# PROGRAM

AND

# BOOK OF ABSTRACTS

Guimarães, Portugal                    7th- 9th, October, 2015

IDC 2015

www.algoritmi.uminho.pt/idc2015

9th International Symposium on Intelligent Distributed Computing

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# WELCOME

We are proud to welcome all of you to IDC'2015, the 9<sup>th</sup> International Symposium on Intelligent Distributed Computing, held in the Cradle of Portugal, the city of Guimarães.

The city of Guimarães, known around the world as the city where Portugal was born, and, nowadays, for its brilliantly recovered Historic Centre, recognized by UNESCO classification as a World Cultural Heritage, represents an excellent opportunity to enter the History of Portugal and, therefore and at the same time, an opportunity to get to know the History of Europe.

Guimarães was nominated to be European Capital of Culture, in 2012, and to be European City of Sport, in 2013.

Also, the Municipality and the University are together in the application to be European Green Capital 2020, to be presented in 2017.

Guimarães is part of the Minho region, naming our institution, the University of Minho.

Founded in 1973, University of Minho (UMinho) began its academic activity in 1975/1976. UMinho is renowned for the quality of its teaching, the quality of its students, the public recognition given to its Alumni and for its strong links with the local community and the surrounding region. UMinho has a student population of almost 20.000, out of which more than 2.000 are PhD students and 5.000 are MSc students.

The Department of Informatics and ALGORITMI research centre, to which we belong, are responsible for research and teaching in the areas of Information Technology and Communications of UMinho. The department and the research centre provide knowledge, expertise and resources in these areas through graduate and undergraduate courses, as well as by carrying out several research projects.

We would like to thank all the institutions, enterprises, participants, authors, referees, program and organization committee members and volunteers: without their hard work, the organization of these events would never be possible.


Paulo Novais and Cesar Analide


General Chairs

# GUIMARÃES

Maps and Venue

Guimarães hosts the 9th International Symposium on Intelligent Distributed Computing, IDC'2015.

Guimarães is a city in the north of Portugal, in the Minho region, approximately 350Km north of the capital, Lisbon, and about 50Km from the second largest city, Porto.

The city of Guimarães has its origin in times previous to the foundation of the Portuguese nationality, and represents more than just the simple birth of a city. Guimarães precedes and prepares the birth of Portugal in the 12th century, and represents the cradle where its prince and its kingdom were born.

The city of Guimarães is like no other city in Portugal. Its past is so intimately intertwined with the History of Portugal that it is proudly referred to as the Cradle of the Nation.

"AQUI NASCEU PORTUGAL"

"HERE BORN PORTUGAL"

The city centre, classified as a UNESCO World Cultural Heritage, is associated with the emergence of the Portuguese national identity in the 12th century. An exceptionally well-preserved and authentic example of the evolution of a medieval settlement into a modern town, its rich building typology exemplifies the specific development of Portuguese architecture from the 15th to the 19th century through the consistent use of traditional building materials and techniques.

## HOTEL DE GUIMARÃES

Hotel de Guimarães: a landmark hotel located in the Cradle of Portugal.

Hotel de Guimarães hosts the organization of IDC'2015 Symposium.

Hotel de Guimarães is located in the centre of Guimarães and is an excellent and modern four stars hotel, where the quality of the services provided and the client's satisfaction are its primal goal. The design and comfort of the rooms are combined with the natural charm of the historic town landscape.

The Piano Bar, an area of election with a modern and appealing decoration, boasts stunning views and is the perfect place for relaxation and refinement.

Visit the restaurant and indulge in the flavours of the finest cuisine of contemporary authors with strong Mediterranean influences.

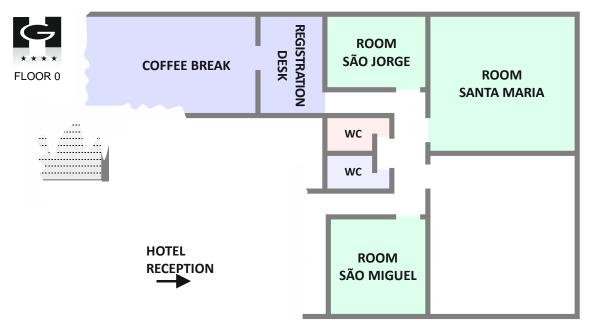Clean-cut design and cutting-edge technology await guests at Hotel de Guimarães.

Hotel de Guimarães abides by the Quality Management System, certified in accordance to European norm ISO 9001-2000.
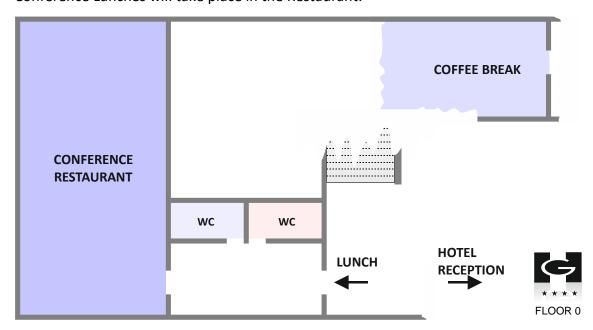
## CONFERENCE ROOMS
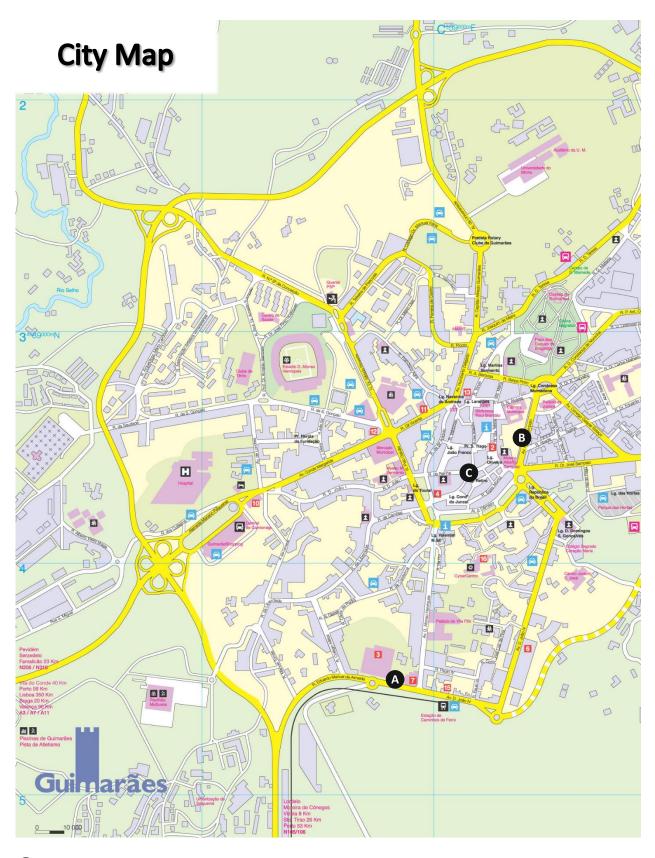
The Conference Rooms are in the entrance level, Floor 0.



## COFFEE BREAKS AND LUNCHES

Coffee Breaks will be served in the Bar, Floor 0.

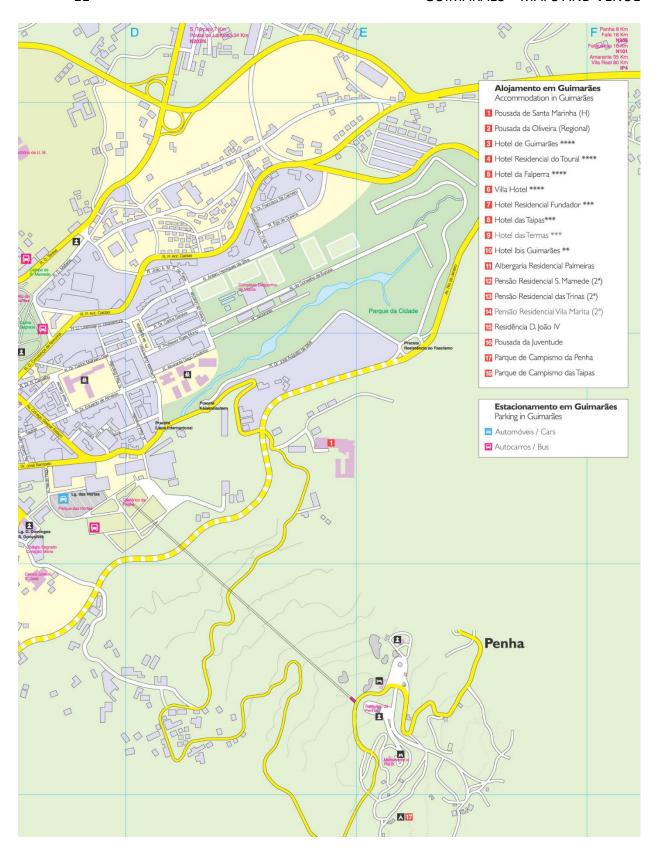Conference Lunches will take place in the Restaurant.

# City Map



| A | HOTEL DE GUIMARÃES **** | Conference Venue |
| B | GUIMARÃES CITY HALL | Welcome Reception |
| C | PALACETE SANTIAGO SQUARE | Conference Banquet |

D　　　　　　　　　　E　　　　　　　　　　F

Penha 8 Km
Fafe 16 Km
N206
Felgueiras 16 Km
N101
Amarante 35 Km
Vila Real 80 Km
IP4

S. Torcato 7 Km
Póvoa de Lanhoso 34 Km
N207/4

**Alojamento em Guimarães**
Accommodation in Guimarães

1　Pousada de Santa Marinha (H)
2　Pousada da Oliveira (Regional)
3　Hotel de Guimarães ****
4　Hotel Residencial do Toural ****
5　Hotel da Falperra ****
6　Villa Hotel ****
7　Hotel Residencial Fundador ***
8　Hotel das Taipas***
9　Hotel das Termas ***
10　Hotel Ibis Guimarães **
11　Albergaria Residencial Palmeiras
12　Pensão Residencial S. Mamede (2ª)
13　Pensão Residencial das Trinas (2ª)
14　Pensão Residencial Vila Marita (2ª)
15　Residência D. João IV
16　Pousada da Juventude
17　Parque de Campismo da Penha
18　Parque de Campismo das Taipas

**Estacionamento em Guimarães**
Parking in Guimarães

　Automóveis / Cars
　Autocarros / Bus

Parque da Cidade

Praceta
Resistência ao Fascismo

Praceta
Kaiserslautern

Praceta
Lions Internacional

Complexo Desportivo
da Vitória

Lg. das Hortas
Parque das Hortas

Lg. D. Domingos
S. Gonçalves

Colégio Sagrado
Coração Maria

Centro Juvenil
S. José

Penha

Santuário da
Penha

Monumento a
Pio IX

17

# INVITED SPEAKERS

We are proud to present the following invited speakers:

- Amílcar Cardoso, University of Coimbra, Portugal;

- Francisco Fernandez de Vega, University of Extremadura, Spain;

- Fernando Boavida, University of Coimbra, Portugal (proposed by FI&SN'2015).

All plenary talks of our invited speakers are open to all attendants of the main conference, special sessions and workshops.

# **Amílcar Cardoso**

University of Coimbra, Portugal

Prof. F. Amílcar Cardoso is a Full Professor at the Department of Informatics Engineering of the University of Coimbra, where he teaches Artificial Intelligence, Multi-Agent Systems, Computational Creativity and other topics. He developed pioneering work on Computational Creativity in the 90's, and, since then, assumed an active role in the area. He currently coordinates the Cognitive and Media Systems Group of CISUC, a team with 17 PhDs that performs research on Artificial Intelligence, Media Systems, Pervasive Systems and ICT for Education. He is currently involved in two EU projects on Computational Creativity: the FET CA PROSECCO (Promoting the Scientific Exploration of Computational Creativity) and the FET/ICT ConCreTe (Concept Creation Technology).

## Computational Creativity: distributed approaches

Computational Creativity is an emerging field that studies and exploits the potential of computers to be more interventive and autonomous in creative processes. In this lecture, we will introduce some basic concepts and terminology of the area, discuss specific computational techniques that have been applied in the implementation of creative systems, focusing in special on distributed approaches. Several examples of concrete creative systems will be presented, focusing especially in applications to the Music and the Arts, paying especial attention to those using distributed techniques.

# Francisco Fdez de Vega

University of Extremadura, Spain

Prof. Francisco Fernandez de Vega is Associate Professor at the University of Extremadura, Spain. He received his BSc from the University of Seville 1993, MSc from the University of Seville 1997, and PhD from the University of Extremadura 2001 (best PhD award 2002). His research interests include Parallel and Distributed Evolutionary Algorithms and their applications to multiple aspects of art and design. He's associate editor of Artificial Intelligence communications, and He's been guest editor with Soft Computing, Parallel Computing, Journal of Parallel and Distributed, Natural Computing and edited the books Parallel and Distributed Computational Intelligence and Parallel Architectures and Bioinspired Algorithms, with Springer. He has published more than 200 referred papers in Conferences and Journals. He is co-chair of the Task Force on Creative Intelligence, IEEE Computational Intelligence Society, and co-chair of EvoPar, part of EvoApplications, the European conference on applications of evolutionary algorithms. His work was recently awarded with the 2013 ACM GECCO Art, Design and Creativity Competition.

## Implicitly Parallel Evolutionary Algorithms Models

Although parallel versions of evolutionary algorithms have been considered and discussed for several decades, most applications still relies on sequential versions of these algorithms. Moreover, the implicit nature of evolutionary algorithms has not been properly understood and applied until recently, when heterogeneous infrastructures have been employed (including grids, clouds and volunteer computing systems) and new models of distributed Evolutionary Algorithms have been required to be run on inherently unreliable hardware resources. In this lecture we will review the evolution of these parallel and distributed models, and how they can face hard problems efficiently.

# Fernando Boavida

University of Coimbra, Portugal

(proposed by FI&SN'2015)

Fernando Boavida received his PhD in Informatics Engineering in 1990, and he currently is Full Professor at the Department of Informatics Engineering (DEI) of the Faculty of Sciences and Technology of the University of Coimbra. He is the founder of the Laboratory of Communications and Telematics of DEI, the Director of the Centre for Informatics and Systems of the University of Coimbra, and the Strategic Director for Communications and Information Technology of the University of Coimbra.

His main research interests are wireless sensor networks, mobility, quality of service, and computer networks in general. He is author/co-author of more than 160 international publications (books, book chapters, refereed journals and conference proceedings) and 50 national publications. He was the chairman of the Program Committee of many international conferences and workshops, and has been involved in numerous program committees of major international conferences, including INFOCOM. He participated, also, in many European projects, such as E-NEXT, EuQoS, WEIRD, OpenNet, CONTENT, GINSENG and MICIE.

He is a senior member of the IEEE and a licensed Professional Engineer. He is a member of the Editorial Advisory Board of the Computer Communications journal.

## Internet of People - Challenges for People-Centric Internet of Things and Connected Smart Objects

Technology now offers the possibility of delivering a vast range of low-cost people-centric services to citizens. Internet of Things (IoT) supporting technologies are becoming robust, viable and cheaper. Mobile phones are increasingly more powerful and disseminated. On the other hand, social networks and virtual worlds are experiencing an exploding popularity and have millions of users. These low-cost technologies can now be used to create an Internet of People (IoP), a dynamically configurable integration platform of connected smart objects that allows enhanced, people-centric applications. As opposed to things-centric ones, IoP combines the real, sensory world with the virtual world for the benefit of people while it also enables the development of sensing applications in contexts such as e-health, sustainable mobility, social networks enhancement or fulfilling people's special needs. This paper identifies the main challenges, a possible approach, and key enabling technologies for a people-centric society based on the Internet of Things.

# AGENDA

AND

# DETAILED PROGRAM

# IDC'2015

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9th International Symposium on Intelligent Distributed Computing

| | Wednesday October 7th, 2015 | Thursday October 8th, 2015 | Friday October 9th, 2015 |
|---|---|---|---|
| 08:00 | Registration | | |
| | | Registration | Registration |
| 09:00 | Conference Opening | Session 4 Ambient Intelligence and Social Networks | Session 7 Machine Learning |
| 10:00 | Session 1 Bio-Inspired Computing | | |
| 11:00 | Coffee Break | Coffee Break | Coffee Break |
| | Keynote Speaker Amílcar Cardoso | Keynote Speaker Francisco Fdez de Vega | Keynote Speaker Fernando Boavida |
| 12:00 | | | |
| 13:00 | Lunch | Lunch | Lunch |
| 14:00 | | | |
| | Session 2 Agent-Based Systems I | Session 5 Intelligent Data Processing | Workshop FI&SN'2015 / Workshop WSRL'2015 |
| 15:00 | | | |
| 16:00 | Coffee Break | Coffee Break | |
| | Session 3 Agent-Based Systems II | Session 6 Distributed Computing | Coffee Break |
| 17:00 | | | Closing Session |
| 18:00 | Special Session ESAmI'2015 / Special Session COMEDAI'2015 | Social Program | |
| 19:00 | | | |
| | Welcome Reception | Conference Banquet | |
| 20:00 | | | |

IDC'2015 participants have full admission to all sessions, including special sessions and workshops.

| | Wednesday<br>October 7th, 2015 |
|---|---|
| 8:00 | Registration |
| 9:00 | Conference Opening |
| 9:30 | Session 1        Bio-Inspired Computing |
| | Room Santa Maria |
| | Chair: Victor Toporkov |
| | <ul><li>*"Reconfiguration of access schemes in virtual networks of the Internet of things by genetic algorithms"*<br>Igor Saenko and Igor Kotenko</li><li>*"GAMPP: Genetic Algorithm for UAV Mission Planning Problems"*<br>Gema Bello-Orgaz, Cristian Ramirez-Atencia, Jaime Fradera-Gil and David Camacho</li><li>*"FSP Modeling of a Generic Distributed Swarm Computing Framework"*<br>Amelia Bădică, Costin Bădică and Marius Brezovan</li></ul> |
| 11:00 | Coffee Break |
| 11:30 | Keynote Speaker        Amílcar Cardoso |
| | Room Santa Maria |
| | Chair: Paulo Novais |
| | <ul><li>*"Computational Creativity: distributed approaches"*<br>Amílcar Cardoso<br>University of Coimbra, Portugal</li></ul> |
| 13:00 | Lunch |
| 14:30 | Session 2        Agent-Based Systems I |
| | Room Santa Maria |
| | Chair: Costin Bădică |
| | <ul><li>*"Agents and Ontologies for a Smart Management of Heterogeneous Data: The IndianaMas System"*<br>Daniela Briola</li><li>*"A CBR approach to allocate computational resources within a cloud platform"*<br>Fernando De La Prieta, Javier Bajo and Juan M. Corchado</li><li>*"From Virtual to Real, Human Interaction as a Validation Process for IVEs"*<br>J.A. Rincon, Emilia Garcia, V. Julian and C. Carrascosa</li><li>*"A Multi-Agent Strategic Planning System based on Blackboard"*<br>Juan Luis Dalmau-Espert, Faraón Llorens-Largo and Rafael Molina-Carmona</li></ul> |
| 16:00 | Coffee Break |

|  | Wednesday<br>October 7th, 2015 | |
|---|---|---|
| 16:30 | Session 3 | Agent-Based Systems II |
|  | Room Santa Maria | |
|  | Chairs: Igor Kotenko | |
|  | o "MAESTROS: Multi Agent Simulation of Rework in Open Source Software"<br>Thiago R.P.M. Rúbio, Henrique Lopes Cardoso and Eugénio Oliveira<br><br>o "Scrutable Multi-agent Hazard Rescue System"<br>Andrei Mocanu and Costin Bădică<br><br>o "Reliable interaction in multiagent systems"<br>Dejan Mitrović, Mirjana Ivanović, Milan Vidaković and and Zoran Budimac<br><br>o "Fault tolerant automated task execution in a multi-robot system"<br>Stanislaw Ambroszkiewicz, Waldemar Bartyna, Kamil Skarzynski and Marcin Stepniak | |
| 18:00 | Special Session ESAmI'2015 | Special Session COMEDAI'2015 |
|  | Room São Jorge | Room São Miguel |
|  | Chairs: A. Costa, J. C. Castillo and F. Silva | Chairs: G. Marreiros, D. Carneiro, E. Martinez-Martin and A. Pimenta |
|  | o "Intelligent distributed systems for rural areas"<br>Luís Frazão, Silvana Góméz-Meire and António Pereira<br><br>o "Intelligible Data Metrics for Ambient Sensorization and Gamification"<br>Artur Quintas, Jorge Martins, Marcos Magalhães, Fábio Silva and Cesar Analide<br><br>o "Hierarchical Architecture for Robust People Detection by Fusion of Infrared and Visible Video"<br>José Carlos Castillo, Juan Serrano-Cuerda, Antonio Fernández-Caballero and Arturo Martínez-Rodrigo | o "Recommendations with personality traits extracted from text reviews", Antonella Di Rienzo and Asana Neishabouri<br><br>o "A framework for the automation of multimodal brain connectivity analyses", Paulo Marques, José Miguel Soares, Ricardo Magalhães, Nuno Sousa and Victor Alves<br><br>o "Emotion Effects on Online Learning", Ana Raquel Faria, Ana Almeida, Constantino Martins and Ramiro Gonçalves<br><br>o "A Reasoning Module for Distributed Clinical Decision Support Systems", Tiago Oliveira, Ken Satoh, Paulo Novais, José Neves, Pedro Leão, and Hiroshi Hosobe |
| 19:30 | Welcome Reception | |

| | Thursday<br>October 8th, 2015 |
|---|---|
| 8:30 | **Registration** |
| 9:00 | Session 4                    Ambient Intelligence and Social Networks |
| | Room Santa Maria |
| | Chairs: Juan Pavón |
| | o *"Analysis of Mental Fatigue and Mood States in Workplaces"*<br>André Pimenta, Davide Carneiro, José Neves and Paulo Novais<br><br>o *"Agent-based Simulation of Crowds in Indoor Scenarios"*<br>*Rafael Pax and Juan Pavón*<br><br>o *"Forming Homogeneous Classes for e-Learning in a Social Network Scenario"*<br>Antonello Comi, Lidia Fotia, Fabrizio Messina, Giuseppe Pappalardo, Domenico Rosaci and Giuseppe M.L. Sarnè<br><br>o *"Social-based arcs weight assignment in trust networks"*<br>Michele Malgeri, Vincenza Carchiolo, Alessandro Longheu, Giuseppe Mangioni and Marco Buzzanca |
| 10:30 | **Coffee Break** |
| 11:00 | Keynote Speaker                 Francisco Fernandez de Vega |
| | Room Santa Maria |
| | Chair: Cesar Analide |
| | o *"Implicitly Parallel Evolutionary Algorithms Models"*<br>Francisco Fernandez de Vega<br>University of Extremadura, Spain |
| 13:00 | **Lunch** |

| | Thursday October 8th, 2015 |
|---|---|
| 14:30 | Session 5                          Intelligent Data Processing |
| | Room Santa Maria |
| | Chair: Davide Carneiro |
| | o *"Towards Semi-automated Parallelization of Data Stream Processing"* Martin Kruliš, David Bednárek, Zbyněk Falt, Jakub Yaghob and Filip Zavoral <br><br> o *"Optimizing satisfaction in a multi-courses allocation problem"* Ana-Maria Nogareda and David Camacho <br><br> o *"Improving the categorization of Web sites by analysis of html-tags statistics to block inappropriate content"* Dmitry Novozhilov, Igor Kotenko and Andrey Chechulin <br><br> o *"Distributed Architecture of Data Analysis System based on Formal Concept Analysis Approach"* Alexey Neznanov and Andrey Parinov |
| 16:00 | Coffee Break |
| 16:30 | Session 6                          Distributed Computing |
| | Room Santa Maria |
| | Chair: David Camacho |
| | o *"Heuristic-Based Job Flow Allocation in Distributed Computing"* Victor Toporkov, Anna Toporkova, Alexey Tselishchev, Dmitry Yemelyanov and Petr Potekhin <br><br> o *"A Data Processing Framework for Distributed Embedded Systems"* Ichiro Satoh <br><br> o *"A Distributed Reputation-based Framework to Support Communication Resources Sharing"* Antonello Comi, Lidia Fotia, Fabrizio Messina, G.Pappalardo, Domenico Rosaci, and Giuseppe M. L. Sarné <br><br> o *"Improving the Weighted Distribution Estimation for AdaBoost using a Novel Concurrent Approach"* Héctor Allende-Cid, Carlos Valle, Claudio Moraga, Hector Allende and Rodrigo Salas |
| 18:30 | Social Program |
| 20:00 | Conference Banquet |

| | |
|---|---|
| | Friday<br>October 9th, 2015 |
| 8:30 | Registration |
| 9:00 | Session 7                         Machine Learning |
| | Room Santa Maria |
| | Chair: Fabrizio Messina |
| | o *"Self-Optimizing a Multi-Agent Scheduling System: a Racing based approach"*<br>Ivo Pereira and Ana Madureira<br><br>o "Collaborative Filtering with Hybrid clustering integrated Method to address new-item cold-start problem"<br>Ferdaous Hdioud, Bouchra Frikh, Asmaa Benghabrit and Brahim Ouhbi<br><br>o *"Applying Reinforcement Learning in Formation Control of Agents"*<br>Vali Derhami and Yusef Momeni<br><br>o *"Context Time-Sequencing for Machine Learning and Sustainability Optimization"*<br>Fábio Silva and Cesar Analide |
| 10:30 | Coffee Break |
| 11:00 | Keynote Speaker               Fernando Boavida |
| | Room Santa Maria |
| | Chair: Alexandre Santos |
| | o *"Internet of People - Challenges for People-Centric Internet of Things and Connected Smart Objects"*<br>Fernando Boavida<br>University of Coimbra, Portugal |
| 13:00 | Lunch |

|       | Friday<br>October 9th, 2015 | |
|-------|-----------------------------|-----|
| 14:30 | Workshop FI&SN'2015 | Workshop WSRL'2015 |
|       | Room São Jorge | Room São Miguel |
|       | Chairs: Alexandre Santos, Pascal Lorenz and António Costa | Chairs: Massimo Ficco and Salvatore D'Antonio |
|       | o *"SDN-Based Services Delivering in Smart Environments"* <br>Lucas Mendes Ribeiro Arbiza, Liane Margarida Rockenbach Tarouco, Leandro Márcio Bertholdo and Lisandro Zambenedetti Granville <br><br> o *"Automated Network Resilience Optimization using Computational Intelligence Methods"* <br>Vitor Pereira, Miguel Rocha and Pedro Sousa <br><br> o *"An Automated Framework for the Management of P2P Traffic in ISP Infrastructures"* <br>Pedro Sousa <br><br> o *"A Geographic Opportunistic Forwarding Strategy for Vehicular Named Data Networking"* <br>Xuejie Liu, M. João Nicolau, António Costa, Joaquim Macedo and Alexandre Santos | o *"A Semantic Driven Approach for Consistency Verification between Requirements and FMEA Analysis"* <br>Gabriella Gigante, Francesco Gargiulo, Massimo Ficco and Domenico Pascarella <br><br> o *"An Analytical Approach for Optimal Resilience Management in Future ATM Systems"* <br>Domenico Pascarella, Francesco Gargiulo, Angela Errico and Edoardo Filippone <br><br> o *"Enabling convergence of physical and logical security through intelligent event correlation"* <br>Gianfranco Cerullo, Luigi Coppolino, Salvatore D'Antonio, Valerio Formicola, Gaetano Papale and Bruno Ragucci <br><br> o *"Model-Based Vulnerability Assessment of Self-Adaptive Protection Systems"* <br>Ricardo J. Rodriguez and Stefano Marrone <br><br> o *"Forensic Data Analysis Challenges in Large Scale Systems"* <br>Damien Conroy |
| 16:30 | Coffee Break | |
| 17:00 | Closing Session | |

# BOOK OF ABSTRACTS

# IDC'2015

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9th International Symposium on Intelligent Distributed Computing

| | Wednesday<br>October 7th, 2015 |
|---|---|
| 9:30 | Session 1                     Bio-Inspired Computing<br>Room Santa Maria<br>Chair: Victor Toporkov |

*"Reconfiguration of access schemes in virtual networks of the Internet of things by genetic algorithms"*

Igor Saenko and Igor Kotenko

Virtual local area networks (VLAN) is a well-known technology of computer security in heterogeneous network infrastructures. It does not require significant computing resources. For this reason, it should find success in Internet of things. The VLAN access control scheme formation is divided into the tasks of initial configuration and reconfiguration. The paper presents an approach to the reconfiguration of VLAN access control schemes based on the improved class of genetic algorithms. Unlike the initial configuration, the reconfiguration additionally uses the previous access control scheme as input. Its search criterion is focused on minimizing the possible changes in the previous scheme. The paper shows that this problem is a special form of the Boolean matrix factorization. Main enhancements relate to generation of the initial population based on trivial solutions, using the columns of the connectivity matrix as the genes of chromosomes and applying in the fitness function the criterion of minimal cost to modify the access scheme. Experimental results demonstrate the proposed genetic algorithm has a high enough effectiveness.

*"GAMPP: Genetic Algorithm for UAV Mission Planning Problems"*

Gema Bello-Orgaz, Cristian Ramirez-Atencia, Jaime Fradera-Gil and David Camacho

Due to the rapid development of the UAVs capabilities, these are being incorporated into many fields to perform increasingly complex tasks. Some of these tasks are becoming very important because they involve a high risk to the vehicle driver, such as detecting forest fires or rescue tasks, while using UAVs avoids risking human lives. Recent researches on artificial intelligence techniques applied to these systems provide a new degree of high-level autonomy of them. Mission planning for teams of UAVs can be defined as the planning process of locations to visit (waypoints) and the vehicle actions to do (loading/dropping a load, taking videos/pictures, acquiring information), typically over a time period. Currently, UAVs are controlled remotely by human operators from ground control stations, or use rudimentary systems. This paper presents a new Genetic Algorithm for solving Mission Planning Problems (GAMPP) using a cooperative team of UAVs. The fitness function has been designed combining several measures to look for optimal solutions minimizing the fuel consumption and the mis-

sion time (or makespan).The algorithm has been experimentally tested through several missions where its complexity is incrementally modified to measure the scalability of the problem. Experimental results show that the new algorithm is able to obtain good solutions improving the runtime of a previous approach based on CSPs.

*"FSP Modeling of a Generic Distributed Swarm Computing Framework"*

Amelia Bădică, Costin Bădică and Marius Brezovan

Swarm computing emerged as a computing paradigm for solving complex optimization problems using a nature-inspired approach. A swarm of particles populates a virtual space that mimics the physical environment. Virtual particles modeled as computational objects are behaving in the virtual space according to the laws of nature, seeking to solve a mathematical optimization problem. In this paper we propose a formal model of a generic distributed framework for swarm computing based on Finite State Process algebra. The model is simple, clear and technology-independent, and it can serve as a basis for concurrent or distributed implementation using available software technologies.

| 11:30 | Keynote Speaker          Amílcar Cardoso<br>Room Santa Maria<br>Chair: Paulo Novais |
|-------|--------------------------------------------------------------------------------|

| 14:30 | Session 2          Agent-Based Systems I<br>Room Santa Maria<br>Chair: Costin Bădică |
|-------|-------------------------------------------------------------------------------------|

*"Agents and Ontologies for a Smart Management of Heterogeneous Data: The IndianaMas System"*

Daniela Briola

The IndianaMas system is a platform for storing, retrieving and analyzing images, manual sketches and multilingual texts about rock carvings: to manage heterogeneous data formats, languages and data sources, it adopts a multiagent architecture that makes easier coping with such a mixed environment, and exploits ontologies to have a clear, formal and self contained representation of the domain. These two architectural solutions make possible to have a very modular organization of the overall system and to manage in parallel different kinds of data, which are exposed thanks to a digital library. In this paper we present the architecture and the functionalities of the IndianaMas system, focusing on the coordination level between the agents and on the organization of structured data in the digital library, to show how the adopted architectural approaches and solutions really allow the management of such a complex system.

*"A CBR approach to allocate computational resources within a cloud platform"*

Fernando De La Prieta, Javier Bajo and Juan M. Corchado

Cloud Computing paradigm continues growing very quickly. The underlying computational infrastructure has to cope with this increase on the demand and the high number of end-users. To do so, platforms usually use mathematical models to allocate the computational resource among the offered services to the end-user. Although these mathematical models are valid and they are widely extended, they can be improved by means of use intelligent techniques. Thus, this study proposes an innovative approach based on an agent-based system that integrated a case-based reasoning system. This system is able to dynamically allocate resources over a Cloud Computing platform.

*"From Virtual to Real, Human Interaction as a Validation Process for IVEs"*

J.A. Rincon, Emilia Garcia, V. Julian and C. Carrascosa

This paper presents a development process for intelligent virtual environments (IVEs) considering the immersion of real objects and human beings in virtual simulations. This development process includes a meta-model for designing, a set of tools to facilitate the implementation and a simulation platform. The paper presents a case study that makes use of this development process for designing adapted spaces for people with physical disabilities.

*"A Multi-Agent Strategic Planning System based on Blackboard"*

Juan Luis Dalmau-Espert, Faraón Llorens-Largo and Rafael Molina-Carmona

In the last years, the organizations have faced deep changes in their environments that have led them to a new complex and uncertain world. More participatory, flexible and distributed structures are needed to address and reduce this uncertainty and complexity. This new form of governance involves changes in the Strategic Planning process to meet the new situation. A new agile, collaborative, integrated, and automated architecture of a Multi-Agent Strategic Planning System is presented. It is based on a blackboard and an ontology, and it lets the participating experts (human or not) cooperate and interact to ensure better decisions.

| 16:30 | Session 3                 Agent-Based Systems II<br>Room Santa Maria<br>Chairs: Igor Kotenko |
|---|---|

**WEDNESDAY, 7th**

*"MAESTROS: Multi Agent Simulation of Rework in Open Source Software"*

Thiago R.P.M. Rúbio, Henrique Lopes Cardoso and Eugénio Oliveira

Rework Management in software development is a challenging and complex issue. Defined as the effort spent to re-do some work, rework implies big costs given the fact that the time spent on rework does not count to the improvement of the project. Predicting and controlling rework causes is a valuable asset for companies, which maintain closed policies on choosing team members and assigning activities to developers. However, a trending growth in development consists in Open Source Software (OSS) projects. This is a totally new and diverse environment, in the sense that not only the projects but also their resources, e.g., developers change dynamically. There is no guarantee that developers will follow the same methodologies and quality policies as in a traditional and closed project. In such world, identifying rework causes is a necessary step to reduce project costs and to help project managers to better define their strategies. We observed that in real OSS projects there are no fixed team, but instead, developers assume some kind of auction in which the activities are assigned to the most interested and less-cost developer. This lead us to think that a more complex auctioning mechanism should not only model the task allocation problem, but also consider some other factors related to rework causes. By doing this, we could optimise the task allocation, improving the development of the project and reducing rework. In this paper we presented MAESTROS, a Multi-Agent System that implements an auction mechanism for simulating task allocation in OSS. Experiments were conducted to measure costs and rework with different project characteristics. We analysed the impact of introducing a Q-learning reinforcement algorithm on reducing costs and rework. Our findings correspond to a reduction of 31% in costs and 11% in rework when compared with the simple approach. Improvements to MAESTROS include real projects data analysis and a real-time mechanism to support Project Management decisions.

*"Scrutable Multi-agent Hazard Rescue System"*

Andrei Mocanu and Costin Bădică

Time-efficient and competent intervention in environmental hazard situations is critical. Numerous experts on the field have to be coordinated and the most appropriate one(s) should be sent to the danger zone. A traditional system would require a lot of effort on the part of the people involved, but would also involve the risk of not taking the best decisions under pressure. We propose an automated system that incorporates multiple autonomous agents, negotiation and argumentation techniques that is not only capable of making rational selections, but which can also provide justi-

fications for the decisions it takes. Making transparent decisions is fundamental for gaining the people's trust in this solution, but can also be used for learning purposes and for fine-tuning parameters. The system, which involves a command center and a dedicated smartphone app for the field experts, has been tested in a simulated experimental scenario around the area of Craiova, Romania.

*"Reliable interaction in multiagent systems"*

Dejan Mitrović, Mirjana Ivanović, Milan Vidaković and and Zoran Budimac

The social ability is one of the defining characteristic of software agents. This paper presents an infrastructure for reliable agent interaction in dynamic environments. The term "reliable" is used to indicate that messages are always delivered to agents, regardless of hardware or software failures. Two concrete models of agent interaction are discussed: direct peer-to-peer messaging, and an action synchronization framework based on a general-purpose model for parallel computations.

*"Fault tolerant automated task execution in a multi-robot system"*

Stanislaw Ambroszkiewicz, Waldemar Bartyna, Kamil Skarzynski and Marcin Stepniak

In multi-robot systems unexpected situations occur frequently, and cause failures of robots performing tasks. Mechanisms for automation of failure handling and recovery (if possible) are proposed. They are based on general protocols similar to the well known standard WS-TX for business transactions. The protocols and mechanisms are implemented in the prototype Autero system as a software platform for accomplishing complex tasks in open and heterogeneous multi-robot systems.

| 18:00 | Special Session | ESAmI'2015 |
|---|---|---|
| | | Energetic Sustainable Ambient Intelligence |
| | Room São Jorge | |
| | Chairs: A. Costa, J. C. Castillo and F. Silva | |

*"Intelligent distributed systems for rural areas"*

Luís Frazão, Silvana Góméz-Meire and António Pereira

Communication technologies have evolved and grown exponentially in recent years. Unfortunately, this growth is not the case in rural areas, where the small population density does not justify the investment made by Internet providers. The creation and development of projects in rural wireless networks are often an effective alternative to traditional Internet providers. However, these projects tend to disappear soon after their implementation due to the cost of managing and solving problems. This paper presents an intelligent distributed system that can help the network ad-

ministrators in maintenance tasks by applying automatic intelligent actions and decisions, ease the installation of new network devices for end users, automatically update existing devices, and manage network traffic by applying algorithms that will decide based on intelligence. This is achieved by using an intelligent distributed system executed on every device of the network and is capable of making decisions and actions that will help administrators with problem-solving, automatic configuration of devices, proactive bandwidth and network traffic management, and reduce costs in maintaining the network.

*"Intelligible Data Metrics for Ambient Sensorization and Gamification"*

Artur Quintas, Jorge Martins, Marcos Magalhães, Fábio Silva and Cesar Analide

The interaction between and people is being defined by technology. New concepts appearing in our society such as Internet of Things allow common devices to be connected to the internet and sharing data with other devices in the environment. The flow of data and information available today can be so overwhelming that it can lose significance by their complexity if not handled properly. This proposal details the use of environmental and behavioural information to produce intelligible data metrics on driving events that can be aggregated and understandable in meaningful manners. Furthermore, their application for the promotion of better behaviours is exemplified with techniques extracted from gamification.

*"Hierarchical Architecture for Robust People Detection by Fusion of Infrared and Visible Video"*

José Carlos Castillo, Juan Serrano-Cuerda, Antonio Fernández-Caballero and Arturo Martínez-Rodrigo

Robust people detection systems are nowadays using heterogeneous cameras. This paper proposes an hierarchical architecture which is focused on robustly detecting people by fusion of infrared and visible video. The architecture covers all levels provided by the INT3-Horus framework, initially designed to perform monitoring and activity interpretation tasks. Indeed, INT3-Horus is used as the development environment where the approach starts with image segmentation in both infrared and visible spectra. Then, the results are fused to enhance the overall detection performance.

| 18:00 | Special Session     COMEDAI'2015 |
|---|---|
| | Cognitive Models and Emotions detection for Ambient Intelligence |
| | Room São Miguel |
| | Chairs: G. Marreiros, D. Carneiro, E. Martinez-Martin and A. Pimenta |

*"Recommendations with personality traits extracted from text reviews"*,

Antonella Di Rienzo and Asana Neishabouri

It is well known that human reasoning and decision-making are strongly influenced by psychological aspects. Recent works explore the adoption of personality traits to provide personalized recommendations. In this article, we report experimental results obtained with implicit recognition of Big Five personality traits from users' text reviews. Hence, we present a personality-based recommender system with the analysis of the overall users' satisfaction regarding the list of recommended items, showing promising results.

*"A framework for the automation of multimodal brain connectivity analyses"*

Paulo Marques, José Miguel Soares, Ricardo Magalhães, Nuno Sousa and Víctor Alves

In neuroscience research, there has been an increasing interest in multimodal analysis, combining the strengths of unimodal analysis while reducing some of its drawbacks. However, this increases complexity in data processing and analysis, requiring a big amount of technical knowledge in image manipulation and a lot of iterative processes requiring user intervention. In this work we present a framework that incorporates some of this technical knowledge and enables the automation of most of the processing in the context of combined resting-state functional Magnetic Resonance Imaging (rs-fMRI) and Diffusion Tensor Imaging (DTI) data processing and analysis. The proposed framework presents an object-oriented architecture and its structure reflects the nature of three levels of data processing (i.e. acquisition level, subject level and study level). This framework opens the door to more intelligent and scalable systems for neuroimaging data processing and analysis that ultimately will lead to the dissemination of such advanced techniques.

*"Emotion Effects on Online Learning"*

Ana Raquel Faria, Ana Almeida, Constantino Martins and Ramiro Gonçalves

Learning is understood as an educational activity which aims to help develop the capacities of individuals. These capabilities make individuals able to establish a personal relationship with the environment in which they are inserted. For the learning process to develop the individual has to use its sensory, motor, cognitive, affective and linguistic. Thus, this work aims at studying the effect of emotion in learning systems in online

learning environments, analysing the extent to which emotional state can influence the thinking, decision making and learning process.

*"A Reasoning Module for Distributed Clinical Decision Support Systems"*

Tiago Oliveira, Ken Satoh, Paulo Novais, José Neves, Pedro Leão, and Hiroshi Hosobe

One of the main challenges in distributed clinical decision support systems is to ensure that the flow of information is kept. The failure of one or more components should not bring down an entire system. Moreover, it should not impair any decision processes that are taking place in a functioning component. This work describes a decision module that is capable of managing states of incomplete information which result from the failure of communication between components or delays in making the information available. The framework is also capable of generating scenarios for situations in which there are information gaps. The proposal is described through an example about colon cancer staging.

| | Thursday<br>October 8th, 2015 |
|---|---|
| 9:00 | Session 4                          Ambient Intelligence and Social Networks<br>Room Santa Maria<br>Chairs: Juan Pavón |

*"Analysis of Mental Fatigue and Mood States in Workplaces"*

André Pimenta, Davide Carneiro, José Neves and Paulo Novais

Mental fatigue is a concern for a range of reasons, including its negative impact on productivity and quality of life in general. The maximal working capacity and performance of an individual, whether physical or mental, generally also decreases as the day progresses. The loss of these capabilities is associated with the emergence of fatigue, which is particularly visible in long and demanding tasks or repetitive jobs. However, good management of working time and of the effort invested in each task, as well as the effect of breaks at work can result in better performance and better mental health, delaying the effects of fatigue. In this paper a model and prototype are proposed to detect and monitor fatigue, based on behavioral biometrics (Keystroke Dynamics and Mouse Dynamics). Using this approach, the aim is to develop leisure and work context-aware environments that may improve quality of life and individual performance, as well as productivity in organizations.

*"Agent-based Simulation of Crowds in Indoor Scenarios"*

*Rafael Pax and Juan Pavón*

Crowd simulation models usually focus on performance issues related with the management of very large numbers of agents. This work presents an agent based architecture where both performance and flexibility in the behaviour of the entities are sought. Some algorithms are applied for the management of the crowd of agents in order to cope with the performance in the processing of their movements and their representation, but at the same time some alternative reasoning mechanisms are provided in order to allow rich behaviours. This facilitates the specification of different types of agents, which represent the people, sensors and actuators. This is illustrated with a case study of the evacuation of the building of the Faculty of Computer Science, where different types of human behaviours are modelled for these situations. The result is the simulation of more realistic scenarios.

**THURSDAY, 8th**

**THURSDAY, 8th**

*"Forming Homogeneous Classes for e-Learning in a Social Network Scenario"*

Antonello Comi, Lidia Fotia, Fabrizio Messina, Giuseppe Pappalardo, Domenico Rosaci and Giuseppe M.L. Sarnè

The use of network technology to provide online courses is the latest trend in the training and development industry and has been defined as the "e-Learning revolution". On the other hand, Online Social Networks (OSNs) represent today an effective possibility to have common and easy-to-use platforms for supporting e-Learning activities. However, as under-lined by previous studies, many of the proposed e-Learning systems can result in confusion and decrease the learner's interest. In this paper, we introduce the possibility to form e-Learning classes in the context of OSNs. At the best of our knowledge, any of the approaches proposed in the past considers the evolution of on-line classes as a problem of match-ing the individual users' profiles with the profiles of the classes. In this paper, we propose an algorithm that exploits a multi-agent system to suitably distribute such a matching computation on all the user devices. The good e effectiveness and the promising efficiency of our approach is shown by the experimental results obtained on simulated On-line Social Networks data.

*"Social-based arcs weight assignment in trust networks"*

Michele Malgeri, Vincenza Carchiolo, Alessandro Longheu, Giuseppe Mangioni and Marco Buzzanca

Virtual interaction with strangers often makes use of underlying trust networks. Usually, existing proposals address the evaluation of global (unique) trust for a given node within the network. In this paper we dis-cuss about how to assess the local (direct) trust a node receives from each of his neighbors. Our proposal is social-based and takes into account both positive and negative experiences as well as the history of past feedbacks, ensuring good stability also when a node receives hundreds of positive feedbacks briefly followed by few negative feedbacks. In order to highlight the stability of this approach we performed several simulations with different networks.

| 11:00 | Keynote Speaker          Francisco Fernandez de Vega<br>Room Santa Maria<br>Chair: Cesar Analide |
|-------|------------------------------------------------------|

| 14:30 | Session 5            Intelligent Data Processing<br>Room Santa Maria<br>Chair: Davide Carneiro |
|---|---|

*"Towards Semi-automated Parallelization of Data Stream Processing"*

Martin Kruliš, David Bednárek, Zbyněk Falt, Jakub Yaghob and Filip Zavoral

Current hardware development trends exhibit clear inclination towards parallelism. Multicore CPUs as well as many-core architectures such as GPUs or Xeon Phi devices are widely present in both high-end servers and common desktop PCs. In order to utilize the computational power of these parallel platforms, the applications must be designed in a way that intensively exploits parallel processing. In our work, we propose techniques that simplify the application decomposition process in data streaming systems. The data streaming paradigm may be applied in many data-intensive applications, e.g., database management systems or scientific data processing. In order to employ these techniques, we have developed a data streaming language called Bobolang that simplifies the design of the application. This approach allows the programmer to write strictly serial operators in a traditional language and then interconnect these operators in an execution plan that presents opportunities for automated parallel processing.

*"Optimizing satisfaction in a multi-courses allocation problem"*

Ana-Maria Nogareda and David Camacho

The resource allocation problem is a traditional kind of NP-hard problem. One of its application domains is the allocation of educational resources. In most universities, students select some courses they would like to attend by ranking the proposed courses. However, to ensure the quality of a course, the number of seats is limited, so not all students can enroll in their preferred courses. Therefore, the school administration needs some mechanism to assign the available resources. In this paper, the course allocation problem has been modeled as a Constraint Satisfaction Optimization Problem (CSOP) and two metrics have been defined to quantify the satisfaction of students. The problem is solved with Gecode and a greedy-based algorithm showing how the CSOP approach is able to allocate resources optimizing the students' satisfaction. Another contribution of this work is the allocation of several courses simultaneously, generating feasible solutions in a short time. The allocation procedures are based on preferences for courses defined by students, and on the administration's constraints at École Hôtelière de Lausanne. Ten data sets have been generated using the distribution of students' preferences for courses, and have been used to carry out a complete experimental analysis.

**THURSDAY, 8th**

*"Improving the categorization of Web sites by analysis of html-tags statistics to block inappropriate content"*

Dmitry Novozhilov, Igor Kotenko and Andrey Chechulin

The paper considers the problem of improving the quality of web sites categorization using data mining methods. This goal is important for automated systems of parental control. The purpose of such systems is protection from unwanted or inappropriate information. The novelty of the proposed approach is in usage of HTML tags statistics of web pages to improve the categorization of sites that are similar in terms of textual content, but differing in their structural features. The paper describes the architecture of the categorization system, the algorithm of its work, the results of experiments, and assessment of classification quality.

*"Distributed Architecture of Data Analysis System based on Formal Concept Analysis Approach"*

*Alexey Neznanov and Andrey Parinov*

This paper describes distributed architecture and data workflow of the analysis system called FCART. Comparing with the similar systems FCART is capable of dealing with various data sources, data pre-processing and interactive analysis, extending functionality by integrating independent web-services and developing plugins. Example of gathering and analyzing data of social networking service is considered.

| 16:30 | Session 6                           Distributed Computing<br>Room Santa Maria<br>Chair: David Camacho |
|-------|--------------------------------------------------------------|

*"Heuristic-Based Job Flow Allocation in Distributed Computing"*

Victor Toporkov, Anna Toporkova, Alexey Tselishchev, Dmitry Yemelyanov and Petr Potekhin

In this paper, we propose a meta-data based approach for a deliberate job flow distribution in computing environments, such as utility Grids. Under conditions of a heterogeneous job ow composition and a variety of resource domains, we examine how different job and resource characteristics affect the efficiency of the scheduling process. Based on the most significant job ow and resource domain characteristics a heuristic distribution quality indicator is introduced. Additional simulation study is performed to verify the indicator in different distribution strategies and to compare them with a random job ow allocation.

*"A Data Processing Framework for Distributed Embedded Systems"*

Ichiro Satoh

A MapReduce-based framework for processing data at nodes on the Internet of Things (IoT) is presented in this paper. Although MapReduce processing and its clones have been designed for high-performance server clusters, the processing itself is simple and generalized, so it should be used in non-high-performance computing environments, e.g., IoT and sensor networks. The proposed framework is unique among the other MapReduce-based processing approaches, because it can locally process the data maintained in nodes on the IoT rather than within high performance server clusters and data centers. It deploys programs for data processing at the nodes that contain the target data as a map step and executes the programs with the local data. Finally, it aggregates the results of the programs to certain nodes as a reduce step. The architecture of the framework, its basic performance, and its application are also described here.

*"A Distributed Reputation-based Framework to Support Communication Resources Sharing"*

Antonello Comi, Lidia Fotia, Fabrizio Messina, G.Pappalardo, Domenico Rosaci, and Giuseppe M. L. Sarné

Improvements in computational and network capabilities of mobile devices along with the wide spread of wireless networks for smart cities, allow users to make accessible temporarily unused communication resources for free or for a fee. Such interesting scenario introduces, however, some critical issues due to reliability of users sharing/consuming resources which are a further concern with respect to those strictly referred to the security. To tackle such problems, in this paper we propose a distributed multi-agent framework, exploiting reputation information, which considers both the price paid by mobile users for resources and some countermeasures to detect malicious users, as confirmed by experimental results.

*"Improving the Weighted Distribution Estimation for AdaBoost using a Novel Concurrent Approach"*

Héctor Allende-Cid, Carlos Valle, Claudio Moraga, Hector Allende and Rodrigo Salas

AdaBoost is one of the most known Ensemble approaches used in the Machine Learning literature. Several AdaBoost approaches that use Parallel processing, in order to speed up the computation in Large datasets, have been recently proposed. These approaches try to approximate the classic AdaBoost, thus sacrificing its generalization ability. In this work, we use Concurrent Computing in order to improve the Distribution Weight

estimation, hence obtaining improvements in the capacity of generalization. We train in parallel in each round several weak hypotheses, and using a weighted ensemble we update the distribution weights of the following boosting rounds. Our results show that in most cases the performance of AdaBoost is improved and that the algorithm converges rapidly. We validate our proposal with 4 well-known real data sets.

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| | Friday<br>October 9th, 2015 |
|---|---|
| 9:00 | Session 7                    Machine Learning<br>Room Santa Maria<br>Chair: Fabrizio Messina |

*"Self-Optimizing a Multi-Agent Scheduling System: a Racing based approach"*

Ivo Pereira and Ana Madureira

Current technological and market challenges increase the need for development of intelligent systems to support decision making, allowing managers to concentrate on high-level tasks while improving decision response and effectiveness. A Racing based learning module is proposed to increase the effectiveness and efficiency of a Multi-Agent System used to model the decision-making pro-cess on scheduling problems. A computational study is put forward showing that the proposed Racing learning module is an important enhancement to the developed Multi-Agent Scheduling System since it can provide more effective and efficient recommendations in most cases.

"Collaborative Filtering with Hybrid clustering integrated Method to address new-item cold-start problem"

Ferdaous Hdioud, Bouchra Frikh, Asmaa Benghabrit and Brahim Ouhbi

Recommender Systems (RSs) are a valuable and practical tool to cope with information overload, as they help users to find interesting products in a large space of possible options. The Collaborative Filtering (CF) approach is probably the most used technique in RSs field due to several advantages as the ease of implementation, accuracy and diversity of recommendations. Despite being much favored over Content-Based (CB) techniques, it suffers from a major problem related to the lack of sufficient data for new-item cold-start problem, which affects recommendations' quality. This paper is focused on resolving issues related to item-side in order to produce effective recommendations. To overcome the above problem, we use a powerful content clustering based on Hybrid Features Selection Method (HFSM), to get the maximum profit from the content. Then, it will be combined side by side to CF under a hybrid RS to improve its performance and handle new-item issue. We evaluate the proposed algorithm experimentally either in no cold-start situation or in a simulation of a new-item cold-start scenario. The conducted experiments show the ability of our hybrid recommender to deliver more accurate predictions for any item and its outperformance on the classical CF approach, which doesn't work as usual especially in cold-start situations.

**FRIDAY, 9th**

*"Applying Reinforcement Learning in Formation Control of Agents"*

Vali Derhami and Yusef Momeni

This paper proposes a new Reinforcement Learning (RL) algorithm for formation of agents in regular geometric forms. Due to curse of dimensionality problem, applying RL algorithms in formation problems cannot present suitable performance. Moreover, since the state space in formation problem is large, this leads to long learning time. Here, a multi-agent fuzzy reinforcement learning algorithm is presented that is an extension of fuzzy actor-critic reinforcement learning in a multi-agent environment. The final action for each agent is generated by a zero order T-S fuzzy system. In conventional fuzzy actor-critic RL, there are several candidate actions for consequence of each fuzzy rule and aim of learning is finding the best action among these discrete candidate actions. Here, using the proposed linear interpolation, a continuous action selection for determining the best action for each fuzzy rule is presented. The simulation results show the proposed method can improve the learning speed and action quality.

*"Context Time-Sequencing for Machine Learning and Sustainability Optimization"*

Fábio Silva and Cesar Analide

Computer systems designed to help user in their daily activities are becoming a norm. Specially, with the advent of the Internet of Things (IoT) where every device is interconnected with others through internet based protocols, the amount of data and information available has increased. Tracking devices are targeting more and more activities such as fitness, utilities consumption, movement, environment state, weather. Nowadays, a challenge for researchers is to handle such income of data and transform it into meaningful knowledge that can be used to predict, foresight, adapt and control activities. In order to this, it is necessary to interpret contextual information and produce services to anticipate these conditions. This project aim to provide a system for the creation of information and data structures to generate user models based on activity and sensor based contextual-information to anticipate future states.

| 11:00 | Keynote Speaker       Fernando Boavida<br>Room Santa Maria<br>Chair: Alexandre Santos |
|-------|---------------------------------------------------------------|

**FRIDAY, 9th**

| 14:30 | Workshop    FI&SN'2015 |
| --- | --- |
| | International Workshop on Future Internet and Smart Networks |
| | Room São Jorge |
| | Chairs: Alexandre Santos, Pascal Lorenz and António Costa |

*"SDN-Based Services Delivering in Smart Environments"*

Lucas Mendes Ribeiro Arbiza, Liane Margarida Rockenbach Tarouco, Leandro Márcio Bertholdo and Lisandro Zambenedetti Granville

Internet of Things scenarios demand adaptability to hold the heterogeneity of systems and devices employed; gateway-based solutions are a common answer to the issues of smart environments. The development of software for gateways, using a middleware to handle the different devices demands, is possible in our working scenario, but the maintenance cost of such a solution is high because of software development constraints imposed by hardware and system limitations of the gateway. This paper depicts an SDN approach for smart environments resulted from a refactoring of a previous middleware proposal. Through an instantiation of the refactored middleware in a home network to deliver a health monitoring service the benefits are demonstrated; the benefits regard the digital representation of the physical realm, deployment and maintenance of services, and management of devices and networks.

*"Automated Network Resilience Optimization using Computational Intelligence Methods"*

Vitor Pereira, Miguel Rocha and Pedro Sousa

This paper presents an automated optimization framework able to provide network administrators with resilient routing configurations for link-state protocols, such as OSPF or IS-IS. In order to deal with the formulated NP--hard optimization problems, the devised framework is underpinned by the use of computational intelligence optimization engines, such as Multi--objective Evolutionary Algorithms (MOEAs). With the objective of demonstrating the framework capabilities, two illustrative Traffic Engineering methods are described, allowing to attain routing configurations robust to changes in the traffic demands and maintaining the network stable even in the presence of link failure events. The presented illustrative results clearly corroborate the usefulness of the proposed automated framework along with the devised optimization methods.

*"An Automated Framework for the Management of P2P Traffic in ISP Infrastructures"*

Pedro Sousa

Peer-to-Peer (P2P) is nowadays a widely used paradigm underpinning the deployment of several Internet services and applications. However, the management of P2P traffic aggregates is not an easy task for Internet Ser-

**FRIDAY, 9th**

vice Providers (ISPs). In this perspective, and considering an expectable proliferation in the use of such applications, future networks require the development of smart mechanisms fostering an easier coexistence between P2P applications and ISP infrastructures. This paper aims to contribute for such research efforts presenting a framework incorporating useful mechanisms to be activated by network administrators, being also able to operate as an automated management tool dealing with P2P traffic aggregates.

*"A Geographic Opportunistic Forwarding Strategy for Vehicular Named Data Networking"*

Xuejie Liu, M. João Nicolau, António Costa, Joaquim Macedo and Alexandre Santos

Recent advanced intelligent devices enable vehicles to retrieve information while they are traveling along a road. The store-carry-and-forward paradigm has a better performance than traditional communication due to the tolerance to intermittent connectivity in vehicular networks. Named Data Networking is an alternative to IP-based networks for data retrieval. On account of most vehicular applications taking interest in geographic location related information, this paper propose a Geographical Opportunistic Forwarding Protocol (GOFP) to support geo-tagged name based information retrieval in Vehicle Named Data Networking (V-NDN). The proposed protocol adopts the opportunistic forwarding strategy, and the position of interest and trajectories of vehicles are used in forwarding decision. Then the ONE simulator is extended to support GOFP and simulation results show that GOFP has a better performance when compared to other similar protocols in V-NDN.

FRIDAY, 9th

| 14:30 | Workshop    WSRL'2015 |
|---|---|
|  | Workshop on Cyber Security and Resilience of Large-Scale Systems |
|  | Room São Miguel |
|  | Chairs: Massimo Ficco and Salvatore D'Antonio |

*"A Semantic Driven Approach for Consistency Verification between Requirements and FMEA Analysis"*

Gabriella Gigante, Francesco Gargiulo, Massimo Ficco and Domenico Pascarella

Consistency within the system life cycle is difficult to guarantee, due to the cross of different skills and requirements, often expressed by means of different languages. In particular, in safety-critical systems consistency between software requirements and safety analysis requires checks to guarantee that safety engineer needs are feasible and implemented by the system. Failure Mode and Effects Analysis (FMEA) is a systematic technique to analyze the failure modes of components, evaluating their impact and their mitigation actions, which are procedures to be implemented by operators or by the system itself (usually by the software). Although the actual efforts to centralize system information in a structured way, safety analysis is not tied in a structured manner to other systems, in particular to software. This paper proposes an automatic approach to check consistency between FMEA and software requirements with a bit effort of formalization. The approach models FMEA and software requirements with Resource Description Framework (RDF) triplets and checks their consistency on the basis of consistency rules.

*"An Analytical Approach for Optimal Resilience Management in Future ATM Systems"*

Domenico Pascarella, Francesco Gargiulo, Angela Errico and Edoardo Filippone

The air transportation system is a large-scale socio-technical system and its modelling approaches emphasize the sociological dimension due to the increasing importance of collaborative decision-making processes in the future Air Traffic Management (ATM). Resilience is assuming an increasing importance within ATM, but it is difficult or even impossible to establish the resilience role in realizing the targeted performance levels of an air traffic system. This paper proposes a systematic methodology for resilience management in ATM. It introduces an analytical definition of a resilience metric for an ATM system and formally states the resilience management problem as an optimization problem. Moreover, it describes a strategy for the problem solution and provides some preliminary results in order to quantitatively prove the validity of the methodology.

**FRIDAY, 9th**

*"Enabling convergence of physical and logical security through intelligent event correlation"*

Gianfranco Cerullo, Luigi Coppolino, Salvatore D'Antonio, Valerio Formicola, Gaetano Papale and Bruno Ragucci

Until now, in most organizations, physical access systems and logical security systems have operated as two independent elements, and have been managed by completely separate departments. The lack of interoperability between the two sectors often resulted in a security hole of the overall infrastructure. An attacker who has physical access can not only steal a PC or confidential data, but can also compromise network security. Therefore, a combination of physical and logical security definitively allows for a more effective protection of the organization. In this work we present a correlation system which aims at bringing a significant advancement in the convergence of physical and logical security technologies. By "convergence" we mean effective cooperation (i.e. a coordinated and results-oriented effort to work together) among previously disjointed functions. The holistic approach and enhanced awareness technology of our solution allows dependable (i.e. accurate, timely, and trustworthy) detection and diagnosis of attacks. This ultimately results in the achievement of two goals of paramount importance, and precisely guaranteeing the protection of citizens and assets, and improving the perception of security by citizens. The effectiveness of the proposed solution is demonstrated in a scenario that deals with the protection of a real Critical Infrastructure. Three misuse cases have been implemented in a simulation environment in order to show how the correlation system allows for the detection of different attack patterns.

*"Model-Based Vulnerability Assessment of Self-Adaptive Protection Systems"*

Ricardo J. Rodriguez and Stefano Marrone

Security mechanisms are at the base of modern computer systems, demanded to be more and more reactive to changing environments and malicious intentions. Security policies unable to change in time are destined to be exploited and thus, system security compromised. However, the ability to properly change security policies is only possible once the most effective mechanism to adopt under specific conditions is known. To accomplish this goal, we propose to build a vulnerability model of the system by means of a model-based, layered security approach, then used to quantitatively evaluate the best protection mechanism at a given time and hence, to adapt the system to changing environments. The evaluation relies on the use of a powerful, flexible formalism such as Dynamic Bayesian Networks.

*"Forensic Data Analysis Challenges in Large Scale Systems"*

Damien Conroy

Large-scale systems generate data, including log data, on a different scale to that typically subjected to either monitoring or forensic analysis. Where scale renders the tasks of security monitoring or investigation overwhelming this represents a vulnerability. There is significant scope to apply big-data techniques to the challenges of monitoring and forensic data analysis in large-scale systems. However, it is key that, where big-data techniques are applied, accepted standards for eDiscovery are adhered to, so that the results of any forensic analysis stand the best chance of being accepted as evidence.

**FRIDAY, 9th**

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