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CONFERENCE ABSTRACTS

2018 International Conference on Software Engineering and Information Management (ICSIM 2018)

2018 International Conference on Big Data and Smart Computing (ICBDSC 2018)

Casablanca, Morocco | January 4-6, 2018

CONTENTS

AGENDA

<Jan. 4th, 2018>

Centre d'informations et d'admission

At the welcome desk

10:00-15:00	**Registration & Materials Collection**
15:00-16:30	**Lab Visit in University Mundiapolis**

<Jan 5th, 2018>

Mundiathèque (Library, Floor 1)

Parallel Keynote Speeches		
9:00-9:10	**Opening Remarks**	**Prof. Dr. Houssain Kettani** **Florida Polytechnic University, Lakeland, Florida, United States**
9:10-9:50	**Keynote Speech I**	**Prof. Salah Al-Majeed** **Military Technological College, Ministry of Defence, Oman** Speech Title: ***5G IoT: Human- Vehicle secured connectivity***
9:50-10:20	**Coffee Break & Group Photo**	
10:20-11:00	**Keynote Speech II**	**Prof. Dr. Vassilis C. Gerogiannis** **Technological Educational Institute of Thessaly, Greece** Speech Title: ***Prioritize Collectively Software Requirements based on Stakeholders' Evaluations***
11:00-11:40	**Keynote Speech III**	**Prof. Dr. Houssain Kettani** **Florida Polytechnic University, Lakeland, Florida, United States** Speech Title: ***Towards Exascale Computing***
11:40-12:20	**Keynote Speech IV**	**Prof. Nabil EL KADHI** **University of Buraimi, Sultunate of Oman**

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		Speech Title: ***Software Engineering and Information Systems Structured Data and Smart Cities: a Shift Forward or Backward***

Lunch Time <12:20-13:30> Location: MundiaResto/1st Floor

<Jan 5th, 2018>

Mundiathèque (Library, Floor 1)

Parallel Sessions-Author presentations		
13:30-16:30	**Session I- Data analysis and software engineering** Session Chair-- Prof. Mounîm A. EL YACOUBI Institut Mines Telecom, Paris Saclay University, France	**Mundiathèque 1st Floor**
	12 presentations-- SIM048 SIM027 SIM028 SIM049 CB008-A CB017 CB019-A CB021-A SIM040 SIM046 CB020 CB203	
Coffee Break <16:30---16:45>		
16:45-19:30	**Session II- Information system development and security technology** Session Chair-- Noriko Hanakawa Hannan University, Japan	**Mundiathèque 1st Floor**
	11 presentations--CB006 CB016 SIM004 SIM006 SIM007 SIM010 SIM012-A SIM017 SIM029 SIM032 SIM042	

Dinner <19:30-20:30> Location: MundiaResto/1st Floor

<Jan 6th, 2018 >

10:00-17:00	Social Program

WELCOME

Dear professors and distinguished delegates,

Welcome to the 2018 International Conference on Software Engineering and Information Management (ICSIM 2018) and 2018 International Conference on Big Data and Smart Computing (ICBDSC 2018) in Casablanca!

We wish to express our sincere appreciation to all the Conference Chairs, Technical Program Committee Chair Members and Technical Committee members. Their high competence and professional advice enable us to prepare the high-quality program. Special thanks to the keynote speakers as well as all the authors for contributing your latest research to the conference. We hope all of you have a wonderful time at the conference and also in Casablanca.

The conference is featured with keynote speeches, peer-reviewed paper presentation and social program. One best presentation will be selected from each parallel session, evaluated from: Originality, Applicability, Technical Merit, Visual Aids, and English Delivery. Wishing you all the very best of luck with your presentations!

We believe that by this excellent conference, you can get more opportunity for further communication with researchers and practitioners with the common interest in software engineering and information management as well as big data and smart computing.

Your suggestions are warmly welcomed for the further development of the conferences in the future. Wish you have a fruitful and memorable experience in University Mundiapolis! We look forward to meeting you again next time.

Best Regards!
Yours sincerely,

ICSIM & ICBDSC 2018 Organizing Committee
Casablanca, Morocco

VENUE

University Mundiapolis (Université Mundiapolis de Casablanca)
Address: Aéropole de Formation 20180, Nouaceur, Casablanca, Morocco

http://www.mundiapolis.ma/

NOTES & TIPS

Notes:

- Your punctual arrival and active involvement in each session will be highly appreciated.
- You are welcome to register at any working time during the conference.
- Certificate of Presentation will be awarded after your presentation by the session chair.
- One *Best Presentation* will be selected from each parallel session and the author of best presentation will be announced and awarded when the session is over.
- Please kindly keep your Paper ID in mind so that the staff can quickly locate your registration information onsite.
- Please kindly make your own arrangements for accommodations.
- Please keep all your belongings (laptop and camera etc.) with you in the public places, buses, metro.

Warm Tips for Oral Presentation:

- Get your presentation PPT or PDF files prepared.
- Regular oral presentation: 15 minutes (including Q&A).
- Laptop (with MS-Office & Adobe Reader), projector & screen, laser sticks will be provided by the conference organizer.

KEYNOTE

Prof. Dr. Houssain Kettani
Florida Polytechnic University, Lakeland, Florida, United States

Dr. Houssain Kettani received the Bachelor's degree in Electrical and Electronic Engineering from Eastern Mediterranean University at Famagusta, North Cyprus, in 1998, and Master's and Doctorate degrees both in Electrical Engineering from the University of Wisconsin at Madison, Wisconsin, USA in 2000 and 2002, respectively.

Dr. Kettani served as faculty member at the University of South Alabama at Mobile, Alabama, USA in 2002-2003, Jackson State University at Jackson, Mississippi, USA in 2003-2007, Polytechnic University of Puerto Rico at San Juan, Puerto Rico, USA in 2007-2012, Fort Hays State University at Hays, Kansas, USA in 2012-2016 and Florida Polytechnic University at Lakeland, Florida, USA, since 2016.

Dr. Kettani has served as Staff Research Assistant at Los Alamos National Laboratory at Los Alamos, New Mexico, USA in summer of 2000, Visiting Research Professor at Oak Ridge National Laboratory at Oak Ridge, Tennessee in summers of 2005 to 2011, Visiting Research Professor at the Arctic Region Supercomputing Center at the University of Alaska at Fairbanks, Alaska, USA in summer of 2008 and Visiting Professor at the Joint Institute for Computational Sciences at the University of Tennessee at Knoxville, Tennessee in summer of 2010.

Dr. Kettani's research interests include computational science and engineering, high performance computing algorithms, information retrieval, network traffic characterization, number theory, robust control and optimization, and Muslim population studies. He presented his research in over sixty refereed conference and journal publications and his work received over four hundred citations by researchers all over the world. He chaired over hundred international conferences throughout the world and successfully secured external funding in millions of dollars for research and education from US federal agencies such as NSF, DOE, DOD, and NRC.

KEYNOTE

Prof. Dr. Vassilis C. Gerogiannis
Technological Educational Institute of Thessaly, Greece

Dr. Vassilis C. Gerogiannis is a Full Time Professor, teaching undergraduate and postgraduate courses, in the fields of "Information Systems", "Project Management" and "Systems Analysis & Design", at the Department of Business Administration of the Technological Education Institute of Thessaly, Greece (University of Applied Science of Thessaly, Greece). He is also an Adjunct Professor, teaching Software Engineering, at the Hellenic Open University, Greece. From 2016, Prof. Gerogiannis is the Head of the Department of Business Administration at the School of Business and Economics of the Technological Education Institute of Thessaly, Greece. From 2016, he is the elected Secretary General of the Hellenic Technical Chamber of Engineers at the Section of Central and Western Greece. In the recent past, he was the Scientific Director of the Institute for Lifelong Education of the Technological Education Institute of Thessaly, Greece. He was also a visiting Lecturer at the University of Thessaly, Greece, at the Aristotle University of Thessaloniki, Greece as well as a visiting Professor at the IPAG Business School, Nice, France, at the Siauliai State College, Siauliai, Lithuania and at the American University of Beirut, Beirut, Lebanon.

Prof. Gerogiannis received his Diploma from the Department of Computer Engineering and Informatics of the University of Patras, Greece in 1992 and his PhD in Software Engineering from the Department of Mathematics of the University of Patras, Greece in 2001.

From 1993 until present, Prof. Gerogiannis has been participated as a technical consultant, software engineer and project manager in numerous R&D projects funded by the European Union or national organizations in Greece. He has authored and co-authored more than 150 papers in international journals/conference proceedings with more than 550 citations. He is a member of the editorial board and reviewer for many international journals and he has received the "best paper award" in two international conferences. His research interests are on software engineering, software requirements engineering, decision making with fuzzy logic approaches, project management and software project management.

KEYNOTE

Prof. Salah Al-Majeed
Military Technological College, Ministry of Defence, Oman

Prof Salah Al-Majeed is a Deputy Head of Systems Engineering Department at MTC Oman, where he also served as an Engineering Foundation Programme Leader. Salah is a Visiting Professor (fellow) at School of Computer Science and Electronic Engineering, University of Essex – UK since 2012. Prior to his current position, he was leading ICT PhD programme as well as his role as Head of Broadcast and Broadband Mobile Multimedia Communication Research Group at Electrical and Electronic Engineering Department, Nazerbayev University, Kazakhstan.

In addition to his role as academic and manager, Prof Al-Majeed has an extensive portfolio of Industrial, Academia and R&D works, leading the innovation of implementing wireless technology. Conduct research into issues and challenges in data exploration through Internet of Things (IoT) and Smart Environment (including Smart City and Biomedical and Health informatics) from a multitude of perspectives, which is driving breakthroughs and innovation in a range of areas, such as Sensor, E-Health , Telemedicine and Mobile Telemedicine , Wireless Networks (4G and 5G) for different layers and applications. Where that can be seen through his role as a lead consultant at North Caspian Operating Company - NCOC – Kazakhstan for Sensabot project and collaborating closely with Huawei, Shell and Carnegie Mellon University – CMU, USA. In addition, his research projects were supported and funded by UK, EU and International organizations and companies.

Prof Al-Majeed is an Editor-in-Chief of Computer Science Engineering: An International Journal, and Editorial Member, International Journal of Computer Science, Engineering and Applications. In addition to his recognition as a Senior Member of IEEE, he is a reviewer for many well-known journals including IEEE transections and an invited keynote speaker for many of international conferences and events. He is currently Technical Activities Officer of IEEE Oman Section.

KEYNOTE

Prof. Nabil EL KADHI
University of Buraimi, Sultanate of Oman

Professor Nabil El Kadhi is Vice-Chancellor of the University of Buraimi, Sultanate of Oman, having more than 25 years of experience in the academe, and more than 15 years of experience in the management of higher education and research. He started his professional career in the early 90s; his assumed positions ranged from Project Manager and Department Head to Lab Director, Master Programs Director, Dean, Provost, Deputy Vice-Chancellor for Academic Affairs and Vice-Chancellor; and he has contributed to institutional excellence, and several industrial projects, such as Data Security and Privacy, Artificial Intelligence, Automatic Translation, Secure Payment, Smart Card Use and various Cloud-based applications. He was also Consultant for Quality Assurance and Accreditation where he re-engineered institutional and academic approaches of some universities and schools in Bahrain and Qatar for successful QA Reviews. He notably contributed to the design and revision of various curricula for both graduate and post graduate levels in France and Bahrain. Since 2006, he focused his professional activities on institutional strategies, research, program/ curricula development and review, and quality assurance in education. His experience encompasses leadership, administration, management, program design and development, quality assurance management, national and international accreditation, staff development, teaching, and assessment.

Professor El Kadhi has a PhD in Computer Science and Information Technology, which he earned in Tunisia (for academic requirements) and France (for research requirements). He has more than 60 international publications indexed by ACM, IEEE, DBLP and others. He is also a reviewer in various international scientific journals and conferences such as International Conference on Security and Management, Super-computing Journal, ICICT-IACSIT, IKE Conferences and International Conference of Network and System Security (NSS), as well as a keynote speaker or chair in numerous international conferences. His research expertise includes Quality Assurance in Higher Education, Instruction, Assessment, Smart Cities Security and Privacy Aspects, Internet and Information System Security, and Cloud Security and Cryptology

Professor El Kadhi is distinguished in developing leading ideas and forming new academic directions based on an analysis of institutional statistics and institutional image; and forging partnerships and collaborations that pave way for exchange programs.

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OPENING &KEYNOTE SPEECHES

Mundiathèque (1st floor)

Morning, Jan 4th, 2018 Time: 9:00-12:20	
9:00-9:10 OPENING REMARKS	**Prof. Dr. Houssain Kettani** **Florida Polytechnic University, Lakeland, Florida, United States**
9:10-9:50 KEYNOTE SPEECH I	**Title-5G IoT: Human- Vehicle secured connectivity** **Prof. Salah Al-Majeed** **Military Technological College, Ministry of Defence, Oman** ABSTRACT--5G continues to take shape at the standards levels, service providers and vendors are aggressively breaking down new, Internet of Things use cases that will be made possible with the ultra-low latency and high bandwidth of next-generation networks. It's clear that pushing compute and processing capabilities to the edge of converged wired and wireless networks is the only way to keep up with the massive data volume the IoT will produce. Vehicle Network and Internet of Things (IoT)' applications, they all demand fast yet ubiquitous network access to gain a new momentum. The rise of new business, new architecture, and new technologies in 5G will present new challenges to security and privacy protection. With Tesla's recent announcement of a semi-autonomous vehicle and Google's strides in testing self-driving cars, we are beginning to see the first signs of a driverless future. But while autonomous vehicles are meant to make driving safer and less stressful, they also present a whole new range of security challenges—challenges that must be addressed long before these vehicles hit the road in large quantities.

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	Combining EEG technologies with other Internet of Things (IoT) technologies like heart rate monitoring, facial emotion recognition, and data mining will not only enhance the picture describing the brain and its functions but also jump another step forward to drive controlling the semi-autonomous vehicles.   Consider a futuristic scenario in which a transportation and logistics company has taken drivers out of the equation with self-driving trucks. What would happen if hackers breached the networks that connect and manage these trucks? They could drive trucks remotely to undisclosed locations, stealing both the vehicles and their contents. They could even threaten lives.
 Coffee break & group photo 9:50-10:20	
10:20-11:00 KEYNOTE SPEECH II	**Title- Prioritize Collectively Software Requirements based on Stakeholders' Evaluations** **Prof. Dr. Vassilis C. Gerogiannis** **Technological Educational Institute of Thessaly, Greece** ABSTRACT-- Efficient consideration of all stakeholders' needs and perspectives in a software project is a key challenge, especially when prioritizing the software requirements to be developed in the next software release. Requirements prioritization (RP) is an important decision making activity in requirements engineering that aims to rank candidate software requirements to be developed in the next software release according to stakeholders' needs and multiple cost, benefit and risk criteria. Although there is a plethora of RP techniques, most of them are not widely adopted in practice mainly due to: (i) the scalability and computational complexity of their use, (ii) the insufficient consideration of project stakeholders, (iii) their sensitivity on subjective ratings of requirements as these are expressed by

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	stakeholders' uncertain evaluations, and (iv) the inadequate consideration of dependencies which possibly exist among requirements. The problem of biased RP is also met in distributed software projects where involved stakeholders cannot easily negotiate and collaborate, being not at the same time/location, to reach a consensus when evaluating software requirements and, thus, RP results often depend on discordant rates given by individuals who may not have complete knowledge about project priorities. In this talk we will present a new RP approach that aims to collectively prioritize software requirements based on their ratings expressed from different stakeholders. The proposed approach follows the steps of a value-oriented process in which multiple and possibly distributed stakeholders assess the values of candidate requirements with respect to various prioritization criteria. The approach applies a group-based, fuzzy multi-criteria technique requiring from involved stakeholders to evaluate requirements using linguistic terms. Stakeholders' linguistic evaluations are aggregated to collectively derive more objective and reasonable assessments on the final requirements' priorities. The underlying representation/computation model of the technique is the fuzzy 2-tuple linguistic model (F2TL). The F2TL model has been widely employed in many evaluation and decision making problems, where decision makers prefer to express their uncertain evaluations qualitatively, but, to the extent of our knowledge, the model has not been used to support the RP problem. The F2TL model follows the computing with words paradigm to combine numerical information and linguistic evaluations without any loss of information in the transformation process between numerical and linguistic values.
11:00-11:40 KEYNOTE SPEECH III	**Title-Towards Exascale Computing** **Prof. Dr. Houssain Kettani** **Florida Polytechnic University, Lakeland, Florida, United States** ABSTRACT-- In 1985, the fastest computer in the world reached 1 Gigaflop/s, or one billion (10^9) calculation per second. By 1996, the speed reached 1 TeraFlop/s or one trillion (10^12), then 1 PetaFlop/s or one quadrillion (10^15) by 2008. In 2016, the fastest computer in the world performs 100 PetaFlop/s and many hand-held devices including smart phones are faster than the fastest supercomputer in the 1980s. The 1 ExaFlop/s mark, or one quintillion (10^18) is expected to be reached in 2020. Currently, the fastest supercomputer has close to eleven million cores and consumes over 15 MW (Mega or million Watts). It is like 150,000 light bulbs of 100W on at the same time. It is more than a million times faster than a personal computer. So, one second of computing using the fastest supercomputer is equivalent to almost two weeks using a PC, while one hour is equivalent to over a century on a PC! These fast computers allowed humans to solve problems that were impossible to solve few years

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	before, including weather (earth and space) forecast, gene permutations, Hurricane tracking, asteroids/comets tracking, spying, etc. However, such humongous machines present huge complexity in operation, maintenance, protection, etc. This remains an active area of interdisciplinary research for continuous improvement in speed, efficiency, hardware and software development as well as algorithms design and analysis to advance the state of the art of parallel computing. The security issue of the embedded devices with IoT- 5G are never easily provided, but with the increasing importance of security at development stages and the use of analytics to monitor the devices and protect the network in which the devices are located, it is necessary to prevent the attackers from infecting low-power devices as well semi-autonomous vehicles. Goals are more vital and important. The paper will address these issues further by moving to a more systematic approach to IoT- 5G security with more focusing on Human Interaction with IoT through BCI.
11:40-12:20 KEYNOTE SPEECH IV	**Title-Software Engineering and Information Systems Structured Data and Smart Cities: a Shift Forward or Backward** **Prof Nabil EL KADHI** **Vice Chancellor, University of Buraimi – Oman** ABSTRACT-- With the computerization, atomization and 'cloudization' of processes, data collection and management, Information Systems have been taking big strides for successful corporate setting today. This presentation illustrates the various shifts and changes from simple data to structured data, and then from 3D to big data and smart processing. Decision making is today shifting toward reactive dynamic ways leading to more efficient and competitive situations. Managing big data and utilizing many kinds of road sensors in obtaining and providing information to various entities and in variety of contexts create new challenges and ambiguities. The presentation tackles such challenges (privacy, secrecy, coherence, and legal aspects among others) as well as summarizes the emergent trends in that regard. With the new challenges to the future and the shift backward, Information Systems which focused for years on a move toward structured data, are now back to non-structured data with smart cities, cloud contents and natural language - based data extraction. Considering the shift from database to big data and cloud as well as challenges in security, Software Engineering methodologies have to adjust and include the cloud aspect distribution in the model, security aspect in the design as well as in testing and validation, where new aspects of distributed multi-sessions and attacks on others are considered.

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Session I

Session I- Data analysis and software engineering

13:30-16:30

Mundiathèque (Library, Floor 1)

Chaired by--Prof. Mounîm A. EL YACOUBI

Institut Mines Telecom, Paris Saclay University, France

Presentations:

SIM048 SIM027 SIM028 SIM049 CB008-A CB017 CB019-A CB021-A SIM040 SIM046 CB020 CB203

Note: Please arrive at the designated conference room 30 minutes earlier, in case some authors are not able to make the presentation on time.

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SIM048 13:30-13:45	Machine learning Techniques for Energy Theft Detection in AMI **Assia Maamar** and Khelifa Benahmed University Tahri Mohammed Bechar,Algeria Abstract. Advanced Metering Infrastructure (AMI and smart meter) is considered as the basic building block for the development of smart grid in the power distribution system. a Smart meter is one of the keys elements of Advanced Metering Infrastructure, it provides two-way communication between customer and electricity utility, Smart Meters send consumption data frequently (e.g., every 15 minutes) to the utility for monitoring and billing, therefore, a gold mine of data is generated for utilities. Smart meters have become a major focus for targeted attacks which lead to the energy theft , resulting in losses of billions of dollars per year in many countries. Therefore, multitude of papers have studied the energy theft detection by applying different disciplines on smart meter data. In this paper, we present an overview of machine learning research in energy theft detection using smart meter data. It then surveys these research efforts in a summary and comparison of learning models used, in terms of performance metrics, simulation and analysis environment, and data sets used. It finally highlights the challenges in energy theft detection .We approve that these challenges have not been adequately addressed and considered in previous contributions, also covering them, is necessary to advance the energy theft detection.
SIM027 13:45-14:00	mituba: Scaling up Software Theft Detection with the Search Engine **Jun Nakamura** and Haruaki Tamada Kyoto Sangyo University, Japan Abstract. This paper aims to reduce total time in detecting software theft using software birthmark methods. The software birthmark is similarity calculation technique among binary programs, is extracted from them. The paper introduces the narrowing phase between conventional extraction phase and comparison phase. Also, in narrowing phase, the proposed method compares a huge number of birthmarks using the search engine.

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	This paper describes how to implement the proposed system, called *mituba*, and evaluates the proposed method with *mituba* by contrasting the conventional system, *pochi*. The result was shown that about 50% of result were similar between the conventional method and the proposed method. Moreover, the false negatives were suppressed in 0.02%, and 0.58%, and improving rate of comparison speed was 104.65%.
SIM028 14:00-14:15	A Framework for Managing Security Risks of Outsourced IT Projects: An Empirical Study **Moneef Almutairi** and Steve Riddle Newcastle University,United Kingdom Abstract. Several firms outsource their IT services partially or totally due to different constraints such as business, financial or legal. Although IT outsourcing has tremendous benefits such as cost reduction, it might expose firms to different security risks including confidentiality, integrity, and availability issues. In this paper, we present the evaluation results for a proposed framework that we developed previously for managing the security and compliance risks of outsourced IT projects. The evaluation is designed to assess several features of the proposed framework. Usefulness, flexibility, simplicity and ease of use as well as achieving a systematic and comprehensive methodology for managing the security and compliance risks of outsourced IT projects are evaluated in this paper. Additionally, we evaluate the usefulness of utilizing project phases and the proposed threat classification approach for identifying and managing security threats in the outsourcing context. Finally, we evaluate the ability of the proposed framework to be applied to any project regardless of project size, cost, or any other constraints.
SIM049 14:15-14:30	A New Reuse Capability and Maturity Model: An Overview **Siham Younoussi,** Ounsa Roudies Mohammed V University in Rabat, EMI, Siweb team , Morocco Abstract. Throughout the last decade, increasingly sophisticated processes models, methods and tools have evolved as a result of structure and culture changes of software organizations. Software reuse is considered as a major factor for increasing productivity

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	and quality. Reuse is implemented more and more by organizations, thereby giving them headway. To be more competitive these organizations try to invest in software reuse, by identifying the most effective reuse strategies, methods and practices. However, there is a high up-front risk of reuse adoption, because a significant initial organization investment is required, while the ROI is not guaranteed. Several Software Reuse Models have been suggested in literature to face the reuse adoption problem, but until now there is no widely accepted model. This paper proposed a new Reuse Capability Maturity Model based on international standards, literature and completed with the most recent and popular approaches as Lean and Devops, to help organizations implementing an efficient reuse program.
CB008 14:30-14:45	The Value of Personal Data: Pricing Models and Information Rights Under EU Data Protection Law **Bart Custers** Leiden University, Netherland Abstract- The commodification of digital identities is an emerging reality in the data-driven economy. Personal data of individuals represent monetary value in the data-driven economy and are often considered a counter performance for “free” digital services or for discounts for online products and services. Furthermore, customer data and profiling algorithms are already considered a business asset and protected through trade secrets. At the same time, individuals do not seem to be fully aware of the monetary value of their personal data and tend to underestimate their economic power within the data-driven economy and to passively succumb to the propertization of their digital identity. This raises the question how to assess the monetary value of personal data and to which extent data subjects have rights to be informed (or should be informed from a moral perspective) about the value of their data. Making data subjects aware of the monetary value of their personal data would likely increase their awareness and controllership on their own personal information could be. In other words, if individuals are shown the “price” of their

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	personal data, they can acquire higher awareness about their power in the digital market and thus be effectively empowered for the protection of their information privacy. In this presentation, different business models for the collection of use of personal data are analyzed. Some models use monetary incentives, such as discounts or digital credits, whereas other use non-monetary incentives, such as personalization or no incentives. Assessing the value of personal data can be done via either market valuation methods or individual's validation methods. Market valuation methods focus on (a) financial results for data records, i.e., market cap/revenues/net income per data record, (b) market prices for data, i.e., price per personal data entry offered on the market by data brokers, (c) cost of a data breaches, i.e., economic cost of a data breach (for firms and individuals) per data entry and (d) data prices in illegal markets, i.e., estimation of prices of personal data in illegal markets. The individual's valuation methods focus on (e) surveys and economic experiments, i.e., valuation of personal data in monetary terms that are reported by individuals in surveys or economic experiments and (f) data on willingness of users to pay to protect their data, i.e., amounts that individuals are ready to spend to protect their personal data. EU data protection law, particularly the General Data Protection Regulation (GDPR) that will come into force in 2018, contains several provisions containing rights for data subjects. These include control rights (such as the right to data access, the right to rectification, the right to data portability, the right to be forgotten and the right to block the processing) and rights to receive appropriate information about data processing (including the right to know which data is collected and processed and for which purposes). It can be argued that, under current EU data protection law, data controllers already have (at least to some extent) an obligation to inform data subjects when they consider providing personal data as 'payment'. I.e., when personal data is collected that is strictly speaking unnecessary for performing the contract, the personal data is collected as a "counter-performance other than money" and must therefore be declared. If not, any

	such processing of personal data would be a breach of the data minimization principle i.e., personal data collected and processed should be relevant to the purposes for which they are to be used) and the purpose specification principle (i.e., the purposes for which personal data are collected should be specified and the data collected may only be used for these purposes).
CB017 14:45-15:00	A Smart City Environmental Monitoring Network and Analysis Relying on Big Data Techniques **Ashraf Tahat**, Ruba Aburub, Aseel Al-Zyoude and Chamseddine Talhi Princess Sumaya Univerity for Tehcnology,Jordan Abstract. A new integrated environmental monitoring system to carry-out real-time measurements on board a moving vehicle is presented. It is composed of an arbitrary number of Electronic Measurements Units (EMU), a smart phone application to relay collected data, and a cloud Central Processing Platform (CPP) to perform analysis utilizing big data techniques and algorithms. Each EMU consists of an electric circuit that incorporates an ultra violet (UV) sensor, an air particles concentration sensor, a temperature sensor and a humidity sensor that all interface to a microcontroller. Bluetooth is employed for communication between the EMU and the smart phone application, while a 3G/4G cellular communications network furnishes the wireless connectivity to the remote CPP. When the collected data reaches the designated cloud server (CPP), it is immediately stored for subsequent analysis. Finally, big data statistical analysis (clustering and classification), mapping and plotting are performed to deduce correlations and to facilitate inferencing. Moreover, the scalability and low-cost of selected components of this realistic system makes it very feasible for large scale deployments in the context of smart cities initiatives, ad-hoc designs, or educational projects.
CB019 15:00-15:15	Data Science for the Internet of Things **Mounîm A. El Yacoubi**

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	Institut Mines Telecom / Telecom SudParis, France Abstract. The Internet of Things (IOT), one of the most cutting-edge technologies in today's societies, connects billions of devices that can communicate between each other in a seamless way. The pervasiveness of connected devices endowed with sensors has allowed the emergence of a huge number of opportunities to design added-value innovations in several important sectors, including Health, Transportation, Agriculture, Gaming, Sports, and Social Interactions. The explosion of Big Data sensed by the connected objects, however, has become a serious problem, as a lot of human endeavor is needed to understand and to interpret the information they convey. The optimal solution to this issue is to develop tools for processing and making sense of the data to automatically infer the information hidden within the overwhelming raw signals generated by the IOT devices on a daily basis. In this context, Machine Learning, or Data Science, has become key as it offers several techniques that are suitable for processing data with uncertainty, and that extract from them relevant information or discover new insights. In this talk, I will introduce the Application of Data Science in the IOT field, with a special emphasis on some important questions such as the visualization and preprocessing of the data, the annotations needed to generate ground-truth for learning and validation, and the feature extraction necessary to encode the most discriminant parameters from the IOT's objects' raw output. I will then provide an overview of current state of the art machine learning models, and the context in which they may be used. Finally, I will show research projects in my team at Telecom SudParis, on IOT and Data Science, in the fields of e-health, Human mobility for Smart Cities, Human Computer Interaction, and Robotics
CB021 15:15-15:30	Electrical Consumption Forecasting for Educational Institutions using Big Data Technologies: An Application Case Study **Houda Daki,** Asmaa El Hannani, Abdelhak Aqqal and Hassan Ouhmane

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National School of Applied Sciences University of Chouaib Doukkali,Morocco

Abstract. Controlling energy consumption on all types of use (building, mobility, lighting, etc.) becomes a key issue for all stakeholders, for many reasons: the fight against climate change, budget control with respect to the rising prices of energy, etc. One of the main problems of energy systems is how to satisfy demand and supply of energy. In the case of Moroccan higher education institutions, which represent a substantial land asset and become financially independent, demand changes take place on different cycles and hence are directly affected by these issues. The electricity consumption of these institutions has steadily increased in the last decade due to their new practices and activities such as the use of electrical and computer science equipment, the implementation of complex scientific experiments, and the organization of big events in various domains. It is within this framework that the National School of Applied Sciences of El Jadida (NSASE), a Moroccan engineering school, has decided to change its energy policy by developing a strategy to encourage local production and increasing the share of renewables in its energy mix, via the installation of a private smart grid. One of the major problems of this transition to renewable energy sources is the storage of energy surplus. Therefore, the NSASE faces the challenge of how to manage the overproduction of electricity, because it can neither inject electricity on the national electrical network since the current Moroccan infrastructure and regulation does not allow it, nor store it due to the lake of storage equipment. Indeed, electricity is difficult to store because the existing storage devices are either poorly performing, expensive or limited by various constraints. For this reason, it is necessary that the production of the energy be permanently, in real time, equal to the consumption. This later is uncertain, especially because of weather conditions, and predictions are needed to maintain the production-consumption balance. Therefore, we propose the integration of Big Data technologies to better store and analyze smart grid data [1] that represent a relevant source for forecasting energy consumption.

Our work focuses on data selection, integration and storage to make analysis and

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	forecasting flexible and scalable. The data selection requires the collection of all factors that influence electrical consumption at the NSASE. Thus, we propose a data model that takes into account meteorological data (temperature, solar radiation, relative humidity, and wind speed), electrical requirements of installed materials, and schedules. At the storage level, we propose a Big Data storage system architecture based on HBase. The proposed system is a distributed, persistent storage system with a horizontal scalability and flexible schema as well as efficient use of disk space as it is based on compression algorithms selected according to the nature of the data and is suitable for random read/write access [2]. But before storing data, an integration phase is required to unify data format. This part is strongly related to data storage system used. HBase storage system offers three data importation solutions using BulkLoad for HFile format, tools for reading and writing, and custom Java API [3]. In our case, we implement custom Java API to handle messages arriving in real time using Kafka java client, retrieve equipment and schedules data from relational databases using JDBC and collect meteorological data using HTTP protocol
SIM040 15:30-15:45	Reverse Engineering of Object Relational Database **Fouad Toufik** and Mohamed Bahaj LITEN, FST Settat,Morocco Abstract. Database reverse engineering allow us to get a conceptual schema which helps developers to understand systems and to ease its maintenance. A lot of reverse engineering methods focus only on Relational Database and also extract just the structural part of the database without constraints and dynamic part (Triggers). In this sense, our main goal is to present a method which generate a Conceptual Schema (CS) from an Object Relational Database (ORDB) extended with a set of OCL integrity constraints.
SIM046 15:45-16:00	Simplification of OWL ontology sources for Data Warehousing **Yassine Laadidi** and Bahaj Mohamed FSTS,Morocco

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	Abstract. Nowadays, with the emergence of new web technologies, no one could deny the necessity of including such external data sources in the analysis process in order to provide the necessary knowledge for companies to improve their services and increase their profits. However, processing data in an open environment such as the web has become too difficult due to the diversity of distributed data sources and incapability of machines to 'understand' the real semantic of web resources. The Semantic Web (SW) provides the semantic annotations to describe and link scattered information over the web and facilitate inference mechanisms using ontologies. Web Ontology Language (OWL) is the W3C recommendation. A Data warehouse (DW) is used in decision making processes to store multidimensional (MD) information from heterogeneous data sources using ETL (Extract, Transform and Load) techniques. In this paper, we introduce firstly a simplification method of OWL inputs and then we define the related MD schema. Transformation rules are applied for defining multidimensional concepts over the OWL graph.
CB020 16:00-16:15	Possibilities of Creation of Community Genealogical Database with Semantic Information **Jaroslav Rozman**, František Zbořil and Radek Kočí Brno University of Technology,Czech Republic Abstract. This paper deals with design of database system for innovative approach for rewriting records from seriel sources, mainly from old church registers. Suitable database together with user friendly GUI for as comfortable rewriting as possible is needed. Since the records will be rewritten by volunteers – mainly amateur genealogists – we need some reputation system that determines ability of reading of old handwriting. Last part will be focused on getting semantic information from those records. This will be the most important part of the work that allows getting information like average number of children per pair, average age at death and so on.
CB203 16:15-16:30	Adaptation the Use of CFD Modelling for Building Thermal Simulation **Aiman Albatayneh**, Dariusz Alterman, Adrian Page School of Natural Resources Engineering and Management, German Jordanian

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University, Amman, Jordan

Abstract. This paper demonstrate the possibility of using CFD simulation alone to determine the internal air temperature of buildings for long periods (one year), without the assistance of any additional software, with fast computing times and an acceptable degree of accuracy for the simulation results. An experiment on CFD simulations were carried out to examine the accuracy of CFD simulation to predict building internal air temperature for a complete house in Perth, Australia. Real data recorded inside a house were compared with CFD modeling results to find the precision of the CFD simulation after CFD adaptation process applied in this research. This study is an attempt to use CFD alone to calculate the buildings internal air temperatures for extended periods (months, years). Using CFD simulations with extended periods have some problems, for example; lengthy computing times, discrepancies in peak temperature time and the internal air temperatures inside the model keep rising with time. Performing CFD analysis after applying the measures to adapt the use of CFD modeling resulted in faster computing times, with 1% of the computing time compared to that for a 1 minute time step, and with 90% of the results lying within 3°C of the real (observed) data. The overall results from CFD simulations with an average accuracy of 92% compared with the real data recorded inside the house.

Coffee Break <16:30---16:45>

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Session II

Session II- Information system development and security technology

16:45-19:45

Mundiathèque (Library, Floor 1)

Chaired by-- Noriko Hanakawa

Hannan University, Japan

Presentations:

CB006 CB016 SIM004 SIM006 SIM007 SIM010 SIM012-A SIM017 SIM029 SIM032 SIM042 SIM048

Note: Please arrive at the designated conference room 30 minutes earlier, in case some authors are not able to make the presentation on time.

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CB006 16:45-17:00	Enhancing Cloud Security using advanced MapReduce k-means on log files **Meryem Amar**, Samira Douzi and Bouabid El Ouahidi Mohammed-V University, Faculty of Sciences,Morocco Abstract. Many customers ranked cloud security as a major challenge that threaten their work and reduces their trust on cloud service's provider. Hence, a significant improvement is required to establish better adaptations of security measures that suit recent technologies and especially distributed architectures. Considering the meaningful recorded data in cloud generated log files, making analysis on them, mines insightful value about hacker's activities. It identifies malicious user behaviors and predicts new suspected events. Not only that, but centralizing log files, prevents insiders from causing damage to system. In this paper, we proposed to take away sensitive log files into a single server provider and combining both MapReduce programming and k-means on the same algorithm to cluster observed events into classes having similar features. To label unknown user behaviors and predict new suspected activities this approach considers cosine distances and deviation metrics.
CB016 17:00-17:15	Domain Adaptation Approach for Credit Risk Analysis **Jichen Huang** and Meixuan Chen Hamilton College, United States Abstract. Credit risk analysis is a crucial task for financial institutions, banks, firms, etc. when conducting financial activities. Data mining techniques have exhibited effectiveness in improving the accuracy and efficiency of credit risk analysis, due to its capability of processing tremendous scale data sets over a short time and its independence of human preconceptions. In this paper, we study a domain adaptation approach based data mining strategy in credit risk analysis tasks. Such a method allows the algorithm to be trained on one source domain with plenty of samples, and then applied to the target domain with relatively limited number of samples available, without requiring the two domains follow the same distribution. Detailed data analysis

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	has been done to verify the effectiveness of such a method. It is shown that the domain adaptation approach can significantly improve the accuracy of credit risk analysis.
SIM004 17:15-17:30	IWSN based on DWPT using an Industrial Noisy Channel for Industry 4.0 Wireless applications **Safaa Saadaoui,** Mohamed Tabaa, Fabrice Monteiro and Abbas Dandache LPRI EMSI，Morocco Abstract. Wireless Sensor Networks (WSNs) are used in several areas such as medicine, multimedia and industry. For the last one, WSNs are used for monitoring and control of industrial equipment. Nevertheless, requirements in the industrial systems differ from the general WSN requirements due to the complex environment propagation. In this work, performance for an architecture of wide-band industrial wireless sensor network under an industrial noisy channel is proposed. Transciever for IWSN is based on IDWPT and DWPT for transmitter and receiver respectively for multi user applications. A model of industrial noise is described and BER performance are presented compared with AWGN channel.
SIM006 17:30-17:45	A Proposal for Resolving the Computer System Failures with Infrastructure Problems and Software Problems **Noriko Hanakawa** and Masaki Obana Hannan University,Japan Abstract. Our proposed way is for resolving computer system failures. Especially, the way is for the computer system failures that are combined with infrastructure problems and software problems. The purpose of the proposed way is that software engineers alone can detect true system faults that combined with infrastructure problems and software problems. The feature of the proposed way is to make events sequences including not only infrastructure events but also software events. The events have the time stamp, IP source address, IP destination address, and protocol type. After that, the events are lined by time series. Many sequences of events in the computer system are automatically

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	generated in a tool that has been developed by us. In addition, we tried to apply our proposed way to a typical system failure of a web application. As a result, if a system failure occurs, the tool automatically selects sequences related to the system failure using IP address and the failure occurrence time. We confirmed that the tool helps software engineers detect faults that are caused by a verge error message “session error” in a web application.
SIM007 17:45-18:00	Balancing Facts and Feelings: Gaining Transparency on IT Project Decisions and Determinants **Boris Idler** and Konrad Spang Festo Global Processes / University of Kassel, Germany Abstract. With growing IT investments and digitization spanning across all business units, making the right choices in IT projects becomes a critical success factor for a company. However - as our study shows – companies still tend to see project selection as a primarily rational problem, neglecting research results describing effects of human decision heuristics on decision making and not incorporating these insights into project selection, execution or evaluation in company practice. A detailed analysis of the determinants of decisions in general, in corporate practice and particularly in IT projects was conducted with eighteen senior IT-project and IT-portfolio managers from multinational corporations. Based on literature review and empirical results a project decision transparency model was designed. The described model fosters clarity on company decision practice and describes what impact human decision heuristics have on IT project selection decisions. The model shows, which measures can be applied to enforce better decision making by balancing a strong methodical approach with incorporation of human decision heuristics.
SIM010 18:00-18:15	Digital project management in the era of digital transformation: Hybrid method **Rachida Hassani**, Younès El Bouzekri El Idrissi and Abdellah Abouabdellah National School of Applied Sciences of Kenitra,Morocco

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	Abstract. Integrating digital into the DNA of their business model is an essential part of business success for companies across industries today. The digital transformation has become a critical management issue and requires new ways of managerial thinking. In this context, we address the specificity of digital projects compared to IT projects in general, to propose a specific project management method for digital projects while respecting the life cycle of IT projects. To do this, we adopt a methodology based on describing the digital projects characters as a type of IT projects, defining the existing methods and making a comparative study to propose a hybrid method that will be helpful for digital companies to conduct and succeed their digital projects.
SIM012 18:15-18:30	Hybrid Mobile development approach and FLOSS tools for mobile ERP client app: A Case Study **Aminearrahmane Achargui** and Abdellah Zaouia INPT, Morocco Abstract. By leveraging the many advancements in both worlds of mobility and cloud computing, Mobile ERPs promise the “anywhere / anytime” extension of an Enterprise Information System (EIS) to employees, business partners and customers with Mobile Applications (apps) that stream corporate data back and forth the ERP application server. Therefore, a case study of the integration of EIS, Cloud Computing, Mobile Computing, Enterprise Mobility, Web Standards, Software Development and FLOSS advancements, has become a necessity. In this grounded research paper, we present an empirical investigation into the usage of the hybrid mobile development approach to create a cross-platform mobile ERP client application using Free/Libre and Open Source Software (FLOSS) tools only. According to our results the main contribution from this three years Case Study is that the ever increasing mobile computing power, has drastically reduced the performance differences between hybrid and native apps. In addition, Hybrid apps can be considered the most appropriate apps type for the case of mobile ERP client apps that sends data to the ERP application server and displays received

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	information on mobile devices using either the native look and feel of each mobile platform or a unique and homogeneous user interface across platforms. Moreover, the combination of FLOSS and the hybrid approach, will be more attractive to enterprises, since it enables them to produce apps faster, cheaper and by taking the most out from their existing web development skills.
SIM017 18:30-18:45	Comparing Credal C-Means and Neutrosophic C-Means Clustering Techniques: Comprehensive Study with Application on Road Safety **Khawla Elbendadi**, Sbai El Hassan and Abdourahmane Koita University Moulay Ismail Meknes, Morocco Abstract. Clustering techniques are unsupervised learning methods. Data clustering is one of the important methods of data mining. It is a process of finding classes from data set with the greatest similarity in the same class and the greatest divergence between different classes. Therefore, these are popular for various data mining and pattern recognition activities. However, the performance of these approaches depends on the data distribution. Thus, selecting an appropriate clustering technique for a given data set is a research challenge. In this article, two concepts of clustering will be compared, credal clustering and neutrosophic clustering. These notions are described by the Credal C-means (CCM) and Neutrosophic C-means (NCM) algorithms. These algorithms were compared for clustering accuracy on different cluster structures. Finally, to show the behavior and effectiveness of the two algorithms, real road safety data were tested and their results compared. These data are represented by trajectories (identified by six variables) crossed by vehicles in a bend (Nantes, France).
SIM029 18:45-19:00	Process approach for information systems in health care: a systematic review and PRISMA Method **Sabrina Guetibi**, Mohammed El Hammoumi and António Carvalho Brito University Sidi Mohammed Ben Abdellah，Morocco Abstract. Hospital Information System is the most fragile component of the health care

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	system in the countries in development process. The modernization of the health care system does not integrate a rigid reflection on the installation of these tools into hospitals, which remain foreign with the strategies of these countries. The main objective of this research is to present a systematic review on the relationship between process approach and continuous improvement with the development and continuity of hospital information systems. Hospital Information System and its sustainability are key factors for the functioning of services in Hospital Institutions which requires principles respect of quality management as the process approach among others. The main question to be treated in this paper is "Which reasons have been given for the views that the process approach is or isn't helping to have and give a Hospital Information System in continuous development?", in order to contribute to the systematization of knowledge in this area, the main objective of this research is to present a systematic review on the relationship between process approach and continuous improvement with the development and continuity of hospital information systems. The systematic review methodology was the PRISMA Statement ®, the search granted to find 7735 based on defined key-words, and after a preliminary examination, according to the exclusion conditions and the eligibility criteria 20 papers were considered relevant to a more detailed study. After an analysis of all relevant documents we have tried to reveal the important gap, which we will try to explore more in future investigations.
SIM032 19:00-19:15	Information System Qualification by component **Sarah Aouhassi** and Mostafa Hanoune Hassan II University of Casablanca, Faculty of Sciences Ben M'sik, Morocco Abstract. Organizations nowadays focus more and more on business quality for various reasons, such as increasing their competitiveness, their productivity or their turnover, and since we are living on the digital era, information system quality requires great attention from all decision-makers. Information System (IS) is by definition composed of five components namely human

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	resources, hardware, software, procedures and data, therefore its qualification rely on the qualification of each component apart. A set of indicators has been defined and interpreted as questions to allow data gathering from a larger population including all IS players which are managers, technical staff, functional staff and users. Four types of surveys has been created to fit every IS player. In this contribution, we emphasize on the survey designed for technical staff by explaining the reasons for not including the whole set of indicators and by finding mathematical formulas relating questions of the survey to indicators in the model, in order to quantify them numerically and aggregate them by component.
SIM042 19:15-19:30	Design of a solar powered smart irrigation system (SPSIS) using WSN as an IoT device **Wafa Difallah,** Khelifa Benahmed, Belkacem Draoui and Fateh Bounaama Tahri Mohamed University of Bechar,Algeria Abstract. The Internet has always been a means of communication between people, but with the technological development and changing requirements and lifestyle, this network has become a tool of communication between things of all types and sizes, and is known as Internet of things (IoT) for this reason. One of the most promising applications of IoT technology is the automated irrigation systems. The aim of this paper is to propose a methodology of the implementation of wireless sensor networks as an IoT device to develop a smart irrigation management system powered by solar energy.
	**Dinner Time: 19:30 -20:30 Location: MundiaResto/ 1st Floor**

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Poster Session	
SIM002	A New Adaptive Model for Web Engineering Methods to Develop Modern Web Applications Karzan Wakil, Dayang N. A. Jawawi Abstract. With the evolution of modern web applications, several web engineering methods proposed to develop web applications. The modern web applications are; Rich Internet Application (RIA), Semantic Web Application (SWA), Ubiquitous Web Applications (UWA), and Intelligent Web Applications (IWA), with each of them having new features. The problem is that current web engineering methods cannot support new features of modern web applications. However, some of them extended for new concern of web applications but have limited, meaning these methods have a lack of adaptability to support features from modern web applications. In an attempt to solve this gap, we have defined a new adaptive model for the web engineering method that can support the new features of modern web applications. This model very efficient in the process development and will be to increase the usability of the methods.
SIM021	Software Development Governance for VSE-SCRUM Teams: Model and Evaluation in a Developing Country Carlos Montenegro and René Arévalo Abstract. Using DSR approach, this research proposes the design and evaluation of a model type artifact for Software Development Governance in VSE Teams. Mainly, the model design is based on IT Governance best practices, COBIT 5, and SCRUM, with structural and dynamic components. The validation phase is done through the model application, in a case study, into an Ecuadorian Public Sector Organization. As a part of the research, the results of a survey show that, in a developing country, the IT and Software Development Governance practices are similar in public and private organizations, and in VSE and not-VSE teams. Besides, the model allowed to have the

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	appropriate responses to the software requirements and facilitated the solution of the drawbacks presented in the project development. The work contributes providing a practical tool for the practitioners and academics and on the expansion of the existing body of knowledge in a topic where there is a research lack.
SIM033	An Analytical and Comparative Review of Cohesion Metrics Aprna Tripathi ABSTRACT. In the present scenario object-oriented paradigm (OOP) is the most popular paradigm due to its features lime reusability, maintainability etc. Large software applications are composed of hundreds of classes which in turn encapsulate huge number of methods. Hence the application is usually organized into modules using the concept of packaging. The desired characteristic of OOP is high cohesion and lower coupling. This enables high understandability and low maintenance overhead of the application. This is because high degree of understandability lowers the time spent to comprehend the software and hence its testability and maintainability. A lot of cohesion metrics are proposed by software scientist at different level. In this paper, the state of art of cohesion metrics is presented and the future scope of research in the same is discussed.
SIM036	Evolution of Health Level-7: A Survey Gulraiz Javaid Joyia, Muhammad Usman Akram, Chaudary Naeem Akbar, Muhammad Furqan Maqsood ABSTRACT. In the area of the healthcare revolution, the standardization of medical information is gaining more attention now a day. To integrate the healthcare systems for sharing, exchanging, storing and querying of patient's data between hospitals and specialists require standardization. There is a need of standardization in order to share such sensitive information among hospitals & specialists. Different medical standards are in use to develop interoperable and reliable medical systems. i.e Health Level 7 (HL-

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	7), FHIR and Digital Imaging and Communications in Medicine (DICOM) etc. All these standards have their own features of limitations. This paper presents a detailed survey on evolution of HL7 standards since its birth. Different landmark modifications in this standard are discussed in this paper. Major research contributions by other researchers related to HL-7 are also presented. The paper finally highlights the features & limitations of HL7 and also compares it with other standards.
SIM050	Influence of Introversion and Extraversion Using MBTI Personality Model on Academic Performance Xuechao Li, Rodrigo Sardinas, Po-Chou Shih and Karl Camp ABSTRACT. To date, research work in exploring the influence of personality on performance in programming courses has often been neglected due to the difficulty of quantitatively defining and measuring human factors. In this paper an empirical experiment was conducted in: (1) measuring Introversion/Extraversion personality types based on Myers-Briggs Type Indicator(MBTI); (2) defining scores of students' assignments as academic performance; and (3) using statistical analysis to verify our hypotheses about the linear relationship between personality types and academic performance. With the support of Independent T-test analysis, conclusions were found that introversion programmers outperformed extroversion programmers in their respective programming courses. In addition, the Pearson Correlation and regression analysis were utilized in order to assist educators in conducting more effective teaching styles in their programming courses.

Memo