Title:

Bridging Cognitive Gaps Between User and Model in Interactive Dimension Reduction

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Abstract:

Interactive machine learning (ML) systems are difficult to design because of the "Two Black Boxes" problem that exists at the interface between human and machine. Many algorithms that are used in interactive ML systems are black boxes that are presented to users, while the human cognition represents a second black box that can be difficult for the algorithm to interpret. These black boxes create cognitive gaps between the user and the interactive ML model. In this paper, we identify several cognitive gaps that exist in a previously-developed interactive visual analytics (VA) system, Andromeda, but are also representative of common problems in other VA systems. Our goal with this work is to open both black boxes and bridge these cognitive gaps by making usability improvements to the original Andromeda system. These include designing new visual features to help people better understand how Andromeda processes and interacts with data, as well as improving the underlying algorithm so that the system can better implement the intent of the user during the data exploration process. We evaluate our designs through both qualitative and quantitative analysis, and the results confirm that the improved Andromeda system outperforms the original version in a series of high-dimensional data analysis tasks.

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