**Matrix Completion for Computational Education Recommendation System**

With the increasing amount of information and the arising complexity of content, the information search and gathering task becomes time-consuming for users. Thus, a recommendation system can be leveraged to provide personalized recommendations to users based on their preferences, behavior, and past interactions with a system or platform. Our motivation in this project is to provide a recommendation system for educational purpose, which helps us design a course optimally. We explore one common approach to recommendation system, i.e., Matrix Completion.

We model the course structure as a bipartite graph, and the student-question performance as a binary matrix. Based on only the partial observations of the binary matrix, we aim to recover the complete matrix in order to give an overall estimate of student performance. In this project, we employ the nuclear norm convex optimization technique for completing matrices and designing education recommendation system. We modify the standard NNM problem formulation by adding one extra optimization variable and one more convex constraint. The matrix completion performance with this modification surpasses the standard one in our specific scenario. Meanwhile, we give a result on the required number of observed entries to exactly complete matrix and obtain a prediction of overall student performance. In addition, we discuss how the course structure will influence the student-question response matrix recovery, and draw a suggestion on the course structure design. In the end, we demonstrate that our matrix completion technique can be leveraged for problems of different dimensions, i.e., different class sizes.