Matrix completion from any given set of observables

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Joint work with Adi Shraibman
Matrix Completion Problem

Alice

Bob

Finding Nemo

Pulp Fiction

Gravity

8

4

9

3

?

?
Basic Algorithm

Find matrix of minimum complexity that agrees with the observed entries.

What complexity measure? Proxy for matrix rank

\[
\begin{pmatrix}
-0.5 & 1 & 8.1 \\
2 & 0.1 & 9
\end{pmatrix}
\]

Movie Rating
Our Contribution

The performance of the trace norm algorithm is well-studied for observations made uniformly at random.

In practice observations can be highly correlated.

For any given set of observed entries, we bound the mean squared error of the algorithm with respect to a given probability distribution.

We tie the performance of the algorithm to the complexity of the set of observations.