The Potentials of Recommender Systems Challenges for Student Learning

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Abstract

Increasingly, educators make use of learning-by-doing approaches to teach students of STEM programmes the skills that they need to become successful in careers in research and development. However, we argue that the technical challenges addressed in these programmes are often too limited and therefore do not support the students in gaining the more advanced skill sets required to thrive in our technology-oriented economy. We therefore suggest to incorporate realistic and complex challenges that model real-world problems faced in industrial settings. Focusing on the domain of recommender systems, we see potentials in embedding recommender systems challenges to enhance student learning to teach students the skills required by modern data scientists.

The Goals and Challenges of STEM Teaching

Analysing the requirements of industries that "depend on engineering knowledge and skills", the Royal Academy of Engineering argued that training graduates of STEM programmes is vital for countries that aspire to be at the forefront of technical innovation [2]. We conclude from this statement that students of STEM programmes need to gain a technical skill set that will allow them to thrive in industry. However, we argue that in the context of research & development, it is equally important to provide students with skills for self reflection and critical thinking.

In order to help students gain well-rounded abilities that will allow them to thrive in research & development careers, STEM courses need to be designed carefully. This does not only include the development of appropriate learning outcomes that address current challenges, but also the application of student-centred teaching methods that trigger students' intrinsic motivation to engage with these outcomes. Trigwell et al. [7], for example, argue that student-centred teaching supports deep learning and hence can play a key role in enhancing students' learning experience.

In the context of teaching STEM courses, Smart and Csapo [6] suggest that learning-by-doing activities can have a positive impact on student engagement. In fact, in the past few years, incorporating practical lab assignments have become an important part of the teaching curriculum. For example, it is not uncommon for students of computer science degrees to implement pieces of software to better understand the techniques taught in the course. Teaching information retrieval,

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Mizzaro [5], for example, opted for mandatory lab assignments for teaching web information retrieval to computer science students. Teaching a similar course, the authors of this paper asked students to develop a search engine using open source software components. Such system consists of different components such as text stemmer, indexing services, retrieval engine, and graphical user interface. After introducing the science behind these components in the lectures, the assignment of the week is to incorporate this component into the students' search engine. Lopez-Garcia and Cacheda [4] refer to this teaching approach as "technical-oriented IR methodology", consisting of theoretical lectures and practical work.

The Opportunities offered by Recommender Systems Benchmarks

Although we agree that such technical-oriented teaching methods allow students to gain basic skill sets, we argue that due to the limited complexity of such lab assignments, we can still observe an increasing "knowledge gap" between skills taught at higher education institutions and skills required in R&D departments. In order to address this gap, we suggest to incorporate more complex assignments that are not only closer to the use cases addressed in industry, but also focus more on teaching academic methods and values that are of high importance to young researchers.

Addressing this, we suggest that lecturers should embrace the potentials of campaign-style research challenges that are often organised in conjunction with major conferences to teach both technical skills and academic methods needed for a career in R&D. Examples include the annual RecSys Challenge, the CLEF NewsREEL campaign or the KDD Cup in which participants have to provide technical solutions for real-world use cases. While participating in these challenges allows students to gain advanced technical skills (e.g., by learning how to employ popular frameworks and libraries such as Apache Flink or Apache Spark), the academic nature of these challenges also allows them to familiarise themselves with the academic practice of evaluation of different algorithms and techniques. We argue that this provides excellent ground for critical thinking and other skills that are in demand in R&D.

Being involved in the organisation of two challenges focusing on recommender systems benchmarking ([1, 3]), the authors of this paper are interested in investigating how to set up productive collaborations with education institutions. Specifically of interest are special editions of challenges that are run within a specific course using an in-course leaderboard. Such challenges effectively add a motivational layer of gamification, as students compete against their classmates for the top slot. Further, an in-course challenge gives students a direct an immediate way of gaining feedback on their own learning: their score on the leaderboard lets them know whether or not their algorithm has been successful. At the same time, the instructor is alerted to students or groups of students that may need particular help.

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