

Learning Analytics and Machine Learning

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ABSTRACT

Learning analytics (LA) as a field remains in its infancy. Many of the techniques now prominent from practitioners have been drawn from various fields, including HCI, statistics, computer science, and learning sciences. In order for LA to grow and advance as a discipline, two significant challenges must be met: 1) development of analytics methods and techniques that are native to the LA discipline, and 2) practitioners in LA to develop algorithms and models that reflect the social and computational dimensions of analytics. This workshop introduces researchers in learning analytics to machine learning (ML) and the opportunities that ML can provide in building next generation analysis models.

Categories and Subject Descriptors

J.1 [Administrative Data Processing] Education; K.3.1 [Computer Uses in Education] Computer-assisted instruction (CAI)

General Terms

Algorithms, Management, Measurement, Documentation, Performance, Experimentation, Security, Human Factors, Theory

Keywords

Learning analytics, machine learning, theory, collaboration

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1. INTRODUCTION

Two prominent challenges exist for the LA discipline: 1) to develop analytics methods and techniques that come from researchers within LA and meet the specific needs and challenges of the discipline (this is particularly important in maturing the complexity of LA) and 2) to ensure active promotion of dialogue and research collaboration at the “edges” of the computational and social dimensions of LA.

Learning analytics projects over the past decade have relied on reasonably well-structured data drawn from learning management systems (LMS) and student information systems (SIS). Social network analysis, recommender systems, as well as student success and predictive models rely heavily on data drawn from these systems. Increasingly, additional online data is being generated, for example through social media, distributed learning systems (such as gRSSHopper¹) and massive open online courses (MOOCs). Data drawn from decentralized systems is messier than data in an LMS or SIS, thus providing further challenges for the field of LA to address.

LA as a field has to date drawn extensively from fields such as statistics, HCI, and research in cognitive tutors [abs]. The interdisciplinary nature of LA brings more technical fields into relation with more social fields. The 1st international conference in Learning Analytics and Knowledge (LAK) addressed this challenge in stating²:

Advances in knowledge modeling and representation, the semantic web, data mining, analytics, and open data form a foundation for new models of knowledge development and analysis. The technical complexity of this nascent field is paralleled by a transition within the full spectrum of learning (education, work place learning, informal learning) to social,

¹ <http://grsshopper.downes.ca>

² <https://tekri.athabascau.ca/analytics/>

networked learning. These technical, pedagogical, and social domains must be brought into dialogue with each other to ensure that interventions and organizational systems serve the needs of all stakeholders.

The growing diversity of educational data affords researchers an opportunity to explore new approaches, already in practice in fields such as artificial intelligence and machine learning, to analyze a broader spectrum of learner data than is currently being considered. This workshop primarily targets the role of machine learning in extending the analytics options available to researchers and as a means to increase the sophistication of LA models and algorithms.

2. WORKSHOP OBJECTIVES & TOPICS

The objective of LAML is to introduce the potential of machine learning to the learning analytics community. It is anticipated that ML will play a substantial role in educational data in the future.

Topics in the workshop include:

- ML's contribution to future LA techniques
- Predictive modeling
- Social network analysis
- Discourse data
- Bayesian analysis
- Distributed datasets and "analytically cloaked" data
- Current LA models and approaches
- Information visualisation
- Student modeling

MOOCs & learning at scale

Real time data analysis and targeted interventions

Student retention

Recommendation models and adaptive learning in large scale open courses

3. FORMAT

The workshop format allows for extensive discussion and interactions.

Workshop agenda is as follows:

1. Introductions and overview (15 min)
2. Presentation: Current state of learning analytics research through methodological lens (45 min)
3. Presentation: What can machine learning contribute to learning analytics? (45 min)
4. Break (30 min)
5. Presentations: 2-3 papers (45 min)
6. Lunch (60 min)
7. Discussion on applications of papers to LA (30 min)
8. Presentations: 2-3 papers (45 min)
9. Break (30 min)
10. Discussion on applications of papers to LA (30 min)
11. Wrap up and conclusion (45 min)