EduRank: A Collaborative Filtering Approach to Personalization in E-learning

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Background

- Growing prevalence of e-learning systems
- Strong need to accommodate to individual differences
- Abundance of datasets from large scale systems with millions of records
- Naive personalization choice: predict success in a given question
- But… best case performance is poor: RMSE of 0.28 for a scale of [0..1]
- Multitude of signals available in the datasets, including retries and solution duration. Example from K12 data set of grade distribution before and after using retries

EduRank Approach

- Ranking Focus
  - Rank a set of questions by Personal difficulty per student
- Algorithm
  - Use grades, number of retries and Time spent to solve question
  - Use AP metric to give more importance To harder questions
  - Infer ranking directly rather than Predicting performance
  - Combine Collaborative Filtering and Social Choice to aggregate rankings Of similar students

Results

- AP Metric
  EduRank significantly outperforms state of the art algorithms

- NDPM Metric
  EduRank significantly outperforms state of the art algorithms

Take-home points

- Ranking focus vs. rating focus
- EduRank managed to outperform a variety of personalization and non-personalization methods
- Can support teachers in tailoring problem sets to individual students and students in informing them about area they need to strengthen