May 2017
Complexity Community Sharing Session
4 May (Thu) 11.00am – 1.00pm
Seminar Room 102

(opposite The Hive) Blk 1 Innovation Centre, Level 1
16 Nanyang Drive, Singapore 637722, NTU

Dr Fedor Duzhin

Extracting Patterns from Educational Data without Conducting Proper Randomized Experiments

As we teach the same course for many years, we use to do little adjustments. We update slides, re-arrange course materials, change weightage of quizzes etc. Sometimes we introduce a new technology or instructional tool, such as clickers. The decision to make such changes is usually based on our gut feeling, on students' feedback on teaching, on our curiosity to try out something new, or, in rare occasions, is informed by research in pedagogy. However, we almost never analyse our own data to see how our decisions help our students to improve their exam scores. The main reason is that conducting a proper randomized experiment in education disrupts the normal teaching process, is time-consuming, requires management's blessing and getting students' consent, and involves sophisticated statistical analysis.

We are going to present a method of mining educational data sets obtained from teaching ordinary undergraduate courses structured to teach rather than to experiment with pedagogy. The data are just simple test scores and students' background, i.e., no questionnaires or concept inventories. Thus, even though a proper publication based on our method of data analysis may require approval by Institutional Review Board or a similar body, the method can still be widely applied for decision-making on a personal level of a course instructor. The mathematical core of our method is symbolic regression via genetic programming, but the end-user doesn't have to understand how it works – we will demonstrate a custom Mathematica notebook that does all the analysis automatically.

We will share some specific findings, such as Clickers are a more effective instructional tool than handwritten assignments and shared online documents are, in turn, a more effective instructional tool than Clickers. It means that we should abandon handwritten assignments as a way to provide feedback to our students - apparently,
they just don't read the grader's comments. Final exam results can be accurately predicted from previous final exam results but predicting project scores has about the same degree of accuracy as predicting random data. It means that maybe final exam are often just a bad way to assess learning.

Dr Fedor Duzhin has been a lecturer at SPMS since 2006. Trained as a pure mathematician, he is now a big enthusiast of experimenting with educational technologies and innovative pedagogies. His work is supported by EdeX grants:
2016 - Does team-based learning improve exam scores?
2017 - How does a tutor's personal style affect students' performance?
Dr Fedor Duzhin holds SPMS teaching awards 2008, 2015 and 2016.

Evaluating aspects of Team Based Learning with a data analytics approach.

Team Based Learning (TBL) is a collaborative learning teaching strategy involving components, such as flipped classroom learning, individual and team based assessments, and student peer evaluations. In the talk we will describe some implementations of TBL in a Mathematics class and discuss some aspects of it from a data analytics perspective.

Dr Anders Gustafsson

Dr Anders Gustafsson has been a lecturer at SMPS since 2006 and REP fellow since 2013. Within the Renaissance Engineering Programme and the CN Yang Scholars Programme he has been experimenting with flipped classroom and student team activities as ways of fostering independent and logical thinking. Dr Gustafsson holds an SPMS teaching award (2011) and a Nanyang Education Award (2015).

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