Choosing a Student Model for a Real World Application

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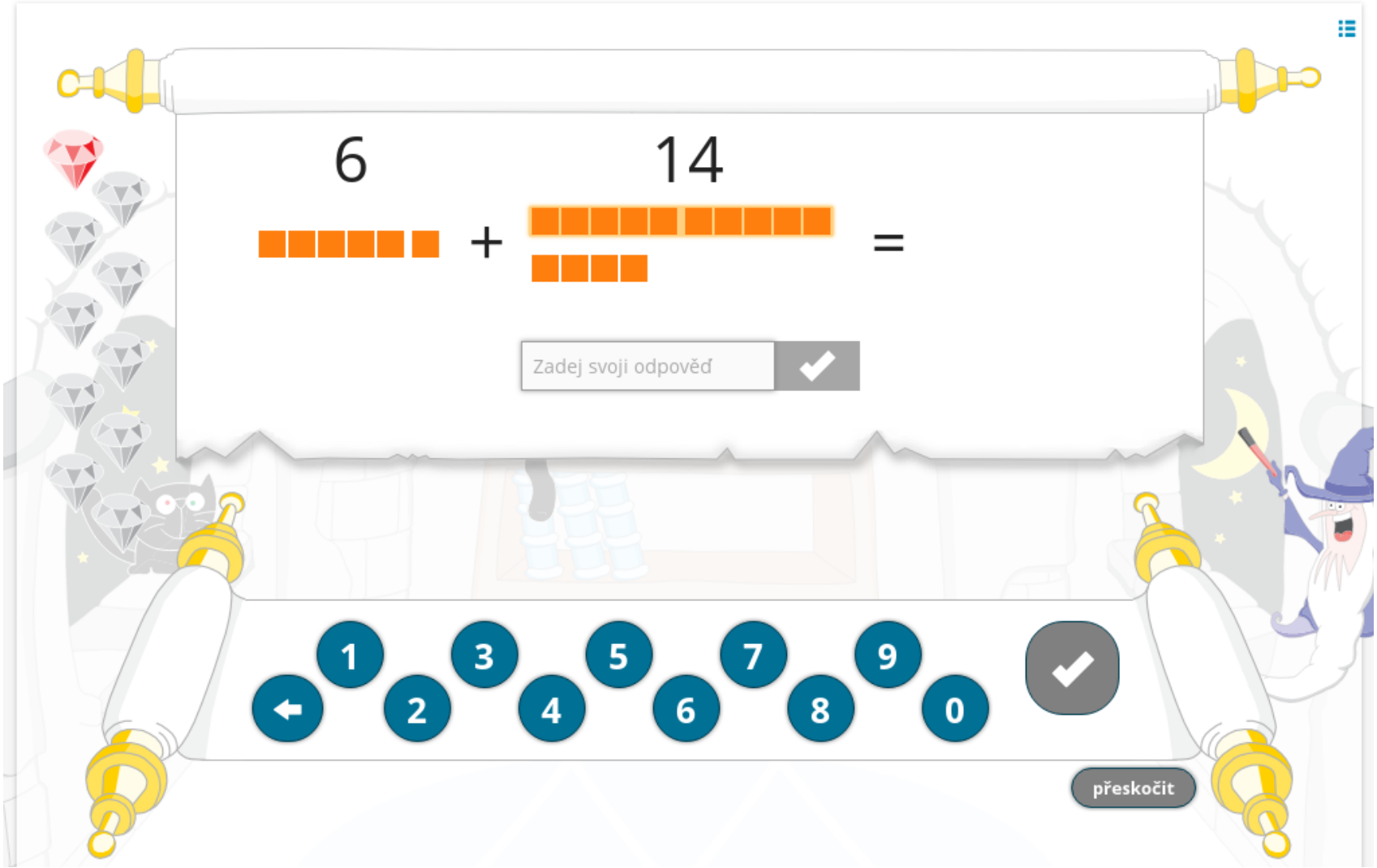
6
14
+
=
Zadej svoji odpověď
1
2
3
4
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7
8
9
0
přeskočit
Adaptive Learning

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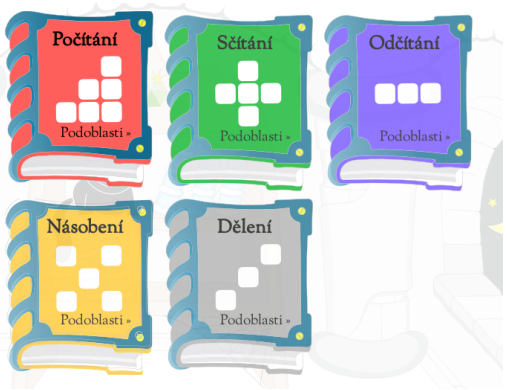


- online, free, without ads
- basic arithmetic - $+, -, \times, \div$
- 150 000 answers, 2 000 items
- adaptive practice
- importance of response time

Adaptive Learning

Response Time

correct answer to 3×5

Response Time

correct answer to 3×5 in **2** seconds

Adaptive Learning

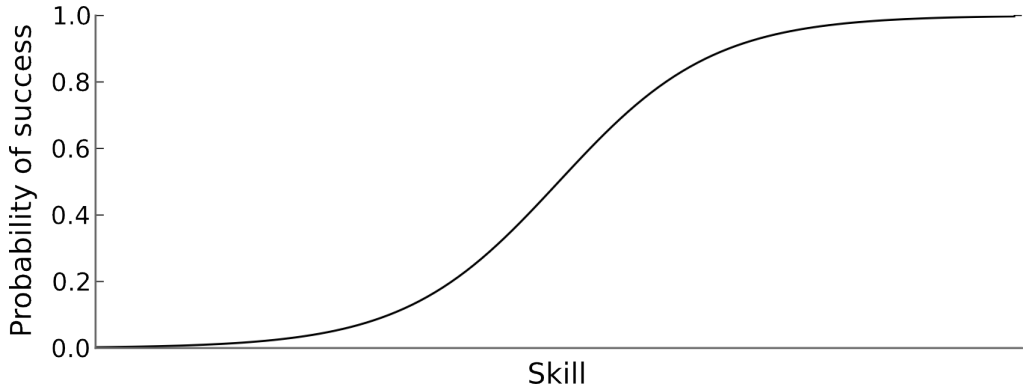
Response Time

correct answer to 3×5 in **14** seconds

Adaptive Learning

Adaptability

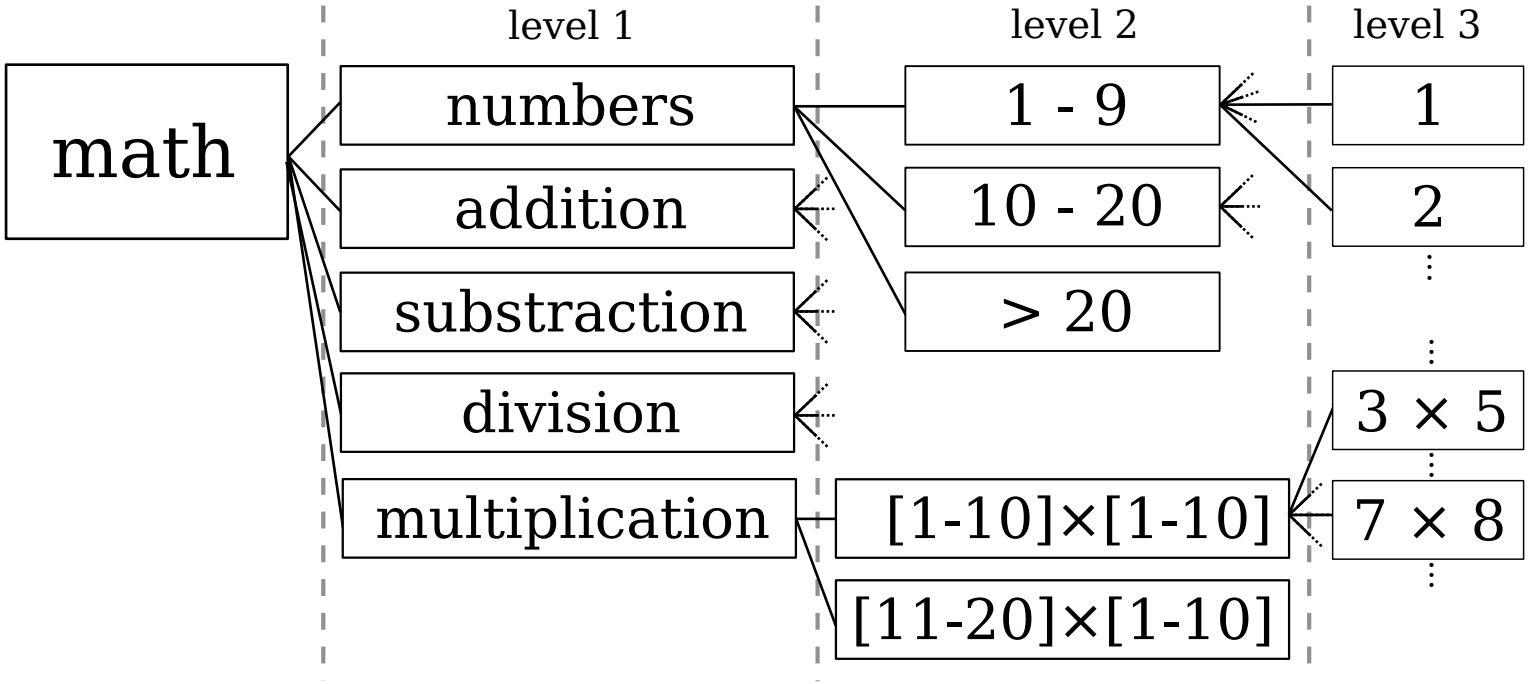
- selection of question - targeting 75% success rate
- model based on logistic function - Rash model
- parameters - **difficulties** of items and **skills** of learners
- domain model - several skills per learner
- online estimation of parameters - Elo rating system
- use of response time



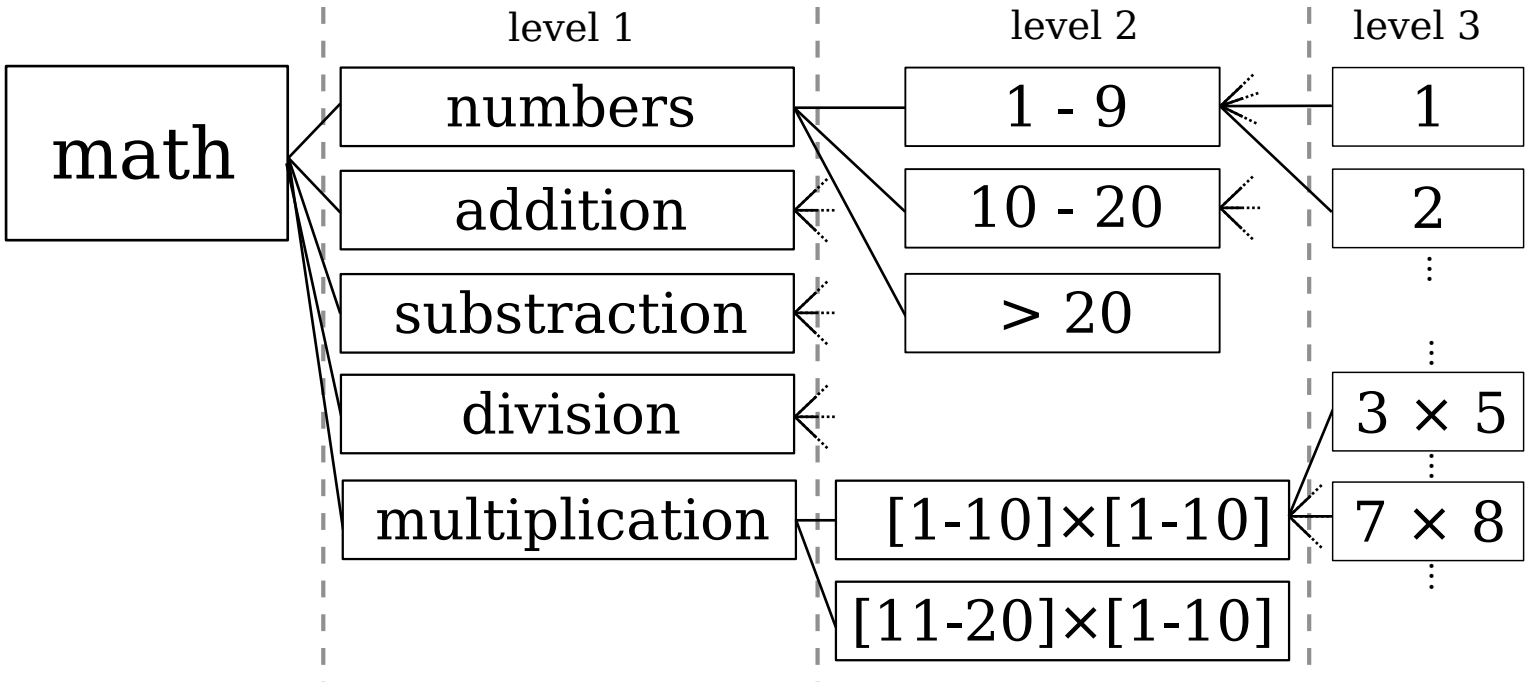
Adaptive Learning

Which aspects of student modeling are most important?

Domain Modeling



Domain Modeling



Too complicated?

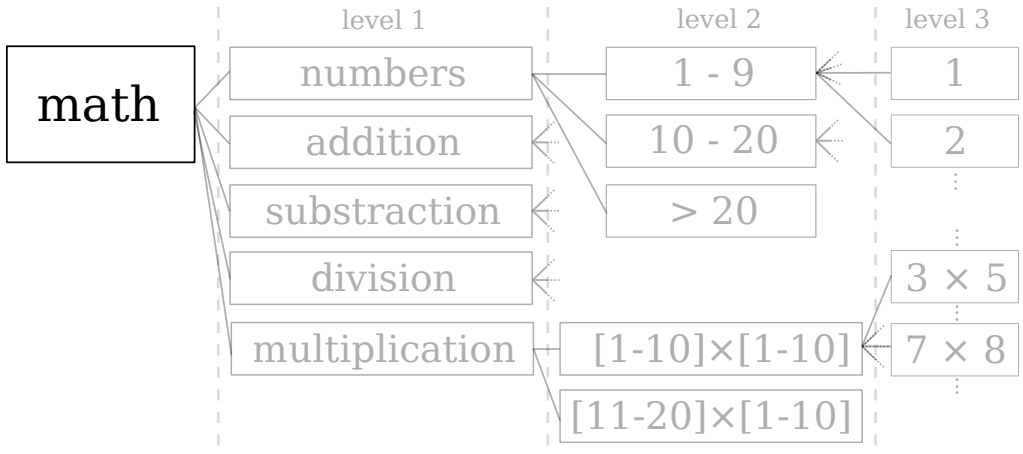
Adaptive Learning

Domain Modeling

- Item average - no skill

Domain Modeling

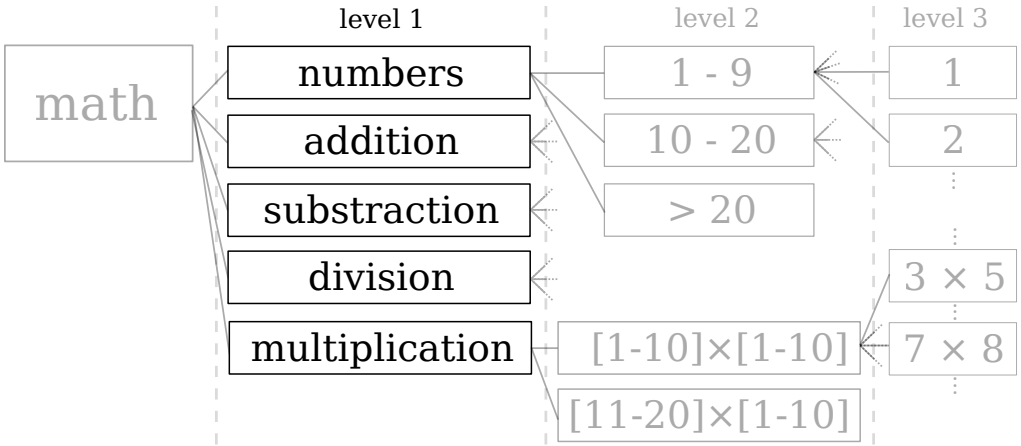
- Item average - no skill
- Basic model - one global skill



Adaptive Learning

Domain Modeling

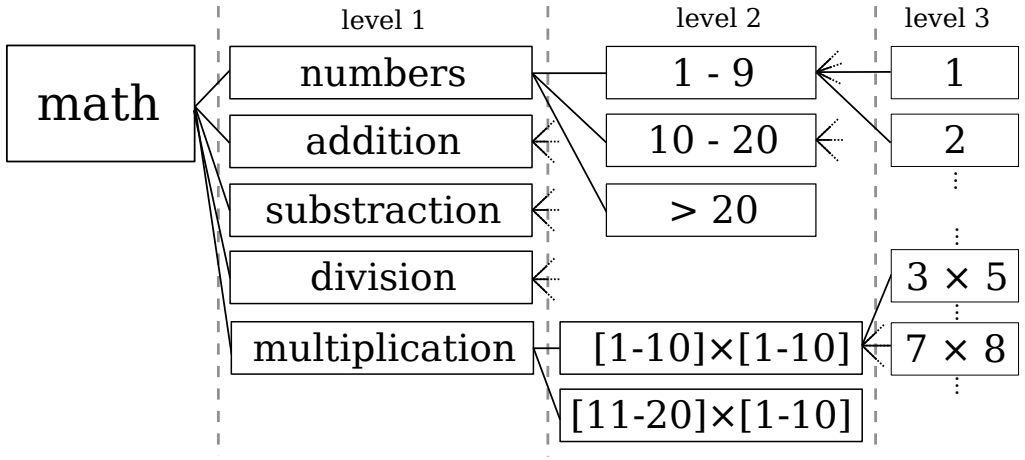
- Item average - no skill
- Basic model - one global skill
- Concepts model - 5 skills



Adaptive Learning

Domain Modeling

- Item average - no skill
- Basic model - one global skill
- Concepts model - 5 skills
- Hierarchical model



Response Times

- classic response:
  - $r = 0$ - wrong answer
  - $r = 1$ - correct answer
- use of response time:
  - $r = 0$ - wrong answer
  - $r \in [0, 1]$ - correct answer

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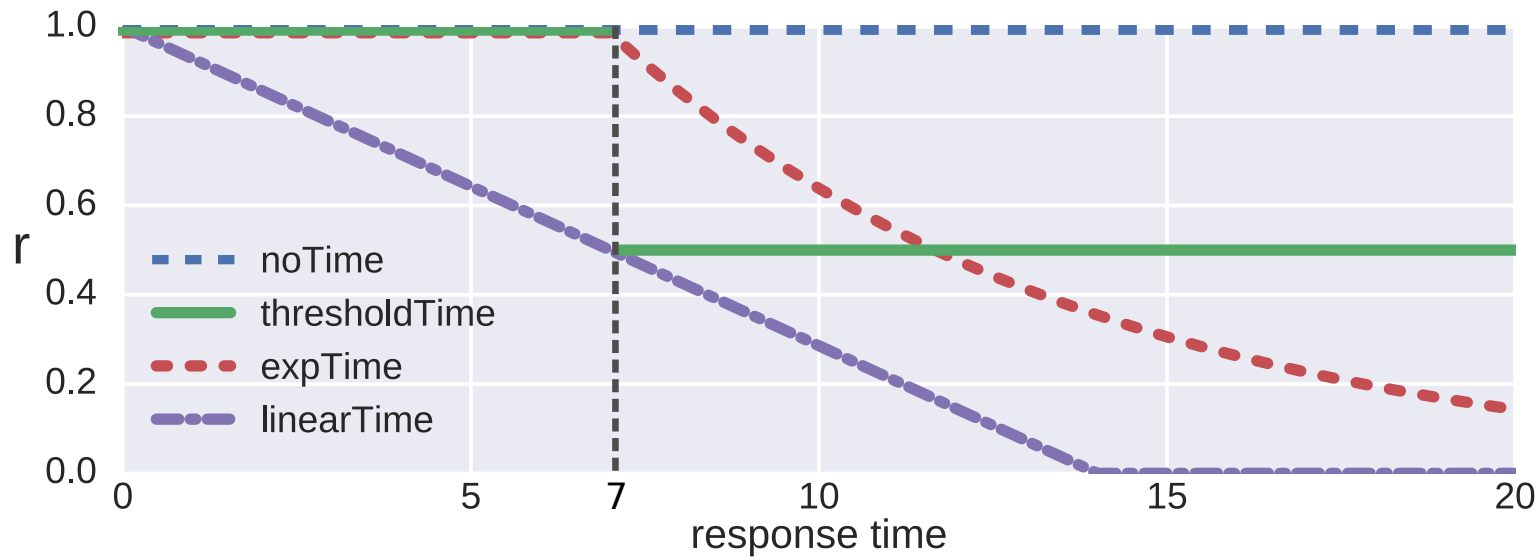
Response Times

- no time
- threshold time
- exponential time
- linear time



Wrong Answers

- many missing answers - skips
- long sequences of missing answers
  - adults trying system
  - gaming system
- simple model extension:
  - probability of missing next answer
  - based on number of previous missing answers

Adaptive Learning

Overview

Three aspects of student modeling

- 4 domain models
- 4 response times uses
- with and without utilization of missing answers

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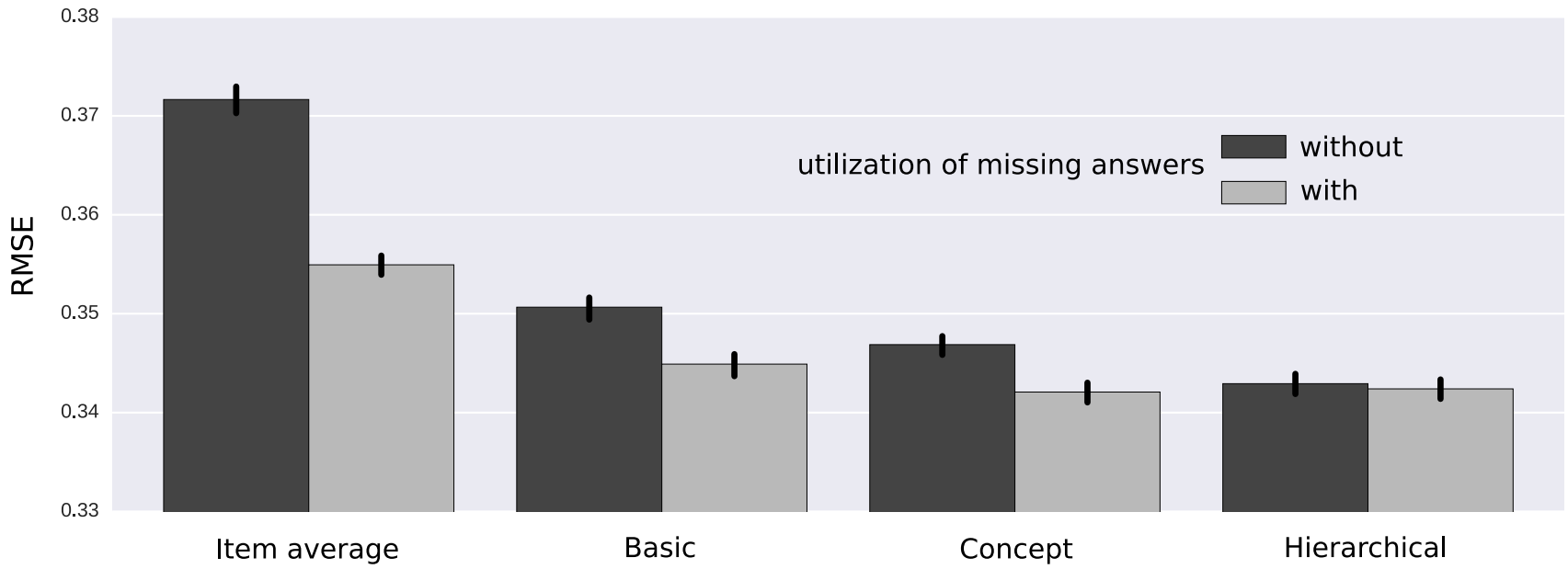
Prediction Accuracy



Prediction Accuracy - Time

Comparing models with different time utilization

- models are trained to predict different absolute values
- direct comparison of RMSE is not possible
- AUC use only relative order of prediction
  - linear time use is the best

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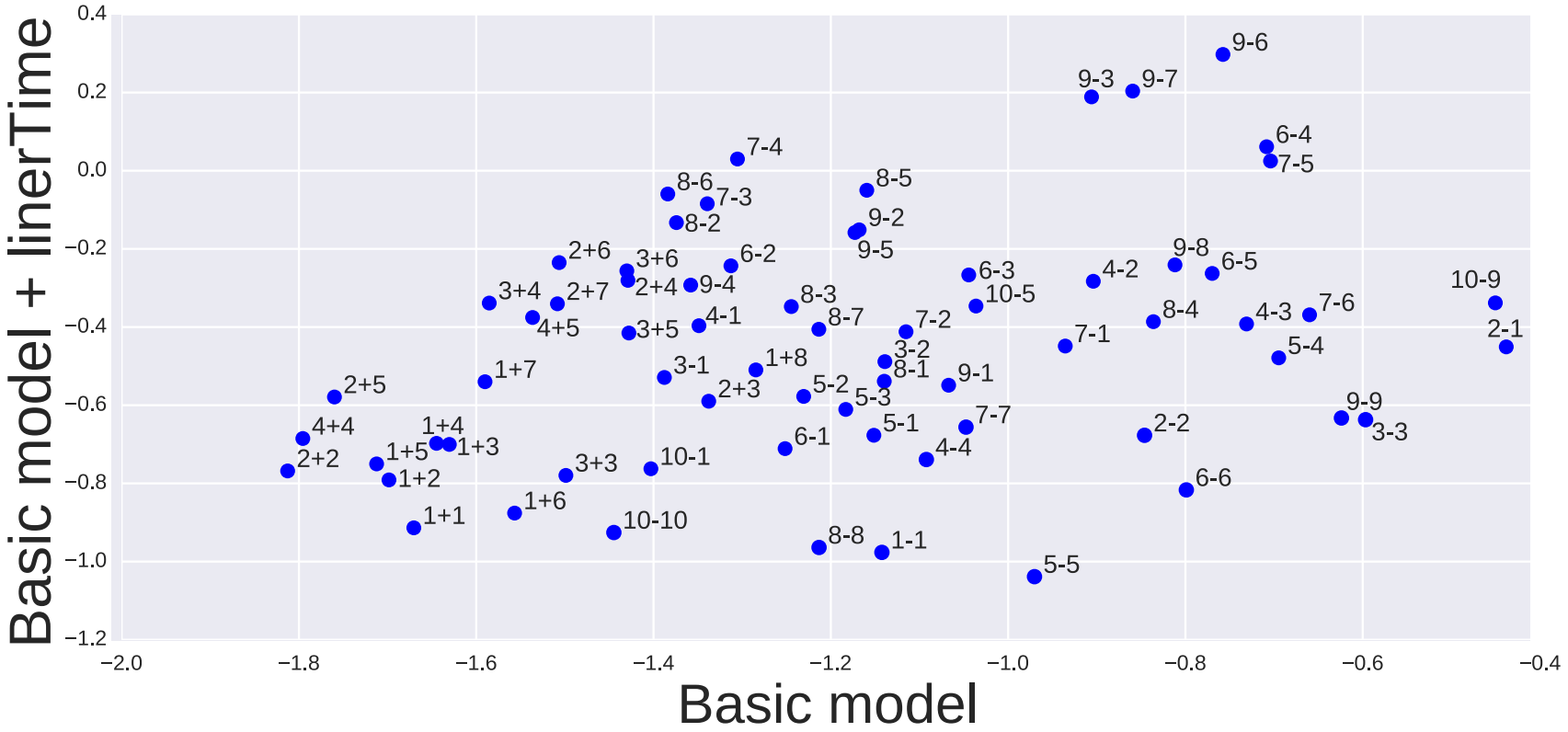
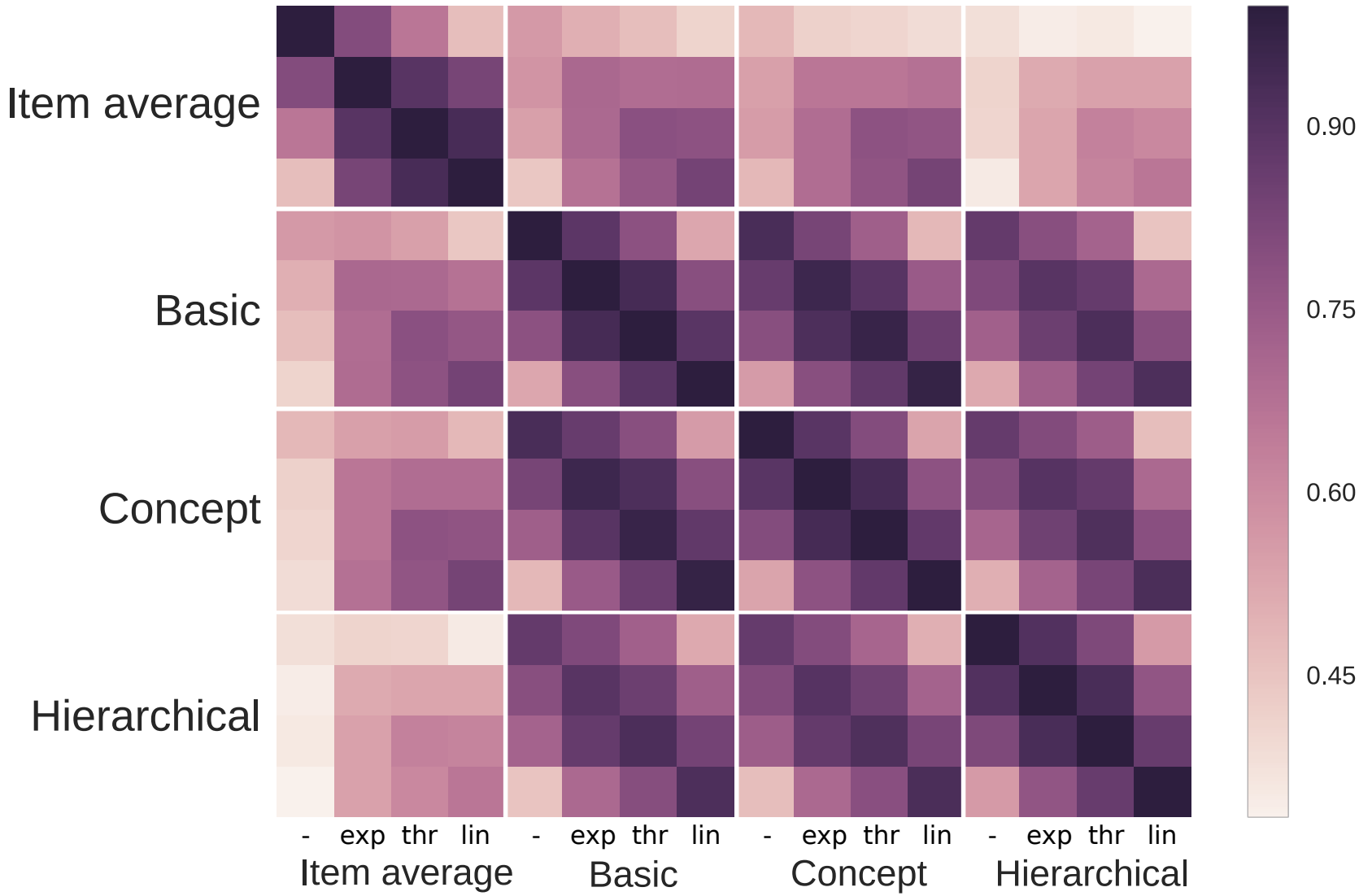
Estimated Parameters - Difficulties



Correlations of Estimated Parameters



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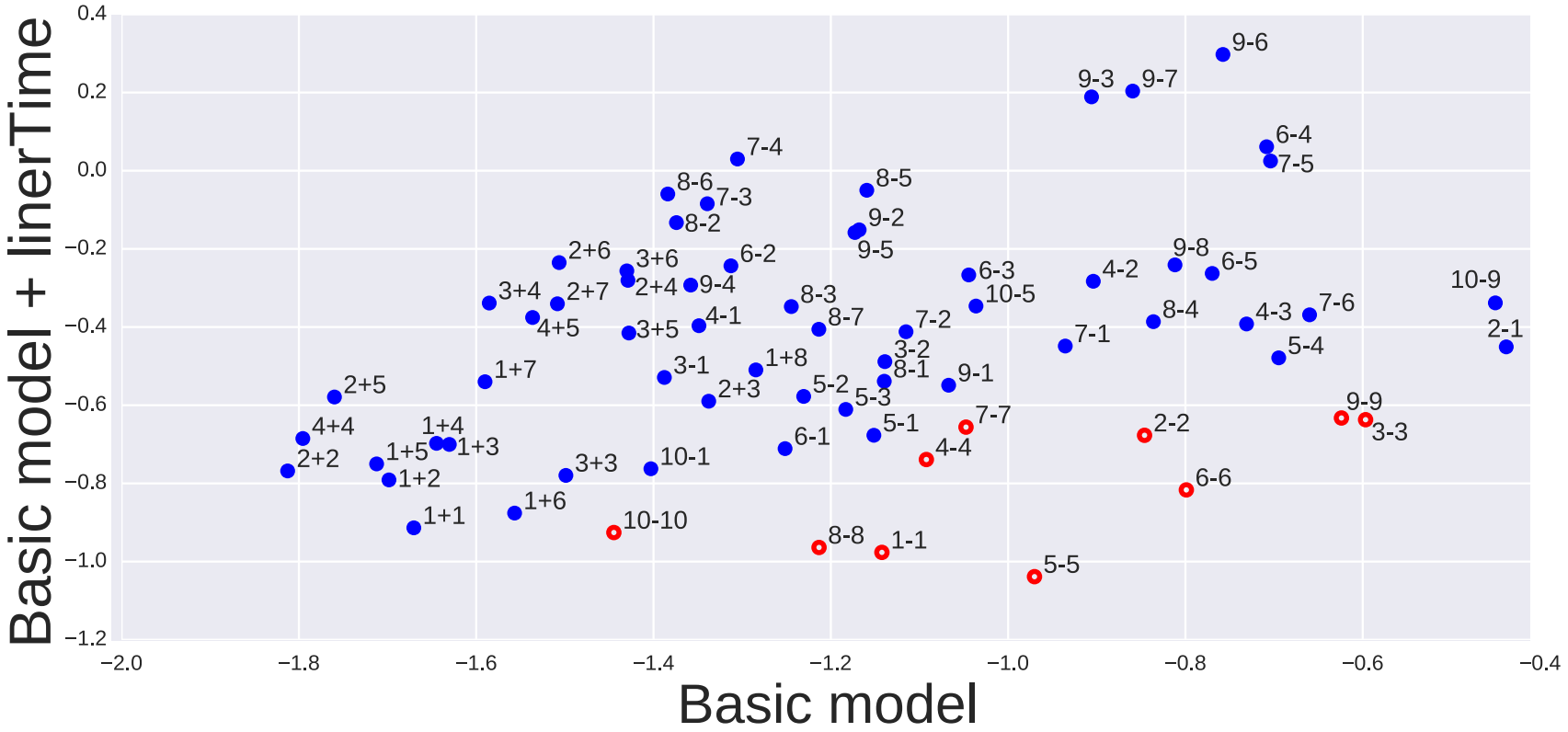
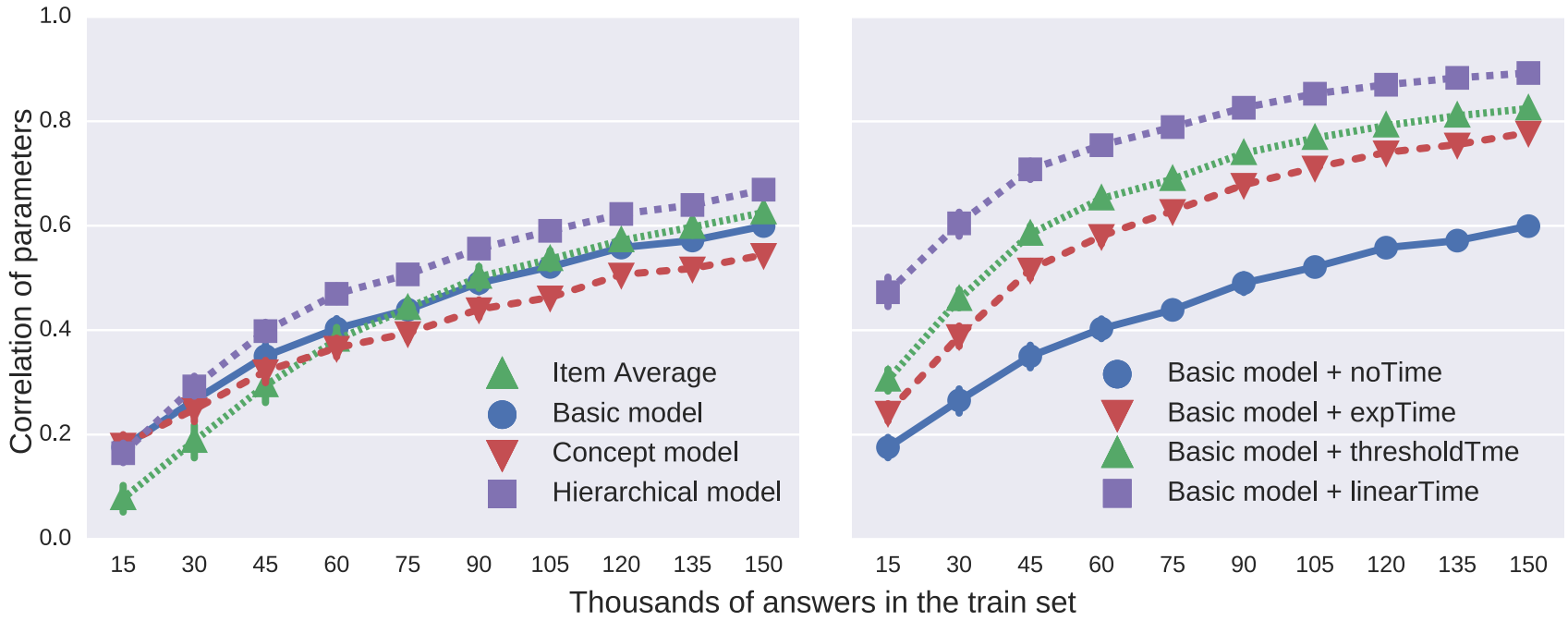
Estimated Parameters



Estimated Parameters - Stability



Conclusion

- response time use have larger impact that domain modeling
- large improvement over baseline does not mean usefulness for more complex models
- incorporation of different aspects of student modeling may be more important than detailed modeling of one particular aspect

Adaptive Learning