Award #: 1835821

CSSI Element: <A high performance suite of SVD related solvers for machine learning>
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1. SVD methods in distance-based learning

➢ Motivation

- The need for investigation of the interplay between SVD solvers and ML algorithm
- Clarify the best practice guidelines
- Propose new algorithms /improve the current existing SVD related algorithms

➢ Our contribution

We examine 3 categories

1. Kernel ridge regression and speedup methods
2. Matrix completion /Nuclear norm
3. Spectral clustering

Key research questions:

1. With different types of eigenvalue distribution, how to identify the termination conditions to make better ML performance?
2. What are the bottleneck in real dataset using SVD and how to speed up the algorithms?

2. Low-Rank Stopping Criteria for Block Parallel SVD

➢ Motivation

- Most SVD algorithms only provide a residual stopping criterion: limit the number of total iterations, matrix vector multiplications, or its execution time
- Lack guarantee on the accuracy

➢ Our contribution

1. New stopping criteria for block parallel SVD algorithms
2. Provide heuristics for dynamically changing both block and restart sizes when necessary
3. Show the performance in both synthetic and real-world applications