Trends in Learning Analytics Research – Major Themes at LAK 16 & LAK 17

Flinders
UNIVERSITY
inspiring achievement

Dr. Richard Price, Data Scientist, Planning and Analytical Services, Flinders University

Flinders
UNIVERSITY
inspiring achievement

The LAK Conference Series

- Learning Analytics & Knowledge
- The premier international learning analytics conference primarily focused on the reporting of LA research
- Been running annually since 2011 (Banff)
- March 2017 held in Vancouver (450 attendees), 2018 to be held in Sydney
- All sessions videoed and available on YouTube/LAK website
- Australia punches well above it's weight in terms of presenters, attendees & LA luminaries

General Themes – Retention Analytics

- Predictive analytics - machine learning based models for predicting students at risk
  - Uni. North Carolina (2016)
  - Blackboard (2016) –'Retention Centre'
  - Open University (UK) – target variable submit next assignment (2016)
  - UniSA (2017), OU UK (2017) Clustering approach (no legacy data required)

General Themes – Social Network Analysis

- Analysis of discussion forum posts
  - Metadata only - Linking SNA metrics (degree, betweeness & network centrality) to performance (Uni. Edinburgh & UniSA, Simon Fraser Uni.)
  - Content analysis
    - identifying threads of course related content against course outline (UniSA)
    - Temporal keyword analysis by student (U. of Singapore)

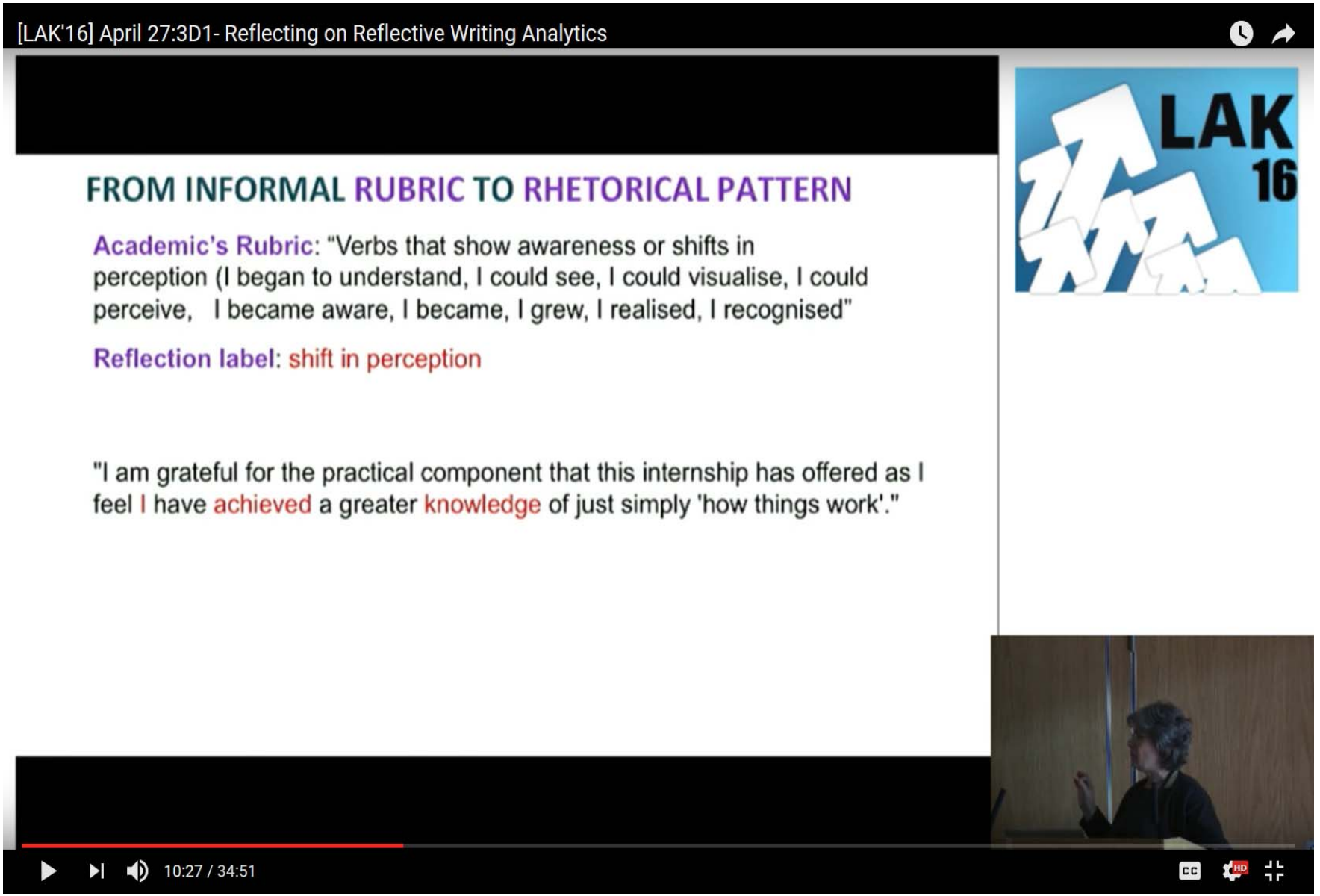
General Themes – Writing Analytics

- Discussion forum posts analysis
  - Thread analysis, quality analysis of posts

- Automated Content Analysis of Discussion Transcripts (Uni. Ed., QUT, SFU & Texas) – Machine learning approach for classification of five stages of cognitive presence

General Themes – Writing Analytics

- Reflective writing analytics (Buckingham-Shum et al. 2016 & 2017)
  - Classifying text for quality of reflection by looking for formal rhetorical patterns (moves)


[LAK'16] April 27:3D1- Reflecting on Reflective Writing Analytics
FROM INFORMAL RUBRIC TO RHETORICAL PATTERN
Academic's Rubric: "Verbs that show awareness or shifts in perception (I began to understand, I could see, I could visualise, I could perceive, I became aware, I became, I grew, I realised, I recognised"
Reflection label: shift in perception
"I am grateful for the practical component that this internship has offered as I feel I have achieved a greater knowledge of just simply 'how things work'."
LAK 16
10:27 / 34:51

General Themes – Writing Analytics

- Academic writing coaching systems
  - UTS Writing Analysis Coder
  - Mwrite – writing to learn (U. of Michigan)
  - Ph.D Thesis Writing Coach – (U. of Zurich)
- Exam Essay Grade Scoring (Pearson)
  - Machine learning system trained on thousands of historical marked exam essays. Extracts textual features that have a high correlation with end grade

LEARNING analytics

- Shift in focus towards the analysis of the learning process
  - Observable trend in LA research moving from the analysis of LMS data towards sensor based monitoring of the learning process (Understanding learner behaviour)
  - LMS activity based metrics have proved to be surprisingly good proxies for the measurement of cognitive engagement however researchers are seeking further improvements

7th International Learning Analytics and Knowledge Conference

can we develop learning technologies that automatically sense and respond to mind wandering?

Keynote Address
Dr. Sidney D'Mello
March 17, 2017

SFU SIMON FRASER UNIVERSITY
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17:46 / 59:18

[LAK'17] May 17: Keynote - Sidney D'Mello: Multimodal Classroom Analytics

7th International Learning Analytics and Knowledge Conference

Keynote Address
Dr. Sidney D'Mello
March 17, 2017

SFU SIMON FRASER UNIVERSITY
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18:49 / 59:18

[LAK'17] May 15: Keynote - Sanna Järvelä: Big data from a little person

7th International Learning Analytics and Knowledge Conference

Our aim

1. Investigate regulatory processes in authentic collaborative learning situations
2. Explore what multimodal data can tell us about critical SRL processes
3. Develop scaffolds and support for SSRL in CSCL

Keynote Address
Dr. Sanna Järvelä
March 15, 2017

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

11:06 / 36:11

[LAK'17] May 15: Keynote - Sanna Järvelä: Big data from a little person

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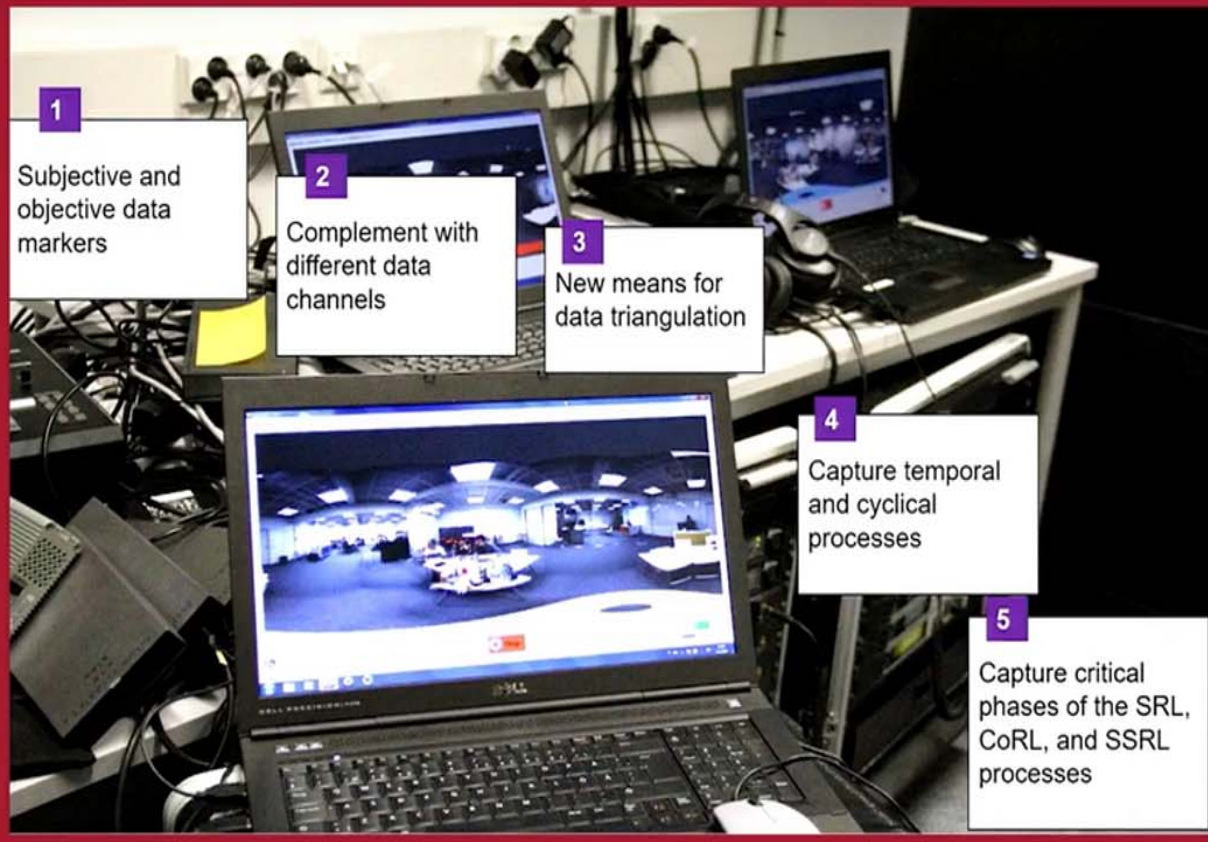

Keynote Address

Dr. Sanna Järvelä

March 15, 2017

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD

19:02 / 36:11

[LAK'17] May 15: Keynote - Sanna Järvelä: Big data from a little person

7th International Learning Analytics and Knowledge Conference

All resulting BIG & COMPLEX data:

101 hours of video,
266 216 000 data points of physiological data,
236 000 EdX log events...

GRAPHICAL USER INTERFACE VISUALIZING COMPLEX DATA
Collaboration with LA, data-mining and signal processing experts

(Alikhani, I., Juuso, I., & Seppänen, T. 2017)

[LAK'17] May 16: Keynote - Timothy McKay: Can a University become a Learning Laboratory?

7th International Learning Analytics and Knowledge Conference

Keynote Address
Dr. Timothy McKay
March 16, 2017

SFU SIMON FRASER UNIVERSITY
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0:07 / 1:09:17

[LAK'17] May 16: Keynote - Timothy McKay: Can a University become a Learning Laboratory?

7th International Learning Analytics and Knowledge Conference

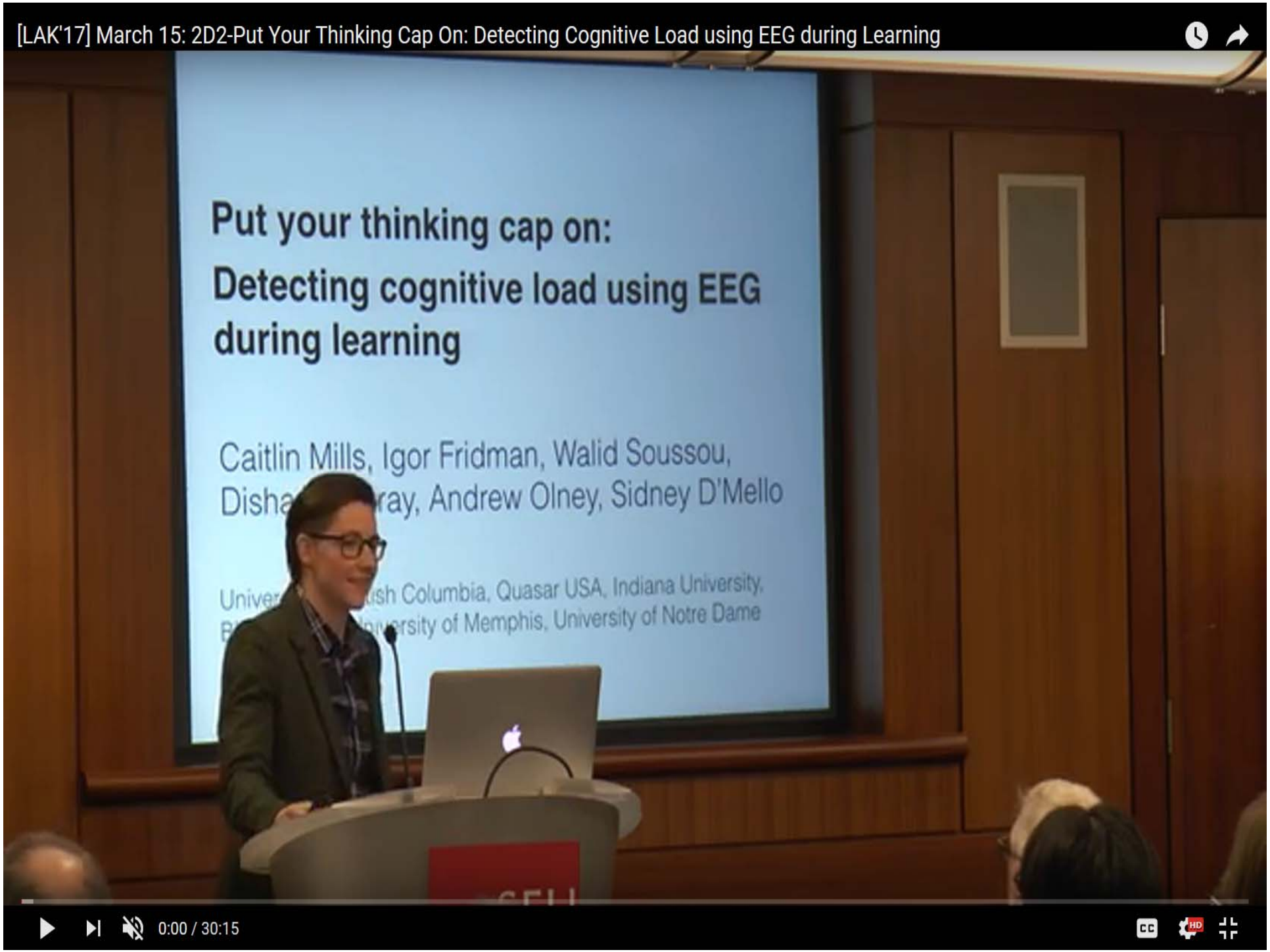
Keynote Address
Dr. Timothy McKay

A Learning Health System

- Today, extensive data about patients and their outcomes are gathered as a matter of course. The Institute of Medicine is calling for creation of a 'learning health system':

"in which knowledge generation is so embedded into the core of the practice of medicine that it is a natural outgrowth and product of the healthcare delivery process and leads to continual improvement in care."[1]

[1] IOM Roundtable on Evidence-Based Medicine, *The*


[LAK'17] March 15: 2D2-Put Your Thinking Cap On: Detecting Cognitive Load using EEG during Learning
Put your thinking cap on:
Detecting cognitive load using EEG during learning
Caitlin Mills, Igor Fridman, Walid Soussou,
Andrew Olney, Sidney D'Mello
Quasar USA, Indiana University,
University of Memphis, University of Notre Dame
0:00 / 30:15

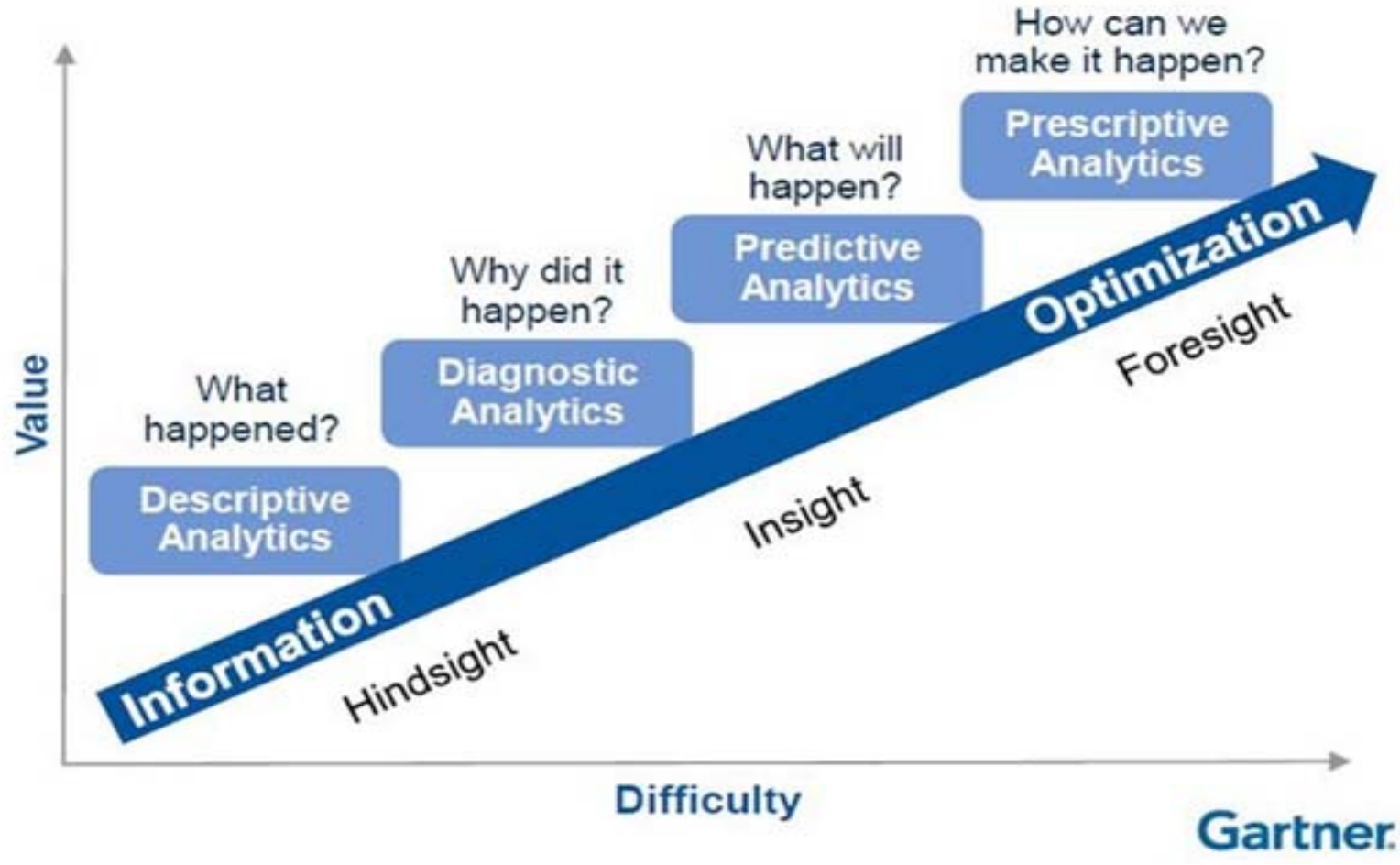
Solutions Looking For An LA Problem

- LA researchers investigating the application of technologies developed for other purposes to the learning environment
  - Social Network Analysis
  - Text analytics
  - Speech recognition
  - Video processing
  - Affective (emotion) Computing (face recog.,speech analytics, text analytics, body posture recog.)

Deployments of Learning Analytics

‘1st Base’
Demographic and Behavioural (LMS) Dashboards –limited to presentation of raw data and descriptive analytics

Gartner's Data Analytics Maturity Model

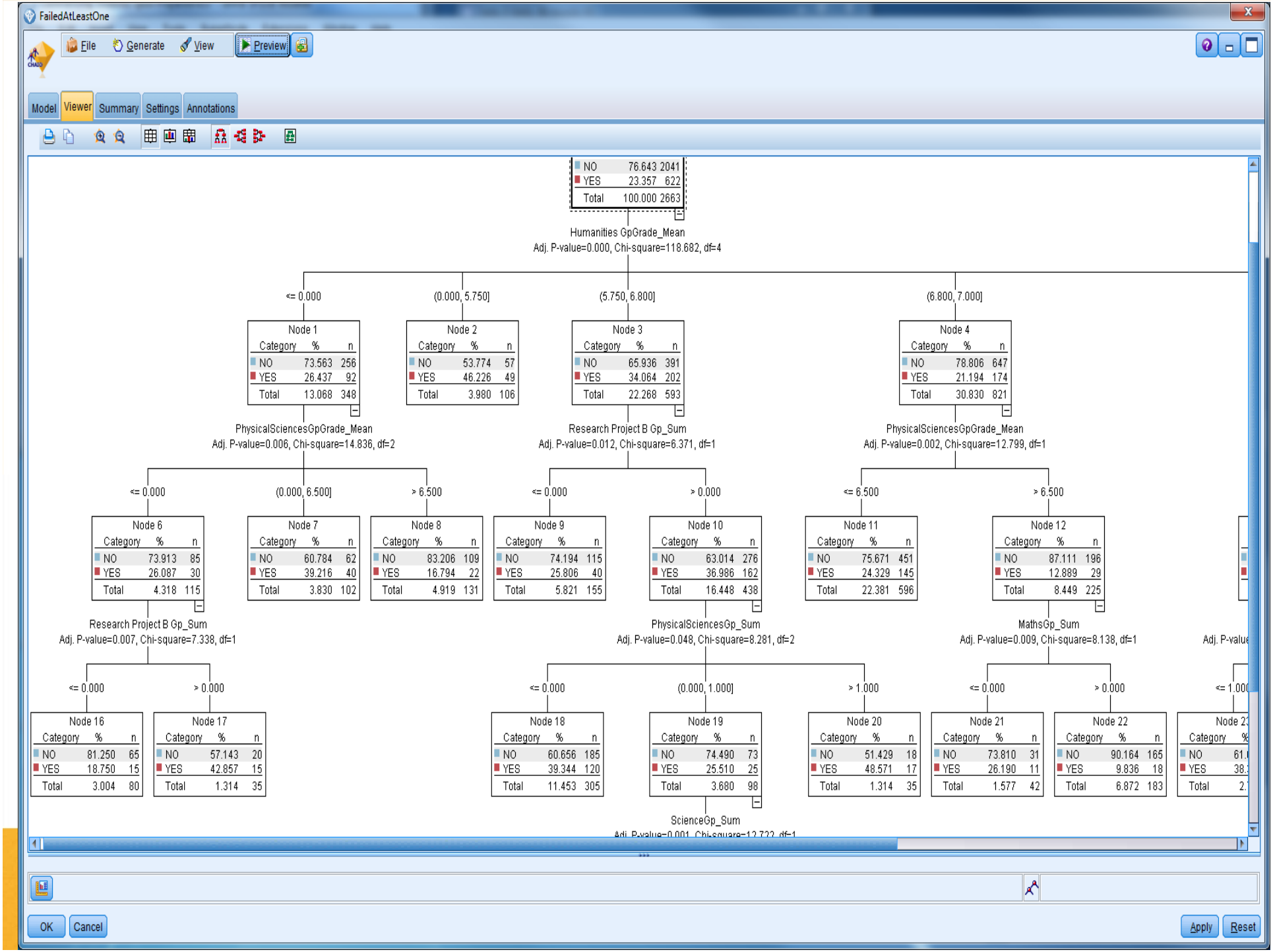


1st Base - Behavioural Dashboards

Presentation of raw data plus descriptive analytics

Predictive Analytics

- 1st Year Preparedness for University Study
  - Predictive model (CHAID decision tree) to predict likelihood of a student failing at least one 1st year topic. Using only prior learning information, some students have >40% chance of failing versus base rate of 23%


FailedAtLeastOne
File
Generate
View
Preview
Model
Viewer
Summary
Settings
Annotations
NO 76.643 2041
YES 23.357 622
Total 100.000 2663
Humanities GpGrade_Mean
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(0.000, 5.750]
(5.750, 6.800]
(6.800, 7.000]
Node 1
Category % n
NO 73.563 256
YES 26.437 92
Total 13.068 348
Node 2
Category % n
NO 53.774 57
YES 46.226 49
Total 3.980 106
Node 3
Category % n
NO 65.936 391
YES 34.064 202
Total 22.268 593
Node 4
Category % n
NO 78.806 647
YES 21.194 174
Total 30.830 821
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Research Project B Gp_Sum
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PhysicalSciencesGpGrade_Mean
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(0.000, 6.500]
> 6.500
<= 0.000
> 0.000
<= 6.500
> 6.500
Node 6
Category % n
NO 73.913 85
YES 26.087 30
Total 4.318 115
Node 7
Category % n
NO 60.784 62
YES 39.216 40
Total 3.830 102
Node 8
Category % n
NO 83.206 109
YES 16.794 22
Total 4.919 131
Node 9
Category % n
NO 74.194 115
YES 25.806 40
Total 5.821 155
Node 10
Category % n
NO 63.014 276
YES 36.986 162
Total 16.448 438
Node 11
Category % n
NO 75.671 451
YES 24.329 145
Total 22.381 596
Node 12
Category % n
NO 87.111 196
YES 12.889 29
Total 8.449 225
Research Project B Gp_Sum
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PhysicalSciencesGp_Sum
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MathsGp_Sum
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> 0.000
<= 0.000
(0.000, 1.000]
> 1.000
<= 0.000
> 0.000
Node 16
Category % n
NO 81.250 65
YES 18.750 15
Total 3.004 80
Node 17
Category % n
NO 57.143 20
YES 42.857 15
Total 1.314 35
Node 18
Category % n
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Node 19
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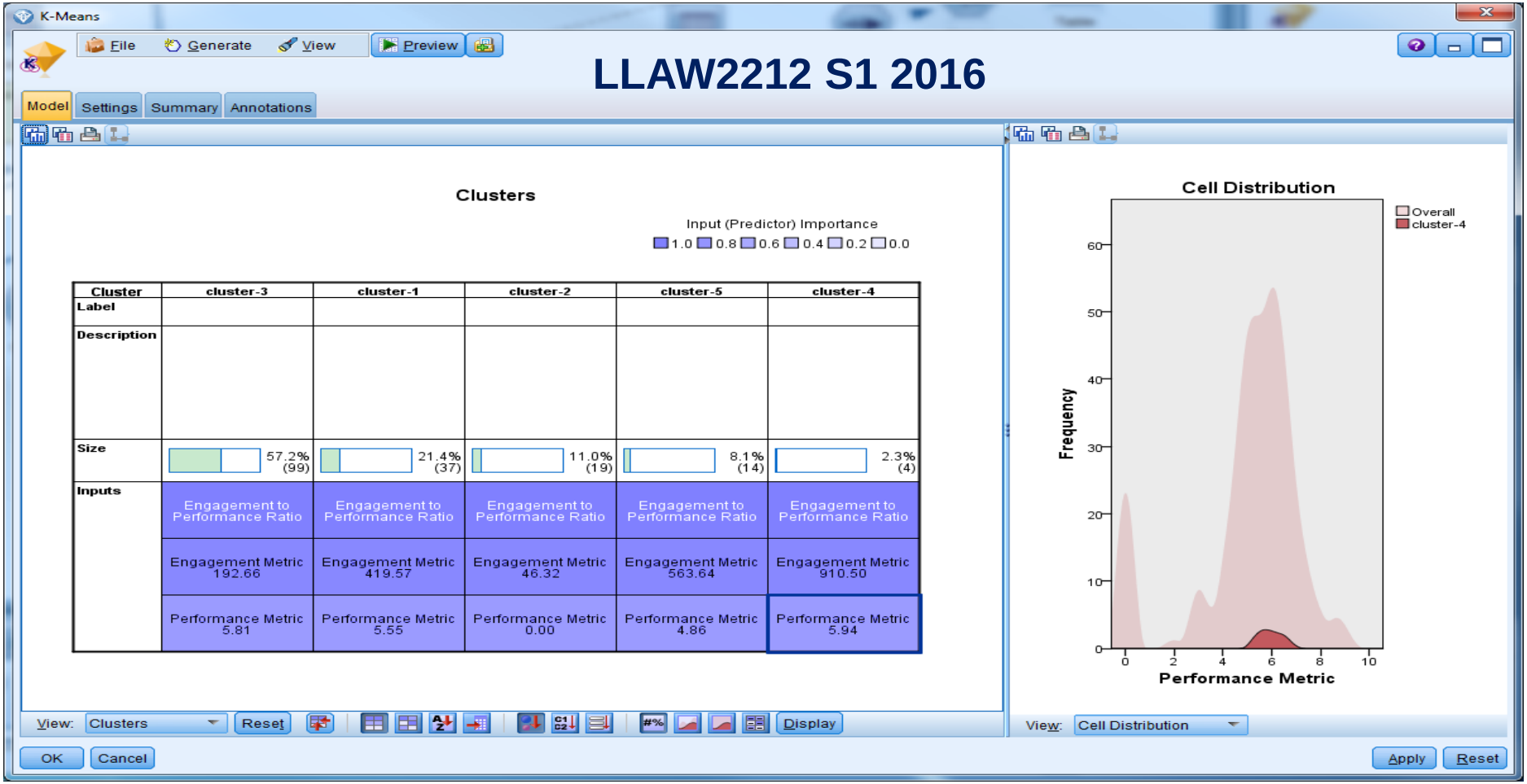
ScienceGp_Sum
OK
Cancel
Apply
Reset

Early Intervention Clustering Tool (L&T Innovation Award)



Conclusion

- Research in learning analytics is a dynamic, diverse, fast moving and growing field
- Commercial LA market predicted to be worth $2.1B by 2019 growing at 25% AGR (RNR Market Research)
- It’s an exciting time to be working in the field of learning analytics !