Dissertation Defense

Doctor of Philosophy in Computer Science

“Tools for Academic Advisors Based on Existing University Student Data” by Nathan Ong

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Time: 1:00PM – 2:00PM
Place: Room 5317, Sennott Square, 3810 Forbes Ave., Pittsburgh, PA 15213

Committee:
- Dr. Daniel Mossé, Professor and former and Interim Department Chair, Computer Science, School of Computing and Information, University of Pittsburgh
- Dr. Taieb Znati, Professor Emeritus and former Department Chair, Computer Science, School of Computing and Information, University of Pittsburgh
- Dr. Erin Walker, Associate Professor, Computer Science, School of Computing and Information, University of Pittsburgh
- Dr. Mary Besterfield-Sacre, Professor and Senior Associate Dean for Academic Affairs, Industrial Engineering, Swanson School of Engineering, University of Pittsburgh
- Dr. Alan Lesgold, Professor Emeritus and former Dean, Teaching, Learning, and Leading, School of Education, University of Pittsburgh

Abstract:
Universities already maintain vast stores of student data, but such data are underutilized and unstructured. Typical student data analytics approaches maintain their focus on unstructured data and create tools that give predictions without the structured context the data came from, requiring users to recontextualize the results to be able to diagnose issues and perform interventions. Academic advisors are no different: despite being stewards of the programs they advise for, it is impossible for them to know every concept from every course, let alone understand the relationships between them. Furthermore, it is just as impossible for advisors to know every student and be able to determine what recommendations may be better for current students that are similar to other historical groups of students.

I propose reintroducing structured context back into the data flow, with the goal of providing advisors with easy-to-interpret tools that provide data-driven insights. I first show that structured student schedule and grade data can uncover new observations when using existing techniques for student grade prediction, specifically that instructors have a larger than anticipated effect on student grades. With the knowledge that structured data can lead to useful information, I then developed two tools that utilize structured data at different granularities that cater to advisors: (a) StudentPaths, for unsupervised machine learning insights into student performance and scheduling at the course level, and (b) Concept Progression Maps, for insights into student performance within a course at the concept level. These tools were developed and utilized in a single-blind study with academic advisors and students, where only advisors had access to the tools and information. From the studies, I found that despite the challenges that advisors had with the tools, the information derived from these tools can change the conversational dynamic in academic advising sessions and demonstrate that these changes have the potential to make a positive impact on future student performance in their courses.