

Exploring the Utility of Response Times and Wrong Answers for Adaptive Learning

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Motivation

Student modeling = estimation of knowledge based on student performance

Student performance:

- correctness of answer
 - specific wrong answer
 - response time
- most models consider only correctness*
- Are these useful?**

Data

umimeto.org

domain	exercise type	answers (×1000)
math: expressions	free text question	658
math: expressions	choice from 2 options	904
math: word problems	free text question	73
Czech: spelling	choice from 2 options	10406
Czech: grammar	drag&drop	541
English: vocabulary	free text question	146
English: grammar	choice from 2 options	151

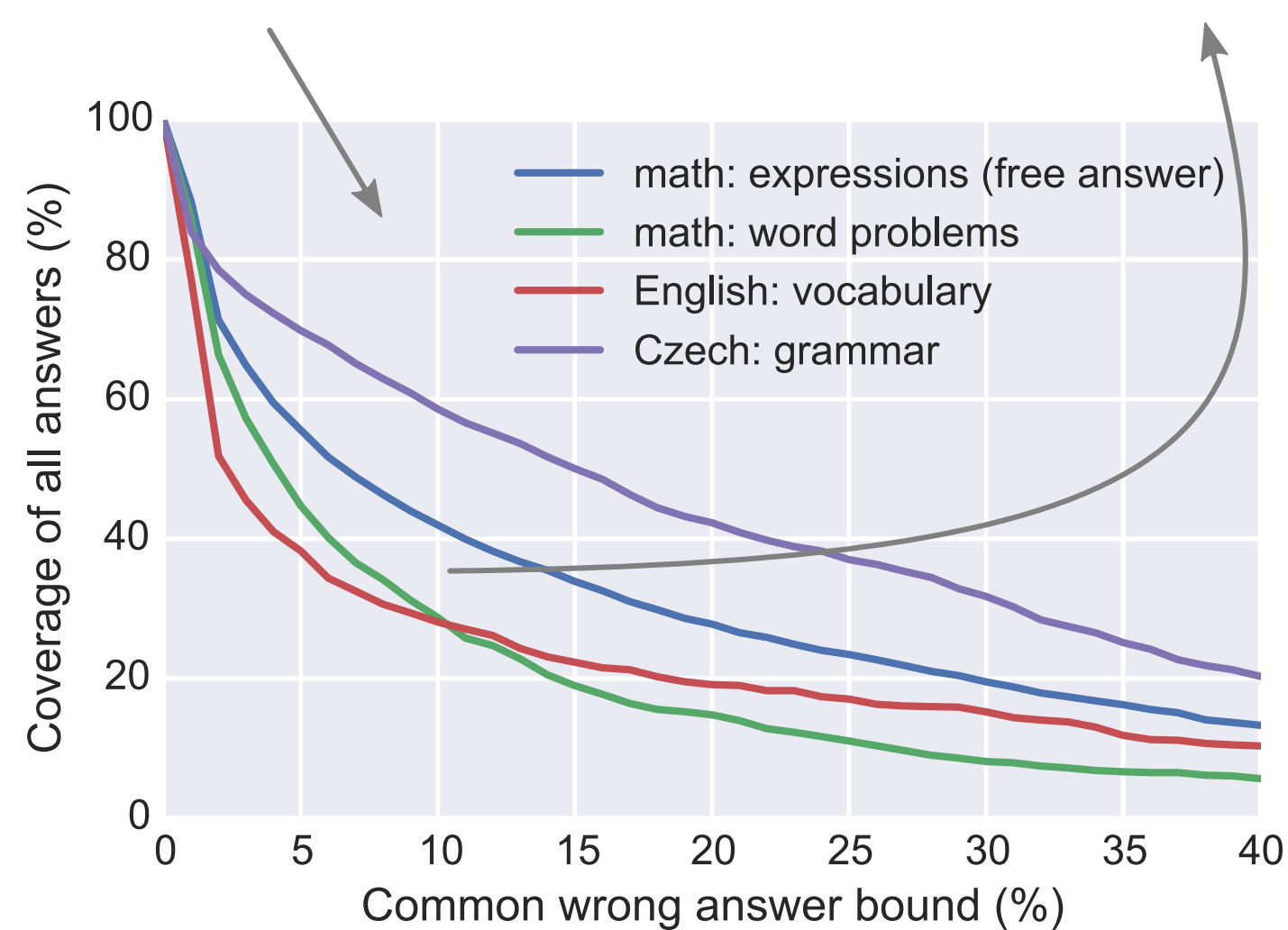
Wrong Answers

Common wrong answer

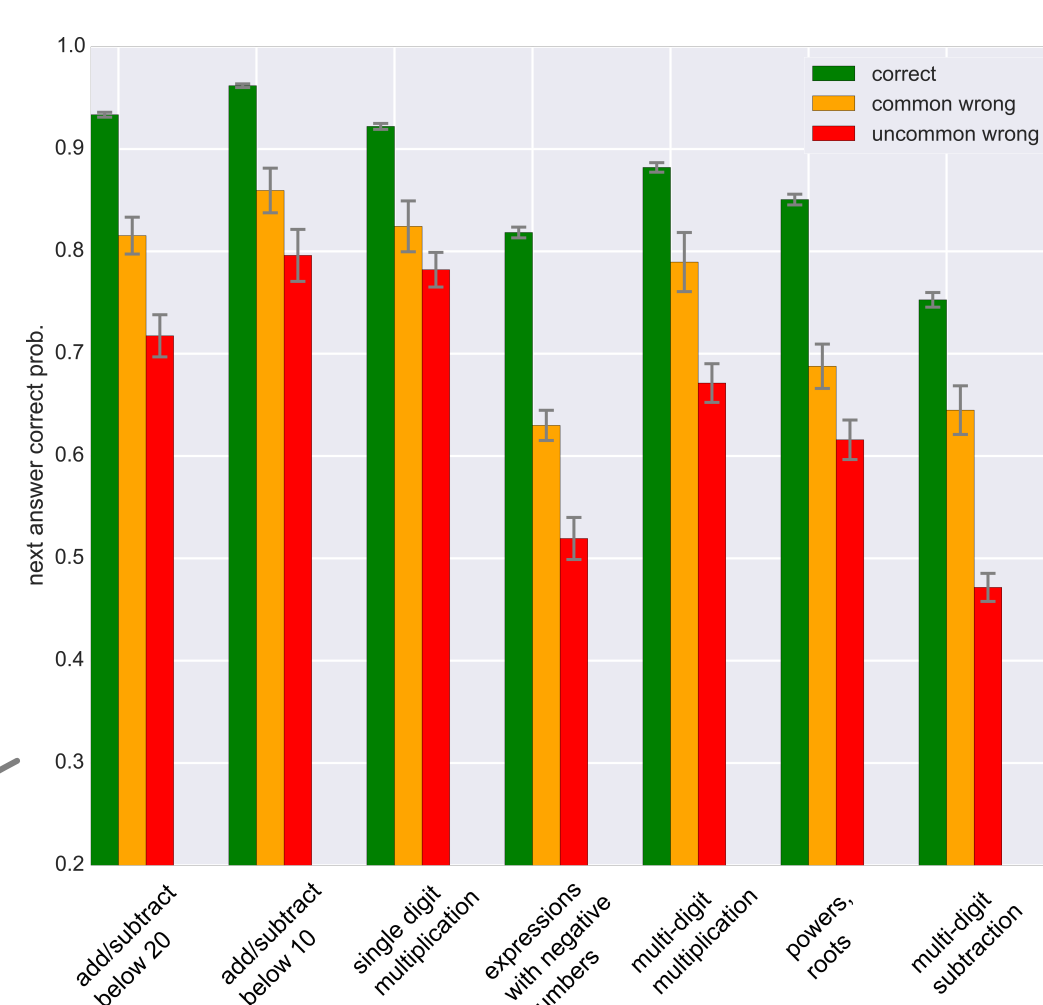
= more than X% of all wrong answers for an item.

What is a suitable choice of X?

We use 10% bound.



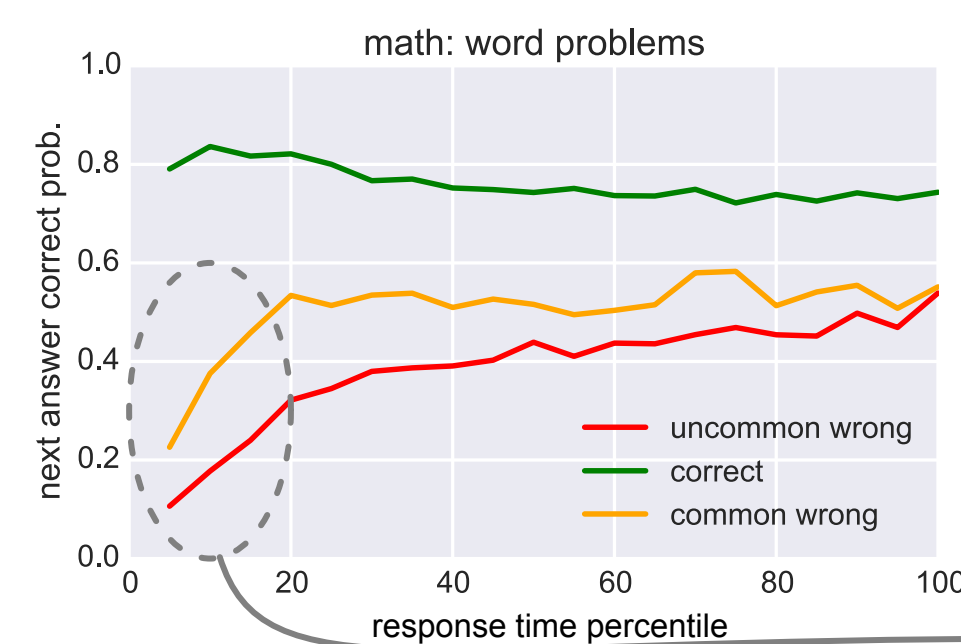
Probability that the next answer will be correct conditioned on the type of answer.



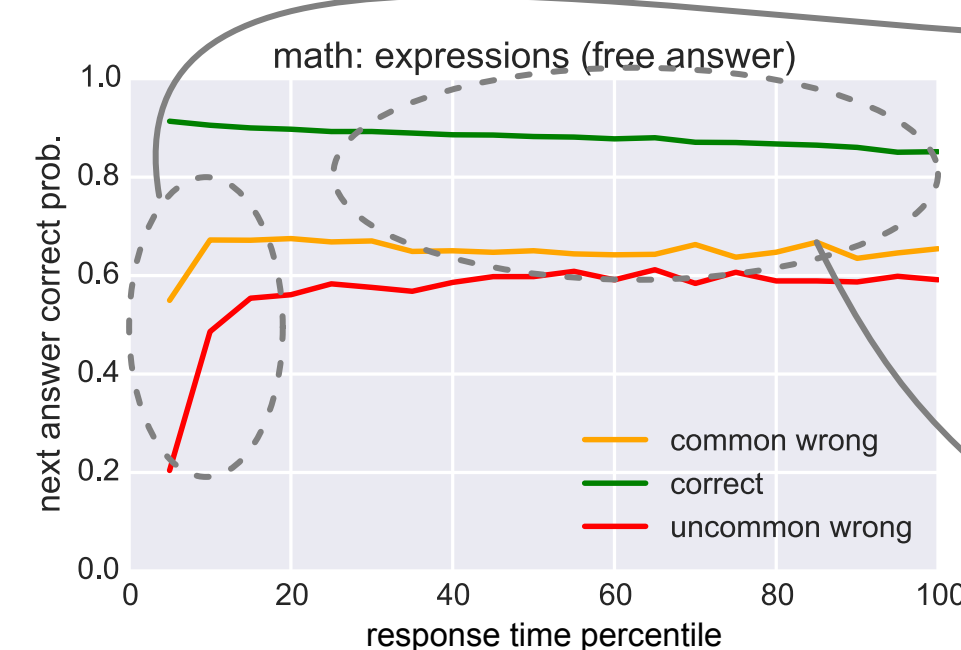
It is useful to differentiate common and uncommon wrong answers.

Response Times

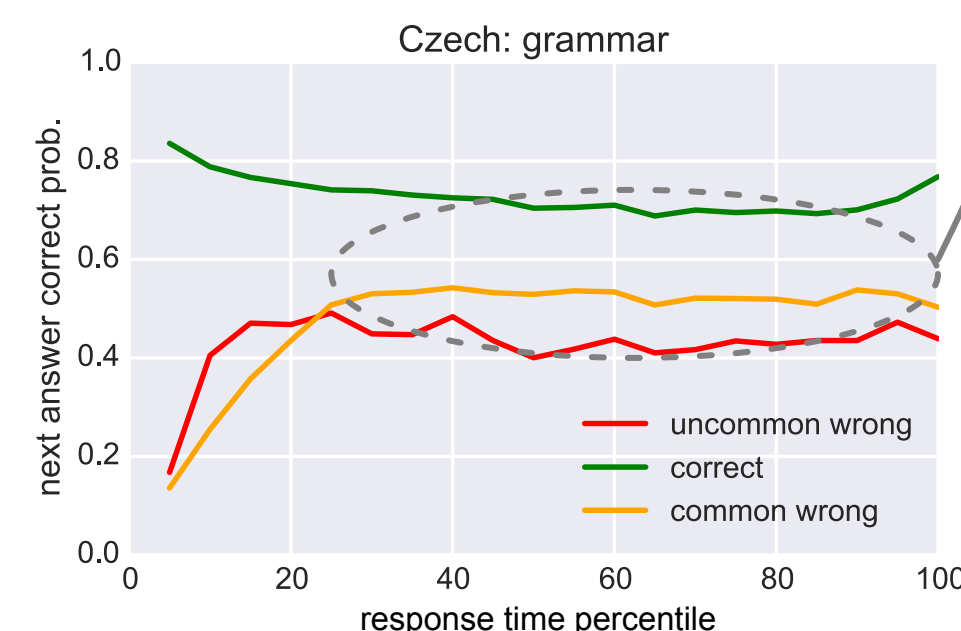
The relationship between the relative response time and future performance:



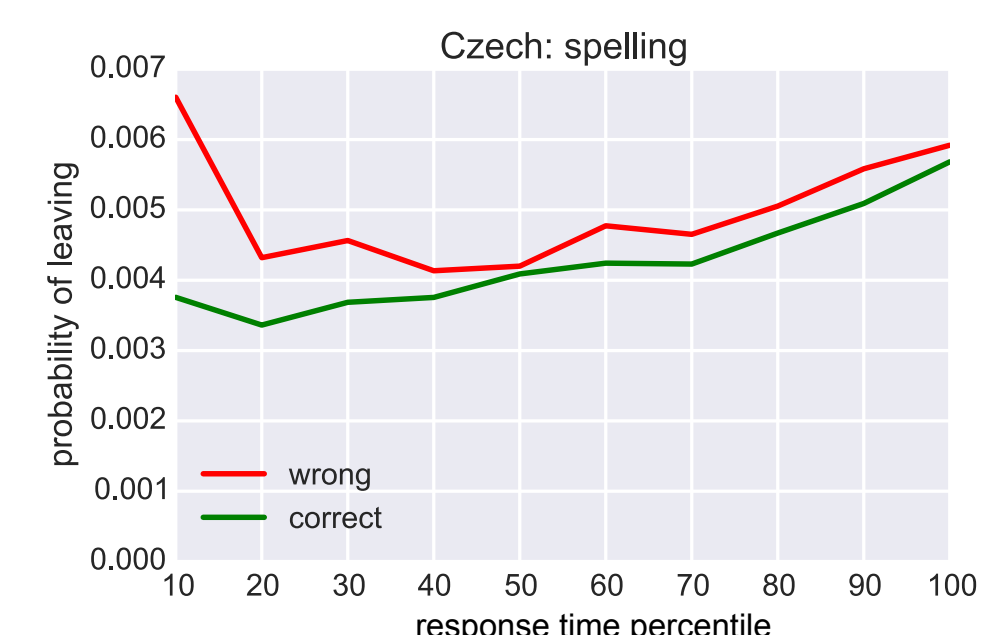
It is useful to distinguish very fast responses.



Otherwise response time is not very informative.



Probability of leaving the exercise:



Summary (simplified)

Wrong answers are more useful than response times.