E-learning experience @ Eurecat

May, 19, 2020

BRAIN @ WORK

INFORMATION COMPETENCE AS BOOSTER
FOR PROSPECTIVE SCIENTISTS

Introduction

Experience from research to professional projects development

EdTech   -   E-Learning

Research - Innovation - Development – Provider

Introduction

User centered design vs. purpose driven design

Introduction

Intelligent Tutoring systems

Training recommendation systems

Adaptive learning

Learning analytics projects

LMS and training projects

VR and AR training solutions

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Intelligent Tutoring systems

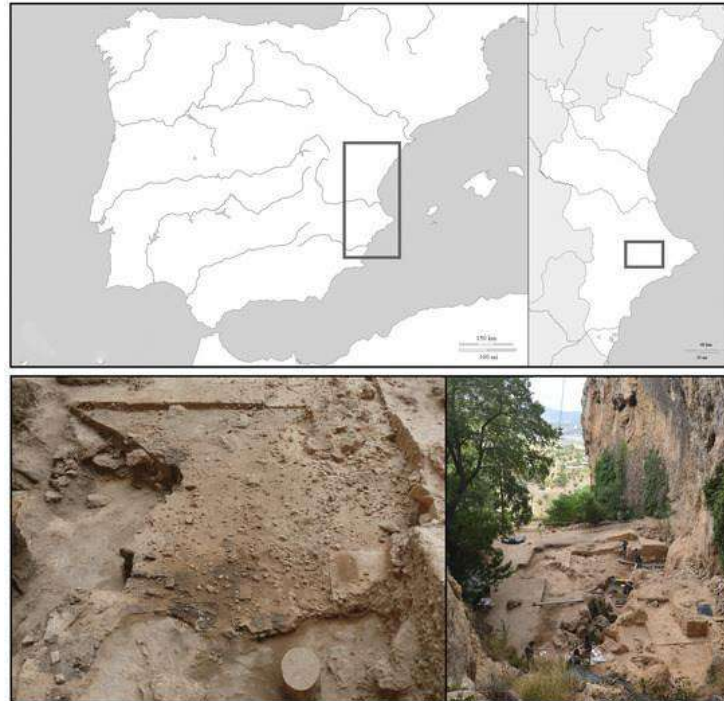Learning analytics projects

Training recommendation systems
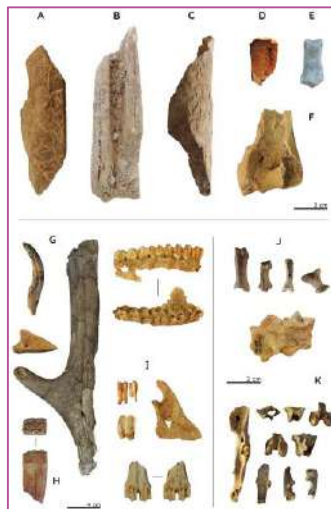
LMS and training projects

Adaptive learning

E-learning in archaeology

"El Salt" (Alicante, Spain)

E-learning in archaeology

The aim of this study is to build an intelligent tutoring system for zooarcheology students while field practices

The objective is to help students to **classify animals from bone fragments in zooarchaeology**. The 3406 bone remains, which have 64 attributes, were obtained from the excavation of the Middle Palaeolithic site of El Salt (Alicante, Spain)
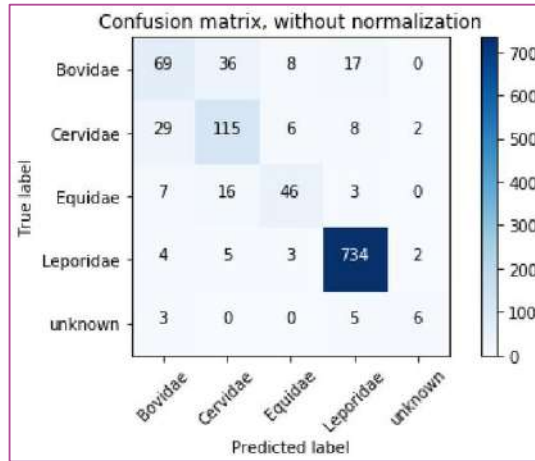
E-learning in archaeology

Table 2. Performance of the different methods in the coarse granularity. Synthetic minority over-sampling technique (SMOTE), support vector machine (SVM), k-nearest neighbors (KNN), adaptive synthetic (ADASYN).

Method (Parameters)	Accuracy	Precision (Weighted)	Recall (Weighted)	F1-Score (Weighted)
Random forest, SMOTE (classifier class weight: balanced, classifier max features: auto, classifier n estimators: 500)	0.86	0.86	0.86	0.86
SVM, SMOTE (classifier C: 100, classifier gamma: 0.001, classifier kernel: rbf)	0.74	0.81	0.74	0.77
Naive Bayes, SMOTE	0.68	0.76	0.68	0.66
Neural Networks, SMOTE (classifier solver: lbfgs, classifier alpha: 1×10^{-5})	0.67	0.75	0.67	0.71
KNN, SMOTE (classifier n neighbors: 3)	0.75	0.79	0.75	0.77
Random Forest, ADASYN (classifier class weight: balanced, classifier max features: auto, classifier n estimators: 100)	0.86	0.85	0.86	0.86
SVM, ADASYN (classifier C: 100, classifier gamma: 0.001, classifier kernel: rbf)	0.72	0.80	0.72	0.75
Naive Bayes, ADASYN	0.68	0.78	0.68	0.65
Neural Networks, ADASYN (classifier solver: adam, classifier alpha: 1×10^{-5})	0.67	0.79	0.67	0.72
KNN, ADASYN (classifier n neighbors: 3)	0.74	0.79	0.74	0.76

E-learning in archaeology

This study uses machine learning techniques to help students to classify bone fragments.

Confusion matrix, without normalization

Random forest was the method which had better results between the tested ones, with an accuracy and f1-score of 0.86 for both.

Most relevant attributes for the prediction were also found.

Other granularities

Medium and fine granularities

E-learning in archaeology

This first version of the ITS was used in August 2019 by 3 students to classify 51 remains that were characterized following the format of the same database but belonged to a different archaeological site called "Abric del Pastor".

The results of the tutor, compared to the predictions of the students frequently agreed even when the remains used for training corresponded to a different site ("El Salt"). Students, due to their limited knowledge and the difficulties of analyzing very fragmented bone remains, usually described the remains based only on the size, which usually agree with the families predicted by the tutor.

E-learning in archaeology

Tutor prediction (**a**) and student's/tutor prediction table (**b**).

On the other side, sometimes the tutor fails and not all the sizes and families are correctly classified. For example, some bones that are correctly described as "small size" by students are characterized as Leporidae by the tutor, which is a mistake. Other mistakes are related to the wrong characterization of birds as Leporidae.

Augmented workplace

Execution platform for the intelligent tutor in augmented reality (AR) for industry 4.0. Communication between AR device (mobile version) with tasks defined in the LMS. The second example incorporates the identification of objects / marks to, for example, be able to mark tasks as completed.
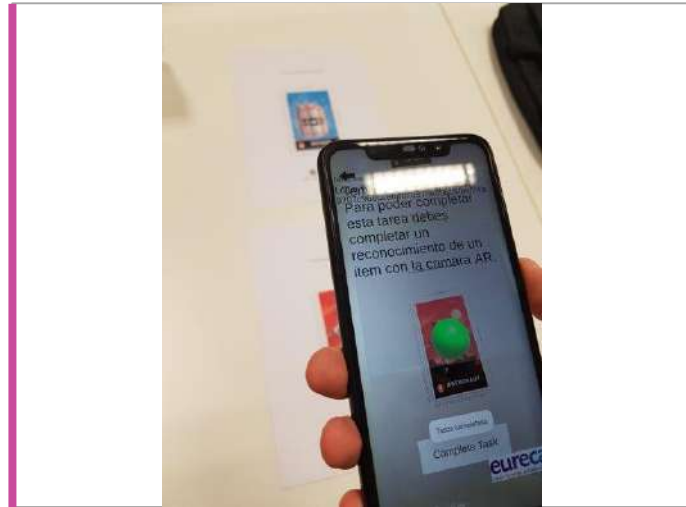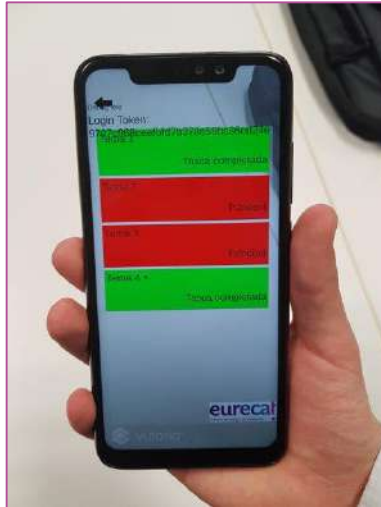
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SkillsMatch

https://demo.skillsmatch.eu

This project measures and validates soft skills. It also creates individual training roadmaps and influences the future of employability.

Real-time processing data streams in learning scenarios

Recommendation of courses in real-time considering emotional states
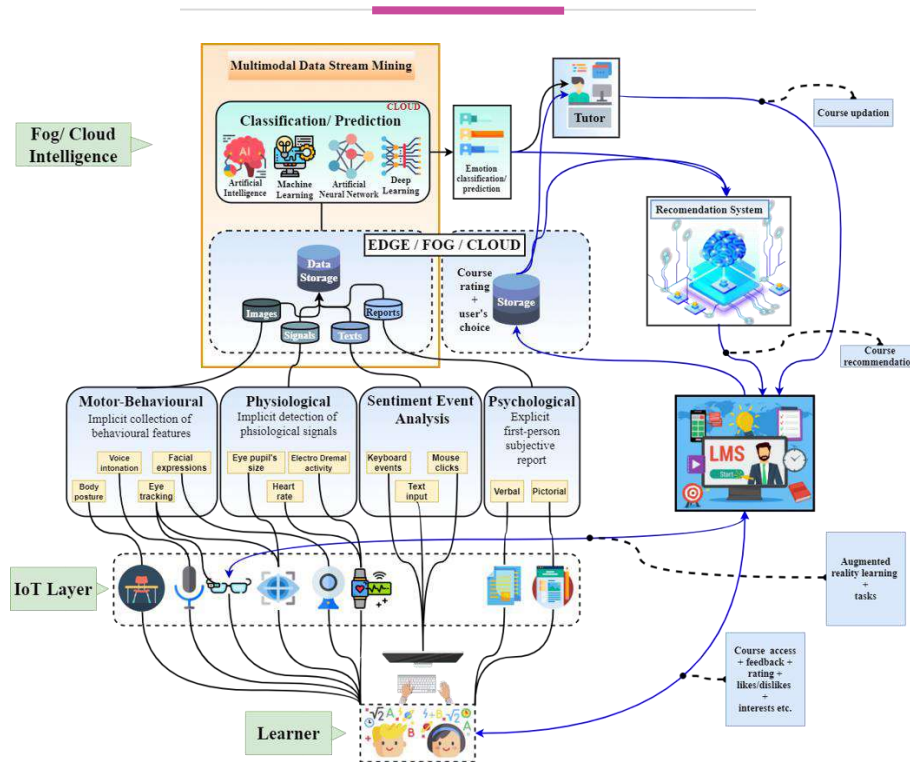
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E-learning in transnational programs: Entrepedia

- To help the inclusion of information and communication technologies (ICTs) in transnational programs

- To present the theoretical background, the gamification and adaptive techniques included in the model and the platform where the courses are implemented.

- To create an immersive learning environment we applied:

  - **Bloom's taxonomy** categorizes and orders thinking skills. We use Lorin Anderson's revised Bloom's taxonomy starting from remembering, understanding, applying, analyzing, evaluating to creating.
  - **Kapp and O'Driscoll** envision a work/learn culture where learning is perceived as optimizing networks.
  - **Flow** is the state of complete absorption when completing a task. To achieve flow, you need intrinsic motivation, a challenging task and the skills to perform it, and an active and engaging task defined by clear factors of success.

E-learning in transnational programs
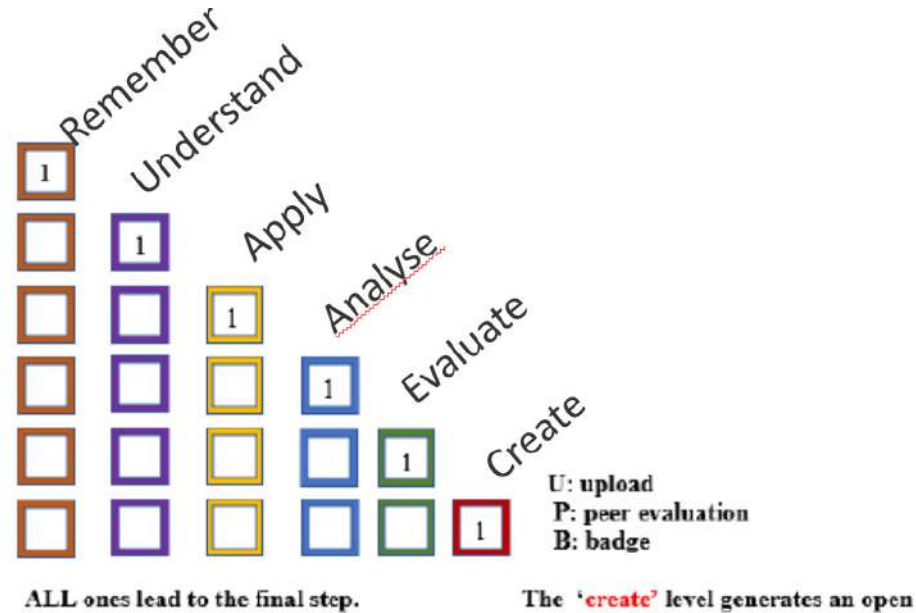
Figure 1: Schematic representation of the course

E-learning in transnational programs

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Intelligent Tutoring systems

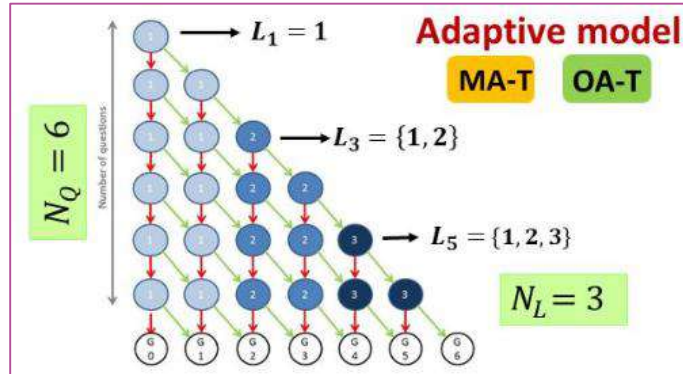Learning analytics projects

Training recommendation systems

LMS and training projects

Adaptive learning

E-learning during Covid-19

**Influence of COVID-19 confinement in students' performance in higher education**

Using a field experiment of 458 students from three different subjects in Universidad Autónoma de Madrid (Spain), we study the differences in assessments by dividing students into two groups.

The first group (control) corresponds to academic years 2017/2018 and 2018/2019. The second group (experimental) corresponds to students from 2019/2020, which is the group of students that interrupted their face – to – face activities because of the confinement.

The results show that there is a significant positive effect of the COVID - 19 confinement on students' performance

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E-learning during Covid-19

Materials, methods and results (applied computing)

From March 11 to 30 (Covid-19 confinement in 2020)
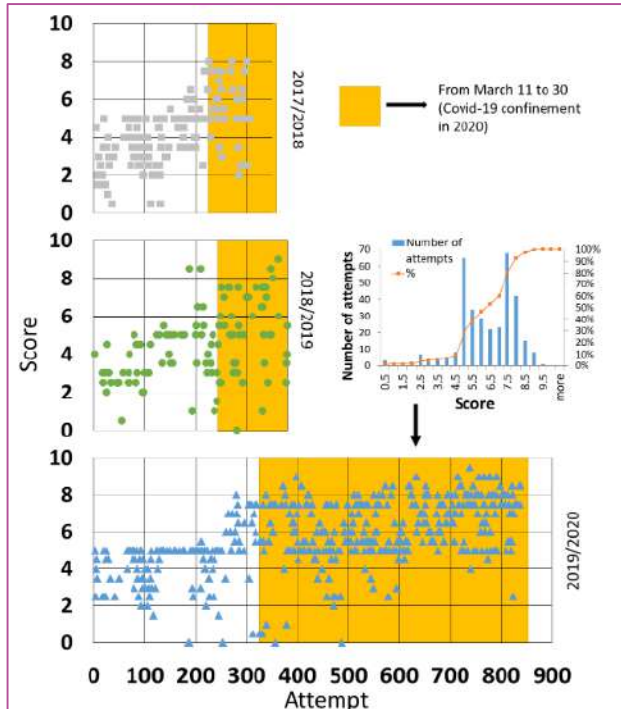
We have used two online platforms. The first one is e-valUAM, an online platform that aims to increase the quality of tests by improving the objectivity, robustness, security and relevance of content. e-valUAM implements all the (Computed-adapted test) CAT tests. The second online platform used in this study is the Moodle platform provided by the Biochemistry Department from Universidad Autónoma de Madrid, where all the tests that do not use adaptive questions are implemented.

Adaptive tests have been used in the subjects "Applied Computing" and "Design of Water Treatment Facilities". Traditional tests have been used in the subject "Metabolism".

E-learning during Covid-19

Metabolism
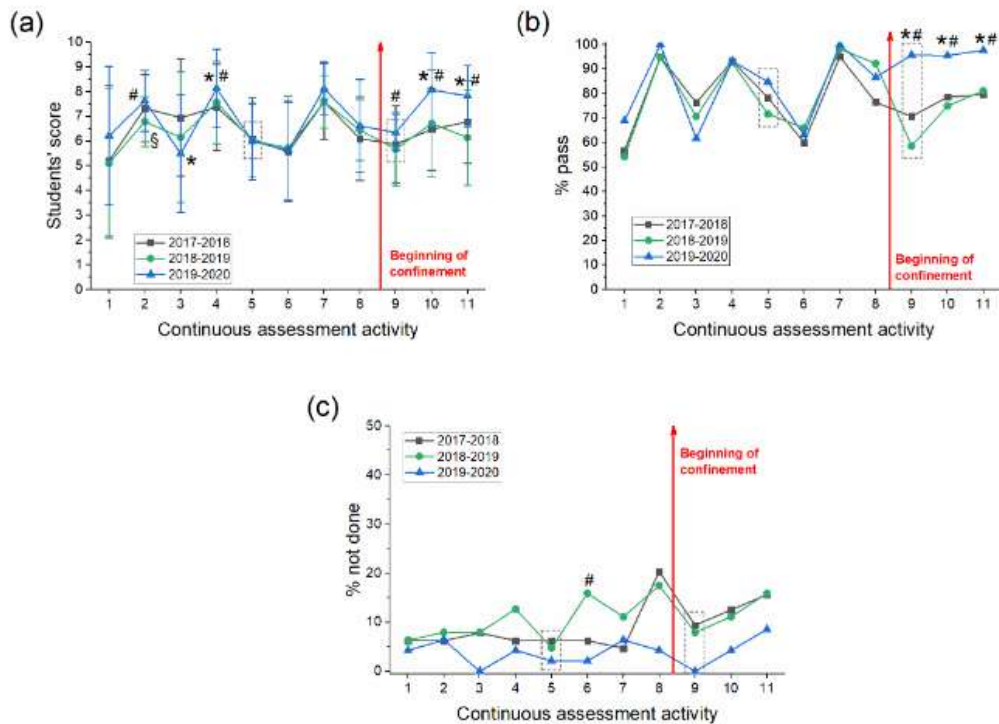
Fig 8. Results of students enrolled in Metabolism during the last 3 academic years.

E-learning during Covid-19

1. Students marks are approximately 2 point over 10 better

2. Students who pass goes from 70 to 90%

3. Participation goes from 85% to 95%
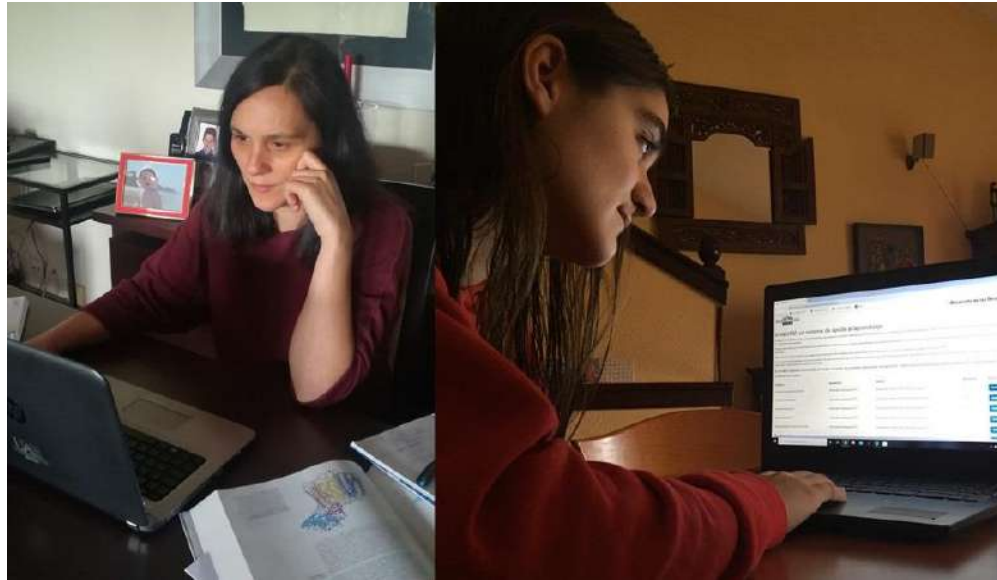
E-learning during Covid-19

1. Is there any effect (positive or negative) of COVID-19 confinement in students' performance? *There is a significant positive effect of COVID-19 confinement on students' performance.*

2. Is it possible to be sure that COVID-19 confinement is the origin of the different performance (if any)? *There are significant differences in students' performance after the confinement that cannot be found before in the same year or when comparing to the previous academic years.*

3. What are the reasons of the differences (if any) in students' performance? *Students can find by themselves many different motivations (rewards) to work on a continuous basis.*

4. What are the expected effects of the differences in students' performance (if any) in the assessment process? *Students get better grades in activities that did not change their format after the COVID-19 confinement. Moreover, we have demonstrated that there is an improvement in their learning performance.*

Evaluation of the satisfaction and applicability of the training actions of vocational training for employment for employed workers
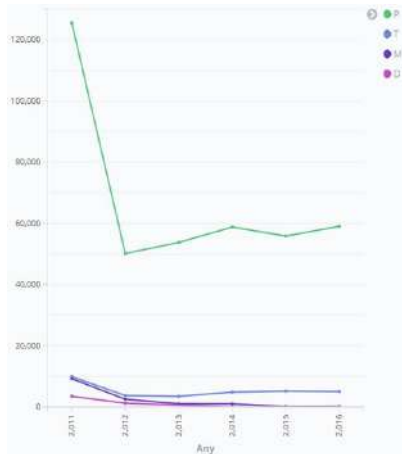
Majority of presential learning
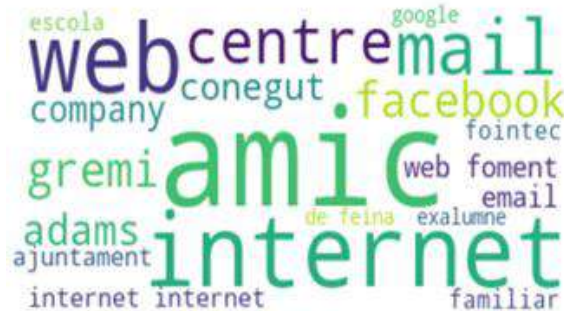
Text processing of source of knowledge of the course
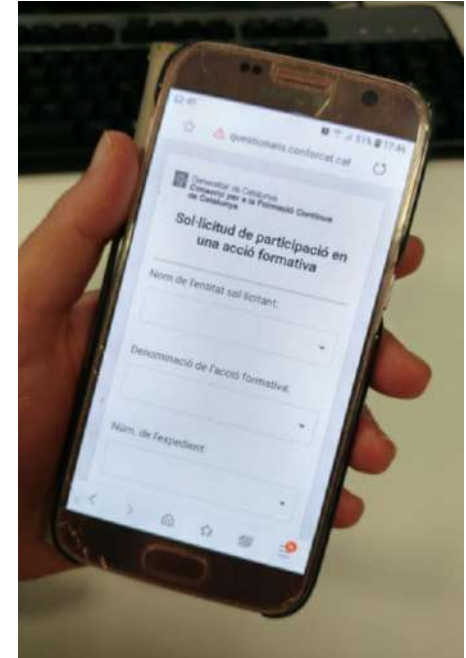
Prototype to obtain data

Gap identification among continuous learning offering and market demands

- Big Data study in the social field to extract knowledge about the **Vocational Training offered and demanded**, in order to identify indicators and trends and set up an interactive map that facilitates decision-making and answers some of the key questions in the sector.

- To carry out the project, the Big Data CoE Barcelona, which manages the Eurecat technology center, will **evaluate large volumes of data corresponding to the history of the last five years**, in order to geographically characterize demand profiles and analyze how they evolve in the time the skills required.

- Phenomena such as **over-training or the impact of the evolution of demand on enrollments will be studied**, as well as different aspects related to **Dual and Occupational Vocational Training**. A comparison will also be made between labor supply and demand in two professional families representing the industrial and service sectors.
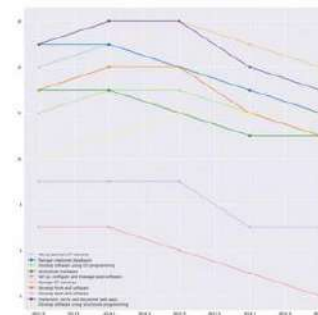
Fig. 5. Evolution of % of top 10 demanded skills with respect to the total ICT demand.
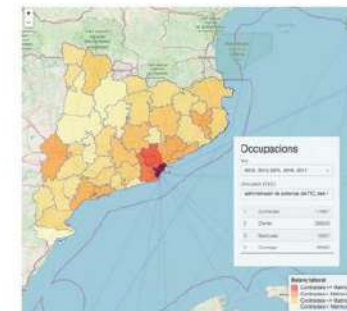
Fig. 6. Territorial analysis comparing between contracts and VET students for sys admins.

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Campus Virtual Eurecat Academy

Secartys

Training in Industry 4.0: Internet of Things and Machine learning

Training for trainers platform

Training for the tourism sector
(for the Catalan Government)

Digit-T (Advanced manufacturing training)

https://training.digit-t.eu

Between

Many other e-learning projects for different sectors with different approaches

- OBS (Olympic Broadcasting Services)

- Tecnomifood

- Barcelona Turisme

- Login.cat

- Between

- IT Academy by Barcelona Activa

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3. Subirats, L., Pérez, L., Hernández, C., Fort, S., Sacha, G.M. A granularity-based intelligent tutoring system for Zooarchaeology. Journal of Applied Sciences, 9, 4960, 2019.

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5. Subirats, L., Fort, S., Martín, A., Huion, P., Peltonen, M., Nousiainen, T., Miakush, I., Vesisenaho, M., G.M. Sacha. Adaptive techniques in e-Learning for transnational programs. Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2019), pp. 879-884. León, Spain.

Thank you