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Rackham Interdisciplinary Seminar

Proposal: Academic Analytics: Interdisciplinary data mining to improve student learning

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Rackham Interdisciplinary Seminar Proposal
January 31, 2011

Submitters: Timothy A. McKay (Physics and Astronomy) and Stephanie D. Teasley (Information)

Seminar Title: Academic Analytics: interdisciplinary data mining to improve student learning

Amount Requested: \$7000
(IMPORTANT: Include total proposed budget as an attachment)

List other sources of support:

Professor McKay's annual Thurnau Professor research stipend: \$3000

List of participants expected among faculty, graduate students, postdocs, and staff:

Faculty:

- Timothy McKay: Physics
- Stephanie Teasley: Information
- August Evrard: Physics
- David Gerdes: Physics
- Brian Coppola: Chemistry
- Mark Banaszak Hall: Chemistry
- Anne Gere: English/Education
- Joe Krajcik: Education
- Stephen Desjardins: Education
- Christopher Miller: Astronomy
- Meg Noori: CSP
- Connie Cook: Education/CRLT
- Guy Meadows: Engineering

Graduate Students:

- Rebecca Matz: Chemistry
- Anbo Chen: Physics
- Jaclyn Sanders: Physics
- Andrew Krumm: School of Education
- Joe Waddington: School of Education

Staff:

- Patrick Manning: Sweetland
- John Gohsman: ITS
- Rob Wilke: LSA/IT
- Mary Wright: CRLT
- Erping Zhu: CRLT

- Tiffany Mara: MPortfolio, Digital Media Commons

Postdocs:

- Mary Antonaros: CRLT
- Steven Lonn: USE Lab, Digital Media Commons

List of graduate programs from which participation is expected:

- Education
- Information
- Psychology
- Physics
- Chemistry
- Engineering

On a separate sheet of paper, please describe the nature of the proposed seminar/colloquia with reference to the criteria. Be explicit about the nature of student and faculty participation in the seminar/colloquia and the means by which graduate students will be incorporated into planning and implementation activities. Explain why this program will be difficult to fund through other sources.

Colleges and universities are increasingly aggregating and analyzing once disparate sources of data, such as a student's admissions records, academic history, and use of campus information technologies. Sophisticated analytic tools are providing businesses, governmental agencies, and educational institutions powerful ways of detecting and interpreting patterns across rich sources of user-generated data. In business, analytic tools are being applied under the rubric of "business intelligence" where, for example, customers' past purchases and online browsing history are mined to automatically make recommendations for future purchases. In higher education, the application of similar tools, called "academic analytics," are being used to support decision-making related to student admissions and housing and, more recently, to develop predictive models aimed at increasing student retention and identifying students at risk for academic failure.

Mining available data and using academic analytics can provide a rich portrait of each student's progress through the university; a map of their journey from application, through the curriculum, to graduation. Performance at every stage is recorded, at a minimum as course grades, but often in more detailed ways. A wide variety of auxiliary information is available as well, including instructor information, student evaluation of courses, usage records for CTools and online homework systems, and more. This information can tell us a tremendous amount about how students progress from naïve beginners to graduates, how they navigate the university, and how they learn. Academic analytics provide us with tools to probe what factors correlate with student success, and whether these factors change with time. We can also probe the nature of the social networks which knit together members of our campus.

Unfortunately, these data sources lie mostly untapped. Many of the faculty and staff who are focused on understanding the academic mission of the university are

not well versed in quantitative analysis of large, complex data sets. At the same time, the U of M community includes a diverse range of experts in data mining, management, and visualization. We are proposing this seminar series in an effort to begin to bring these two groups together around the general topic of academic analytics. In doing this, we hope to spark conversation and collaborations which will connect central questions of student success with next generation tools able to address them.

Substantial federal and private resources are being made available for the pursuit of these new approaches to academic data. For example, the Gates and Hewlett Foundations have jointly funded the Educause "Next Generation Learning" challenge, calling for new applications of technology in learning analytics as part of education reform at all levels. At the NSF, the Transforming STEM Learning program likewise calls for the development of technologically-enabled new learning environments, powered by data rich analytic tools. We expect this seminar series to lead to new collaborative proposals here at Michigan; proposals that will fund research and application of academic analytics and well as training in these methods for graduate students and post docs.

Graduate students will be incorporated into planning and implementation activities by including them in the decision-making process about the readings and activities for the bi-weekly seminars as well as in the resulting grant-writing. This will give them experience in two important aspects of academic life: developing seminars and writing grants. In addition, graduate students will have input into the selection of invited speakers and opportunities to interact with these guests outside of the seminar.

Why is funding from this program needed? This topic touches on all parts of the campus, from research into undergraduate admission and classroom teaching to studies of the structure and function of social networks and academic collaborations. Academic analytics has applications relevant for faculty research, student success, and staff effectiveness. As such, it is difficult to identify its natural home. We are hoping that initial support from Rackham and OVPR will enable us to bring this community together across campus for the first time, reveal something of the potential of this approach, and foster a series of self-sustaining collaborations.

Budget:

Biweekly lunch seminars: 7 in fall 2011 and 7 in winter 2012 @\$200 = \$2800

Visiting speakers: 3 in fall 2011 and 3 in winter 2012 @\$1200 = \$7200

Total cost: \$10000 (\$7000 from this proposal, \$3000 from McKay's Thurnau funds)