DSI WARS
Case Study III:
A New Recommender

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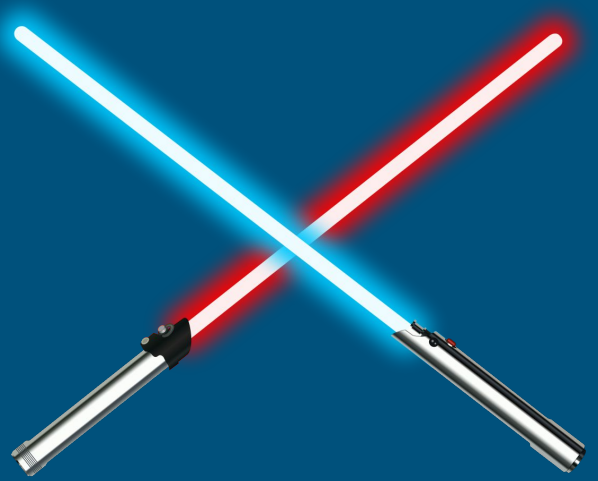
You will never find a more wretched hive of bad recommendations and villainy

- We're missing sales due to poor recommendations.
  - We don't show customers movies they are likely to enjoy (and buy).
  - Customers shop elsewhere because they receive recommendations for movies that they will like.
- We want to make these sales!
  - Good recommendations will make customers think of us first when looking for new movies!



Singular-value Decomposition: A more elegant model from a more civilized time

- Singular-value Decomposition (SVD) can find underlying features of movies, allowing us to group movies based on these attributes.
- For example, we can measure the underlying “action-ness” of a movie and create a detailed profile based on many such features.
  - These features do not have to match our notions of genre. Thus, SVD can find user preferences that we may not be able to define well or even find!
- Using these latent features, we can match users to unrated movies that closely match their preferences.
- Most importantly, the model is well-tested and easily deployable.

Use the SVD: An example prediction

After training our SVD model, we can predict the movies that a user would most likely enjoy and what they would rate that movie

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Top known movies for user 601:
Henry Fool (1997) | Genre: Comedy|Drama
Fear and Loathing in Las Vegas (1998) | Genre: Comedy|Drama
Usual Suspects, The (1995) | Genre: Crime|Thriller
Poltergeist (1982) | Genre: Horror|Thriller
Evil Dead II (Dead By Dawn) (1987) | Genre: Action|Adventure|Comedy|Horror

Top predictions for user 601:
Big Lebowski, The (1998) | Genre: Comedy|Crime|Mystery|Thriller
Monty Python and the Holy Grail (1974) | Genre: Comedy
Godfather, The (1972) | Genre: Action|Crime|Drama
Reservoir Dogs (1992) | Genre: Crime|Thriller
Godfather: Part II, The (1974) | Genre: Action|Crime|Drama
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These predictions are more accurate than those calculated by the current model.

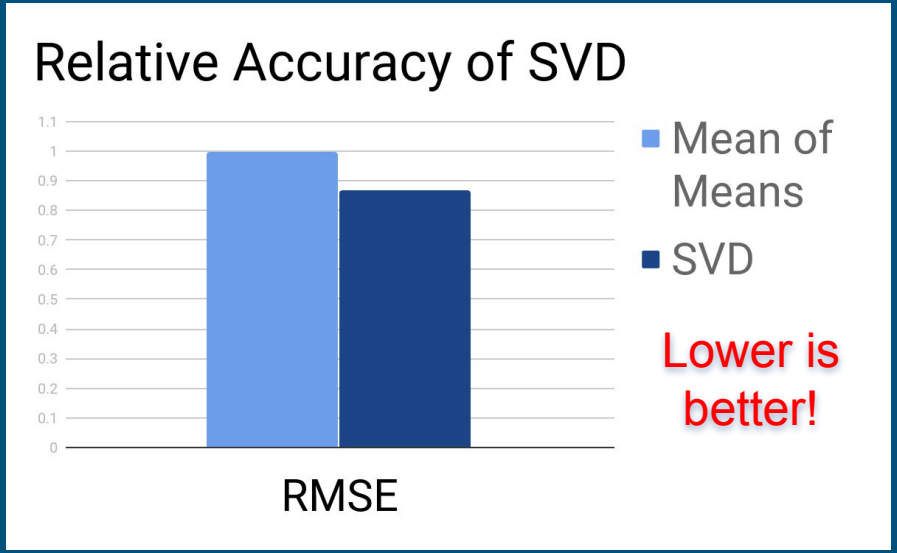
It’s not an RMSE the SVD would tell you...

The dataset consists of 1 million users and 1682 movies and was evaluated using five-fold cross validation (training the model using ⅘ of the data and measuring the error on the remaining ⅕, averaged across all 5 segments).

Mean of Means (current system)
RMSE: 0.997
Runtime: 87 s

SVD
Mean RMSE: 0.874
Runtime: 278 s

RMSE is the square root of the variance of the residuals and a good measure of how accurately the model predicts the response



***Runtimes calculated on 4-year-old laptop**

The Dark Side of the SVD
(SVD cons and other recommender options)

SVD produces recommendations based on

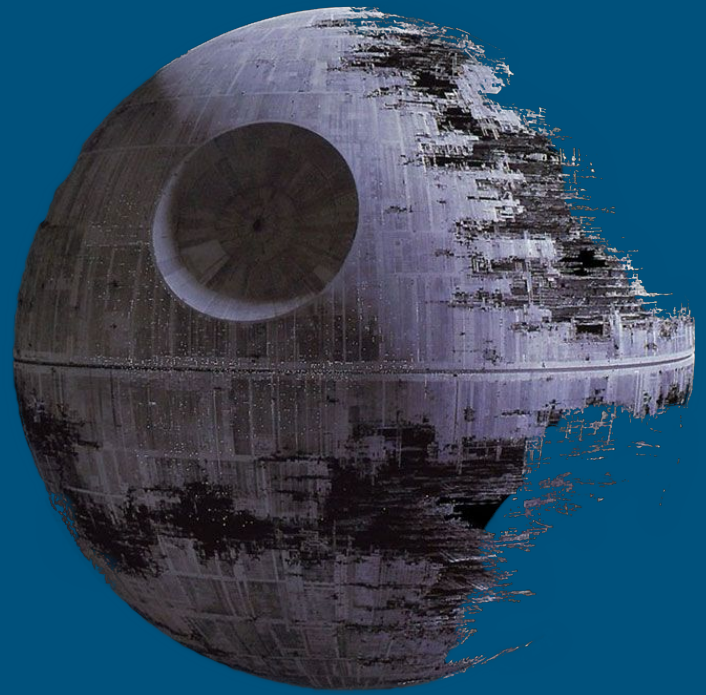
- Latent features that can be hard to interpret
- Performs poorly with strongly non-linear data

BUT

- SVD runs faster and makes better predictions than other related algorithms

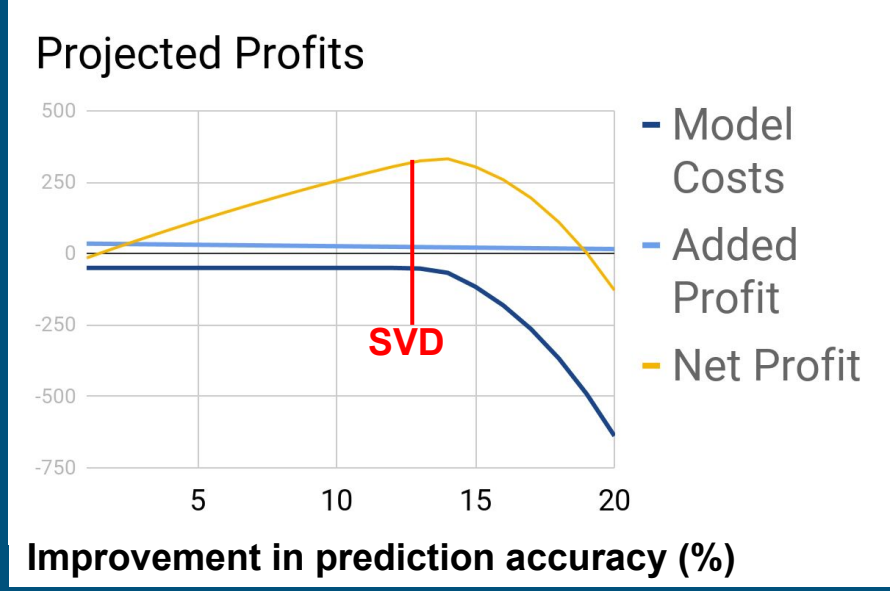
Witness the power of this fully operational model!

- How much will our customers respond to an improvement of this magnitude?
  - Model can be deployed to a subset of users to determine how they respond to improvements in recommendations (A/B testing).



The SVD Awakens

- Current results are based on a simple and *quickly optimized* SVD model. This is strictly out of the box and a clear improvement over our current system, giving an immediate 13% improvement in performance.
  - Need to determine the predicted benefits of improvements before investing heavily.
- Every percent improvement in the model wins a few extra sales.
  - Increased sales are shown as a constantly decreasing may behave differently (light blue line).



- Improvements to the SVD (or other) model may be difficult and very costly.
  - A/B testing of the simple SVD model should help determine these profits/losses.
  - We can revisit the model when we have more info about customer response.

Dedicated to Rand’s dog’s leg

He fell down the stairs and may have broken it :(