Toward an Edu-Metaverse Supporting Immersive Explorations and Collaborative Learning Through Knowledge Graph and VR Techniques

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Metaverse as an education platform aims at bringing students and educators together into an interactive virtual environment that could potentially unleash a much richer educational content medium due to the highly immersive

learning experience. The driving forces railing the development of engaging education interactions between instructors and students in a metaverse environment stem from (1) the need to expand educational access, and (2) enhancing the convenience of learning processes. First, knowledge graphs (KGs) are increasingly been built for pedagogical purposes. To depict the rich but latent relations among different concepts in a course textbook, course KGs are constructed and refined interactively. However, the application of course KGs for real study scenarios and student career development remains largely unexplored and nontrivial. In this talk, we present a novel tool exploiting course knowledge graphs, to facilitate both intra-course study and inter-course development for students significantly. An interactive web system has been developed for both instructors to construct and manipulate course KGs, and for students to view and interact with knowledge concepts. Next, to visualize the centrality of a course KG based on various metrics, concept-level advising is designed, through which we propose a tailored algorithm to suggest the learning path based on what concepts students have learned. Course-level advising is instantiated with a course network, which indicates the prerequisite relations among different levels of courses, corresponding to the annually increasing curricular design and forming different major streams. Through building such an edu-metaverse, our work solves a pressing issue for edu-metaverse on how it can manifest to connect a broad range of learning material and educational concept together on a ubiquitous platform for users to learn and explore knowledge. To facilitate association, exploration, and engagement in collaborative learning, we combine the structure of KGs and the immersion of virtual reality (VR) in our pilot metaverse prototype, K-Cube VR, which is developed and tested to validate the underlying edu-metaverse theory and framework. Examples will also be provided to illustrate the effectiveness of our Edu-Metaverse approach.