The Spanish Network of Learning Analytics: Achievements and Challenges

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Seminario eMadrid «Revisión y desafíos en Learning Analytics»
8th May, 2020

GSIC-EMIC Grupo de Sistemas Inteligentes y Cooperativos
Educación, Medios, Informática y Cultura

GOBIERNO DE ESPAÑA
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Outline

- Introduction
- Achivements
  - SNOLA - A brief historical perspective
  - Current research trends in SNOLA
- Challenges
- Conclusions and open research lines

Introduction

- Networks or researchers and technology are at the core of any discipline (Latour, 2005)
- LA has grown “as it is” thanks to its networks

- In Spain: SNOLA
- There is interest in reflecting about the work done and contributions of the network, like in Papamitsiou, Giannakos, & Ochoa, (2020).

Papamitsiou, Z., Giannakos, M., and Ochoa, X. (2020). From childhood to maturity: Are we there yet?: Mapping the intellectual progress in learning analytics during the past decade, in *Proceedings of LAK 2020*

Goals and method

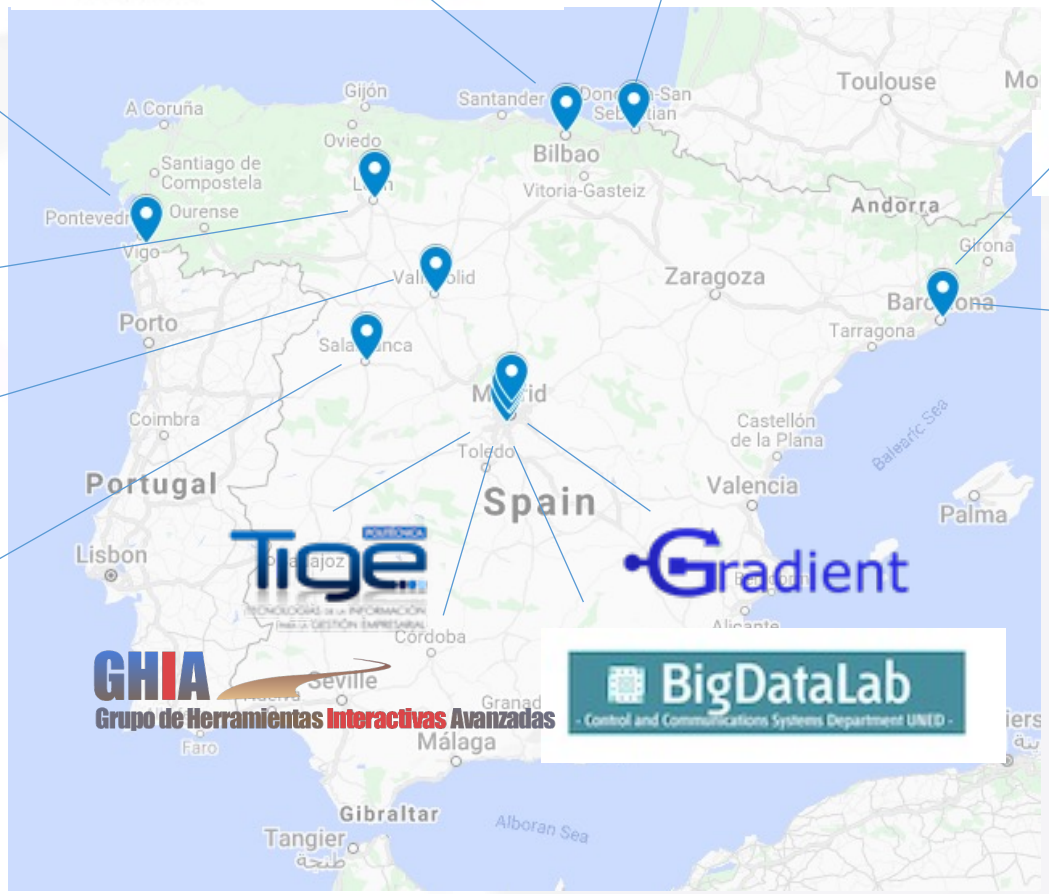
- Goals:
  - What has been the trajectory of the network?
  - What are the main research goals of its members?
  - What are the challenges in the field according to its members?
- Method
  - Review of archival data
  - Open ended questionnaire to the members of the network
  - Further elaboration with the respondents

Martínez-Monés, A., Dimitriadis, Y., Acquila-Natale, E., Álvarez, A., Caerio-Rodríguez, M., Cobos, R., Conde-González, M. A., García-Peñalvo, F. J., Hernández-Leo, D., Menchaca, I., Muñoz-Merino, P. J., Ros, S., y Sancho-Vinuesa, T. (2020). **Achievements and challenges in learning analytics in Spain: The view of SNOLA**. *RIED. Revista Iberoamericana de Educación a Distancia, 23*(2), (preprint).

Outline

- Introduction
- Achivements
  - SNOLA – Overview
  - Current research trends in SNOLA
- Challenges
- Conclusions and open research lines

SNOLA - Members



SNOLA - History

- **2013** — Network kick-off
- **2015** — 1st Official Recognition
- **2020** — 2nd Official Recognition

2013	• TEEM 2013 • LASI 2013 (UC3M)
2014	• TEEM 2014 • LASI 2014 (UNED)
2015	• TEEM 2015 • LASI 2015 (U Deusto)
2016	• TEEM 2016 • LASI 2016 (U Deusto)
2017	• TEEM 2017 • LASI 2017 (UC3M) • EDUCON 2017
2018	• TEEM 2018 • LASI 2018 (ULeón)
2019	• TEEM 2019 • LASI 2019 (U Vigo)
2020	• TEEM 2020 • LASI 2020 (UVa, Online)

2013 2014 2015 2016 2017 2018 2019 2020 2021

SNOLA - Collaborations

- Open to other groups and stakeholders at a local and international level

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Current research trends

- Analysis of the open questionnaire
- Main results
  - Characterization of the network
  - Identification of 7 (non-orthogonal) research trends
- General characteristics
  - 34 distinct research lines
  - Goals (most cited):
    - Increase learner retention and performance (26)
    - Improve the quality of the learning environment (16)
    - Identify indicators for learning / elements of the learner model (7+4)
  - 7 research trends

Research Trends

Predictive learning analyti

S: Student
T: Teacher
R: Researcher
M: Manager
ID: Instructional designer

Research line	Publication	User(s)	Data sour	
Prediction of learning results and dropout	(Moreno-Marcos et al., 2020)	S / T / M	Students' actions (MOOC)	Random Forest, Regression, Neural Networks, Decision Trees
Identification of engineering students at risk	(Martínez et al. 2019)	S / T	Students actions (Moodle and Virtual Campus)	Predictive analysis
Prediction of learning results and dropout	(Cobos & Olmos, 2018)	T / M	Students actions (MOOCs)	Predictive analytics, Machine Learning, Statistical analysis
Actionable information based on prediction of academic engagement in MOOCs	(Bote-Lorenzo & Gómez-Sánchez, 2018)	S / T	Students' actions (MOOC)	Feature selection, Machine Learning
Analysis and classification of student data with prediction purposes (Interactions)	(Agudo-Peregrina et al., 2014)	T / M / R	Student's actions (Moodle)	Log data classification, Regression
Educational data mining	(Guerrero-Higueras et al., 2019)	S / T	Students actions (Version system)	Machine Learning
Definition of high-level actionable indicators based on low level data.	(Alexandron et al., 2017)	S / T	Students' actions (MOOC)	Machine Learning, Artificial Intelligence Techniques, Semantic modelling, Heuristics

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Research Trends

Predictive learning analytics

Gradient

DROPOUT PREDICTION

- Self-paced MOOCs: Model depend on enrollment date
- Event-based SRL variables are useful to predict dropout
- Good predictions from 25-33% of the theoretical MOOC duration

DATA USE to PREDICT

- Videos ✓
- Exercises ✓
- Activity ✓
- Self-regulated learning (SRL)
  - Self-reported SRL ✗
  - Event-based SRL ✓
- Demographics and intentions ✗

Moreno-Marcos, P. M., **Muñoz-Merino, P. J.,** Maldonado-Mahauad, J., Pérez-Sanagustín, M., Alario-Hoyos, C., & **Delgado-Kloos, C.** (2020). Temporal analysis for dropout prediction using self-regulated learning strategies in self-paced MOOCs. *Computers & Education*, *145*, 103728.

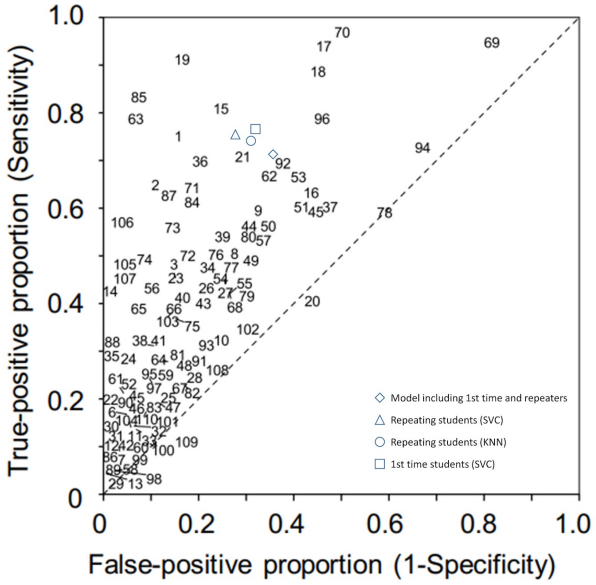
SNOLA

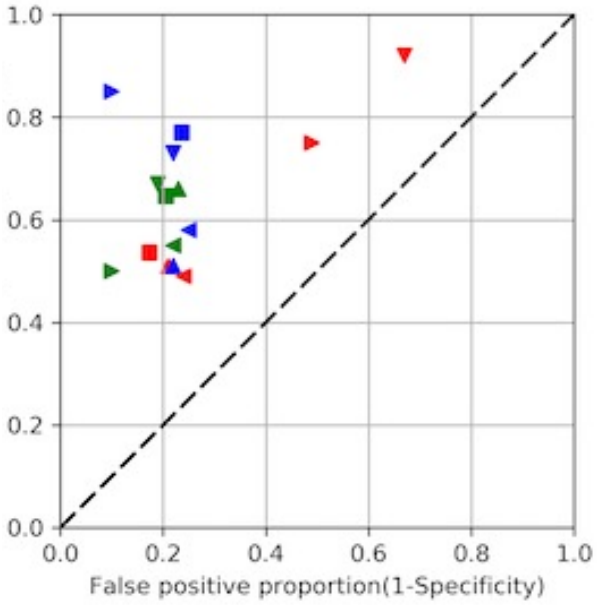
Research Trends

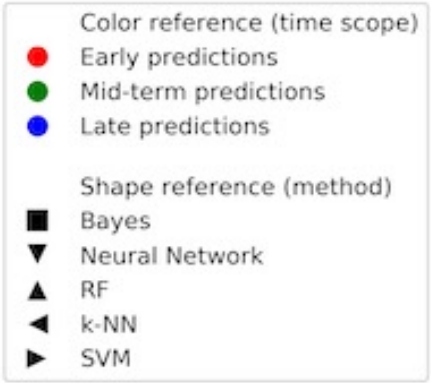
Predictive learning analytics

LAIKA

- Identification of engineering students at risk







Martínez, J. A., Campuzano, J., **Sancho-Vinuesa, T.,** & Valderrama, E. (2019). Predicting student performance over time. A case study for a blended-learning engineering course. *CEUR Workshop Proceedings*, *2415*, 43–55.

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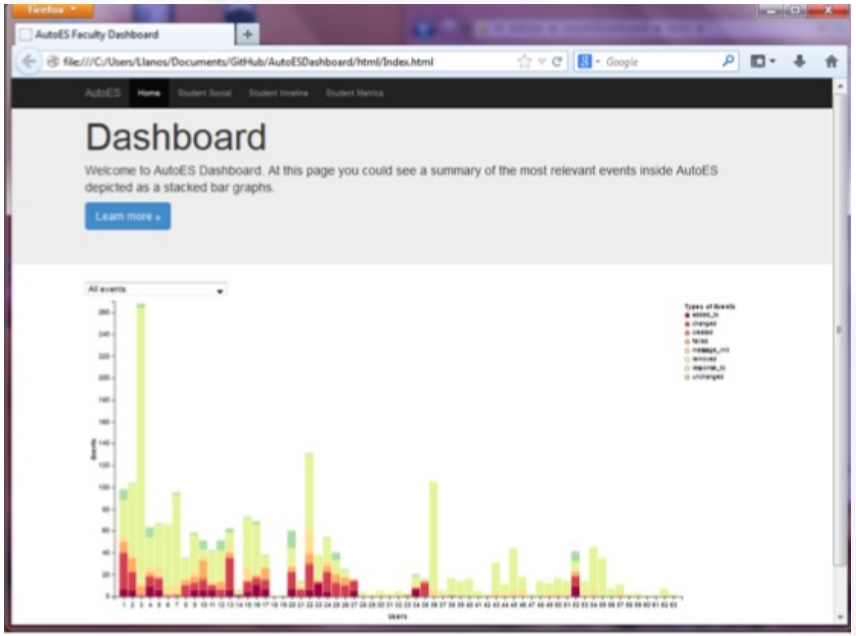
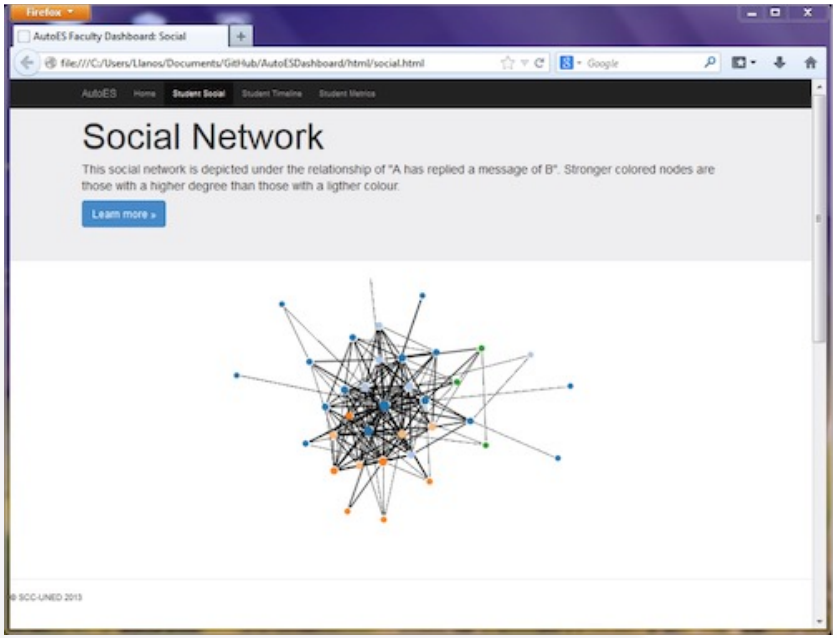
Research Trends
Visual analytics

Research line	Publication	User(s)	Data sources	Analysis techniques
Visual analytics of eLearning systems (VeLA)	(Gómez-Aguilar et al., 2014)	T	Students' actions on the VLE, Grades	Visual analytics
LA Dashboards for virtual labs	(Tobarra et al., 2014)	S	Platforms logs	Heuristics
Visual Analytics of students' actions	(Ruipérez-Valiente, et al., 2015)	S / T	Students' actions on the system (MOOC)	Visual analytics
LA Dashboard for MOOCs	(Cobos et al., 2016)	T / M	Students' actions on the system (MOOC), grades, demographics, self-reported data	Descriptive Statistics
Visualization of peer and self-assessment data in Moodle (MWDEX)	(Chaparro-Peláez, et al., 2019)	T	Peer-assessment grades (Moodle Workshops)	Visual Analytics
Automatic generation of adapted dashboards	(Vázquez-Ingelmo et al., 2019)	S / T / M / R	-	Multi-Dimensional Analysis (MDA), ML
Graph generation of educational data in online learning for social network analytics (GraphFES)	(Hernández-García & Suárez-Navas, 2017)	T / M	Student activity (Moodle log data-Forums)	Social Network Analysis, Data visualization

Research Trends
Visual analytics

- Dashboard for virtual evaluation laboratories

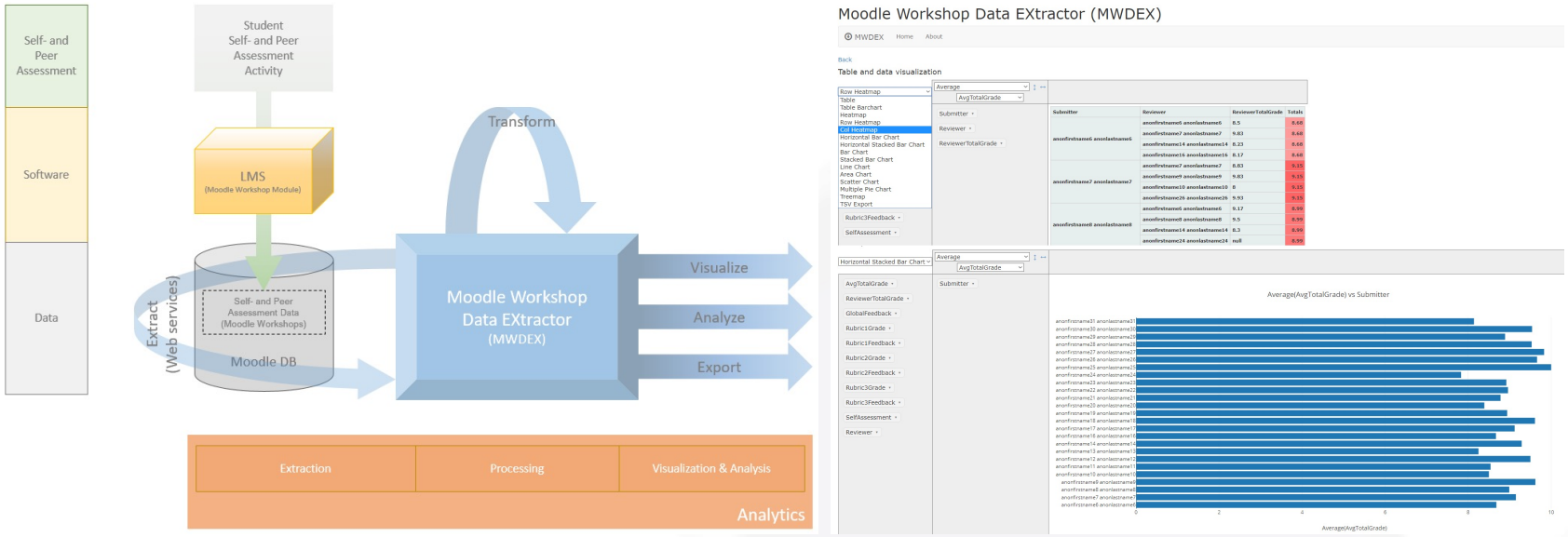




Tobarra, L., **Ros, S.,** Hernández, R., Robles-Gómez, A., **Caminero, A. C.,** & Pastor, R. (2014). Integrated Analytic dashboard for virtual evaluation laboratories and collaborative forums. In *2014 XI Tecnologías Aplicadas a la Enseñanza de la Electrónica (TAEE)*

Visual analytics

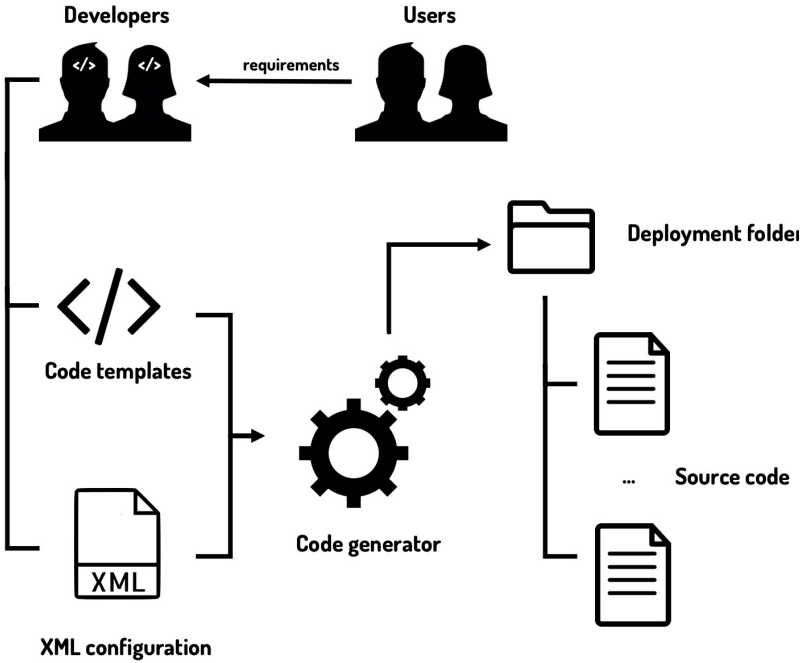
- Visualization of peer and self-assessment data in Moodle – Moodle Workshop Data EXtractor (MWDEX)

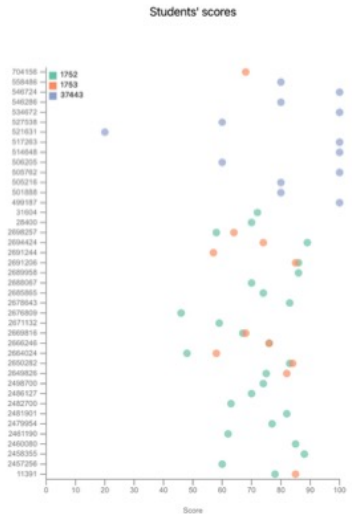


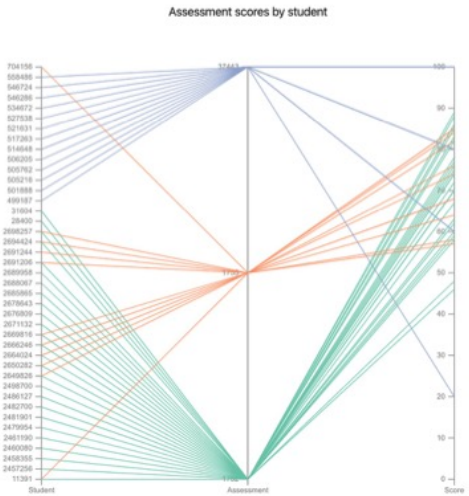
Chaparro-Peláez, J., Iglesias-Pradas, S., Rodríguez-Sedano, F. J., & **Acquila-Natale, E.** (2019). Extraction, Processing and Visualization of Peer Assessment Data in Moodle. *Applied Sciences*, *10*(1). https://doi.org/10.3390/app10010163

Research Trends
Visual analytics

- Automatic generation of adapted dashboards







Vázquez-Ingelmo, A., García-Peñalvo, F. J., & Therón, R. (2019). Taking advantage of the software product line paradigm to generate customized user interfaces for decision-making processes: A case study on university employability. *PeerJ Computer Science*, *5*. https://doi.org/10.7717/peerj-cs.203

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Research Trends

Support to active learning strategies

Research line	Publication	User(s)	Data sources	Analysis techniques
Orchestration of collaborative learning activities (PyramidApp)	(Amarasinghe, et al., 2019)	S / T	Actions on PyramidApp: progress in the activity, answers to the tasks, students' discussions	ML, descriptive statistics, data visualization
Adaptive learning based on user models	(Muñoz-Merino et al., 2018)	S / T	Students' actions on the system (Intelligent Tutoring Systems)	Bayesian networks, rules, Item Response Theory.
Support to dialogic peer feedback (Synergy)	(Er et al., 2019)	S / T	Students actions on the system, content of the feedback,	Descriptive statistics
Social learning supported by learning analytics	(Claros et al., 2015)	S / T	Students actions on the system (content and social)	SNA, CSCL
Learning analytics to improve Flipped Classrooms	(Rubio-Fernández et al., 2019)	S / T	Students' actions on the system (SPOC)	Visual analytics, clustering, adaptation
Definition of design criteria for self-regulated learning support tools	(Manso-Vázquez, et al., 2018)	M	xAPI profile	-

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Research Trends

Support to active learning strategies

- Supporting the scalability of collaborative peer feedback
  - Based on a model of dialogic peer feedback
  - Instructor dashboards for class-wide interventions
  - Student dashboards for supporting:
    - Self-regulation, co-regulation, and socially shared regulation of learning.
  - LA-empowered online platform:
    - Synergy, synergylearn.net

Er, E., **Dimitriadis, Y.,** & Gaseviç, D. (2019). An analytics-driven model of dialogic peer feedback. In *13th International Conference on Computer Supported Collaborative Learning (CSCL 2019).*

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Research Trends

Learning analytics for Learnig Design

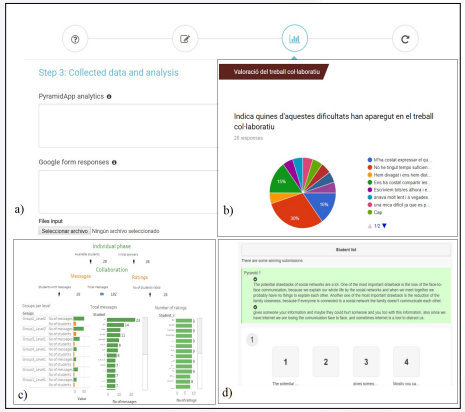
Research line	Publication	User(s)	Data sources	Analysis techniques
Support to learning design processes (ILDE2)	(Michos, Hernández-Leo, & Albó, 2018)	T	Actions on ILDE2, (a kind of social network for teachers), feedback on teachers' and students	Social Network Analysis (SNA), data visualization, descriptive statistics
Learning analytics for learning design (OrLA, T-Glade, TAP)	(Wiley, Dimitriadis, Bradford, & Linn, 2020)	T / R	Students actions on the system (WISE science inquiry system); submission of results; grades	TAP (an NLP method)

Research Trends

LA for Learning Design

- How can teachers investigate the impact of learning activities in their context (e.g. schools)?
- An approach that connects LA with analytics of learning designs across multiple educators in a community

- Technology supporting teachers:
  - Design of learning activities
  - Formulation of inquiries
  - Collecting, aggregating visualizing data
  - Community sharing, community inquiry



Michos, K., **Hernández-Leo, D.**, Albó, L. (2018). Teacher-led inquiry in technology-supported school communities. BJET 49(6), 1077-1095.

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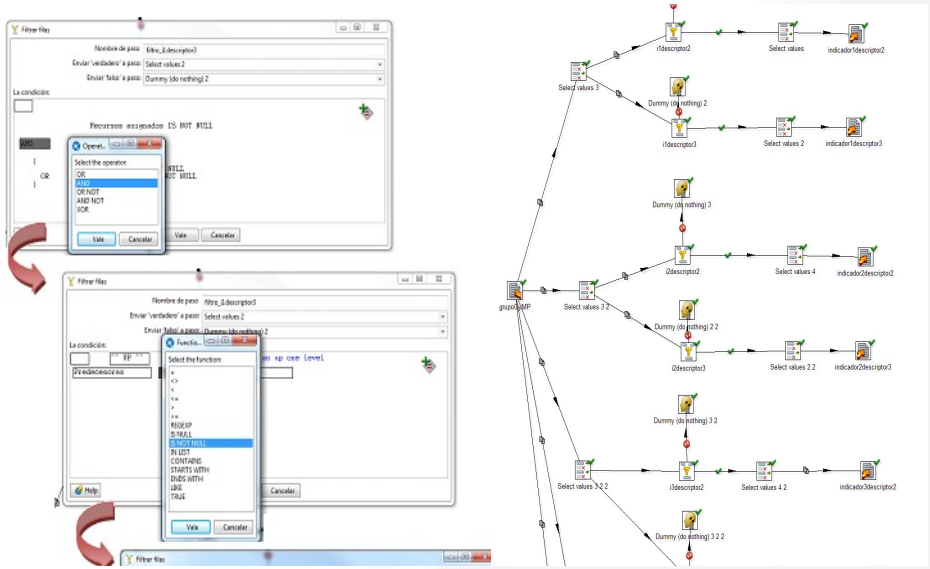
Research Trends
Assessment support

Research line	Publication	User(s)	Data sources	Analysis techniques
Definition and adjustment of assessment processes (Ramon / TEA)	(Villamañe et al., 2017)	S / T / ID	Students' answers, grades	Statistics, Regression, NNLS, Data visualization
Learning analytics for the assessment of 21st-century skills	(Menchaca et al., 2018)	S / T	Grades	Heuristics
Analysis of Moodle logs for decision making and workgroup assessment	(Tobarra et al., 2017)	S / T	MOOC platform logs	Heuristic
Workgroup assessment	(Conde et al., 2018)	S / T	Students' actions on the system (VLE)	Quantitative analysis and heuristics
Measurement and analysis of teamwork indicators in online education (TeamworkRM)	(Hernández-García et al., 2018)	T	Students' actions (Moodle log data-Forums & wikis)	Data classification (ETL), Regression

Research Trends
Assessment support

DeustoLearningLab Ingeniería

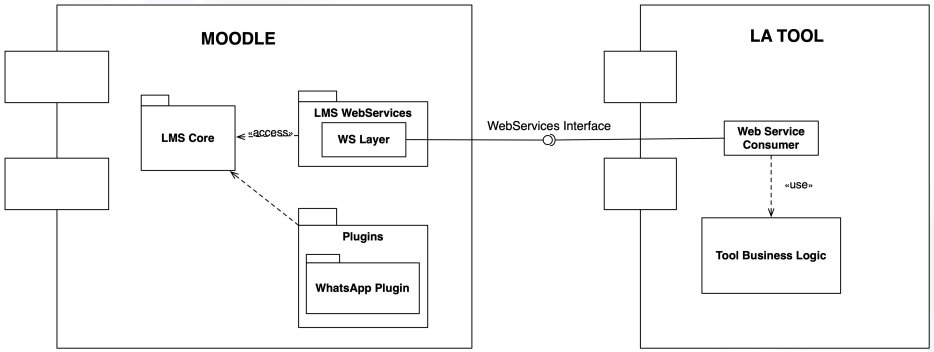
- Assessment of 21st century skills
  - Integrate formative student assessment data from different tools
  - Criteria for data analysis based on assessment rubrics.



Menchaca Sierra, I., Guenaga, M., & Solabarrieta, J. (2018). Learning analytics for formative assessment in engineering education. *The International Journal of Engineering Education*, *34*(3), 953–967.

Research Trends
Assessment support

- Assessment of teamwork to populate a competence ontology



DNI del alumno: 72455638F	Usuario de WhatsApp: Pedro
DNI del alumno: 71245644V	Usuario de WhatsApp: +34 618 56 32 25
DNI del alumno: 85678633X	Usuario de WhatsApp: Alex Clase
DNI del alumno: 71400577Q	Usuario de WhatsApp: Carlos C
DNI del alumno: 73888323Z	Usuario de WhatsApp: +34 629 45 19 66
Seleccionar archivo Chat de What...rupo5 SO.txt	Enviar

Porcentaje de mensajes largos de la disusión: 45%

Número de mensajes cortos por usuario: 43.75

Número de mensajes largos por usuario: 35.25

Show 10 entries Search:

Nombre de la discusión	Fecha de creación	Mensajes	Mensajes cortos	Mensajes largos	Vistas
BUSQUEDA MIEMBRO RESTANTE	2018/12/05 19:27:05	5 (1.58%)	5 (1.58%)	0 (0%)	34
CREACCION Y REPARTO DE TAREAS	2018/12/17 11:20:35	24 (7.59%)	17 (5.38%)	7 (2.22%)	108
ELECCIÓN COORDINADOR DEL GRUPO	2018/12/05 19:16:11	8 (2.53%)	8 (2.53%)	0 (0%)	61
EVOLUCIÓN PRÁCTICA	2018/12/18 13:26:50	83 (26.27%)	34 (10.76%)	49 (15.51%)	317
MISIÓN Y OBJETIVOS	2018/12/11 14:27:42	18 (5.7%)	11 (3.48%)	7 (2.22%)	105
NOMBRE DEL GRUPO	2018/12/11 14:14:56	8 (2.53%)	7 (2.22%)	1 (0.32%)	44
REPARTO DE TRABAJO Y CREACIÓN WIKI	2018/12/11 13:59:14	20 (6.33%)	15 (4.75%)	5 (1.58%)	92
TAREA 1: MAIN	2018/12/19 23:27:29	19 (6.01%)	14 (4.43%)	5 (1.58%)	66
TAREA 3:ACCIONES USUARIO	2018/12/19 23:30:15	47 (14.87%)	24 (7.59%)	23 (7.28%)	185
TAREA 4: ACCIONES FACTURADOR	2018/12/19 23:30:54	45 (14.24%)	20 (6.33%)	25 (7.91%)	164

Showing 1 to 10 of 12 entries Previous Next

Resultados evaluación sumativa

Show 10 entries Search:

Nombre	Apellidos	Mensajes	Mensajes cortos	Mensajes largos
[redacted]	[redacted]	64 (20.25%)	44 (13.92%)	20 (6.33%)
[redacted]	[redacted]	77 (24.37%)	41 (12.97%)	36 (11.39%)
[redacted]	[redacted]	68 (21.52%)	31 (9.81%)	37 (11.71%)
[redacted]	[redacted]	107 (33.86%)	59 (18.67%)	48 (15.19%)

Showing 1 to 4 of 4 entries Previous Next

Conde, M. A., Colomo-Palacios, R., García-Peñalvo, F. J., & Larrucea, X. (2018). Teamwork assessment in the educational web of data: A learning analytics approach towards ISO 10018. *Telematics and Informatics*, *35*(3), 551–563. https://doi.org/https://doi.org/10.1016/j.tele.2017.02.001

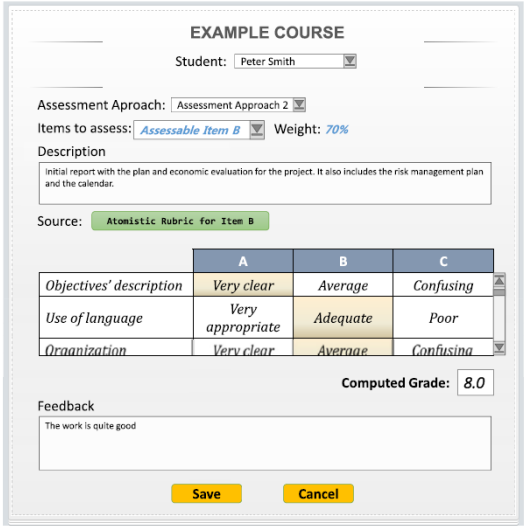
SNOLA

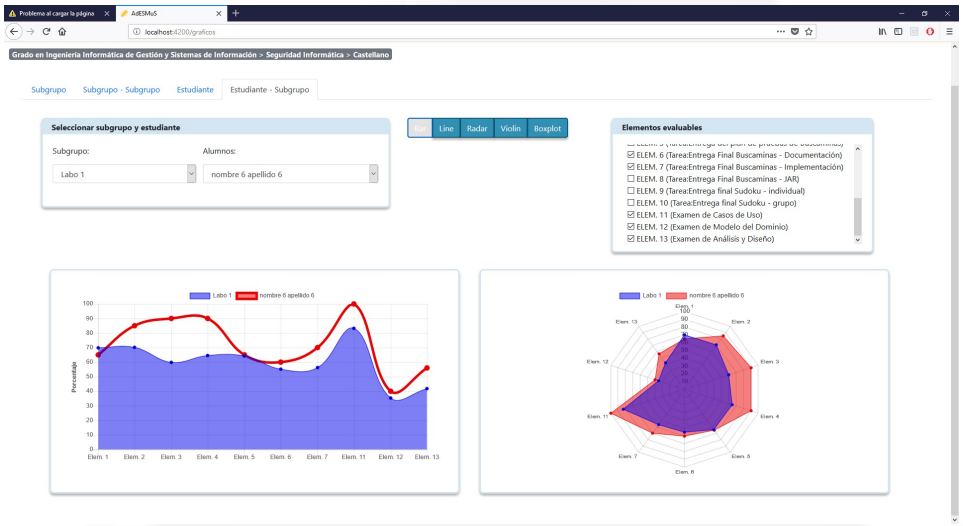
Research Trends
Multimodal and contextual data

Research line	Publication	User(s)	Data sources	Analysis techniques
Students monitoring in blended learning environments (CASA, AdESMuS)	(Villamañe et al., 2020)	S / T	Grades	Statistics, Linear Regression, Data visualization
Multimodal learning analytics of f2f collaborative learning	(Vujovic & Hernández-Leo, 2019)	T / R	Multimodal data, motion capture, EDA, sound, students' self-reported data	ML, statistic analysis
Use of wearables to estimate levels of stress and sleep quality.	(de Arriba-Pérez et al. 2018)	S	Biometric signals	ML
Design-aware learning analytics (GLUE!-CASS, Glimpse)	(Rodríguez-Triana et al. 2015)	T	Students actions on the system (DLE), data from the learning design, self-reported data	Heuristics

Research Trends
Multimodal and contextual data

- Helping teachers to
  - Define the multiple assessment approaches in a course
  - Integrate and analyze the collected data





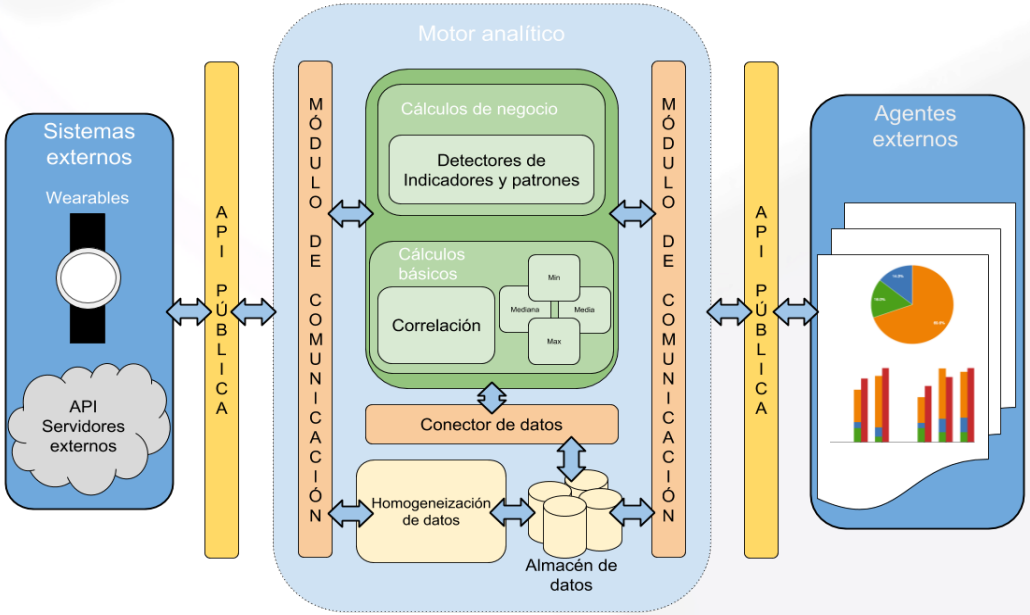
Villamañe, M., **Alvarez, A.,** & Larrañaga, M. (2020). CASA, An Architecture to Support Complex Assessment Scenarios. *IEEE Access*. https://doi.org/10.1109/ACCESS.2020.2966595

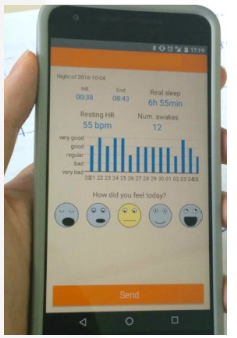
Research Trends

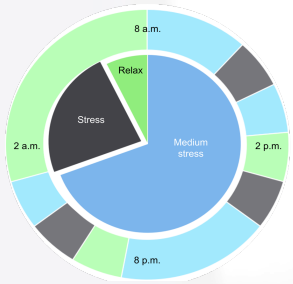
Multimodal and contextual data

GIST

- Do sensors in wearables provide adequate data to estimate stress and sleep quality?







de Arriba-Pérez, F., **Caeiro-Rodríguez, M.,** & Santos-Gago, J. M. (2018). How do you sleep? Using off the shelf wrist wearables to estimate sleep quality, sleepiness level, chronotype and sleep regularity indicators. *Journal of Ambient Intelligence and Humanized Computing*, *9*(4), 897–917. https://doi.org/10.1007/s12652-017-0477-5

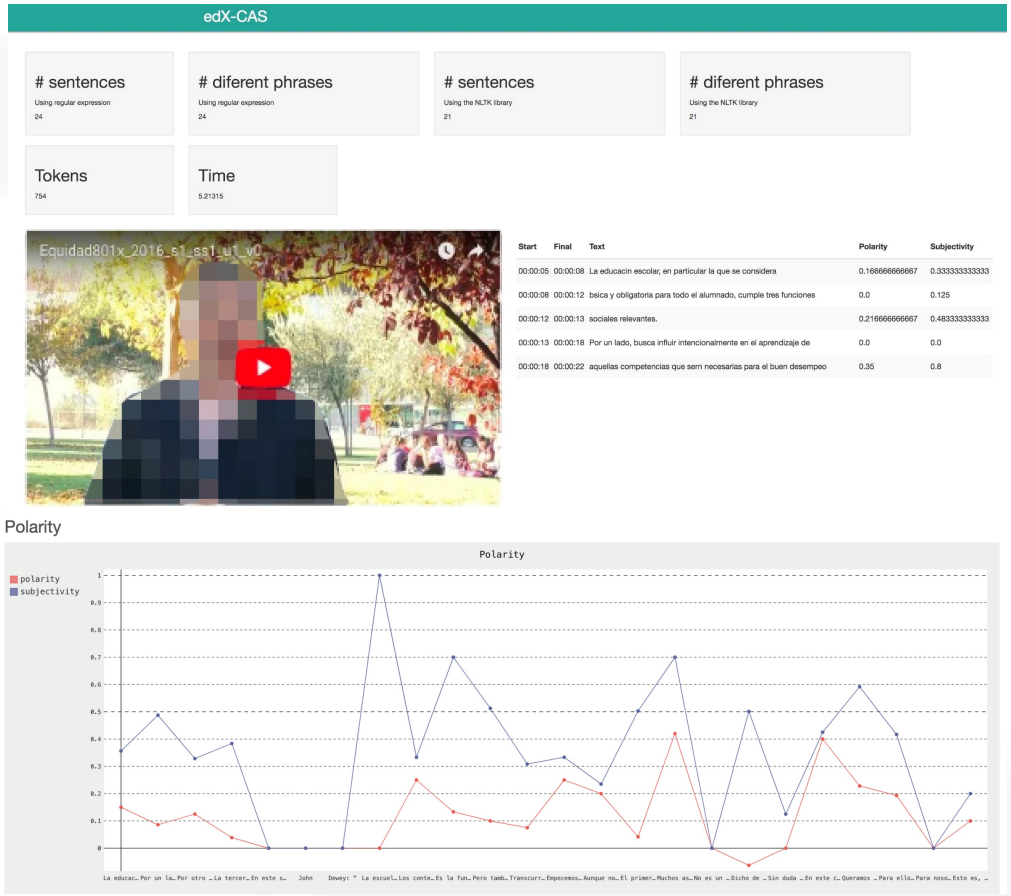
SNOLA

Research Trends
Sentiment analysis

Research line	Publication	User(s)	Data sources	Analysis techniques
Social and sentiment analysis	(Ros et al., 2017)	S / T	Forum messages	Heuristics
Academic success prediction based on emotion modelling (PresenceClick)	(Ruiz et al., 2018)	S / T	Sensors, self-reported emotions	Transition matrix, Decision trees, Data visualization
Sentiment Analysis	(Cobos et al., 2019)	T / M	Student. actions on the system (MOOCs), MOOC contents	Descriptive analytics, Natural Language Processing (NLP), Sentiment Analysis

Research Trends
Sentiment analysis

edX-CAS
A Content Analysis System that supports Sentiment Analysis for Subjectivity and Polarity detection in Online Courses at edX



Cobos, R, Jurado, F., & Blázquez-Herranz, A. (2019). A Content Analysis System that supports Sentiment Analysis for Subjectivity and Polarity detection in Online Courses. *IEEE Revista Iberoamericana de Tecnologías Del Aprendizaje*, *14*(4), 177–187. https://doi.org/10.1109/rita.2019.2952298

Outline

- Introduction
- Achivements
  - SNOLA - A brief historical perspective
  - Current research trends in SNOLA
- Challenges
- Conclusions and open research lines

Challenges

- Increase adoption by end users (8)
- Ethical, privacy, and security issues (7)
- Quality of process and the results (6)
- Increase personalization / adaptation / interoperability of data and tools (5)
- Improve real learning (5)
- Apply LA at an institutional level (5)

Conclusions & Open research lines

- SNOLA has maintanined sustained levels of activity and boosted research in LA in the Spanish context
- This work provides a first overview of the activity of SNOLA, its research trends and interests
- New research lines are open
  - Contribute to international reflection on current trends and challentes in LA
  - Identification of gaps and challenges to drive future action

Thanks on behalf of all the SNOLA team!

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