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Stat 517

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Literature Review Critique

Dimensionality Reduction: A Comparative Review, Maaten et al., 2009

Written by Dalyn McCauley

**Length of Paper**

This paper goes through thirteen ways that dimensional reduction can, and possibly should, be done. Since many data sets are much too large to compute with the meager computers researchers have on hand, dimensional reduction is necessary to keep the computational burden reasonable. The authors argue that PCA, although the most common method, is inappropriate in some situations, outlining the strengths and weaknesses of each method within the paper. Due to space constraints, this literature review looked at five of these methods, picking exemplars from each category described within the paper. In this regard, the length of the paper was very well planned. It was long enough to give good explanations and insights into each technique but short enough to not get lost in the weeds, so to speak.

**Depth of Understanding**

After reading the literature review, it becomes apparent that the author understands the paper. The explanations are clear and concise, which can only be done when a firm grasp of the concepts have been achieved. She understood the paper enough to make educated decisions on which methods to discuss, cherry picking the most helpful methods, as described in the paper.

**Completeness**

The author clearly made an effort to cover the topics as thoroughly as possible, given the size constraints. Although the original article does not include any illustrations to the points it was making, she researched the topics to find other articles and include the relevant charts and graphs from them. Choosing the methods of dimensionality reduction as she did ensured the literature review covered the breadth of knowledge discussed within the paper, letting the more redundant methods stay in the original paper.

**Difficulty**

The paper itself was quite difficult, delving into the math behind the conclusions. Not only did the paper explain the theory behind the methods, the author also had to juggle how each method was evaluated. Explaining the computational load on a computer was made more difficult because even that was explained in theoretical values.

**Comprehensiveness**

The literature review encompassed the article well, explaining each chosen form of dimensionality reduction very well. The article measures these methods by reducing artificial and natural datasets, which she also describes in depth. I would have liked to see an explanation as to why each method worked as well as they did on one or the other. Some methods were found to perform better on the artificial than natural datasets; for a better understanding as to when to apply each method, an explanation as to why this happened would have been nice.

**Clarity**

This paper was well written, even formatted in such a way as to make it easy to understand the material. There was a logical flow from one section to the next that allowed an easy comparison between the methods. Her added research into these methods to afford the reader illustrations made the paper that much more comprehensible. This scaffolded her best point made in the paper. The chart showing the computational loads and performance of each method of dimensionality reduction made her explanations as to which method performed better that much clearer.