

*LAK 2013: Third International Conference on*  
**Learning Analytics  
and Knowledge**

*8 – 12 April 2013*

Organized By:

**SOLAR**  
SOCIETY for LEARNING  
ANALYTICS RESEARCH

KATHOLIEKE UNIVERSITEIT  
**LEUVEN**



Leuven, Belgium



[www.lakconference.org](http://www.lakconference.org)



Association for  
Computing Machinery

*Advancing Computing as a Science & Profession*

**The Association for Computing Machinery  
2 Penn Plaza, Suite 701  
New York New York 10121-0701**

**ACM COPYRIGHT NOTICE. Copyright © 2013 by the Association for Computing Machinery, Inc. Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Publications Dept., ACM Inc., fax +1 (212) 869-0481, or [permissions@acm.org](mailto:permissions@acm.org).**

For other copying of articles that carry a code at the bottom of the first or last page, copying is permitted provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, +1-978-750-8400, +1-978-750-4470 (fax).

#### **Notice to Past Authors of ACM-Published Articles**

ACM intends to create a complete electronic archive of all articles and/or other material previously published by ACM. If you have written a work that was previously published by ACM in any journal or conference proceedings prior to 1978, or any SIG Newsletter at any time, and you do NOT want this work to appear in the ACM Digital Library, please inform [permissions@acm.org](mailto:permissions@acm.org), stating the title of the work, the author(s), and where and when published.

**ACM ISBN: 978-1-4503-1785-6**

# LAK 2013 Chairs' Welcome

Welcome to the third edition of the Learning Analytics and Knowledge conference. This year, the medieval and, at the same time, modern city of Leuven, Belgium is the venue where researchers and practitioners of this exciting field come together to discuss current status and future trends. Similar to Leuven, Learning Analytics is an old and new field at the same time. Old, because it deals with a problem that exists since Plato's times: how to improve the way students learn. New, because the tools used to achieve this goal, like Big Data and natural language processing, were not feasible merely 10 years ago. Leuven is also the home of beautiful centuries old buildings filled with young, smart and active students. In Learning Analytics, we can also find established researchers in the fields of Educational Research and Technology-Enhanced Learning, collaborating with a large contingent of new and promising researchers that could be called Learning Data Scientists.

As organizers of this year's conference, we had the tough job, together with the other chairs, to improve over what was an already very successful event in 2012. This year, we received almost double the number of submissions, signaling a growing interest in the field. One hundred twenty six high quality contributions made it hard for the Program Chairs and Workshop and Tutorial Chairs to select the 16 full papers, 24 short papers, 11 posters, 5 workshops, 3 tutorials and 3 panels that constitute the program of LAK-13. The acceptance rate for full papers has decreased to 28% from 39% last year, assuring that the talks that we will hear this year should be even better than the ones we attended in Vancouver. This year is also the first time that submissions were received from authors from all 5 continents. While there is still a predominance of North American and European researchers in LAK-13, the voices and viewpoints from other parts of the world are making their entrance in the field.

To taste the diversity of the current status of Learning Analytics research, you only need to scan these proceedings. The topics identified by the Program Chairs in the papers go from theoretical discussion of what is the role of Learning Analytics in the current scientific scene to quite technical discussions on how to apply social network analysis or discourse analytics to measure the progress of students. Whether you are a seasoned researcher or a practitioner who wants to introduce Learning Analytics in your institution, you will find great ideas in the following pages.

We hope that LAK-13 will be a place for you to meet old and new colleagues, to get up-to-date with new trends and techniques to address known and new problems and to (re)discover a field where innovation is firmly rooted in time-proven foundations, just like Leuven.

**Erik Duval**  
University of Leuven, Belgium  
*General Chair*

**Xavier Ochoa**  
Escuela Superior Politécnica del Litoral, Ecuador  
*General Chair*

# Table of Contents

LAK 2013 Conference Organization.....	viii
LAK 2013 Additional Reviewers.....	xi

## Reflections on Learning Analytics

- Learning Analytics as a “Middle Space”.....1  
*Dan Suthers, Katrien Verbert*
- Multidisciplinarity vs. Multivocality, the case of “Learning Analytics”.....5  
*Nicolas Balacheff, Kristine Lund*

## Visualization to support awareness and reflection

- Addressing learner issues with StepUp!: an Evaluation.....14  
*Jose Luis Santos, Katrien Verbert, Sten Govaerts, Erik Duval*
- Live Interest Meter - Learning from Quantified Feedback in Mass Lectures.....23  
*Verónica Rivera-Pelayo, Johannes Munk, Valentin Zacharias, Simone Braun*

## Social network analysis and visualization

- Considering Formal Assessment in Learning Analytics within a PLE: The HOU2LEARN Case.....28  
*Eleni Koulocheri, Michalis Xenos*
- Visualizing Social Learning Ties by Type and Topic: Rationale and Concept Demonstrator.....33  
*Bieke Schreurs, Chris Teplovs, Rebecca Ferguson, Maarten De Laat, Simon Buckingham Shum*

## Communication and collaboration

- Analysis of Writing Processes Using Revision Maps and Probabilistic Topic Models.....38  
*Vilaythong Southavilay, Kalina Yacef, Peter Reimann, Rafael A. Calvo*
- Learning Analytics for Online Discussions: A Pedagogical Model for Intervention with Embedded and Extracted Analytics.....48  
*Alyssa Friend Wise, Yuting Zhao, Simone Nicole Hausknecht*
- Understanding Promotions in a case study of student blogging.....57  
*Bjorn Levi Gunnarsson, Richard Alterman*

## Discourse analytics

- Analyzing the Flow of Ideas and Profiles of Contributors in an Open Learning Community.....66  
*Iassen Halatchliyski, Tobias Hecking, Tilman Göhnert, H. Ulrich Hoppe*
- Epistmeology, Pedagogy, Assessment and Learning Analytics.....75  
*Simon Knight, Simon Buckingham Shum, Karen Littleton*
- An Evaluation of Learning Analytics To Identify Exploratory Dialogue in Online Discussions.....85  
*Rebecca Ferguson, Zhongyu Wei, Yulan He, Simon Buckingham Shum*

## Behavior analysis

- Towards the Development of Multimodal Action Based Assessment.....94  
*Marcelo Worsley, Paulo Blikstein*
- Multimodal Learning Analytics..... 102  
*Paulo Blikstein*
- Toward Collaboration Sensing: Applying Network Analysis Techniques to Collaborative Eye-tracking Data..... 107  
*Bertrand Schneider, Sami Abu-El-Haija, Jim Reesman, Roy Pea*
- Inferring Higher Level Learning Information from Low Level Data for the Khan Academy..... 112  
*Pedro J. Muñoz-Merino, José A. Ruipérez Valiente, Carlos Delgado Kloos*

## Affect analytics

- Affective states and state tests: Investigating how affect throughout the school year predicts end of year learning outcomes.....117  
*Zachary A. Pardos, Ryan S.J.d. Baker, Maria O.C.Z. San Pedro, Sujith M. Gowda, Supreeth M. Gowda*
- An Eye-Tracking Study of Notational, Informational, and Emotional Aspects of Learning Analytics Representations .....125  
*Ravi K. Vatrupu, Peter Reimann, Susan Bull, Matthew Johnson*

## Predictive analytics

- What Can We Learn from Facebook Activity? Using Social Learning Analytics to Observe New Media Literacy Skills.....135  
*June Ahn*
- Improving retention: predicting at-risk students by analysing clicking behaviour in a virtual learning environment.....145  
*Annika Wolff, Zdenek Zdrahal, Andriy Nikolov, Michal Pantucek*
- Open Academic Analytics Initiative: Initial Research Findings.....150  
*Eitel Lauria, Erik Moody, Sandeep Jayaprakash, Nagamani Jonnalagadda, Joshua Baron*

## Sequence analytics

- Interpreting Data Mining Results with Linked Data for Learning Analytics: Motivation, Case Study and Directions.....155  
*Mathieu D'Aquin, Nicolas Jay*
- Nanogenetic Learning Analytics: Illuminating Student Learning Pathways in an Online Fraction Game.....165  
*Taylor Martin, Ani Aghababayan, Jay Pfaffman, Jenna Olsen, Stephanie Baker, Phillip Janisiewicz, Carmen Petrick Smith, Rachel Phillips*

## MOOCs

- Deconstructing Disengagement: Analyzing Learner Subpopulations in Massive Open Online Courses.....170  
*Rene Kizilcec, Chris Piech, Emily Schneider*
- The Pairing of Lecture Recording Data with Assessment Scores: A Method of Discovering Pedagogical Impact.....180  
*Negin Mirriahi, Shane Dawson*

- MOOCs and the Funnel of Participation.....185  
*Doug Clow*

### Assessment

- What Different Kinds of Stratification Can Reveal about the Generalizability of Data-Mined Skill Assessment Models.....190  
*Michael A. Sao Pedro, Ryan S.J.d. Baker, Janice D. Gobert*
- Assessing Students' Performance Using the Learning Analytics Enriched Rubrics.....195  
*Ioannis Dimopoulos, Ourania Petropoulou, Symeon Retalis*
- Model-Driven Assessment of Learners in an Open-Ended Learning Environment.....200  
*James R. Segedy, Kirk M. Loretz, Gautam Biswas*
- Formative Assessment and Learning Analytics.....205  
*Dirk Tempelaar, Hans Cuypers, Evert van de Vrie, André Heck, Henk van der Kooij*

### Supporting teachers

- STEMscopes: Contextualizing Learning Analytics in a K-12 Science Curriculum.....210  
*Carlos Monroy, Virginia Snodgrass Rangel, Reid Whitaker*
- Supporting teachers Supporting Action Research with Learning Analytics.....220  
*Anna Lea Dyckhoff, Vlatko Lukarov, Arham Muslim, Mohamed Amine Chatti, Ulrik Schroeder*
- A case study inside Virtual Worlds: use of analytics for immersive spaces.....230  
*Vanessa Camilleri, Sara de Freitas, Matthew Montebello, Paul McDonagh-Smith*

### Challenges

- Issues, Challenges, and Lessons Learned When Scaling up a Learning Analytics Intervention.....235  
*Steven Lonn, Stephen Aguilar, Stephanie Teasley*
- An evaluation of policy frameworks for addressing ethical considerations in learning analytics.....240  
*Paul Prinsloo, Sharon Slade*
- Aggregating Social and Usage Datasets for Learning Analytics: Data-oriented Challenges.....245  
*Katja Niemann, Martin Wolpers, Giannis Stoitsis, Georgis Chinis, Nikos Manouselis*

### Analytic architectures

- From Micro to Macro - Analyzing Activity in the ROLE Sandbox.....250  
*Dominik Renzel, Ralf Klamma*
- Analytics of collaborative planning in Metafora - architecture, data, and analytic methods.....255  
*Andreas Harrer*

## Design briefings

- GradeCraft: What Can We Learn From a Game-Inspired Learning Management System?.....260  
*Caitlin Holman, Stephen Aguilar, Barry Fishman*
- System for Assessing Classroom Attention.....265  
*Mirko Raca, Pierre Dillenbourg*
- Orchestration of complex inquiry: Three roles for learning analytics in a smart classroom infrastructure.....270  
*James D. Slotta, Mike Tissenbaum, Michelle Lui*

## Panels

- Crafting Transformative Strategies for Personalized Learning/Analytics.....275  
*Linda Baer, Donald Norris, Ann Hill Duin, Robert Brodnick*
- Educational Data Scientists – A Scarce Breed.....278  
*Simon Buckingham Shum, Ryan S.J.D. Baker, John Behrens, Martin Hawksey, Naomi Jeffery, Roy Pea*

## Workshops

- 1st International Workshop on Discourse-Centric Learning Analytics.....282  
*Simon Buckingham Shum, Maarten de Laat, Anna De Liddo, Rebecca Ferguson, Paul Kirschner, Andrew Ravenscroft, Ágnes Sándor, Denise Whitelock*
- Analytics on Video-Based Learning.....283  
*Michail N. Giannakos, Konstantinos Chorianopoulos, Marco Ronchetti, Peter Szegedi, Stephanie D. Teasley*
- Learning Object Analytics for Collections, Repositories & Federations.....285  
*Miguel-Angel Sicilia, Xavier Ochoa, Giannis Stoitsis, Joris Klerkx*
- 2nd International Workshop on Teaching Analytics.....287  
*Ravi Vatrapsu, Peter Reimann, Wolfgang Halb, Susan Bull*

# LAK 2013 Conference Organization

## General Chairs

Erik Duval, University of Leuven, Belgium  
Xavier Ochoa, Escuela Superior Politécnica del Litoral, Ecuador

## Program Chairs

Dan Suthers, University of Hawai'i, USA  
Katrien Verbert, Eindhoven University of Technology, The Netherlands

## Workshop and Tutorial Chairs

Ulrich Hoppe, University of Duisburg-Essen, Germany  
Nikos Manouselis, Agro-Know, Greece  
Alyssa Wise, Simon Fraser University, Canada

## Doctoral Consortium Chairs

Katherine Maillet, Institut National des Télécommunications, France  
Ralf Klamma, RWTH Aachen University, Germany  
Ravi Vatrappu, Copenhagen Business School, Denmark

## Awareness, Interaction and Memory Chairs

Tony Hirst, Open University, UK  
Doug Clow, Open University, UK

## Local Chair

Joris Klerkx, University of Leuven, Belgium

## Program Committee

Tel Amiel, Universidade Estadual do Campinas, Brasil  
Ebrahim Bagheri, Ryerson University, Canada  
Ryan Baker, Teachers College, Columbia University, USA  
Paulo Blikstein, Stanford University, USA  
Peter Brusilovsky, University of Pittsburgh, USA  
Simon Buckingham, Open University, UK  
Cristian Cechinel, Universidade Federal do Pampa, Brasil  
Ming Ming Chiu, SUNY-Buffalo, USA  
Kon Shing Kenneth Chung, University of Sydney, Australia  
Grainne Conole, Open University, UK  
Shane Dawson, The University of British Columbia, Canada  
Maarten de Laat, Open Universiteit Nederland, Netherlands  
Anna De Liddo, Open University, UK



Michael Derntl, RWTH Aachen, Germany  
Stefan Dietze, Knowledge Media Institute, Open University, UK  
Pierre Dillenbourg, École Polytechnique Fédérale de Lausanne, Switzerland  
Yannis Dimitriadis, University of Valladolid, Spain  
Vania Dimitrova, School of Computing, University of Leeds, UK  
Hendrik Drachslers, Open Universiteit Nederland, Netherlands  
Gregory Dyke, University of Lyon, France  
Rebecca Ferguson, The Open University, UK  
Dragan Gasevic, Athabasca University, Canada  
Janice Gobert, Worcester Polytechnic Institute, USA  
Sabine Graf, Athabasca University, Canada  
Marek Hatala, Simon Fraser University, Canada  
Caroline Haythornthwaite, University of British Columbia, Canada  
Eelco Herder, L3S Research Center, Germany  
Zoran Jeremic, University of Belgrade, Serbia  
Jelena Jovanovic, University of Belgrade, Serbia  
Judy Kay, University of Sydney, Australia  
Kinshuk, Athabasca University, Canada  
Paul Kirschner, Open Universiteit Nederland, Netherlands  
Nancy Law, Hong Kong University, China  
Stefanie Lindstaedt, Know-Center, Austria  
Allison Littlejohn, Glasgow Caledonian University, Scotland  
Lori Lockyer, University of Wollongong, Australia  
Phillip Long, University of Queensland, Australia  
Kristine Lund, University of Lyon, France  
Taylor Martin, University of Texas at Austin, USA  
Alejandra Martínez-Monés, University of Valladolid, Spain  
Riccardo Mazza, University of Lugano, Switzerland  
Patrick McAndrew, The Open University, UK  
Gordon McCalla, University of Saskatchewan, Canada  
Bruce McLaren, Carnegie Mellon University, USA  
Agathe Merceron, Beuth University of Applied Sciences, Germany  
Tanja Mitrovic, University of Canterbury, New Zealand  
Louis-Philippe Morency, University of South Carolina, USA  
Jad Najjar, Eummena, Belgium  
Jun Oshima, Shizuoka University, Japan  
Abelardo Pardo, Universidad Carlos III de Madrid, Spain  
Kai Pata, Tallinn University, Estonia  
Peter Reimann, University of Sydney, Australia  
Cristobal Romero, Universidad de Córdoba, Spain  
Carolyn Rose, Carnegie Mellon University, USA  
Demetrios Sampson, University of Piraeus, Greece  
Stefan Scherer, University of South Carolina, USA  
Andreas Schmidt, Hochschule Karlsruhe, Germany  
Hans-Christian Schmitz, Fraunhofer FIT, Germany  
Bruce Sherin, Northwestern University, USA  
Miguel-Angel Sicilia, University of Alcalá, Spain  
George Siemens, Athabasca University, Canada  
Marcus Specht, Open Universiteit Nederland, Netherlands  
John Stamper, Carnegie Mellon University, USA  
Stefan Trausan-Matu, University "Politehnica" Bucharest, Romania

Martin Wolpers, Fraunhofer FIT, Germany  
Marcelo Worsley, Stanford University, USA  
Kalina Yacef, University of Sydney, Australia  
Michael Yudelson, Carnegie Mellon University, USA  
Amal Zouaq, Royal Military College of Canada

## **LAK 2013 Additional Reviewers**

Chris Brooks, University of Saskatchewan, Canada  
Sandro Camargo, Universidade Federal do Pampa, Brasil  
Moushir M. El-Bishouty, Athabasca University, Canada  
Paulo Gaona, University of Alcalá, Spain  
Jim Greer, University of Saskatchewan, Canada  
Jan-Pan Hwang, National Cheng Kung University, Taiwan  
Milos Kravcik, RWTH Aachen, Germany  
Jing Leng, Hong Kong University, China  
Leonardo Lezcano, University of Alcalá, Spain  
Jingyan Lu, Hong Kong University, China  
David Martin, University of Alcalá, Spain  
Kasia Muldner, The University of British Columbia, Canada  
Enayat Rajabi, University of Alcalá, Spain  
Michael Sao Pedro, Worcester Polytechnic Institute, USA  
Richard Tortorella, Athabasca University, Canada