Improving education with (automated) feedback

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Introduction

How to use different forms of (automated) feedback to improve higher education, while keeping an eye on privacy and energy cost. The project has a split approach.

- The first goal is to improve the learning habits of novice programmers to increase their learning effectiveness, by automatic tools and hands on training
- The second aim is to create an automated feedback loop using Machine Learning

Research

Feedback for novice programmers

- First study improved compiler errors (summer 2022)
- The second study will measure the effect of reflection (summer 2023)

Learning Analytics and Machine Learning

- **Projects on student applications and dropout (in progress)**
    - Bachelor applications
    - Early drop-out detection
- **Projects on energy consumption and privacy for Machine Learning methods (2 publications)**
    - How much is privacy worth? Measuring k-anonymity on accuracy and energy cost (summer 2022)
    - Comparing accuracy and energy cost for k-anonymization and synthetic data (summer 2023)

Results

Publications

- Energy cost and accuracy impact of k-anonymity
    - **DOI:** 10.1109/ICT4S55073.2022.00018
- Energy cost and machine learning accuracy impact of k-anonymization and synthetic data techniques
    - **ARXIV:** https://arxiv.org/pdf/2305.07116v1.pdf

Tools

- Improved compiler feedback addon for novice programmers learning in C
- Reflection method for novice programmers

Conclusion

- The effect and usefulness of Machine Learning in education is still being explored. The impact of measures on privacy and energy consumption require more research
- Early results on improving learning effectiveness for novice programmers show small effects. Other approaches are worth exploring

Teaching & Learning Centre
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