimensional data.  
*- Chapters 2 & 3 & 4*
5. Finding the right balance between under- and over-segmentation in a projection is non-trivial.  
*- Chapters 2 & 4*
6. Neural networks help retain desirable properties of dimensionality reduction such as dimensional scalability, computational scalability, genericity, ease-of-use, and stability.  
*- Chapter 4*
7. The value of a quantitative metric is often limited to a number that cannot fully capture the qualitative assessment made by the human mind.
8. Interdisciplinary research is an essential collaborative approach to knowledge discovery that transcends traditional disciplinary boundaries, yielding new perspectives and solutions to complex problems.
9. Science is driven by fundamental and philosophical questions about our existence, and progresses in the form of art.