



THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book

15th Annual International Conference on
Information Technology & Computer Science
20-23 May 2019, Athens, Greece

Edited by
Gregory T. Papanikos

2019

Abstracts
15th Annual International
Conference on Information
Technology & Computer
Science

20-23 May 2019, Athens,
Greece

Edited by Gregory T. Papanikos

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Preface

This book includes the abstracts of all the papers presented at the *15th Annual International Conference on Information Technology & Computer Science (20-23 May 2019)*, organized by the Athens Institute for Education and Research (ATINER).

In total 34 papers were submitted by 35 presenters, coming from 13 different countries (Albania, Brazil, Finland, France, Germany, India, Norway, Philippines, Puerto Rico, South Korea, Switzerland, UK, and USA). The conference was organized into 9 sessions that included a variety of topic areas such as Health Care Informatics and Medical IT, Artificial Intelligence, IT Security, Social Media, IT Education and Other Issues. A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into 6 divisions and 37 units. Each unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

**15th Annual International Conference on Information
Technology & Computer Science
20-23 May 2019, Athens, Greece**

Scientific Committee

All ATINER's conferences are organized by the [Academic Council](#). This conference has been organized with the assistance of the following academics, who contributed by chairing the conference sessions and/or by reviewing the submitted abstracts and papers:

1. Gregory T. Papanikos, President, ATINER & Honorary Professor, University of Stirling, UK.
2. Panagiotis Petratos, Vice-President of Information Communications Technology, ATINER & Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.
3. Pascal Jollivet, Head, Computer Unit, ATINER & Associate Professor, University of Technology of Compiègne / Sorbonne University, France.
4. Till Haenisch, Professor, Academic Member, ATINER & DHBW Heidenheim, Germany.
5. Christoph Karg, Professor, Aalen University of Applied Sciences, Germany.
6. Yiannis Papadopoulos, Academic Member, ATINER & Professor, University of Hull, UK.
7. Amos Olagunju, Professor, St Cloud State University, USA.
8. Ana Ktona, Academic Member, ATINER & Associate Professor, University of Tirana, Albania.
9. George Kontos, Associate Professor, Western Kentucky University, USA.
10. Chhavi Rana, Academic Member, ATINER & Assistant Professor, UIET MDU Rohtak, India.
11. Thomas Fehlmann, Academic Member, ATINER & Senior Researcher, Euro Project Office AG, Switzerland.

FINAL CONFERENCE PROGRAM
**15th Annual International Conference on Information Technology &
Computer Science, 20-23 May 2019, Athens, Greece**

Monday 20 May 2019

08:00-08:40 Registration and Refreshments

08:40-09:00 (Room A - 10th Floor): Welcome and Opening Address by Gregory T. Papanikos, President, ATINER.

09:00-10:30 Session I (Room D - 10th Floor): Technology in Education*

Chair: Panagiotis Petratos, Vice-President of Information Communications Technology, ATINER & Fellow, Institution of Engineering and Technology & Professor, Department of Computer Information Systems, California State University, Stanislaus, USA.

1. Rogelio Palomera-Garcia, Professor, University of Puerto Rico at Mayagüez, Puerto Rico & Rogelio Palomera-Arias, Assistant Professor, University of Texas at San Antonio, USA. Technology in Education: How much is Too Good? How much is Too Bad?
2. Aino Saarinen, PhD Student, University of Helsinki, Finland. The Use of Digital Technologies at School and Cognitive Learning Outcomes: Findings from the Finnish PISA 2015 Data.
3. Luciane Santos, Associate Professor, UDESC - Santa Catarina State University, Brazil. Teaching and Learning with Technology in Basic Education: Developing Computational Thinking of Students.

**This session is jointly offered with the Education Unit.*

10:30-12:00 Session II (Room D - 10th Floor): Health Care Informatics & Medical IT

Chair: Till Haenisch, Professor, DHBW Heidenheim, Germany.

1. Yiannis Papadopoulos, Professor, University of Hull, UK & Luis Torrao, PhD Student, University of Hull, UK. Philosophy-Inspired Computing for the Future of Mental Health.
2. Carsten Lecon, Professor, Aalen University of Applied Sciences, Germany. Kinetosis Analyzation of the Symptoms Occurrence in Combination with Eye Tracking.
3. Ana Ktona, Associate Professor, University of Tirana, Albania, Anila Mitre, Associate Professor, University of Tirana, Albania, Denada Collaku, Lecturer, University of Tirana, Albania & Jezuina Koroveshi, Lecturer, University of Tirana, Albania. Intelligent Systems to Support Decision Making.
4. Petrika Manika, Lecturer, University of Tirana, Albania & Ana Ktona, Associate Professor, University of Tirana, Albania. Introducing a Model for the Representation of Medical Data using Ontologies and Web Technologies.

12:00-13:30 Session III (Room D - 10th Floor): Artificial Intelligence & Machine Learning

Chair: Yiannis Papadopoulos, Professor, University of Hull, UK.

1. Jezuina Korovesi, Lecturer, University of Tirana, Albania, Ana Ktona, Associate Professor, University of Tirana, Albania, Denada Collaku, Lecturer, University of Tirana, Albania & Endri Bimbari, Software Engineer, Raiffeisen Bank, Albania. A Reinforcement Learning Approach for Target Tracking using Neural Network as Function Approximation.
2. Thomas Fehlmann, Senior Researcher, Euro Project Office AG, Switzerland. Testing Artificial Intelligence with Artificial Intelligence.
3. Eberhard Kranich, Senior Researcher, Euro Project Office AG, Germany. Steps towards a Sensitivity Analysis for Linear Multiple-Response Transfer Functions.
4. Marina Burdack, Research Fellow, Aalen University of Applied Sciences, Germany & Manfred Rossle, Professor, Head of the Business Informatics Study Program, Aalen University of Applied Sciences, Germany. MyPaper – A Prototype of an Intelligent Paper Organization Tool based on Machine Learning Techniques.
5. Sebastian Stigler, Research Fellow, Aalen University of Applied Sciences, Germany & Marina Burdack, Research Fellow, Aalen University of Applied Sciences, Germany. A Practical Approach of Different Programming Techniques to Implement a real-Time Application using Django.

13:30-14:30 Lunch

14:30-16:00 Session IV (Room D - 10th Floor): IT Security & Other Issues

Chair: Thomas Fehlmann, Senior Researcher, Euro Project Office AG, Switzerland.

1. Till Haenisch, Professor, DHBW Heidenheim, Germany & Christoph Karg, Professor, Aalen University of Applied Sciences, Germany. Using Monte Carlo Simulation to Estimate the Success of IT Security Measures in Industry 4.0 Environments.
2. Christoph Karg, Professor, Aalen University of Applied Sciences, Germany & Till Haenisch, Professor, DHBW Heidenheim, Germany. Using an Extended Attack Defence Graph Model to Estimate the Risk of a Successful Attack on an IT Infrastructure.
3. Spyros Tragoudas, Professor and Chair, Department of Electrical and Computer Engineering, Southern Illinois University Carbondale, USA, Puneet R. Savanur, PhD Student, Southern Illinois University Carbondale, USA & Damianos Veskoukis, Graduate Student, Southern Illinois University Carbondale, USA. Efficient Verification of a Requirement.
4. Mihail Mateev, Chief Assistant Professor, University of Architecture, Civil Engineering and Geodesy (UACEG), Bulgaria. Management of Smart Energy Systems with IoT-Based Predictive Analytics for More Efficient Energy Consumption.

16:00-17:30 Session V (Room B - 10th Floor): Technology, Internet, and Social Media I*

Chair: George Kontos, Associate Professor, Western Kentucky University, USA.

1. Chul Hyun Lee, Professor, Gyeongin National University of Education, South Korea. Analyzing the Difficulties pre-Service Elementary School Teachers Feel in EPL Programming Learning Process.
2. Trond Vegard Johannessen, Associate Professor, NHH Norwegian School of Economics, Norway & Anna Mette Fuglseth, Professor, NHH Norwegian School of Economics, Norway. Experiences from a Problem-based Learning Approach to Teaching Spreadsheet Modelling.
3. Mihaela-Viorica Rusitoru, Associate Researcher, University of Franche-Comté | ELLIADD, France, Ioan Roxin, Professor, University of Franche-Comté | ELLIADD, France & Federico Tajariol, Professor, University of Franche-Comté | ELLIADD, France. Skills for Educational and Social Inclusion. How Digital Competences could Improve Lifelong Learning?
4. Soo Jeong Lee, Research Fellow, Korea Research Institute of Vocational & Education Training, South Korea. A Study on Development of E-learning Population Education Program in Response to Low Birthrate & Aging Society in South Korea.
5. Binyu Yang, Research Assistant, The George Washington University, USA. College Students' Use of Self-Regulatory Prompts in Online Vocabulary Learning.
6. Lorena Valerio, Faculty, Travel & Tourism Management, De La Salle-College of Saint Benilde, Philippines. Effectiveness of YouTube as an Edutainment Medium: An Exploratory Study.

**This session is jointly offered with the Education Unit.*

21:00-23:00 Greek Night and Dinner

Tuesday 21 May 2019

07:45-11:00 Session VI: An Educational Urban Walk in Modern and Ancient Athens

Group Discussion on Ancient and Modern Athens.
Visit to the Most Important Historical and Cultural Monuments of the City (be prepared to walk and talk as in the ancient peripatetic school of Aristotle)

11:15-13:00 Session VII (Room D - 10th Floor): Computer Science & IT Education

Chair: Christoph Karg, Professor, Aalen University of Applied Sciences, Germany.

1. Amos Olagunju, Professor, St Cloud State University, USA. The Impacts of Agile and DevOps on Future Computer Science and Information Technology Curricula.
2. Ignatios Vakalis, Professor, California Polytechnic State University, USA. Proven Strategies for Increasing Female Undergraduate Enrollments in Computer Science/Software Engineering.

3. George Kontos, Associate Professor, Western Kentucky University, USA. How to Create a Web Assignment that Encourages Community Participation.
4. Marc Hermann, Researcher / Lecturer, Aalen University of Applied Sciences, Germany & Carsten Lecon, Professor, Aalen University of Applied Sciences, Germany. A Flexible Search Function for Online Courses in the Sense of Attribute Grammars.
5. Chhavi Rana, Assistant Professor, UIET MDU Rohtak, India. Learning Analytics and Educational Data Mining: A Survey from 2005 to 2015.

13:00-14:00 Lunch

14:00-15:30 Session VIII (Room D - 10th Floor): Technology, Internet, and Social Media II*

Chair: Amos Olagunju, Professor, St Cloud State University, USA.

1. Jean-Luc Gurtner, Professor, University of Fribourg, Switzerland & Estelle Trisconi, Lecturer, University of Applied Educational Sciences of Lausanne, Switzerland. Completing one's Homework with or without the Interference of Social Networks. The Role of Gender, Type of Tasks and Student Level.
2. Sumita Chakraborti-Ghosh, Professor, Tennessee State University, USA. Technology for Inclusion: Special Education, Rehabilitation for All.
3. Elizabeth Diaz, Senior Lecturer, The University of Texas at Arlington, USA. My School in a Tablet: miABCEscuela.
4. Marianna Baranovskaa, Research Fellow, Macromedia University of Applied Sciences, Germany. LectureCast and Immersion - Why 360-degree Video is (not) a Solution.

**This session is jointly offered with the Education Unit.*

15:30-17:00 Session IX (Room D - 10th Floor): Special Topics

Chair: Chhavi Rana, Assistant Professor, UIET MDU Rohtak, India.

1. Biswadip Ghosh, Associate Professor, Metropolitan State University of Denver, USA. Improving the Effectiveness of C2C e-Commerce Apps by building User Collaboration.
2. Anil Ghosh, Professor, Indian Statistical Institute, India. Use of a New Dissimilarity Measure in Order to Solve Problems in Popular Clustering Algorithms.
3. Gledis Basha, Lecturer, Polytechnic University of Tirana, Albania & Elma Zanaj, Associate Professor, Polytechnic University of Tirana, Albania. Range Transmission Studied at Underwater Acoustic Networks.

20:00- 21:30 Dinner

Wednesday 22 May 2019
Mycenae and Island of Poros Visit
Educational Island Tour

Thursday 23 May 2019
Delphi Visit

Friday 24 May 2019
Ancient Corinth and Cape Sounion

Marianna Baranovskaa

Research Fellow, Macromedia University of Applied Sciences, Germany

LectureCast and Immersion - Why 360-degree Video is (not) a Solution

The use of audiovisual media serves different purposes in various stages in teaching- and learning environments. The most frequent implementation scenarios include the illustration of content and action, and, in particular, lecture recordings in academic surroundings. Not least, daily routines of the younger generation can serve as usable scientific content (cf. Reinmann 2009, p. 256) by tying in the known media usage behavior of students, which has been shaped increasingly by the reception and communication of audio-visual content (Gidion & Weyrich, 2017, S. 64; Zawacki-Richter et al., 2014, p. 32).

Current technological developments in the field of audiovisual media reduce the distance between a recorded action and its reception. By using 360-degree-Video - particularly in combination with a Head Mounted Display (VR-glasses) - a live-situation is being approached whereby an immersive projection, shielding the external world (Slater & Wilbur, 1997), aims for presence-experience (Singer & Witmer, 1998), which provides recipients with the feeling of physical presence in another place and time (Ramalho & Chambel, 2013).

Vohle and Reinmann (2012, p. 3) point out that, over handling a subject of learning within an authentic setting without pressure to act, it is highly likely to explicate and expand the one's knowledge. On that note, 360-degree-Videos, projected on VR-glasses, hold a particular learning potential due to the intended presence-experience: learners become the center of a spherical projection which they explore by choosing an image section individually by moving their head, while the physical shield composed of VR-glasses and headphones, refrains them from outside distractions (Hebbel-Seeger, 2018).

In a study undertaken with freshmen of the Media Management program in all locations of the Macromedia University, we investigated the question whether and how learning abilities of the recipients are impacted by the approach of a real-life-situation in media conveyed communication via immersive technologies (360°-Video on Head Mounted Display/VR-glasses).

All things considered, it can be stated that an immersive media format alone does not generate added value: there is no increase of attention that further enhances learning, which can be derived from the feeling (of presence) of sitting in a lecture room, even beyond the possibly initial distraction of the appeal of novelty.

Furthermore, the teacher-centered mode as represented in regular lectures is unsuitable for a spherical projection due to its spatial setting, where only one direction is being employed. In order to exploit possible media-specific values of 360°-videos in the context of LectureCasts, it is consequently necessary to work either with a modified concept of a teacher-centered lecture, using the entire space, or to set a focus on the content by combining the recorded lecture with additional visual elements.

Our team is currently part of a federal research joint project SCoRe (Student Crowd Research), funded by the German Federal Ministry of Education and Research (BMBF), carried out by the Universities of Bremen, Hamburg and Kiel as well as Macromedia University Hamburg and the Ghostthinker GmbH, where we expand this perspective by analyzing the contribution made by innovative video formats, including 360°-video, to the research-based learning within a crowd.

Gledis Basha

Lecturer, Polytechnic University of Tirana, Albania

&

Elma Zanaj

Associate Professor, Polytechnic University of Tirana, Albania

Range Transmission Studied at Underwater Acoustic Networks

The main difference between wireless networks and underwater networks is that in the underwater networks the capacity of the acoustic channel, unlike the capacity of the ground radio channels, depends significantly on the distance between the nodes. That is why many protocols for underwater networks, present the concept of the relay node that serves as the intermediate between a source and a destination. This intermediate node increases the capacity of the broadcast channel and can transmit more data in the unit of time. Relay nodes in terrestrial networks do not bring this advantage, as in the electromagnetic channel the capacity does not depend on the distance of communication. They are used to establish the connection between the transmitter and receiver when there is no connection between them or when it is intended to reduce energy consumption.

This study will consider how the impact of environment noise affects transmission radius, and thus the performance of the communications by using the parameters of a selected modem Evologics S2 CR7 / 17. Four sources of noise are usually considered in the underwater acoustic networks: turbulence, shipping, waves, and thermal noise. In the band where the acoustic networks usually operate, from 5khz to 100khz, there are only affected by wind's noise, which depends on the location and time, and it is not a constant noise in the ocean environment.

As the minimum level of ocean noise, we obtained the approximation of zero-wind's speed noise. Apart from the wind, during this study is taken in consideration even the impact of other intermittent noises, such as: rain, seismic activity and biological noises. The noise effect in underwater acoustic modems influences the decreasing of the transmission range. So, when the value of noise is low, the transmission range of the acoustic modem communication is high, and as the noise level increases, the radius decreases. This affects the operation of the underwater acoustic network, as the acoustic connections between the modems can be disconnected. The study of intermittent noise is important as there is always a minimum or average noise level, and the network is required even in difficult oceanic conditions, or in the case of seismic activity warnings, etc. In this paper, we investigate the potential impact of marine biological noise and the other intermittent on underwater acoustic

networks. Since in such circumstances the overall ocean ambient noise will be much higher than usual, the maximum transmission range of underwater modems will be reduced.

Marina Burdack

Research Fellow, Aalen University of Applied Sciences, Germany

&

Manfred Rossle

Professor, Head of the Business Informatics Study Program, Aalen
University of Applied Sciences, Germany

MyPaper - A Prototype of an Intelligent Paper Organization Tool based on Machine Learning Techniques

Academic papers are the base knowledge for further research areas. They contain scientific theories and methods, describe further experiences and results in special domains. Researchers, students and Ph.D. students need this base knowledge to develop new theories, algorithms, or evaluate existing concepts. But at the begin of each research project a founded literature review process is needed. These literature review process contains different steps, like keyword definition, searching in literature databases like IEEE-Explore, Springer Link, Science Direct and finally the storage of the paper. If the paper will not be clearly named and categorized in folders, a later efficient use of interested papers are difficult, because the different folders have to be searched and the stored papers has to be opened. In addition, a clear categorization of the paper is often difficult, that the same paper will be often stored in different folder. But academic paper contains from the author defined keywords which allow a multiple categorization. It also contains an abstract which give a short overview about the paper and can quickly read for a first paper scan process.

Ph.D. students especially for those who write their Ph.D. on the base of paper (in german "kumulative promotion") have to write papers for high ranked journals and conferences. These journals and conferences are listed and ranked in so called VHB lists. A good practice to write new papers is to reference earlier duplicated papers from the journal or conference where the new paper will be submitted.

To optimize the paper writing process MyPaper was implemented. It is a prototype of an intelligent paper organization tool based on a web framework which allows to storage papers efficiently and to categorize the paper by using the paper keywords. It also integrates journals and conferences from the VHB lists and their call-of-paper deadline. In addition, different meta data like citations count at the moment by adding, the kind of paper (journal, proceeding, conference and so on) and the abstract are stored. By integrate a project structure, different stored papers can be marked and referenced for special projects.

Sumita Chakraborti-Ghosh
Professor, Tennessee State University, USA

**Technology for Inclusion:
Special Education, Rehabilitation for All**

Technology is a key aspect of today's and tomorrow's life and for any form of communication, daily living, education and functional activities. The primary focus of this presentation is solely targeted to the effective use of technology for students with exceptional needs in inclusion classrooms. The presentation will include an interactive discussion of how use of different technologies for different purpose in daily life and for academic and functional independence through the information that are explained and described in the book "Technology for Inclusion: Special Education Rehabilitation, for ALL" authored by the presenter.

Elizabeth Diaz

Senior Lecturer, The University of Texas at Arlington, USA

My School in a Tablet: miABCEscuela

Nowadays, there are mobile applications for Banking, Cooking, Fitness, Videos, Movies, Languages. My tablet is full of different applications with different functionalities. We propose to have one Application that encompasses my whole school with all the subjects, grades, teachers, lesson plans, content for each class.

miABCEscuela is a bilingual web-based application. miABCEscuela is made up of three different levels: level of administration, level of teacher, level of student. At the school level, it allows the school administration to register: all the teachers, all the grades, all the program objective per grade. At the teacher's level, it allows the teacher to prepare his/her classes as well as its lessons plan. miABCEscuela allows teachers to prepare their lesson plans and its corresponding content so that their students can either prepare themselves ahead of time or just take the class away from school. At the student level, it allows students to take their classes whenever they want, wherever they are. Students can take their classes, activities, practices in either English or Spanish. miABCEscuela can be used as a tool for missing classes or it can be used as a Homeschooling System. It can be used just to reinforce classes which might be difficult for the students. miABEScuela is the perfect tool to level up students who have come from other countries and do not have a command of the English language. Classes being in both languages make easier for students to do their regular classes in their own language and then to review the classes in English. It might be the other way around, it can be used for English speaking students who are learning Spanish. Our goal is to have all our students to be fluent in both languages at any time, at any place. miABCEscuela allow students to have online classes at their own pace and at their own rhythm,

miABCEscuela allow students to use old test for practices, allow students to watch videos and games related to any subject to reinforce their learning while they are playing. miABCEscuela is a tool to teach you while you are playing in your own language. Any school or any student can subscribe to miABCEscuela. We are planning to allow students to join their grade even if their school does not have a subscription. This mechanism will expose students to another level, to a content different from their teacher, from their school. miABCEscuela is a virtual bilingual STEM school.

Thomas Fehlmann

Senior Researcher, Euro Project Office AG, Switzerland

Testing Artificial Intelligence with Artificial Intelligence

Artificial Intelligence (AI) is all over the place, nowadays. No longer limited to the computer laboratory, it now sets up media campaigns, influences people, decides elections, protects property, and drives cars.

However, the principles of AI are quite old; most of them origin from the early times of computer science and had been discussed in the seventies and the eighties. They were but theoretical concepts as computer power was a scarce resource, and the data to feed the perceptron of that time not available.

The principles of AI are classification of entities, and the solution of the equation $f(x) = y$, where x and y are vectors in spaces of different dimensions and semantics. For instance, y could be the observable behavior of people or extrasolar planets, and x the unknown cause of it. Traditional solution methods are regression, where both x and y are measurable, or eigenvector methods where the x are not directly measurable but correlation between the two is measurable. If there isn't much known about the transfer function f , neural networks can be set up that learn the transfer function, based on experience.

If a car uses an image recognition system, it must learn to distinguish between people walking, running, children playing, waiting, and bicycles riding, or being walked. Such a system is programmed to learn; not the characteristics of the images are programmed into it. The system should also be able to recognize people and things if not seen in full, even partly hidden behind a bush, by fog, or at night.

Unfortunately, such neural networks do not only learn, they also unlearn. Van Gerven et. al. have shown that they can get distressed ("mad") as any neural information processing, similar to humans. If I ever dare to sit into an autonomous car, I probably want to know whether and when this car had passed its last test with its current state of the learning system.

This requires the ability to test software-intense systems autonomously. It must be possible to test a car's image analysis capabilities in regular intervals to see whether it still works as expected; thus, detecting "madness" early enough to avoid damage. The crucial point is that testers are not around after such learning took place, or after a software update was downloaded in the car, or the car connected to a new even smarter smartphone providing new capabilities. Whether the old capabilities still work, needs being tested.

Moreover, tests must evolve as well. They no longer can be static; test suites need to expand for new learnings, new environments, and new standards and regulations.

This is autonomous real-time testing, and the AI engine needed to furnish relevant tests is what we'll explain in the paper.

Anil Ghosh

Professor, Indian Statistical Institute, India

Use of a New Dissimilarity Measure in order to Solve Problems in Popular Clustering Algorithms

Popular clustering algorithms based on usual distance functions (e.g., the Euclidean distance) often suffer in high dimension, low sample size situations, where concentration of pairwise distances has adverse effects on their performance. In this article, we use a new dissimilarity measure based on the data cloud, which takes care of this problem. This dissimilarity index uses the distance concentration property to its advantage, and as a result, clustering algorithms based on it usually perform better for high dimensional data. We also address the problem of estimating the number of clusters. This is a challenging problem in cluster analysis, and several algorithms are available for it. We show that many of these existing algorithms have superior performance in high dimensions when our proposed dissimilarity index is used instead of Euclidean distance. We also construct a new estimator based on penalized Dunn index and prove its high dimensional consistency. Several simulated and real data sets are analyzed to demonstrate the usefulness of the proposed method for cluster analysis of high dimensional data.

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Improving the Effectiveness of C2C e-Commerce Apps by Building User Collaboration

Consumer to Consumer (C2C) eCommerce is growing through Applications such as OfferUp, Craislist, Uber and AirBnB. Several theoretical and empirical studies have sought to define or operationalize specific measures to investigate the impact of many characteristics of feature quality on their effectiveness. However, several large gaps still plague the current body of C2C Application evaluations. The IS research literature identifies two types of resources that can be deployed to support any eCommerce application - (1) the tangible resources such as UI navigability, server capacity, networking speed, applications quality, etc. and (2) the intangible resources related to the actual user management to support the adoption and usage issues by establishing user communities. For C2C Apps, success also depends upon users recognizing the norms, intellectual structures and conventions to contribute and/or decipher the information from these applications to allow them to make decisions and perform transactions. Social capital (or relationship) resources allow users to engage with other users, thus enabling better transactions and usage of the C2C applications. Such intangible resources can be achieved through collaborative practices at the user level to complement the established technical infrastructure resources that have already been deployed. The above arguments support the need for a complementary set of capabilities to develop these intangible resources - a "so-called" community of practice to establish relational and shared understanding to facilitate more effective C2C transactions. These capabilities may include developing user communities that encourage: (1) creating structural norms and symmetries to support C2C transactions, (2) creating opportunities for knowledge exchange, (3) creating an expectation that such knowledge exchanges have value, and (3) creating motivation for users to participate in these collaborative activities. This research performs an empirical field study of a sample of C2C Apps that provide localized eCommerce opportunities, to identify the most important quality features (from the Kano Model) of these Apps that impact their effectiveness. This research also investigates the moderating role of building social capital resources (pro sharing norms, generalized trust and group identification) through the development of user communities of practice among the active App users on the effect size between C2C Application quality and Application effectiveness. The two research questions are:

1. Which antecedents of App quality from the 11 categories identified in

- the Kano model have a stronger relationship with App effectiveness for C2C Apps?
2. Do social capital resources moderate the relationship between Application quality and effectiveness for C2C Apps?

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&

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Completing One's Homework with or without the Interference of Social Networks. The Role of Gender, Type of Tasks and Student Level

By the age of 15, students attending swiss schools are confronted almost every day with 1 to 2 hours of homework in 3 to 5 different subjects. While some of the requests made by their teachers consist in rather routine tasks or simple consolidation of a newly learned skill, others are more challenging and require a higher dose of mental efforts and creativity.

In the first part of her PhD, the second author of this contribution investigated whether types of tasks, their anticipated facility or difficulty are taken in account by students when starting their homework. Do they plan ahead, monitor their investment based on tasks characteristics or do they simply proceed linearly on a first in first serve basis or follow their preference for a given subject? Results show that total time on task is higher when students start their homework with the tasks they consider as the more difficult, but that, at the same time, only a small proportion of students really evaluate the level of difficulty of each task before starting their homework.

In the second part of the dissertation, the possible interference of social networks solicitations on students' homework organization and completion was tested using a simulation. We compared four types of tasks - two tasks for a language class (chase the intruder in a vocabulary list and writing the end of a short text), two math tasks (express fractions through surfaces and solving word problems). Results confirmed some of our expectancies - that girls and more able students are more capable to resist to the intrusion of a solicitation while completing a cognitive task than boys or less able students, for instance. In contrast to what we had predicted however, resistance to a solicitation proved lower in more difficult and more creative tasks such as the "finish writing" task than in more routine and less demanding tasks such as "chase the intruder", or "shade surfaces", independently of its order of presentation. Given that intrusion of a solicitation was also less disruptive in the "word problem solving" task than in the "finish writing" task, we interpret this result as dependent on the nonlinear character of the writing process.

Since the likelihood of being distracted by social networks during homework is affected by student and task characteristics, we suggest that students should be at least informed, as best trained, to handle efficiently the presence or the absence of their smartphone on their desk while completing their homework.

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&

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Using Monte Carlo Simulation to Estimate the Success of IT Security Measures in Industry 4.0 Environments

The choice of defense strategies in IT Security is often guided by qualitative methods only. For common scenarios like securing desktop computers, web servers or extranets there are well accepted best practices for establishing a secure environment. For other scenarios like computers in production environments (“Industry 4.0”) these best practices are not as clear. To secure this kind of systems there are a number of options, but their relevance for a certain application is less clear and specific for the situation. With unlimited resources all existing techniques could be applied, but in reality resources are limited.

Because of this the allocation of budget or assignment of priorities to more sophisticated techniques is a hard problem.

This paper describes a method based on attack trees which allows to assess the value of defense measures based on simulated attacks. The goal is not to provide an automatic strategy generator or tool selector but to make the importance of specific measures transparent and help make decisions by supporting the human security specialist without requiring the effort of a complete risk analysis.

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A Flexible Search Function for Online Courses in the Sense of Attribute Grammars

Attribute Grammars are mostly used when specifying a compiler or a software program: A context-free grammar is enriched by variables (attributes) rules and conditions. This approach can also be adapted for a flexible search function – in our case in the context of online courses for e-learning: In general, a course consists of chapters – each composed of subsections (and sub-subsections, etc.). Furthermore, chapter as well as subsections have some metadata, for example title, learning matter (subject), points (of exercises), level (beginner, well-advanced, expert), prerequisites, etc. Our data model allows defining inferred attributes alongside the hierarchical connections between objects (parent/ children relationship). By doing so, it is also possible to apply aggregate functions like sum or average. For example, if a chapter has the title 'SQL', this value can inherit to the subsections, so that a search for 'SQL' will not only results in the chapter but also in the subsections – with less weighting. One the other hand, the points of exercise subsections can be transferred to the superior chapter using a sum function, so that a search for all exercises with a specific total point is possible.

Furthermore, another way of structure oriented searching is possible: The (recursive) structure of the learning object can be described by object-valued attributes. For example, the titles of all objects of a hierarchy can be described as a character string `o6.titlepath='Databases/Languages/SQL'`. In this manner, also regular expressions can be used, for example in order to look for all subsections of chapters with the title 'Data Models' or 'SQL': `*/(('Data Models'|'SQL'))/*`.

When generating online courses, we use an XML document, so an easy access to structure information as well as to the metadata is possible.

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&

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Experiences from a Problem-based Learning Approach to Teaching Spreadsheet Modelling

The spreadsheet is an important tool to support decision makers. However, evidence exists that critical errors occur in spreadsheets applied in managerial business processes. Furthermore, experience with spreadsheets does not seem to increase expertise considerably. Therefore, bachelor students in a business school should acquire spreadsheet skills during their studies.

This paper reports our experiences from teaching a section on spreadsheet modelling based on principles of problem-based learning. The spreadsheet modelling section was part of a compulsory 7.5 ECTS credits introductory course on business data processing for around 400 students at the bachelor level. The section on spreadsheet modelling comprised 1/3 of the course.

A quasi-experiment was conducted to analyse the effects of teaching. We compared a sample of N=117 students' answer to similar spreadsheet tasks, one before and one after the course.

According to the principles of problem-based learning (PBL), the course section was organised to help the students develop their conceptual understanding of spreadsheeting and prepare them for real-life spreadsheet modelling through a series of problem-solving sessions of increasing complexity. However, in a class of around 400 students, it is not possible for a course facilitator to have the extensive contact with the students assumed in the PBL approach. Therefore, we complemented the PBL approach with aspects of the flipped-classroom approach. Instead of plenary lectures, the course facilitator developed a set of videos. The problem-solving sessions were organised in groups of 20 - 40 students administered by experienced student assistants, who had been trained by the course facilitator. However, the course facilitator took care of the debriefing discussions with the students, challenging their solutions.

The pretest revealed that around 90% of the sample of 117 students lacked basic technical spreadsheet skills, and that they did not know how to structure a spreadsheet so that their model was useful for decision support. The posttest, conducted at the end of the spreadsheet modelling section, showed that more than 90% of the same students had acquired basic spreadsheet skills and managed to model a similar task according to the principles of spreadsheet design taught.

It is not surprising that most students had acquired spreadsheet skills after the course. In our analysis, we therefore emphasise the weaknesses of the students' answers, particularly that 26% (N=30) of the students still used constants in some of their formulas and, thus, had hidden assumptions in their model.

In the paper, we discuss possible explanations of the weaknesses in order to enhance the understanding of how to improve spreadsheet teaching. Limitations of our study are discussed together with suggestions for further research.

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&

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Using an Extended Attack Defence Graph Model to Estimate the Risk of a Successful Attack on an IT Infrastructure

In a commercial environment, the goal of each security measure is the protection of the company's or organization's assets. In the context of information security, the measures focus on computer systems and the data stored on them. Usually, the financial budget to be spent on security measures is limited. As a consequence, not all of the available measures can be applied because of monetary restrictions. Hence, a choice must be made on how much money to spend on which security measure in order to use the financial resources in an optimal manner.

The selection of the measures to secure a company's IT infrastructure is usually based on best practices. In the case of office IT environments, many of the choices are based on the experience which was gathered in the last decades. In the case of industrial production environments, the situation is quite different, since the process of digitalization just begins to find its way into these environments. According to IT security experts, there is the need of a quantitative assessment of a security measure with respect to the environment it shall be applied to. This kind of assessment may assist decision makers in choosing and prioritizing appropriate security measures.

This paper describes an approach to assess the effectiveness of security measures on the basis of Monte Carlo simulations. The approach builds on the well-known model of attack defense graphs. An attack defense graph is a directed acyclic graph whose nodes represent threats which arise from existing vulnerabilities and counter measures to mitigate the respective threats. The nodes are grouped in disjunctions or conjunctions in order to specify the dependencies. Each sink of the graph represents an attack which may be the result of successfully exploiting the vulnerabilities which are located on the paths towards the sink. The attack may be prevented by successfully applying the counter measures which lie on the paths towards the sink.

In order to estimate the risk of a successful attack, the model is extended with additional information. In particular, both a capability and a difficulty value are assigned to each node representing a threat or a counter measure. The capability of a threat or a counter measure describes the skill level of an attacker to successfully implement the threat or the skill level of a defender to successfully deploy a counter measure,

respectively. It is assumed that the capability value is independent of the environment to be analyzed. The difficulty value of a node measures the difficulty of implementing a threat or of deploying a counter measure in a given environment, respectively. To enable Monte Carlo simulation techniques, probabilities are derived from the capability and the difficulty values.

To answer questions such as “How does the usage of security measure A influence the risk?” or “Is security measure A better than security measure B with respect to the mitigation of the risk?”, several Monte Carlo simulations are performed and analyzed. The simulation results can help the decision makers to select these counter measures which fit the best for their IT environment. Another application of the approach is the computation of an cost-optimal selection of security measures which minimize the risk of a successful attack.

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How to Create a Web Assignment that Encourages Community Participation

A collaborative project is described. In this project, students in a web design class contacted local businesses and created web sites (collections of web pages) to benefit these businesses. Two phases of the project, planning and implementation, are described. The project, suitable for both online and face-to-face instruction, required that students keep a journal. The instructor did a follow-up investigation to assure that the websites that students created were indeed what the businesses asked for.

In this presentation, the importance of training our students properly in web page design will be emphasized. Participants will learn how to help their students understand that the overall process of developing a web site is not just creating the web pages and linking them together. Good planning includes sketching the navigation structure of the web site and determining the content and navigation of each web page. In addition, keeping a journal of student-business meetings and interactions is important.

Ideally, participants should have some interest in teaching web design but anyone who wants to know how to help students work collaboratively with the community is welcome.

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A Reinforcement Learning Approach for Target Tracking using Neural Network as Function Approximation

In this work, we consider the problem of tracking a moving target in a simulated multi agent environment. The environment consists of a rectangular space bounded by walls. The first agent, which is the target, moves randomly in the space avoiding the walls and emits some light that makes it recognizable. The second agent has the task of detecting the moving target by the light it emits, and following it, keeping as close as possible without crashing. The target is expected to accelerate or decelerate, as well as change direction. We will use reinforcement learning in order for the tracker to learn how to detect any change in direction or speed and stay within a certain range from the target. In reinforcement learning, a form of machine learning, the agent learns by interacting with the environment. By doing so, for each action taken, the agent receives a reward or penalty, which is used to determine positive or negative behaviour. Unlike other machine learning forms, such as supervised learning, the agent is not explicitly told what action to take in each state. In order to learn that, the agent has to go through a series of trial and error by interacting with the environment and receiving the rewards. The goal of the agent is to maximise the total reward received during the interaction. This form of machine learning has applications in different areas, such as: game solving, with the most known game being AlphaGO; robotics, for design of hard-to engineer behaviours; traffic light control and personalized recommendations etc. In the problem of tracking a moving target, the task of learning deals with continuous state. Since the state is continuous, we approximate the value function using neural network. We will apply two algorithms, Q-Learning and SARSA, and will compare the results of each for learning the best policy.

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Steps towards a Sensitivity Analysis for Linear Multiple-Response Transfer Functions

Artificial Intelligence (AI) is a long-standing theoretical concept that nowadays has become a buzzword in almost all business areas that relate to digitalization. A key component in AI and Big Data applications is the concept of transfer functions which reflect the required relationships between the various input parameters termed controls, and the observed output(s) called response(s) of the considered process. To validate the compliance of the resulting process with predefined response specifications, the so-called goals, a sensitivity analysis is conducted. This paper represents a sensitivity analysis procedure concerning linear multiple-response transfer functions. As an example for intelligent behavior supported by sensitivity analysis, we use the House of Quality (HoQ) which is the key design component of Quality Function Deployment (QFD).

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Intelligent Systems to Support Decision Making

Intelligent systems offer support not only in those areas of life when is required to analyze a large number of options to take a decision, but also when there is a growing uncertainty about the solution that will be given to a specific problem and right decision has a great impact in the field. Medicine is one of the areas where the use of intelligent tools to assist in decision making is of a great importance because they can provide predictions from diagnosis of the disease to its prognosis. For example, Diabetes mellitus (DM) must be treated on time otherwise it can cause severe complications. In order to avoid as much as possible these complications, DM needs to be diagnosed at its earliest stage. A decision support system (for prediction) can be of great help in this regard. Machine learning algorithms can be used to train and evaluate the predictive system. The objective of our work was to design and implement a decision support system of diabetes mellitus diagnosis. The first step toward this system was the identification of factors affecting diabetes which was accomplished by asking experts of the field. The experts of the field also provided as with the necessary data that we utilized to train the prediction system using various machine learning algorithms, such as Naive Bayes, Bayesian Networks, Logistic Regression, and Logistic Model Tree. We compared the output of these algorithms and it resulted that Logistic Regression is the one that provided us with the best accuracy. The model generated from this algorithm is implemented in the system that will support diabetes diagnosis decision making.

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Kinetosis Analyzation of the Symptoms Occurrence in Combination with Eye Tracking

The general kinetosis is a well-known problem. Besides common types of kinetoses such as seasickness there are visually induced kinetosis. One of these special form of kinetosis is caused among others in virtual reality. Common symptoms such as nausea, blurred vision or dizziness are familiar. There are several theories about the origin of motion sickness. In the context of virtual space the rest frame theory is very interesting for the examination of motion sickness. Basically, the theory states that human beings are looking for fixed points in order to maintain their equilibrium. The paper investigates the detection of symptoms with the accumulation of fixed points. We used a head mounted display including eye tracking to collect the data of our probands.

A total of 26 subjects participated in the study. The Motion History Questionnaire determines the general Motion Sickness susceptibility, and after staying in virtual space, the Simulator Sickness Questionnaire is used to analyze the symptoms. The eye tracking data from the virtual space was evaluated and compared to the results of the Motion History Questionnaire and Simulator Sickness Questionnaire. The evaluation of the eye data shows differences between the subjects with a tendency to motion sickness and those without. The data indicates that it is indeed possible to measure kinetosis in the virtual space with eye tracking data.

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Analyzing the Difficulties pre-Service Elementary School Teachers Feel in EPL Programming Learning Process

Programming education using EPL (Educational Programming Language) in elementary schools plays an important role in developing computing thinking skills. Despite the importance of EPL programming education, elementary school teachers have vague fears and negative perceptions about programming. This is due to programming difficulties. Because programming requires the correctness of grammars and logic, there is a high probability of errors, which makes programming difficult. Therefore, it is necessary to develop an EPL education program that can systematically learn EPL while reducing programming difficulties and errors. To do this, it is necessary to grasp the difficulties that pre-service elementary teachers feel in the process of EPL programming. In this study, we investigate and analyze the difficulties pre-service elementary school teachers have in the process of solving EPL programming fundamentals tasks.

First, after completing the EPL programming tasks for students who have been in the Entry (<https://playentry.org/>) programming lessons for 5 weeks, we survey the difficulties they felt in the EPL programming process. Next, Think Aloud is applied to collect and analyze qualitative data about the real-time difficulties experienced by pre-service elementary school teachers during EPL programming. The learner's main difficulties in EPL programming learning process is the concept of object movement and direction rotation in screen, when and how to apply variables, using block commands with multiple parameters, finding of the generalized rules for problem solving, and when to use block commands related to lists(array) can be. Once we know the difficulties that pre-service elementary school teachers have in the EPL programming learning process, we will be able to develop a more effective EPL programming education program to reflect these points.

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A Study on Development of E-learning Population Education Program in Response to Low Birthrate & Aging Society in South Korea

The objective of this study is to explore the possibility by verifying the effects of consumption education using SNG(Farmville game) in Home Economics lesson for middle school.

Regarding the results of study, in the results of analyzing correlations between contents of consumption education in Technology & Home Economics curriculum for middle school and elements of SNG(Farmville game), their contents were closely related, so that there was the possibility of utilization for consumption education lesson. Second, in the results of analyzing the economic preference, economic understanding, and consumption habit of an experiment group performing SNG(Farm Ville game) and a comparative group without it, the mean value of economic understanding of the experiment group was statistically significantly higher than the comparative group's. The economic preference and economic understanding of male students were statistically significantly higher than female students', so that lesson activities using SNG(Farmville game) had effects on the consumption education for middle school students. This study suggested the necessity of new approaches including lessons using SNG in accordance with changes in teaching/learning environment, in the consumption education of Home Economics for high school.

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&

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Introducing a Model for the Representation of Medical Data using Ontologies and Web Technologies

One of the major obstacles to successful interdisciplinary studies in the field of medicine is the complexity and diversity of knowledge and terminology within the field. The difficulty of finding and selecting important data is great and mainly because of the different formats, schemes and semantics that this data has. There is also a difficulty in extracting automatic knowledge from previous practice or history because of the diversity of human information systems. This paper aims to present a model for representing medical data using ontologies and semantic web technologies. This paper gives a clear and detailed explanation of the basic concepts of semantic web and ontologies. Through ontologies it is possible to construct models of fields that are understandable both by humans and by machines. OWL (Ontology Language Web) language is used for determining ontologies, with the main aim being the improvement and structuring of data as well as their integrity. This paper presents a study on the representation of cardiovascular disease data, using ontologies and semantic web technologies.

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Management of Smart Energy Systems with IoT-Based Predictive Analytics for More Efficient Energy Consumption

Smart energy solutions and related systems like smart homes, smart cities are growing and stay the essential part of the whole ecosystem, that we use to optimize the energy consumption.

Modern Smart Energy systems can be highly successful, but they require intensive monitoring, control and management.

Predictive analytics is one of the most important functionalities, required for modern intelligent systems, related to management of the energy consumption. There are 2 different aspects:

- Prediction of the energy price and availability
- Prediction of possible failures of the smart energy system equipment.

In the past predictive analytics was quite expensive feature, because statistical algorithms require more computing power. With cloud-based IoT-based Predictive Analytics is easier, cheaper and more easily accessible for design, implementation and maintenance.

This research has a goal to propose target solution design and appropriate models for Predictive Analytics in Smart Energy systems, based on Microsoft Azure.

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The Impacts of Agile and DevOps on Future Computer Science and Information Technology Curricula

Self-organizing cross-functional teams often collaborate to develop the requirements and solutions to software products. DevOps is designed to facilitate rapid code deployment to production by teamwork of developers and operators of computerized systems. With DevOps, an organization can increase the distribution speed of applications and services to better serve its clients, and to remain resilient in market competitions. DevOps enables Agile teams to implement continuous integration and continuous delivery, to launch products faster into the market. What are the current viable DevOps tools used to gather the requirements, develop, test, integrate, deploy, maintain and monitor large-scale software products? This paper evaluates a variety of DevOps tools for managing geographically separated and parallel teams, infrastructure automation, configuration and security management, application build and deployment automation, code sharing and versioning, performance management, log management and systems monitoring.

All computing science students ought to learn the concepts of adaptive planning, evolutionary growth, unceasing enhancement, timely delivery, and fast and supple response to software modification that agile software development promotes. To be prepared for the future information technology workforce, students must absorb the hands-on skills for secure software development and operations. Students ought to learn how to run software products from inception to retirement. A survey was administered to seek the opinions of academicians, industry and government personnel on the practices and needs for Agile software development and DevOps tools in computing curriculum. The survey results reveal that: Agile software development skills are increasingly important in hiring decisions; the industry is increasingly using Agile, DevOps and cloud practices in software development and digital pipeline applications; and there is a concern about the readiness of the current university graduates and existing workforce for digital transformation, and the capacity of the universities to produce the workforce for future information technology. This paper presents the barriers to the incorporation of Agile and DevOps into computing curriculum. The paper details the use of DevOps and other tools in the implementation of simulation laboratories for understanding virtualization and automated software management, containers, OpenStack and software-defined networking, and complex IoT infrastructures.

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**Technology in Education: How much is Too Good?
How much is Too Bad?**

The benefits of using technology in education have been documented in multiple publications, and are seen along all stages, from kinder to graduate education. When used appropriately these benefits range from just been a source of information (replacing books), to programs helping the development of skills, to social channels promoting group interactions, virtual access to remote areas, and so on. There is no doubt that we will continue to find applications and develop new forms of technology to improve our profession.

But on the other hand, the improper use, or the excessive use, of technology can produce serious drawbacks and give unwanted results and outcomes in the education system.. This becomes more evident in postsecondary education, where we are aiming to form professionals whom we expect to be productive in a relative short time. There might be multiple causes. Perhaps the pressure from industry to produce graduates with skills in specific software packages, or simply the fact that a student can be more productive faster when he/she masters a particular tool, motivates courses and curricula to emphasize the use of software tools at the expense of developing the basic knowledge and skills that the software performs. We can mention some examples.

Example 1: The course of numerical methods was eliminated from the engineering curriculum at many universities because software like Matlab and Mathcad can be used instead.

Example 2: A manufacturing company complains that recent graduates hired have excellent skills using AutoCAD, but are unable to read or generate layouts for new products on their own.

Example 3: Engineering students in upper classes had problems in an exam doing simple arithmetic operations because calculators were not allowed. Other professors complained saying that nowadays those skills are not necessary because calculators are available.

Example 4: The use of graphic calculators in the precalculus course at university X was abandoned after two years because the students from those courses demonstrated poor skills in problem solving in later courses that require understanding of curve properties and characteristics.

The above examples are just some among hundreds of examples that the authors and many colleagues have identified in many post-secondary institutions in the US and also in Latin America. Several professors, specially administrators, have argued that those are anecdotal examples. But empirical evidence show that these are not unexpected problems.

Our experience, and empirical observations, as well as that from many colleagues whom we have discussed this issue, has shown that for most subjects, students who start learning the fundamentals without using technology, learn the software packages faster and make better use of them, than those students that start with technology from the beginning.

Our concern is that many curricula for professional education are emphasizing the use of technology beyond rational limits, sacrificing teaching of basics and fundamentals. We want to bring this misuse of technology to the light, for an in depth discussion analysis and organized research.

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&

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Philosophy-Inspired Computing for the Future of Mental Health

Computing applications are currently being developed with two goals in mind: a) to facilitate new product innovation and create new markets or b) to increase productivity and provide efficiency and cost savings and therefore competitive advantage in existing markets. Both goals are driven by economics and do not engage with the deeper psychological needs of humanity. However, with most developed nations facing a growing mental health crisis, we strongly believe in the need for computing that addresses psychological needs. Motivated by this observation we develop philosophically and psychologically inspired applications that can have a useful psychological role.

The first application is a digital art studio called *Timaeus*, an acronym standing for Three-dimensional Illuminated Media-Augmented Ethereal-Unreal Sculptures. *Timaeus* is the name of a classical Platonic dialogue, but here it signifies a digital art studio that enables creation of personalized virtual sculptures that can be customized with media including pictures, videos and music. Such media can represent memories or more generally facts embedded in sculptures which are hollow and translucent, could be illuminated, and navigated either externally or internally. *Timaeus* sculptures thus become curved spaces or worlds where projected media can be experienced in three dimensions. The art studio is being applied in studies which explore new forms of creative artistic expression and for art therapy, e.g. of dementia patients.

A second related development discussed is an 'Infinite Virtual Stoa' that we coded to host an expandable online repository of resources about Stoicism. Our Stoa is a virtual colonnaded building in the form of the ancient geometrical pattern known as 'the flower of life'. The building is composed of overlapping circles arranged in a flower-like pattern that is potentially expandable to infinity. In our application, the Stoa becomes an art gallery/library for the creative exhibition of online Stoic resources: quotes, stories, books, paintings and videos. One can create areas of study devoted to philosophers like Epictetus, Seneca and Marcus Aurelius, or thematic areas where ideas are explained with quotes, text, animations and videos. Specific ideas or themes can be presented creatively as multimedia sculptures using *Timaeus*. We believe that Stoicism is a powerful system of ideas from which humanity can still learn about

pursuing a good, ethical life of equanimity in the face of adversity. Key developments in psychology such as Logotherapy and Cognitive Behavioral Therapy have cited Stoicism as their main inspiration.

The paper discusses our motivation, applications and outlines future work.

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Learning Analytics and Educational Data Mining: A Survey from 2005 to 2015

Higher Education is at a point of unparalleled ambiguity and transformation with financial changes leading to increased focus on student focused model that emphasize on student engagement that leads them to better performance and employability [5,6,8]. The stakeholder in Indian Higher Education system faces stiff competition from International Universities and other organizations that are offering flexible education online. Learning analytics (LA) is the process of using this data to improve learning and teaching and refers to the measurement, collection, analysis and reporting of data about the progress of learners and the contexts in which learning takes place. Educational Data Mining is an emerging discipline, concerned with developing methods for exploring the unique types of data that come from educational settings, and using those methods to better understand students, and the settings which they learn in. In this paper, a comparative study is carried out using the output from projects implementing learning analytics around the world and there is an attempt to compare the strategies both LAK and EDM are using to contribute in this field.

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Skills for Educational and Social Inclusion. How Digital Competences could Improve Lifelong Learning?

Context and background: Societal challenges are generating major transformations in education, training, and pedagogy. The arrival of the new technologies in the field of education started to revolution the educational principles. The social gap between different categories of learners is more visible. Education has the mission to face these social challenges. It seems that the human being needs to update and improve constantly his skills and competencies. He is called to be involved in a “lifelong learning” process.

Purpose and research question: Lifelong learning became an economic imperative of our societies. To adapt to this moving and changing society, learners of all ages have to acquire new knowledge and skills. For this reason, the main aim of this contribution is to analyse *which are the most valuable skills for the new millennium and in what manner could digital competences fully improve the learning offering?*

Methodology: To answer to this research question, we will realise a comparative analysis by starting from the international and European approaches in this regards. The European Union proposed a list with eight core competencies. UNESCO and other international organisations promote skills and competencies which enable learners to be competitive. Digital skills are present in these educational and legal tools. Moreover, “media education” doesn’t exist for the moment in these regulations, but needs to be more debated.

Research conclusions: Education for learners of all ages becomes an imperative for our society. Each human being must deploy this potential and benefit of an integral development. Thus, citizens will be “armed” with necessary skills for lifelong learning, while not only the economic-based skills are promoted but also media education.

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The Use of Digital Technologies at School and Cognitive Learning Outcomes: Findings from the Finnish PISA 2015 Data

Background: In the PISA 2000, 2003, and 2006 studies, Finland was ranked among the best countries in cognitive learning outcomes across all countries. In the PISA 2012 and 2015 tests, however, the ranking of Finland substantially declined. Simultaneously, extensive investments were made in digital technologies at schools in Finland. This study investigated whether the use of digital technologies at school is linked to students' learning outcomes in Finland.

Methods: We used the Finnish PISA 2015 data ($N=5037$). Cognitive learning outcomes (i.e. scientific literacy, mathematical literacy, reading literacy, and collaborative problem-solving) were evaluated with a 2-hour pattern of computer-based tests. ICT (information and communications technology) use at school, ICT availability at school, and students' perceived ICT competence were assessed with self-rating questionnaires.

Results: When adjusted for age, gender, and the index of parental economic, social, and cultural status (ESCS), it was found that frequent ICT use at school predicted weaker performance in all the cognitive learning outcomes, i.e. lower scores of scientific literacy, mathematical literacy, reading literacy, and collaborative problem-solving. Further analyses revealed that frequent ICT use had a negative effect on students' cognitive learning outcomes at all levels of students' ICT competence, but the effect was more negative at high levels than low levels of students' ICT competence. Moreover, frequent ICT use at school had a negative effect on students' cognitive learning outcomes at high levels but not at low levels of ICT availability at school.

Discussion: Frequent use of digital technologies at school appears to be linked to weaker cognitive learning outcomes in Finland. This finding appears not to be accounted by low levels of students' ICT competence or scarce availability of ICT devices at school.

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Teaching and Learning with Technology in Basic Education: Developing Computational Thinking of Students

We live, in the contemporaneity, changes in our professional practices, school, social, among others, because of the uses we make of digital technology. These changes are accompanied by benefits and challenges arising from the new possibilities of equipment, devices, programs and applications with which we interact in our day to day. In this context, both teachers and researchers in the area of Education seek to understand the phenomena of insertion and use of technology in teaching and learning processes, which shows that the process of technological innovation in education deserves our attention and our studies. One of the issues that has been discussed concerns the insertion of programming teaching in Basic Education. There is a link between these approaches and the resources to which we now have access thanks to the increasing and continuous technological innovation. Among them, we can mention (i) the use of digital games as a way of approaching the universe of most students and (ii) teaching methodologies that value students as content producers. This paper presents the results of a research that investigated the development of computational thinking of Elementary School students who participated in a mini-course of digital game programming with Scratch software in school. The objective of the research is to evaluate situations of children's computational thinking development in educational contexts, as well as to discuss the teaching of programming as a trend in Education. Learning situations were proposed to students using active teaching methodologies. They produced digital content to math in game format. Analyzing the possibilities and conditions of insertion of programmatic teaching in the basic education curriculum, the idea is discussed that the children can participate in computer programming activities in Basic Education, because it develops the computational thinking, that can help in the learning of different school contents, focusing on problem solving and on the use of Information and Communication Technologies.

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&

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A Practical Approach of Different Programming Techniques to Implement a real-Time Application using Django

Nowadays real-time web applications surround our daily life. They exist in different areas like shopping, blogs or stock markets. But they can also be used to implement business applications in the industry 4.0 area. All these applications especially web-shops like Amazon or Zalando have to process different parallel task. Different users can buy different or the same products at the same time, so that the applications need to organize the different buying processes. In the background of these application different processes are parallel synchronous or asynchrony working, like user-authentication, ERP (enterprise resource planning) integration, homepage visualization and so on.

But a business web-application in the context of industry 4.0 is not usually a web-shop. There the web-applications are normally used for real-time dashboards or monitoring the production line, so that the web-shop templates cannot be used. Thus, an own real-time web application has to be implemented which includes user authentication with session handling, allows synchronous and asynchronous process real-time tasks. Here the stable and continuous processing of streaming data are very important, because thousands of values will be sent via MQTT to the application which have to process and visualize the data in milliseconds.

But these web-applications can not only used for real-time dashboards. It can also be used to visualize predictive maintenance applications so that new tasks in the kinds of machine learning algorithm has to be integrated in the main web-application, thus more synchronous and asynchronous task must be processed. The work of synchronous and asynchronous tasks is from main interest for the research area. Especially for the later productive use of these web-application in the industry 4.0 To implement these topics, different program techniques can be used. For research purpose two kinds of web-applications on the base of pythons Django web framework were implemented where on the one hand multithreading and on the other hand the celery task queue was used to organize different tasks. Both web applications contain the following tasks: streaming MQTT data, transform the data in three steps and visualize the data in a real-time chart.

The web-applications were evaluated by the following criteria: user usability on different devices, performance by working with huge amount

of streaming data, possibilities to optimize the load distribution and avoid overloading, possibilities to scale up and down hardware.

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Efficient Verification of a Requirement

An efficient method to generate tests known as Modified Condition Decision Coverage (MC/DC) tests is presented in order to verify whether a requirement meets its specification [1,2,3,4]. Consider a requirement IF $(A>B) \cdot (A>C) + (A>B) \cdot (B>C)$ THEN statement_1 ELSE statement_2. The conditions are the binary variables I_1, I_2, I_3 defined as: $I_1 = (A>B)$, $I_2 = (A>C)$, $I_3 = (B>C)$, and the decision is the expression $(A>B) \cdot (A>C) + (A>B) \cdot (B>C)$. Equivalently, the decision is the binary function $(I_1 \cdot I_2) + (I_1 \cdot I_3)$ of three binary variables (conditions).

Each MC/DC test is a binary assignment to conditions so that each condition (binary variable) independently affects the outcome of the decision. All MC/DC tests must be generated in order to verify the requirement, and there are always $n+1$ MC/DC tests on a decision with n conditions [1,2,3,4]. In the example, the 4 MC/DC (I_1, I_2, I_3) tests are: (0,1,1), (1,0,1), (1,1,0), (1,1,1). When we apply (0,1,1) followed by (1,1,1) the decision is impacted only by I_1 . When we apply (1,0,1) followed by (1,1,1) the decision is impacted only by I_2 . When we apply (1,1,0) followed by (1,1,1) the decision is impacted only by I_3 .

In general, the decision can depend on many conditions, and the automatic test pattern generation (ATPG) of the MC/DC tests can be quite time consuming. The ATPG tool in [5] is not time efficient, and in some cases fails to generate MC/DC tests. The goal in this work is to develop a PODEM-based ATPG tool that quickly generates all MC/DC tests. It is based on a modification of the PODEM algorithm that generates tests to detect manufacturing defects in digital circuits. The work in [6] shows that PODEM-based formulations may be useful in compacting MC/DC tests but test set compaction aspects are not currently considered. Experimental results on complex decisions will be presented to demonstrate the efficiency of the proposed ATPG.

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Proven Strategies for Increasing Female Undergraduate Enrollments in Computer Science/Software Engineering

Many computing departments at universities in the USA, and beyond, are experiencing significant increases in enrollments. While these increases are largely welcome, the percentage of female students majoring in computer science or software engineering remains (very) low. Computing is one of the most important disciplines, which is enhancing a plethora of scientific disciplines; shaping societal interactions; expanding expressions in the area of fine arts and is also serving as a key component to major current and future innovations. Certainly creativity, in addition to in depth technical knowledge are necessary components for success. Unfortunately, the field of computing still experiences a lack of gender diversity.

For the last 11 years, the Department of Computer Science/Software Engineering at Cal Poly State University in San Luis Obispo, has achieved great success in dramatically increasing the number of undergraduate female students.

The paper will first present compelling reasons/cases for diversity and inclusion of women in computing (and more generally in information technology). Social justice, innovation and business cases will be outlined.

The Department of Computer Science-Software Engineering at Cal Poly -San Luis Obispo (public; 1200 undergraduate majors; lab intensive curriculum) has successfully implemented a cadre of evidence-based approaches, via a multi-year strategic plan to attract and retain, educate, empower many more young women in Computer Science- Software Engineering.

The presentation will outline the cadre of interlinked approaches that have been developed:

- Instituting a first year (first quarter) menu-based course, featuring different “tracks” and reflecting student interests (robotics, games, visual art, music, mobile apps, and recently, cybersecurity). All “tracks” employ project-based learning with common learning outcomes.
- Developing two interdisciplinary, cross-departmental minor programs: Computational Art (CS and Art/Design), and Data Science (CS and Statistics). Many more female students are taking CS courses since the departments of Art/Design and Statistics have 70% and 55% female majors respectively.

- Enriching mentoring. Female students (during first year courses) are paired with upper-division female students. In addition, there is mentoring with members of the Industry Advisory Board.
- Strengthening the “Women in Computing” student club. Membership has tripled during the last few years. Club activities include: recruiting, mentoring, tutoring, and developing corporate connections.
- Providing support to female students (cohorts of first year and upper division, approximately 80-100 each year) to attend the Annual Grace Hopper Celebration.
- Deploying female students to recruit additional female students from their respective high schools, thus creating a distributed and scalable recruiting strategy. Roadshow materials infused with personal experiences make captivating presentations.

The percentage of female students has risen: from 9% in 2010 to 28-30% in 2018. In addition, the retention rate of students is now at 92%.

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Effectiveness of YouTube as an Edutainment Medium: An Exploratory Study

Most research on edutainment is focused on children and primary education when educators utilize games, interactive activities, television, and computer to engage primary students. Although the concept of edutainment has been around for decades, edutainment has not been fully explored in the area tourism and hospitality management courses in higher education, when social networking sites (SNSs) have become a necessity to the new generation of learners called digital natives or the Google-eyed YouTube generation. Studies shown that the use of social networks (SNS) complements and enhances teaching in traditional classrooms. YouTube it is a social network tool, which has progressed as one of the fastest-growing social network sites in the world, because aside from entertainment, educators use it to support their teaching. The primary learning theory that will be used to reinforce edutainment is social learning. This study will focus not only on the entertainment aspect of the medium but more importantly on its pedagogical aspect by revealing the effectiveness of YouTube video and the attitudes of tourism and hospitality management students enrolled in sales and marketing subject. Convenience sampling method will be used. In this study, students being surveyed are under the classes (Sections A&B) of the researcher-teacher. Section A (experimental group) will be shown a YouTube video, and Section B (control group) will learn from conventional way of teaching. YouTube video (selected by the teacher based on the following criteria; relevance to the session topic in the syllabi, minutes of the video, entertainment value, i.e. animation, graphics, etc.) will be shown to the surveyed students before the teacher discusses the lesson. After watching the selected YouTube video, the teacher will assess the learning of the students in Section A. for Section B, conventional method of teaching will be applied (no use YouTube video), after the discussion, same set of quiz will be given to the students. T-Test will be employed to reveal the results comparing the learning effectiveness of the intervention. That is, the experimental group will be exposed to the YouTube video, while the control group will be exposed to the conventional method. The result of this study will benefit educators in developing or choosing videos from YouTube or other online sources to be used in the classroom, and how educators can design syllabi integrating edutainment media. This study can benefit the developers of

educational videos keeping in mind the edutainment factor, which enhances learning.

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College Students' Use of Self-Regulatory Prompts in Online Vocabulary Learning

While online learning has become an integral part of higher education and offer students the freedom to learn at any time, from any places (Means, Toyama, Murphy, & Baki, 2013), the lack of self-regulation has been identified as a significant factor that could influence online learners' learning experiences and academic outcomes (Oh & Reeves, 2013). Because students' self-regulation will not improve spontaneously without purposeful interventions (Barnard-Brak, Paton, & Lan, 2010), many instructional designs, strategies, and supports have been applied and provided in traditional classrooms to activate students' self-regulated behaviors and enhance their self-regulated strategies. However, the literature focusing on learners' self-regulated learning (SRL) and SRL interventions in online learning environments still remain limited. Thus, further research on guided practices for activating student's self-regulation in online contexts is urgently needed.

Three constructs within Zimmerman's (2000) theoretical framework of self-regulation will be integrated into the self-regulatory prompts (SRP): goal setting, metacognitive monitoring, and self-evaluation. Using a mixed method design, this study is to examine whether the SRP enhance students' self-regulatory processes, and how high and low-level self-regulation students respond to the SRP differently. In my study, approximately 90 Chinese college students will be involved in a 12-session online English vocabulary course, and the students will either be randomly assigned in an experimental group who receive SRP or a control group who do not receive them. In addition, a microanalytic method will be applied on six college students from the experimental group, three high-level self-regulated (SR) students and three relatively low-level SR students, aiming to have a more comprehensive and accurate recording of their use of self-regulatory prompts. The expected outcomes of this study are that both high-level and low-level SR students' self-regulatory processes/shifts could be documented, and the SRP could help activate and enhance students' self-regulation in an online English course.