

Junhui Yao  
Personalized Online Learning  
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## KC Model Refinement with LFA

### 5.3 Reporting

- Info to include in report: Clear description of the new models, summary of DataShop stats comparing them to the basic model.

First new model is in ds2438\_tx\_2020\_0217\_222604 (POL2) (new KC model name). This model split the FindCF into two KCs which are generateCF(common factor) and copyCF. The hypothesis for this would be only students figure out the numerator, the denominator would be the same. Therefore, students will only copy the numerator. It turns out well. AIC(3777.6 to 3759.05) and BIC(4450.93 to 4445.22) both go down compared to the basic model.

Second new model is in ds2438\_tx\_2020\_0217\_222604 (N2) (new KC model name). This is a path dependent model and it hypothesizes that div1top would make it a difference if it is 7 or not 7 since 7 is kind of hard to think of as common factor. There is no obvious improvement. AIC(3777.81 to 3777.82) barely changes; BIC(4451.14 to 4457.98) goes down compared to the basic model.

### 6.4 Reporting

Info to include in report:

- Description of models that you gave LFA as input. Please give a brief description in words, and the rationale for these models. (E.g., what hypotheses regarding what is hard for students are you encoding?)
- but also include a table that lists the selections with the KC for each. If you used one or more path-dependent KC models, please describe how you re-labeled the selections.

The input I gave LFA was ds2438\_tx\_2020\_0217\_222604 (N2) (All data, student step). I hypothesize student will find it easy if it involves common factor 7 since 7 is kind of unique among common factors. In addition, students will find numerator harder to enter compared to denominator (copy and paste). All else same, I changed div1top to div1top7 and div1topNot7.

button1	judgeLowestForm
button2	judgeLowestForm
button3	judgeLowestForm
button4	judgeLowestForm
conclusionBox	judgeLowestForm
den1	divide
den2	divide
den3	divide
den4	divide
denGCF	divide
div1bottom	copyCF
div1topNot7	generateCF
div1top7	generateCF
div2bottom	copyCF
div2topNot7	generateCF
div2top7	generateCF
div3bottom	copyCF
div3topNot7	generateCF
div3top7	generateCF
div4bottom	copyCF
div4top	generateCF
divGCFbottom	copyGCF
divGCFtop	copyGCF
done	done
GCFentry	calcGCF
num1	divide
num2	divide
num3	divide
num4	divide
numGCF	divide

## 7.1 Reporting

- Info to include in report:
  - Description of which models you selected to move forward with. Just copy all the info for your selected models from allModels.txt, though without the student intercepts.

I selected the following model.

Model 1:

LL: -1786.5040983704093    AIC: 3779.0081967408187    BIC: 4439.51847723223    RMSE: 0.35008903101184763

Change history:    split all by done    split all by calcGCF    split all by findCF    split all by copyGCF

Search Expansion: 4

## 9.1 Reporting

- Info to include in report:
  - Description of which model you settled on as the final better model.
  - AIC, BIC, and RMSEs for this model (so we can compare).
  - Screenshot of the leaderboard.

Cross Validation*									
Model Name	KCs	Observations with KCs	AIC	BIC	RMSE (student blocked)	RMSE (Item blocked)	RMSE (unblocked)	Observations (unblocked)	
Unique-step	208	3,302	3,352.95	6,459.02	0.436375	0.433839	0.389424	3,302	
basic	6	4,504	3,777.81	4,451.14	0.396315	0.359938	0.359592	4,504	
new KC model name	7	4,504	3,771.82	4,457.98	0.391915	0.363557	0.358803	4,504	
LFA1	5	4,504	4,049.54	4,710.05	0.401853	0.373408	0.373442	4,504	
Single-KC	1	4,504	4,271.20	4,880.41	0.409973	0.389269	run but incomplete: CV is incomplete...		

The best model I settled on is new KC model name. AIC is 3777.82. BIC is 4451.14. RMSE(Student blocked) is 0.391915. RMSE(item blocked) is 0.363557. RMSE(unblocked) is 0.358803. RMSE(Observations unblocked) is 4504.

## 10. Generate design recommendations

Final step: Generate some thoughts as to how the tutor might be updated if you were to adopt the new KC model.

- How should the KCs be labeled in the skill meter?]

KCs should serve as resources for learners to understand the status quo of their capacities. Therefore, it should be labeled in full phrase with clear reference.

- For which KCs would you write new hints? Might that be problematic for any of the KCs? (Note: You are not asked to write new hints, though in answering the previous question it might help to generate some new hints.)

I would write new hints for the generate CF. Students should be reminded of the available options when they have a cold start.

- How will you make sure all KCs will be sufficiently practiced?

There is a dependency between copyCF and generateCF. If students could generate common facts, then it is very likely they would copy that right. If they copy wrongly, it could be contributed to their carelessness.

- Are new problem types needed?

No new problem types are needed.

- Other ideas for making the tutor better, based on this KC revision.

I would recommend we could have two modes (basic and advanced) For the basic, the format for the blank could be drag and drop format. The advanced one would be to fill the blank.