

Systems for Adaptive Practice of Facts

Jan Papoušek

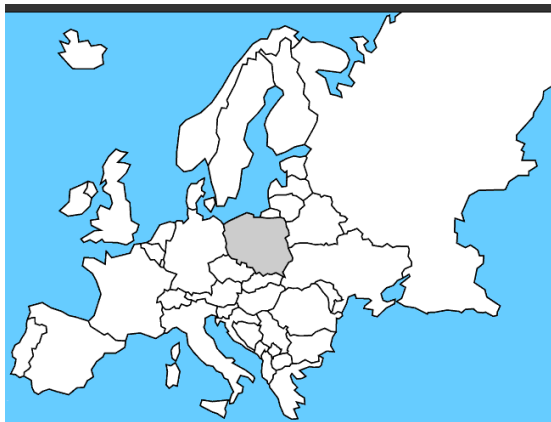
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Systems for Practice

- learning vs. practice systems
- focus on atomic tasks (items)
 - **facts – vocabulary, location of countries, anatomy**
 - simple mathematics tasks
 - estimates – currency conversion
- adaptability in smart question construction



Jak se jmenuje stát
zvýrazněný na mapě?

 Maďarsko

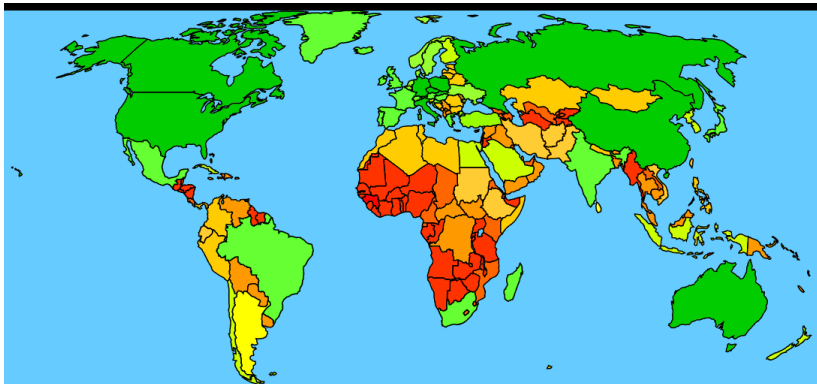
 Německo

 Polsko

 Nevím

➔ Pokračovat

↺ Znovu zvýraznit



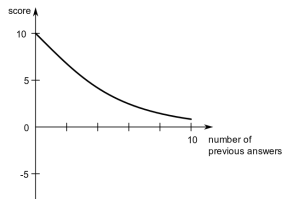
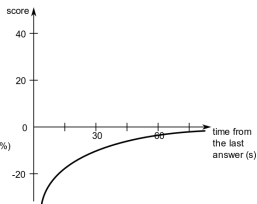
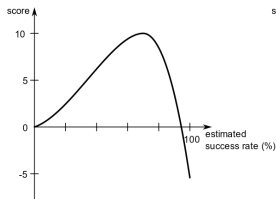
- source of data for research
- almost 9 mil. answers
- almost 50 000 feedback records
- per month:
 - 1 mil. answers
 - 10 000 users
 - 10 000 feedback records

- ① predictive model
 - estimation of prior knowledge (user) and difficulty (item)
 - estimation of current knowledge (user, item)
- ② question construction
 - item
 - (question type)
 - number of options
 - items in options

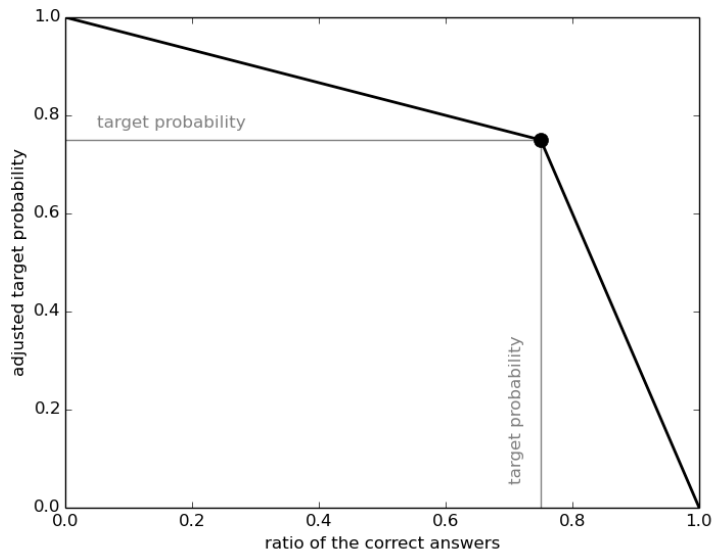
Predictive Model: Elo

- rating of chess players
- player 1 vs. player 2
→ student (θ) vs. item (d)
- update, $R \in \{0, 1\}$, $E(R) \in [0, 1]$
 - $\theta := \theta + K \cdot (R - E(R))$
 - $d := d - K \cdot (R - E(R))$

Question Construction: Item



Question Construction: Target Difficulty



Research Questions

- Does the adaptability have any effect?
 - motivation vs. learning
- What are the optimal parameters (algorithm) for adaptivity?
 - target difficulty, difficulty adjustment, items in options
- What is the effect of feedback loop?
 - predictive model vs. question construction
- What is the impact of predictive model itself?
- Can we reproduce lab based experiments in online environment?

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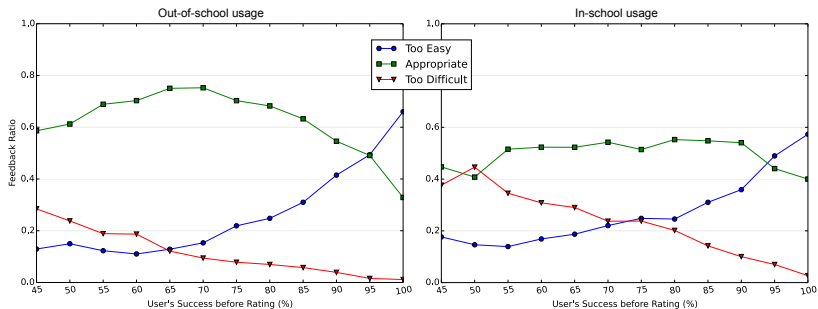
User's Motivation: Target Item and Options

Target item	Options	Answers
adaptive	adaptive	33.0
adaptive	random	20.0
random	adaptive	20.0
random	random	19.5

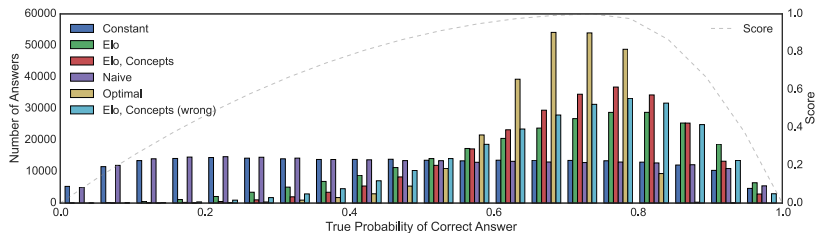
User's Motivation: Difficulty Adjustment

Adjustment	Answers
true	28.0
false	21.0

User's Motivation: Difficulty



Impact of Predictive Model on Student's Practice



-  Juraj Nižnan, Jan Papoušek, and Radek Pelánek, *Exploring the role of small differences in predictive accuracy using simulated data*, Workshops held at Artificial Intelligence in Education (AIED), 2015.
-  Jan Papoušek and Radek Pelánek, *Impact of adaptive educational system behaviour on student motivation*, Artificial Intelligence in Education (AIED), 2015.
-  Jan Papoušek, Radek Pelánek, Jiří Řihák, and Vít Stanislav, *An analysis of response times in adaptive practice of geography facts*, Educational Data Mining (EDM), 2015.
-  Jan Papoušek, Radek Pelánek, and Vít Stanislav, *Adaptive practice of facts in domains with varied prior knowledge*, Educational Data Mining (EDM), 2014, pp. 6–13.