Interactive Unknowns Recommendation in E-Learning Systems

Abstract—The arise of E-learning systems has led to an anytime-anywhere-learning environment for everyone by providing various online courses and tests. However, due to the lack of teacher-student interaction, such ubiquitous learning is generally not as effective as offline classes. In traditional offline courses, teachers facilitate real-time interaction to teach students in accordance with personal aptitude from students’ feedback in classes. Without the interruption of instructors, it is difficult for users to be aware of personal unknowns. In this paper, we address an important issue on the exploration of user unknowns from interactive question-answering process in E-learning systems. A novel interactive learning system, called CagMab, is devised to interactively recommend questions with a round-by-round strategy, which contributes to applications such as a conversational bot for self-evaluation. The flow enables users to discover their weakness and further helps them to progress. In fact, despite its importance, discovering personal unknowns remains a challenging problem in E-learning systems. Even though formulating the problem with the multi-armed bandit framework provides a solution, it often leads to suboptimal results for interactive unknowns recommendation as it simply relies on the contextual features of answered questions. Note that each question is associated with concepts and similar concepts are likely to be linked manually or systematically, which naturally forms the concept graphs. Mining the rich relationships among users, questions and concepts could be potentially helpful in providing better unknowns recommendation. To this end, in this paper, we develop a novel interactive learning framework by borrowing strengths from concept-aware graph embedding for learning user unknowns. Our experimental studies on real data show that the proposed framework can effectively discover user unknowns in an interactive fashion for recommendation in E-learning systems.