Robin Schmucker

https://rschmucker.github.io ⌂
(+1) 412-520-4586 ✆
rschmuck@cs.cmu.edu ✉

PROFILE

I am broadly interested in machine learning for education, including domains such as online tutoring systems, conversational learning and educational measurement. My work focuses on developing scalable technologies that enhance the experience of human learners and teachers. I employ a multidisciplinary research methodology, integrating machine learning, natural language processing, statistics, causal inference, and human-computer interaction with insights from learning sciences and psychology. This approach applied to educational products at the CK-12 Foundation led to significant advancements, currently benefitting millions of learners globally.

EDUCATION

Ph.D. in Machine Learning – CARNEGIE MELLON UNIVERSITY — OCT. 2024 (EXPECTED)
Thesis Topic: Sequence-Modeling for Assessments and Interventions in Intelligent Tutoring Systems
Advisor: Prof. Tom Mitchell

M.S. in Machine Learning – CARNEGIE MELLON UNIVERSITY — MAY 2021
Related Coursework: Deep Reinforcement Learning, Advanced Machine Learning, Data Analysis, Intermediate Statistics, Convex Optimization, Graduate Artificial Intelligence

B.S. in Computer Science – KARLSRUHE INSTITUTE OF TECHNOLOGY — MAR. 2018
Thesis Topic: Learning and Recognizing Activity Patterns with Multimodal Sensor Data
Advisor: Prof. Manuela Veloso

RESEARCH & WORK EXPERIENCE

Applied Scientist Intern — FEB. 2021 – APR. 2021 & MAY 2020 – AUG. 2020
Berlin office, Amazon Web Services, Inc.
• Member of research group associated with Amazon SageMaker.
• Design of algorithms for automated hyperparameter optimization.
• Contribution of multi-objective optimization algorithms to open-source project AutoGluon.
Advisor: Michele Donini and Cédric Archambeau

Student Intern — SEPT. 2017 – MAR. 2018
Machine Learning Department, Carnegie Mellon University
• Learning robot activity patterns based on sensor data of a real humanoid-like robot.
• Member of CMU's RoboCup2018 home robotics team.
Advisor: Prof. Manuela Veloso

Undergraduate Research Assistant — MAY 2017 – AUG. 2017
Telecooperation Office, Karlsruhe Institute of Technology
• Development of a social media analysis framework and event detection algorithms for graphs.
• Analysis of data from Germany's largest Q&A website (Gutefrage.de).
Advisor: Prof. Michael Beigl

Summer Internship — AUG. 2014 – SEPT. 2014 & AUG. 2013 – SEPT. 2013
Centre for Quantum Technologies, National University Singapore
• Verification of theoretical research results in an independent numerical simulation in Matlab.
• Study of the visible effects of special relativity when traveling close to the speed of light.
Advisor: Prof. Stephanie Wehner and Prof. Artur Ekert

PUBLICATIONS & WORKING PAPERS

• **Robin Schmucker**
  Harnessing Machine Learning and Generative AI: A New Era in Online Tutoring Systems
  To appear XRDS: Crossroads, The ACM Magazine for Students, 2024.

• **Robin Schmucker**, Meng Xia, Amos Azaria, Tom Mitchell
  Ruffle&Riley: Insights from Designing and Evaluating a Large Language Model-Based Conversational Tutoring System
  International Conference on Artificial Intelligence in Education (AIED), 2024.

- **Robin Schmucker***, Frederik Baucks*, Conrad Borchers, Zachary A. Pardos, Laurenz Wiskott
Gaining Insights into Group-Level Course Difficulty via Differential Course Functioning
ACM Conference on Learning@Scale (L@S), 2024.

- Steven Moore, **Robin Schmucker**, Tom Mitchell, John Stamper
Generation and Tagging of Knowledge Components from Multiple-Choice Questions
ACM Conference on Learning@Scale (L@S), 2024. (best dataset award)

- Yang Shi, **Robin Schmucker**, Keith Tran, John Bacher, Kenneth Koedinger, Thomas Price, Min Chi, Tiffany Barnes
The Knowledge Component Attribution Problem for Programming: Methods and Tradeoffs with Limited Labeled Data
Journal of Educational Data Mining (JEDM), 2024.

- **Robin Schmucker***, Frederik Baucks*, Laurenz Wiskott
Gaining Insights into Course Difficulty Variations Using Item Response Theory
International Conference on Learning Analytics & Knowledge (LAK), 2024. (best paper nominee)

- Ted Zhang, Harshith Arun Kumar, **Robin Schmucker**, Amos Azaria, Tom Mitchell
Learning to Compare Hints: Combining Insights from Student Logs and LLMs
Workshop on Artificial Intelligence for Education (AAAI-AI4Edu), 2024.

- **Robin Schmucker**, Meng Xia, Amos Azaria, Tom Mitchell
Ruffle&Riley: Towards the Automated Induction of Conversational Tutoring Systems
NeurIPS Workshop: Generative AI for Education (GAIED), 2023.

- **Robin Schmucker**, Nimish Pachapurkar, Shanmuga Bala, Miral Shah, Tom Mitchell
Learning to Give Useful Hints: Assistance Action Evaluation and Policy Improvements
European Conference on Technology Enhanced Learning (ECTEL), 2023.

- Yang Shi, **Robin Schmucker**, Min Chi, Tiffany Barnes, Thomas Price
KC-Finder: Automated Knowledge Component Discovery for Programming Problems
International Conference on Educational Data Mining (EDM), 2023.

- **Robin Schmucker***, Frederik Baucks*, Laurenz Wiskott
Tracing Changes in University Course Difficulty Using Item Response Theory
Workshop on Artificial Intelligence for Education (AAAI-AI4Edu), 2023.

- **Robin Schmucker**, Tom M Mitchell
Transferable Student Performance Modeling for Intelligent Tutoring Systems
International Conference on Computers in Education (ICCE), 2022. (best paper nominee)

- **Robin Schmucker**, Jingbo Wang, Shijia Hu, Tom M Mitchell
Assessing the Performance of Online Students - New Data, New Approaches, Improved Accuracy
Journal of Educational Data Mining (JEDM), 2022.

- **Robin Schmucker**, Gabriele Farina, James Faeder, Fabian Fröhlich, Ali Saglam, Tuomas Sandholm
Combination Treatment Optimization Using a Pan-Cancer Pathway Model
PLOS Computational Biology, 2021.

- **Robin Schmucker**, Michele Donini, Muhammad Bilal Zafar, David Salinas, Cédric Archambeau
Multi-Objective Asynchronous Successive Halving
Submitted to Conference on Neural Information Processing Systems (NeurIPS), 2021.

- Valerio Perrone, Michele Donini, **Robin Schmucker**, Krishnaram Kenthapadi, Cédric Archambeau
Fair Bayesian Optimization
Conference on AI, Ethics, and Society (AIES), 2021.

- Gabriele Farina, **Robin Schmucker**, Tuomas Sandholm
Bandit Linear Optimization for Sequential Decision Making and Extensive-Form Games
AAAI Conference on Artificial Intelligence, 2021.

- **Robin Schmucker**, Michele Donini, Valerio Perrone, Muhammad Bilal Zafar, Cédric Archambeau
Multi-Objective Multi-Fidelity Hyperparameter Optimization with Application to Fairness
NeurIPS Workshop on Meta-Learning, 2021.

- Gabriele Farina, **Robin Schmucker**, Tuomas Sandholm
  Counterfactual-Free Regret Minimization for Sequential Decision Making and Extensive-Form Games
  Workshop on Reinforcement Learning in Games (AAAI-RLG), 2020.
- Michiel de Jong, Kevin Zhang, Travers Rhodes, Aaron Roth, **Robin Schmucker**, Chenghui Zhou, Sofia Ferreira, João Cartucho, Manuela Veloso
  Towards a Robust Interactive and Learning Social Robot
  International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2018.
- **Robin Schmucker**, Chenghui Zhou, Manuela Veloso
  Multimodal Movement Activity Recognition Using a Robot's Proprioceptive Sensors
  RoboCup Symposium, 2018.
- C. Pfister, J. Kaniewski, M. Tomamichel, A. Mantri, **R. Schmucker**, N. McMahon, G. Milburn, S. Wehner
  A Universal Test for Gravitational Decoherence
  Nature Communications 7, 13022, 2016.

INVITED TALKS

- Large Language Models for Conversational Tutoring Systems, University of Pennsylvania, 2024
- ML for Assessments and Interventions in Online Tutoring Systems, Texas A&M, 2024
- Towards the Automated Induction of Conversational Tutoring Systems, University of Memphis, 2023
- What can Machine Learning do for Education?, Burlington Public School, 2023
- Machine Learning Paradigms for Intelligent Tutoring Systems, ETH, 2023

TEACHING

- Mentor for **Undergraduate Research Apprenticeship**, Summer 2024 (CMU)
- Teaching Assistant for **Deep Reinforcement Learning & Control**, Spring 2022 (CMU)
- Teaching Assistant for **Convex Optimization**, Fall 2020 (CMU)

COMMUNITY SERVICE

- Chair for "LLMs in the classroom" session at AIED conference, 2024
- Reviewer for AIED (2024, 2023), JLA (2024), EDM (2024), L@S (2024), ICLR R2-FM (2024), AAAI AI4Edu (2023)
- Mentor in CMU machine learning PhD mentoring program, since 2023
- Mentor in CMU undergraduate AI mentoring program, since 2022
- Served on department retreat committee organizing social events, 2019–2023
- Served on MLD PhD admission committee, 2021
- Member of press team for German network for young scientists (JuForum), 2017-2018

SCHOLARSHIPS & AWARDS

- **Tools Competition**, 21st Century World Track, Catalyst Award ($50,000), 2024
- **KIISS-Scholarship**, Karlsruhe Institute of Technology & Robert Bosch GmbH, 2014–2018
- **Society for Gifted Students**, Karlsruhe Institute of Technology, 2014–2018
- **CLICS-Scholarship**, Karlsruhe Institute of Technology, 2017
- **Ferry-Porsche-Scholarship**, Porsche AG, 2015
- **2. Place in Math/CompSci**, Jugend Forscht Competition, Baden-Wuerttemberg, Germany, 2014

COMPUTER SKILLS

Languages	Python, C++, R, Java, JavaScript
Operating systems	Linux, Windows, macOS
Other	PyTorch, Tensorflow, Sklearn, ROS, SQL

LANGUAGES

German	Native speaker
English	Fluent
Spanish	Basic