Robust Principal Components Analysis Algorithm (20110246, Dr. Gilad Lerman)

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Principal Components Analysis Algorithm

A principal components analysis (PCA) algorithm has been created which is more robust to outliers and data corruption than those in current usage. PCA is one of the most useful and widely used algorithms for data analysis and is useful in areas of data mining and machine learning, but is very sensitive to outliers and corruption. The developed alternative PCA algorithm is not only much more robust with respect to these issues, the speed and performance is comparable to currently available PCA algorithms. In comparison to other robust PCA algorithms it is 1 to 2-orders of magnitude more efficient.

Moving Object Identification and Face Recognition Applications

One application of this algorithm is in video surveillance: identifying moving objects as outliers by partitioning foreground objects from the background. Points associated with the moving object and the background are partitioned, respectively, into separate subspaces. Other applications include removal of shading for facial recognition, identification of the same structure from different viewing angles, and reconstruction of 3-dimensional structures from multiple 2-dimensional images. Extensions of the algorithm provide online processing, which is the ability to add new data without requiring re-processing of the entire data set.

Benefits of Robust PCA Algorithm:

- More robust to outliers and data corruption than currently used PCA algorithms.
- Speed and performance comparable to currently available PCA algorithms.
- Potential applications include identifying moving objects in video surveillance and facial recognition.

Phase of Development All methods and theory have been finalized and initial testing on real data has been performed.

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