

Item Ordering Biases in Educational Data

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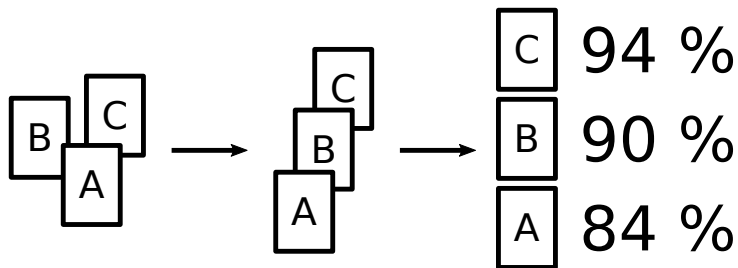


AIED 2019

Biases in Educational Data

- self-selection
- attrition, mastery
- **item ordering**

Item Ordering Bias Example



Why Does It Matter?

- collected data are used to modify the system
- bias in data → misleading conclusion → wrong action

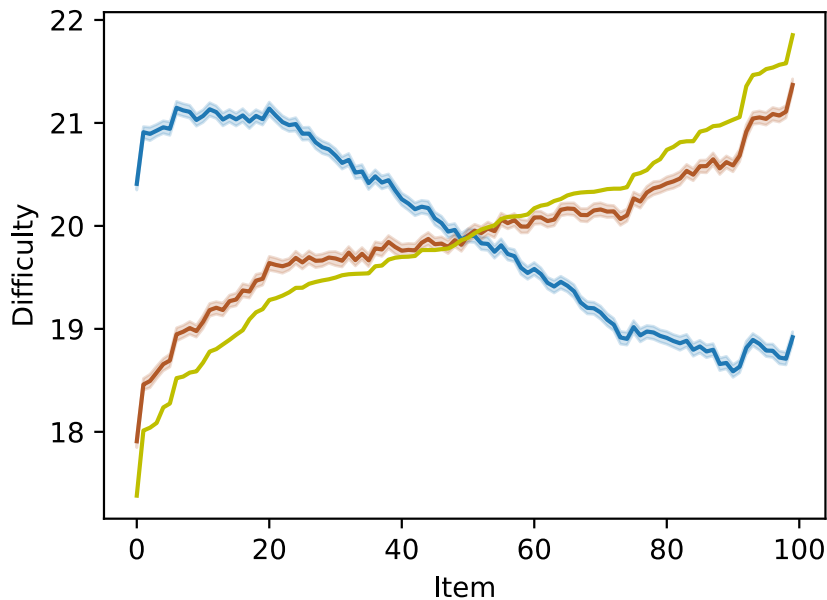
How to Explore It?

- difficult from already collected data
- easy through simulations

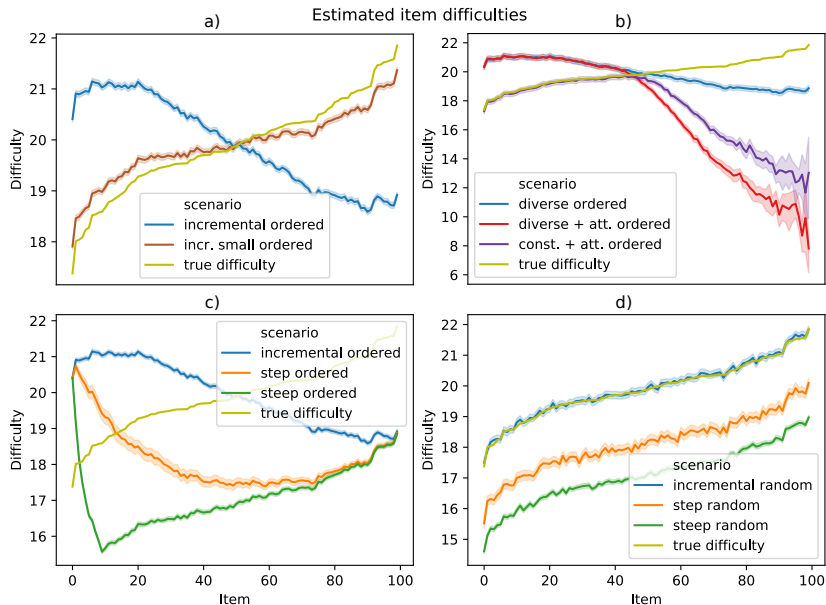
Simulation Setup

- 1 take an available student
- 2 select an item
- 3 generate a solving time using a model
- 4 repeat

Simulation Results



Simulation Results (cont.)



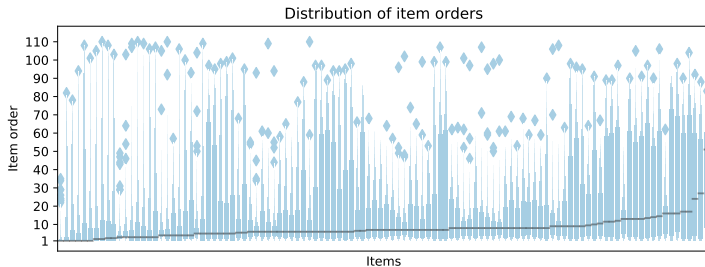
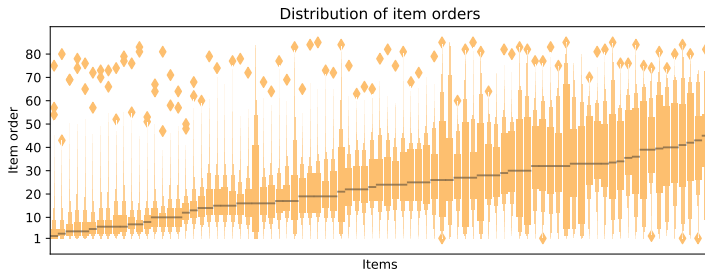
Simulation Results – Takeaway

- relation between skill and difficulty increases is important
- randomization helps
- attrition can amplify the problem

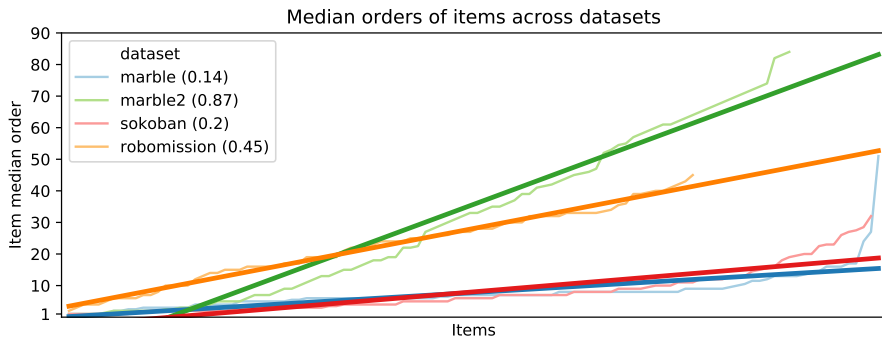
Is It Relevant to Me?

- it depends
- are student solving sequences random

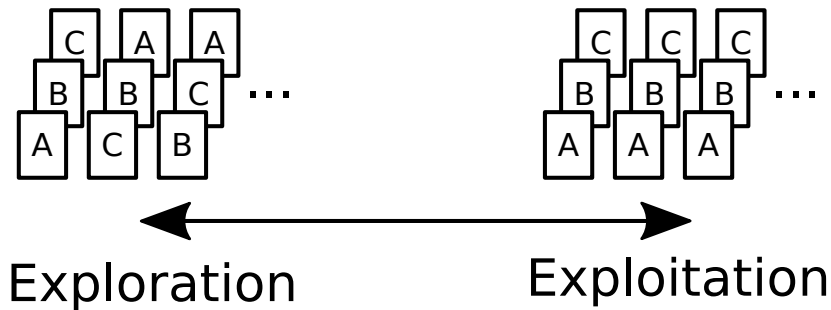
Is It Relevant to Me? (cont.)



Is It Relevant to Me? (cont.)



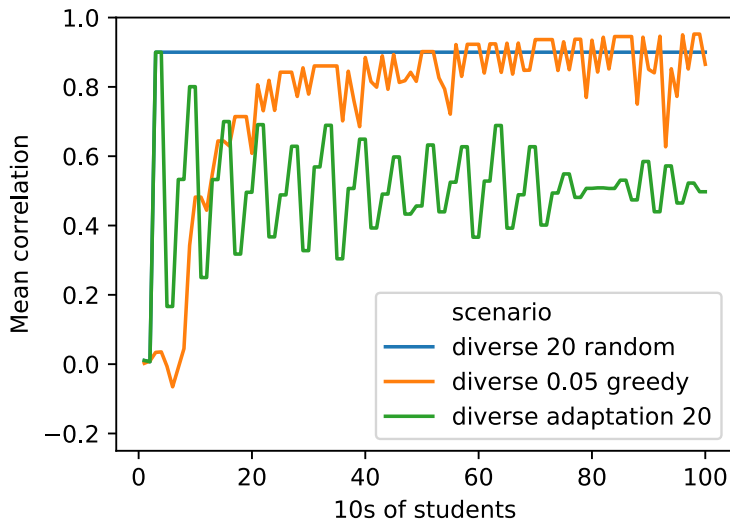
Exploration–Exploitation Tradeoff



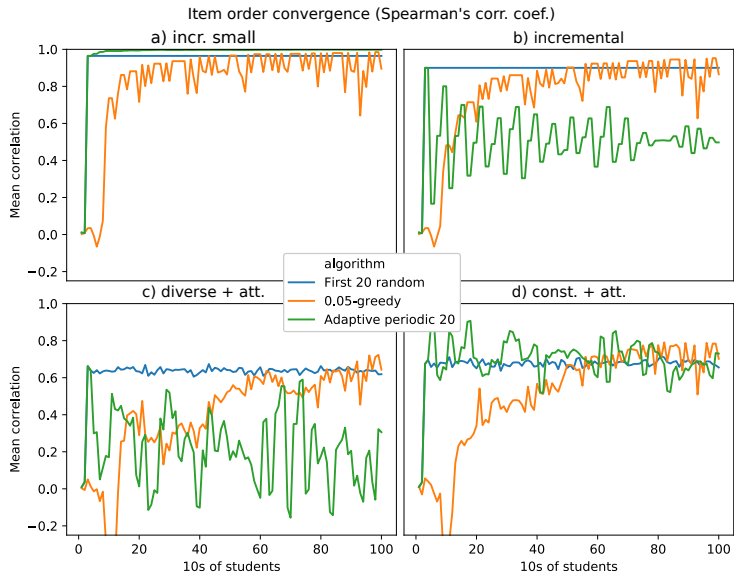
Experiments With Dynamic Ordering

- first k random
- ϵ -greedy
- adaptive periodic k

Experiments With Dynamic Ordering (cont.)



Experiments With Dynamic Ordering (cont.)



Conclusion

- item ordering bias is real
- randomization helps to reduce the bias
- know your biases before you analyze the data