Machine Learning for Education Laboratory
ML4ED

Calcularis Crusaders

Research project in education field

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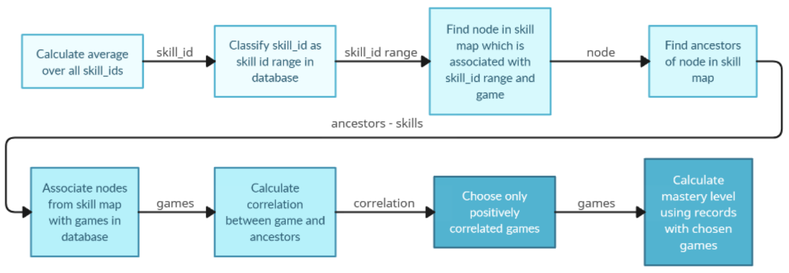
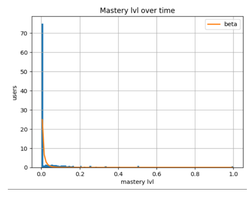
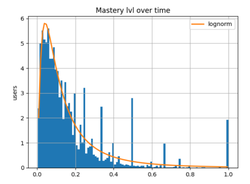
Machine Learning for Behavioral Data (MLBD) Course, EPFL, 2023

1 INTRODUCTION

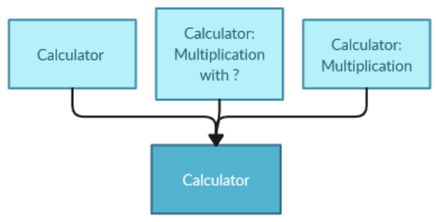
Mastery definition

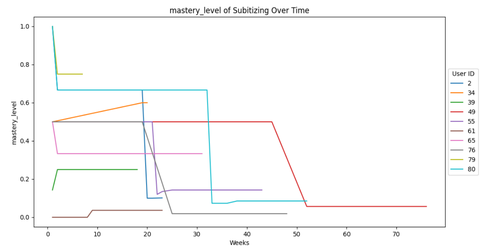






Example

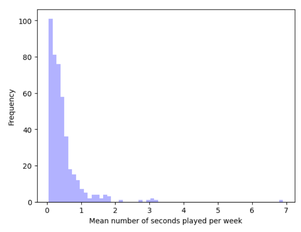


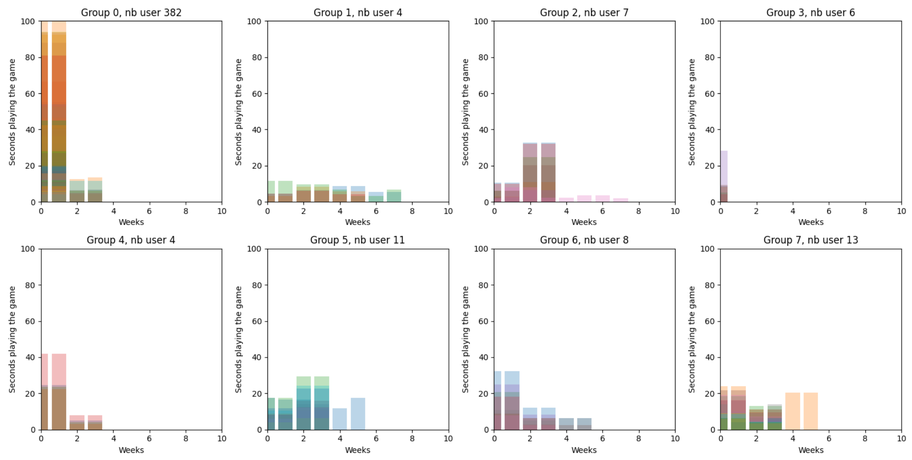


2 STUDENT BEHAVIOR ANALYSIS FOR TOP GAME

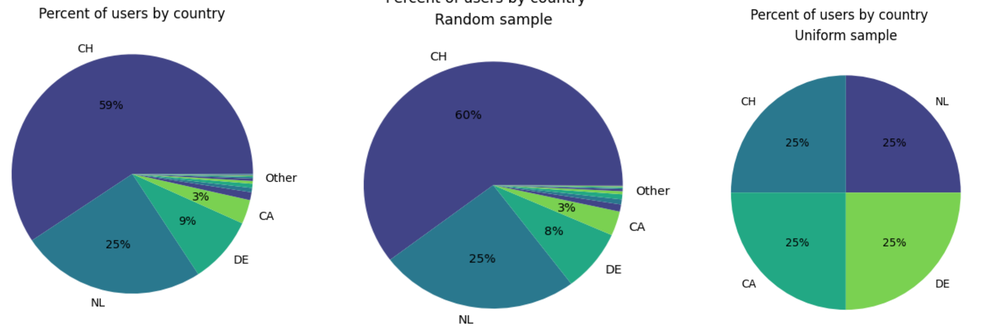
How does student's behavior evolve over time?

Are there patterns in user's behavior?



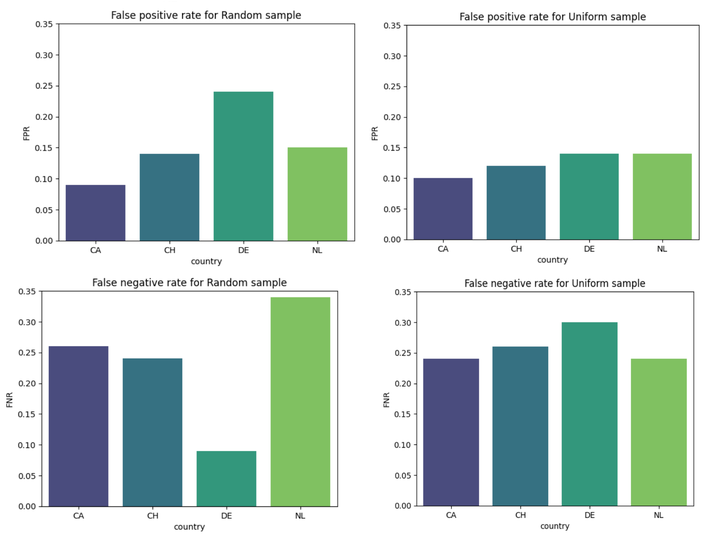


3 FAIRNESS ANALYSIS



Do predictive models favor students from certain counties? How can sampling alleviate biases?

We define mastering a skill as reaching a mastery level above average. We want to help students who perform below average.



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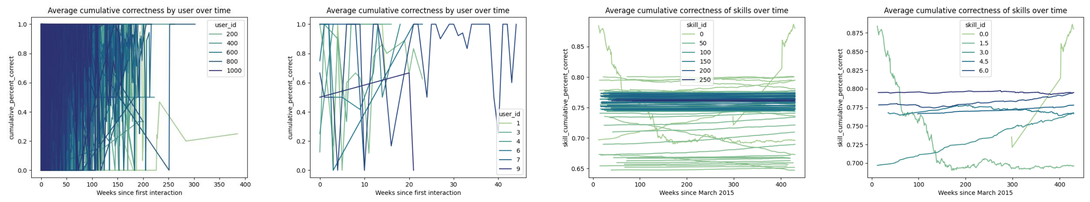
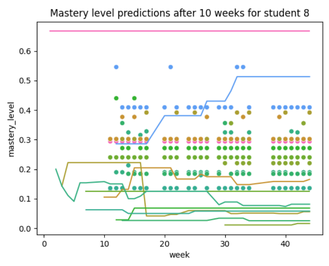
4 PREDICTION OF MASTERY

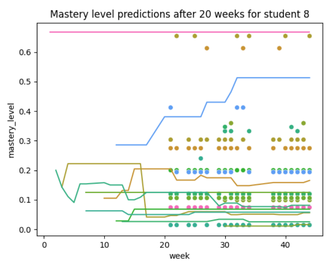
Can we capture history with cumulative features?

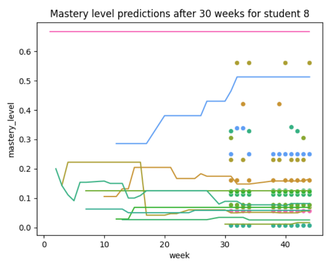


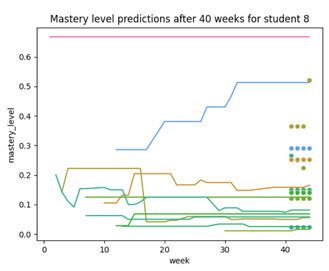
Can we predict mastery over many future weeks for early intervention?

--- Case study ---









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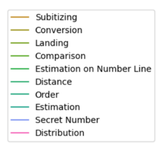
MAPE

0.11

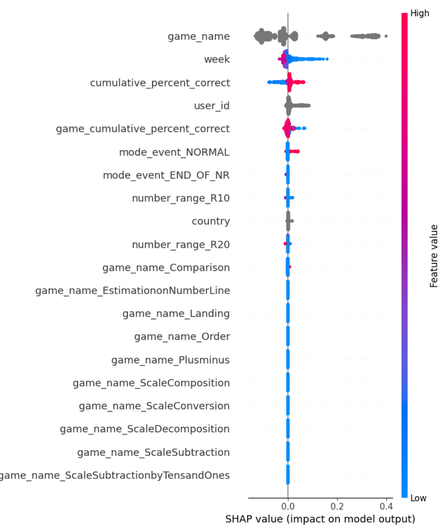
0.13

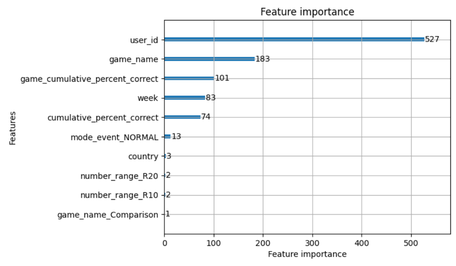
0.12

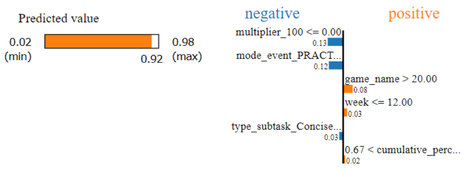
0.11



Can we recommend interventions using interpretability?







Feature	Value
multiplier_100	0.00
mode_event_PRACTICE	0.00
game_name	26.00
week	5.00
type_subtask_ConciseOrderingTaskDescription	0.00
cumulative_percent_correct	0.75

5 CONCLUSIONS

- **Skill mapping and correlation analysis among games is us create more accurate predictions, as we use it to create mastery level.**
- **The models end up using features that accumulate over time a lot**
- **Predicting multiple steps into the future is unreliable, but more data may help educators make early predictions about students' skill mastery.**
- **Local explanations like SHAP and LIME can give educators ideas about which factors help predict a student's mastery level. The factors do not always agree.**
- **Sampling the data has a big effect on the models fairness. Uniform sampling can help achieve Equalized Odds.**
- **Clustering can be used to help professors predict users failing to learn.**

REFERENCES

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