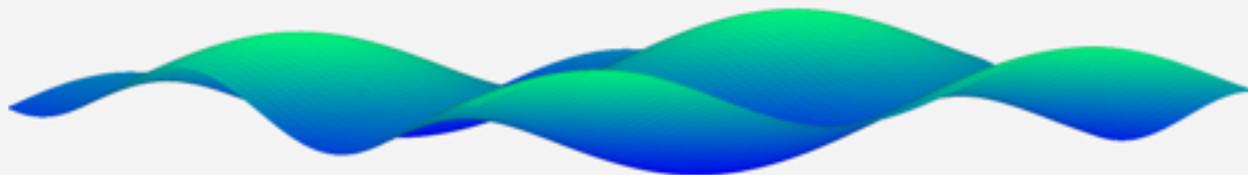


# Student Project

## Tensorplot: Interactive Visualization of High-Dimensional Data



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### Topic

High-dimensional data is often hard to interactively explore, visualize and understand. Unfortunately, the most usual visualization diagrams are limited to 2 or 3 dimensions and are difficult to use for complex and structurally rich data sets in higher dimensions. While many libraries and software packages exist for navigating sparse data (where each sample is a point), dense data is more challenging. The goal of this project is to develop a **GUI to interactively explore multidimensional data** (3 dimensions or more). For many dimensions and/or large grid sizes, data should be managed in a compressed format. We want to use a framework for handling compressed information, called tensor decomposition, that can greatly simplify the input. The data sets and the compression framework will be provided and are not part of the expected tasks. Upon completion of the project, the GUI will be integrated as a part of the framework

and released as an **open source package**.

### Assignment

The project will be implemented in **Python**. As a first stage, you should familiarize yourself with a) a plotting library (for example *matplotlib*); b) a GUI framework (for example *TkInter*); and c) manipulation of multidimensional arrays in Python (*NumPy*). Based on this you should create an interactive interface where the user can select a region of the data set and obtain a chart out of it (1D plots, surface plots, etc.). Finally, you should implement a number of additional visualization diagrams that are especially well-suited for high-dimensional data (projections, parallel coordinates, dimensional stacking). The routines that you write to produce all diagrams should be grouped into an API and delivered along their documentation.

### Requirements

Interest in scientific and information visualization. Experience with GUI programming and knowledge of linear algebra would be beneficial.

### Work Load

- 20% theory
- 65% implementation
- 15% testing

### Student Project Type

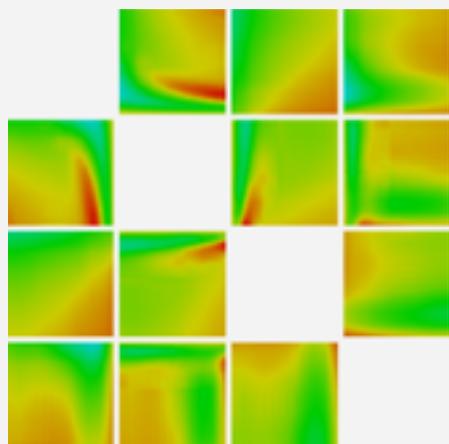
This project can fit into a Software or Master Project.

### Supervision

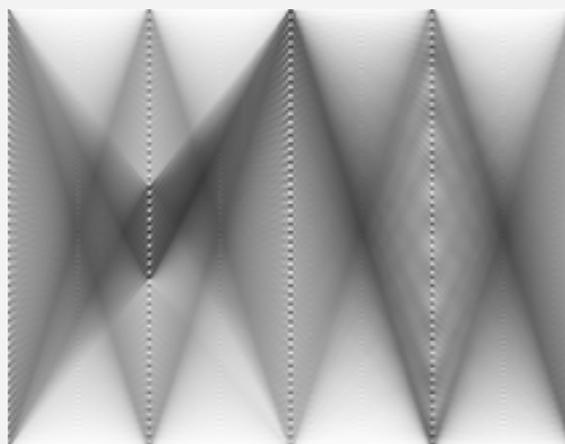
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Rafael Ballester (Assistant)

### Contact

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Projections of a 4D data set



Parallel coordinates (5 dimensions)