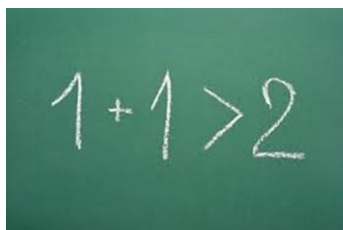




Research Synergies



This is a period in which CTS members have been involved in multiple activities, including participation in 75 ongoing research projects and organization of several international events, which shows the active role of CTS in the international research community.

A major challenge now is to break the walls of research silos in order to leverage the potential of multi-disciplinary and interdisciplinary research. As it is well known, many opportunities for innovative research lie on the border zones between disciplines.

A well-known phenomenon is that it is easier to collaborate with distant groups than with colleagues next door, and we are not an exception. But we could reach a much wider impact potential if we re-enforce the internal collaboration. In fact, most of the running projects could benefit from knowledge from other CTS groups. As widely acknowledged, seeking synergies among different knowledge areas can lead to:

- Complementary views, getting a more comprehensive understanding of the issues;
- Adding competences, combining experiences, approaches and methods;
- Enlarging networking and impact;
- Increasing competitiveness in the national and international scientific community;
- Better decision-making / problem solving capabilities;
- Sharing resources;
- Etc., among several other benefits.

Another example: most organized events could involve more groups / research areas. Seating at the opening keynote session of Petri Nets 2023 I couldn't avoid feeling sad. Such a good scientific program and nice community, such a tremendous effort by the local organizers to run a great event, but most groups of CTS didn't take advantage of it. Looking at the program and quality of the contributions, I guess that all research areas of our center could greatly benefit from a stronger involvement in this event. Pity! We need to find ways of increasing synergies among us.

It is all about ambition – do we want to remain a set of small groups (silos) or be relevant actors in creating global impact?

The only way to cope with the contemporary societal challenges and ensuring an effective involvement with societal stakeholders is through a multi-disciplinary and interdisciplinary perspective. Society does not care about self-centered research silos. Of course, research silos are not our original creation, as many organizations suffer from this. But **to really matter we need to break the walls of those silos**.

Of course, we need to be good in our field of expertise to not be afraid of collaboration. Unsecure people do not dare to break the walls. But we have excellent researchers. Let's be ambitious and join efforts to create sustainable impact.

Certainly, inter-group / inter-disciplinary collaboration needs to be based on strong research ethics and RRI (Responsible Research and Innovation) principles. We all need to support the re-enforcement of those principles to ensure a healthy collaborative environment.

Let's put an extra effort into creating positive synergies in CTS.



*Luis Camarinha-Matos
Director of CTS*

Editorial

CTS had the visit of the External Advisory Board, where there was the opportunity to present CTS' high-quality research and gather the External Advisory Board Members suggestions. In the upcoming days, CTS' members will be involved in four exciting scientific events: DoCEIS 2023, YEF-ECE 2023, SMARTGYsum doctoral school and Petri Nets 2023. DoCEIS 2023 serves as a platform for doctoral students to share their work, fostering collaboration and knowledge exchange. IES/IEEE technical co-sponsored conference YEF-ECE 2023 provides a space for new engineers to showcase their ideas. The SmartGYsum Doctoral School (ITN Marie-Curie project) catered to Early Stage Researchers in the European Electric Energy Systems domain, offering comprehensive lectures to enhance their expertise. Lastly, Petri Nets 2023 brings together experts in the formal modelling and analysis of concurrent systems, enabling the dissemination of cutting-edge research and promoting advancements in the field. Each event had its unique focus, attracting professionals, academics, and enthusiasts who were passionate about their respective areas of interest. These events played a crucial role in advancing research, fostering innovation, and building connections within the scientific community. Participants left with new insights, expanded networks, and a renewed enthusiasm to push the boundaries of their fields.

João Martins
CTS Communication Officer

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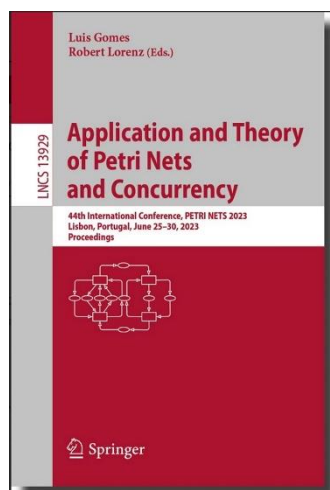
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Petri Nets 2023



The 44th edition of the Petri Nets conference, an event co-sponsored by CTS, took place on our campus on 25-30 Jun 2023.

An excellent event organized by Luis Gomes and his team that brought a very dynamic community that has been able to keep an active research agenda for an impressive number of years.

Congratulations !

<https://petrinets2023.deec.fct.unl.pt/>



Visit of External Advisory Board

On 16-17 March 2023 we had the visit of the External Advisory Board of CTS. It was an opportunity to summarize the achievements of the center in the last 5 years (2018-2022). The event included a plenary presentation of the main achievements and a demonstration of several prototypes, during the first day. The second day was devoted to a brainstorming session on the strategy and directions for future research on advanced cyber-physical systems, and to getting feedback and recommendations from the EAB members.

The EAB is composed of:

- Academia: Prof. Arturo Molina (Monterrey Tech, Mexico), Prof. Leopoldo Franquelo (U Sevilla, Spain), Prof. Weiming Shen (Huazhong University of Science and Technology, China)
- Industry: Christoph Hanisch (former FESTO, Germany), João Manuel Melo (former CTT, Portugal).



An exhibition of representative R&D prototypes and systems on advanced cyber-physical systems was organized in the facilities of Uninova.

This was an excellent occasion to reflect on our achievements during the last 5 years and to start a brainstorming exercise about the strategy for next 5-year period.

Important feedback and suggestions were collected from the members of the EAB.



Snapshots of prototype demonstrations for the External Advisory Board

Event with the Portuguese Government

On March 29 the event "Governo+Próximo" brought a government delegation to the NOVA School of Sciences and Technology. The delegation consisted of Catarina Sarmento e Castro, Minister of Justice; Elvira Fortunato, Minister of Science, Technology and Higher Education; Isabel Ferreira, Secretary of State for Regional Development; Mário Campolargo, Secretary of State for Digitalization and Administrative Modernization; and Cláudio Vilar Furtado, President of the National Institute of Industrial Property. During this visit, two presentations were made on projects that were deemed to have a significant societal impact. In this context, Professor José Manuel Fonseca presented the IPSTERS, FORESTER, and FUELMON projects, all of which were coordinated by members of CTS-UNINOVA. The session showcased the results achieved by the three FCT funded projects, all contributing to the improved management of the territory, particularly in the prevention and fight against wildfires.



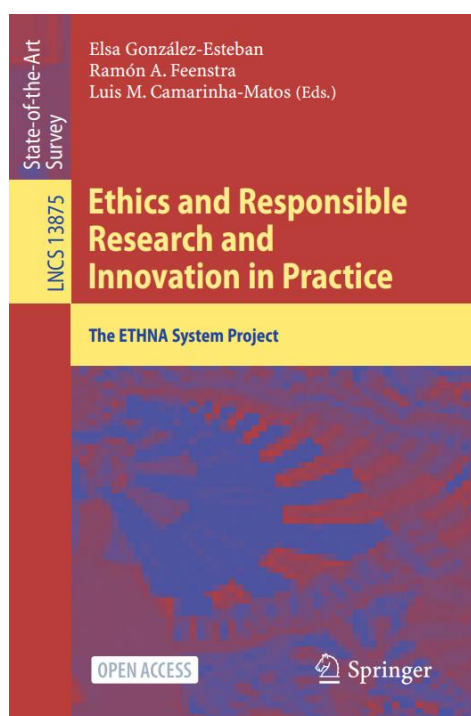
IMPACTOUR: Final Event

IMPACTOUR project had its final event in Madrid, last 20 and 21 of June, where Sneška Quaedvlieg-Mihailović (EUROPANOSTRA Secretary General) made an invited presentation. IMPACTOUR also organized and participated in the International Conference on Cultural Tourism Advances, held in Brussels from 27 to 28 of June.

The goal of the Conference was to further understand the sustainable development potential of cultural tourism by focusing on successful policy interventions, new cultural tourism trends, advances in visitor management systems, and new business and/or governance models. The Policy sessions addressed sustainable development strategies with the participation of representatives from UNESCO, European Travel Commission, European Cultural Tourism Network and Europa Nostra. Also present were the COST Director and the Directorate General for Research and Innovation, the Directorate General for Education and Culture, and the Directorate General for Internal Market, Industry, Entrepreneurship and SMEs of the European Commission.



New Open Access Book



Innovation and research centers, universities, and their researchers need to achieve results in very competitive contexts, as they are increasingly subject to high-pressure situations, which can lead to some unacceptable behaviors. At the same time, there is a growing awareness of the need to conduct such research and innovation activities with honesty and integrity, respecting well-accepted practices and shared ethical and social values. In this context, there has been a growing discussion about the responsibility that institutions have in relation to promoting policies conducive to research integrity, public engagement, open access, and gender equality in research processes. Various ethics management instruments – such as codes of ethics and best practices or ethics committees – can play a prominent role in achieving the above goals.

In recent years, ethics committees, for example, have been gradually consolidated in different contexts, and it is not uncommon for specific funding organizations or specific scientific journals to make it a prerequisite for funding or publishing research work. However, the implementation and consolidation of these ethics tools have undergone a long and complex process. Moreover, it is also not a homogeneous process in each of the different countries. Even when institutions attempt a top-down implementation approach, individual researchers and other stakeholders are often too busy with their own projects to get involved in the process.

With this in mind, the European initiative ETHNA System has designed an ethics governance framework that can be implemented following specific guidelines and tools that can help different types of institutions to promote and generate responsible research and innovation.

This multi-author book aims to present these practical contributions, their conceptualization and characteristics, as well as the experience gained from their application in different institutions. Its main objective is to provide a practical and useful guide that will help other institutions to start introducing Research Ethics effectively in their organizations. In this sense, the book clearly distinguishes itself from other existing publications in research ethics that have more theoretical and philosophical content, without providing practical guidance. In addition, and drawing on prominent international researchers, the book also includes topics of future relevance in the

The book includes a specific chapter on the implementation of RRI at CTS:

Implementing RRI in a Research and Innovation Ecosystem

Luís M. Camarinha-Matos, Filipa Ferrada & Ana Inês Oliveira

New organizational forms are emerging today at all levels of society, and more and more research is conducted in dynamic collaborative networks or ecosystems. Unlike traditional research centers, these new types of organization are very dynamic, with fluid boundaries, and volatile in terms of membership. This characteristic requires that more attention be paid to research ethics and RRI. This work reports on an implementation process carried out in a research and innovation ecosystem according to the principles and guidelines proposed by the ETHNA project. The process, its barriers and drivers are described, and finally, learned lessons and recommendations are presented.

https://doi.org/10.1007/978-3-031-33177-0_6



field that arise from the current push for (the realization of) an honest and open science.

The results of the book are an outcome of the ETHNA system project (developed in the years 2020–2023) with the participation of various members of the project as well as external researchers who stand out for their knowledge in the field of RRI and research ethics.

Available in open access:

<https://doi.org/10.1007/978-3-031-33177-0>

ETHNA System Final Conference

"Ethics and Responsible Research and Innovation in Practice"

The ETHNA System Project organized its Final Conference in Castellón de la Plana, Spain, on 15-16 June 2023, during which we presented the results of the Research and Innovation Governance Ethical System that we have designed and implemented along the last three years and a half. During the conference we also debated about the future challenges in order to advance in the consolidation of a Responsible and Open Science. Sister projects, and other experts and entities interested in grounding ethical governance for the use of responsible research and innovation (RRI) in Higher Education, Research Funding, Innovation Ecosystems and Research Centres, also participated.



"A long and winding road"... At the ETHNA System Final Conference, partners from Universitat Jaume I, Applied Research and Communications Fund, UNINOVA-CTS, and Education and Youth Board of Estonia talk about their experiences in applying the ETHNA System and research ethics tools in four different contexts.



<https://www.youtube.com/watch?v=eMN23wy-4co>

(CTS presentation: 2:14:38)

<https://www.youtube.com/watch?v=L6wc9lwHHt0>
<https://www.youtube.com/watch?v=7xql03H2FV0>



Doctor Honoris Causa

On May 26, 2023, Prof. José Barata was bestowed with the honorary title of Doctor Honoris Causa by the Technical University of Cluj Napoca, Romania, in recognition for his contributions to science and technology and his outstanding academic achievements.

Congratulations, José!

With this recognition, CTS now counts on **two** of its members holding the prestigious title of *Doctor Honoris Causa* in the field of Robotics and Intelligent Manufacturing.



Recent PhD Thesis

Thesis: Evaluating Resilience of Cyber-Physical-Social Systems - Using Graphical Security Models and Timed Coloured Petri Nets

PhD Candidate: Shabnam Pasandideh

Supervisor: Luis Gomes Co-supervisor: Pedro Pereira

NOVA School of Science and Technology, 8 March 2023

Nowadays, protecting the network is not the only security concern. Still, in cyber security, websites and servers are becoming more popular as targets due to the ease with which they can be accessed when compared to communication networks. Another threat in cyber physical social systems with human interactions is that they can be attacked and manipulated not only by technical hacking through networks, but also by manipulating people and stealing users' credentials. Therefore, systems should be evaluated beyond cyber security, which means measuring their resilience as a piece of evidence that a system works properly under cyber-attacks or incidents. In that way, cyber resilience is increasingly discussed and described as the capacity of a system to maintain state awareness for detecting cyber-attacks. All the tasks for making a system resilient should proactively maintain a safe level of operational normalcy through rapid system reconfiguration to detect attacks that would impact system performance. In this work, we broadly studied a new paradigm of cyber physical social systems and defined a uniform definition of it. To overcome the complexity of evaluating cyber resilience, especially in these inhomogeneous systems, we proposed a framework including applying Attack Tree refinements and Hierarchical



FUTURE EVENTS



14th Advanced Doctoral
Conference on Computing,
Electrical and Industrial Systems



**Technological Innovation for Connected
Cyber Physical Spaces**

July 5-7, 2023
Caparica (Lisbon) – Portugal

Preliminary Program:

A – Energy Communities

- **A Critical Review of District Heating and District Cooling Socioeconomic and Environmental Benefits**
S.M. Masum Ahmed, Edoardo Croci, Annamaria Bagaini
- **A Collaborative Dimension for Renewable Energy Communities**
Kankam O. Adu-Kankam, Luis M. Camarinha-Matos
- **Storage System for Energy Communities**
Adriana Mar, Pedro Pereira, João F. Martins
- **Renewable Energy Communities in Africa: A Case Study of Five Selected Countries**
Mathew Atinsia Anabadongo, Kankam O. Adu-Kankam, Felix Amankwah Diawuo

B – Smart Energy and Power Systems

- **Optimal Load Shedding for Smart Power Grid Resilience Enhancement Considering Cyber-Physical Constraints**
Sonia Hosseinpour, João Martins
- **Superconducting Saturable Core Reactor as Variable Inductance for Controlling the Power Flow in a Transmission Line**
Leonardo Miúdo, João Murta Pina, Nuno Amaro
- **An Overview of the Functions of Smart Grids Associated with Virtual Power Plants including Cybersecurity Measures**
Anas Abdullah Alvi, Enrique Romero-Cadaval, Eva González-Romera, Jamil Hassan, Dmitri Vinnikov

C – Electronics and Communications

- **A Load Balancing Mechanism for 3D Network-on-Chip with Partially Vertically Connected Links**
Shiva Majidzadeh
- **Enhancing Dynamism of IoT Service Composition**
Ruben Gomes, Noélia Correia
- **Systematic Design Methodology for Optimization of Voltage Comparators in CMOS Technology**
João Xavier, Pedro Barquinha, João Goes
- **Trans-Boolean Cyber Physical Systems**
Francisco Neves, Raul Rato, Manuel Ortigueira

D – Intelligent Manufacturing

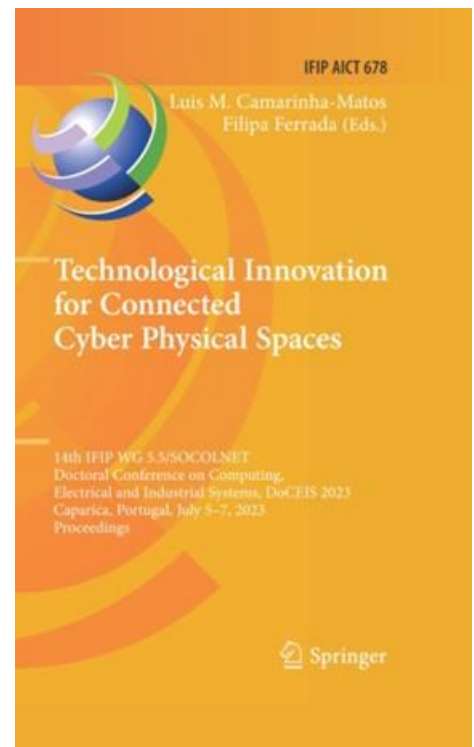
- **A Bio-inspired and Altruistic-based Framework to Support Collaborative Healing in a Smart Manufacturing Shop-Floor**
Luis A. Estrada-Jimenez, Sepideh Kalateh, Sanaz Nikghadam Hojjati, Jose Barata
- **Reconfigurable Framework for Data Extraction Using Interoperable Brokers in Manufacturing**
Nelson Freitas, Andre Dionisio Rocha, Fábio M-Oliveira, Duarte Alemão, José Barata
- **Synthetic Data Generation on Dynamic Industrial Environment for Object Detection, Tracking, and Segmentation CNNs**
Danilo G.Schneider, Marcelo R. Stemmer

E – Intelligent Computational Systems

- **Preliminary Verification of Liveness in a Control Part of Cyber-Physical Systems modeled by a Petri Net**
Mateusz Poplawski, Remigiusz Wiśniewski, Grzegorz Bazydło, Maxim Maliński
- **QIBERT-Classifying Online Conversations Messages with BERT as a Feature**
Bruno D. Ferreira-Saraiva, Manuel Marques-Pita, João Pedro Matos-Carvalho, Zuñil Pirola
- **Supply Chain Quality Improvement Based on Customer Compliance**
Rene Maas, Eduard Shevtshenko, Tatjana Karaulova
- **Monte Carlo Simulation Applicable for Predictive Algorithm Analysis in Aerospace**
Jorge Bautista Hernández, María Ángeles Martín Prats

F – Health and Biomedical Information Systems

- **Cleaning ECG with Deep Learning: A Denoiser Based on Gated Recurrent Units**
Mariana Dias, Phillip Probst, Luís Silva, Hugo Gamboa
- **Exploring Kolmogorov Complexity Approximations for Data Analysis: Insights and Applications**
Jorge Miguel Silva, Diogo Pratas, Sérgio Matos
- **Clinical Data Integration Strategies for Multicenter Studies**
João Rafael Almeida, Alejandro Pazos, José Luís Oliveira
- **Support Operation and Maintenance of Power Wheelchairs with Digital Twins: The IoT and Cloud-based Data Exchange**
Carolina Lagartinho-Oliveira, Filipe Moutinho, Luís Gomes



<https://doceis.dee.fct.unl.pt/>

YEF-ECE 2023



Preliminary Program: 7 Jul 2023

Y1 – Electronics

Machine Learning Techniques in Modern Chipless RFID Environments
Marcelo Colaço, Tommy Alstrøm, Hiba Nassar and João Goes

Design of an RF-CMOS Switched-Capacitor Power Amplifier for NB-IoT RF Transceivers
Ana Isabel Ferreira dos Santos and João Pedro Abreu de Oliveira

Oscillator-based dynamic entropy for TRNG

João Lameiras, Luís Oliveira, Joao Cabacinho and João Casaleiro

Visible Light Communication at Urban Intersections to Improve Traffic Signaling and Cooperative Trajectories

Gonçalo Galvão, Manuel Augusto Vieira, Manuel Vieira, Paula Louro, Mario Véstias and Pedro Vieira

Assessment of the Zero Distortion Bias Point Using Design-Oriented 7-Parameter MOSFET Model

Rodrigo Pinto, Pedro Toledo and João Oliveira

Banana Ripening Assessment Classification using Artificial Intelligence Algorithms with Electrochemical Impedance Spectroscopy Data

Eduardo Gonçalves Freitas, João Matos Carvalho and Rui Manuel Tavares

Y2 – System Development and Control

True Random Number Generator Prototype Implemented in an FPGA

Rafael Oliveira, João Cabacinho, Luís Oliveira and João Casaleiro

Performance evaluation of TRNG based on Ring Oscillators implemented on FPGA

Guilherme Matos, Pedro Correia, José Rocha, João Casaleiro and Luis Oliveira

Automatic Python code generation for Embedded/Cyber-Physical Systems

Pedro Vale and Fernando Pereira

EMG Based MIDI Controller

Sebastião Pedrosa and Anikó Costa

Instrumentation and control of a target fixed-wing drone for launch and capture

João Carvalho and Bruno J. N. Guerreiro

Y3 – Power Electronics and Systems Analysis

Control of Nine-Phase Machine with Strongly Coupled Winding Sets

Živa Stare, Rastko Fišer and Klemen Drobnič

A DC Solid State Transformer to Interconnect Bipolar DC Microgrids with Voltage Balance Support

Fábio Sobral, V. Fernão Pires and A. J. Pires

MMLIBB DC-DC Converter: A Novel Modular, Multi-Level, Interleaved-Based, Bidirectional Topology

Vitor Monteiro and Joao Afonso

Optimization of a green hydrogen production system

Jesús Sánchez Solís, Enrique Romero Cadaval, Javier Rodríguez Barrero and Fermín Mendoza Azores

Model Generation and Origin – Destination (OD) Matrix Forecasting for metro systems

Daniel Sanz Sobrino, Javier Andión, Juan C. Dueñas, José M. del Álamo and Felix Cuadrado

An Air Balancing Method For Multi-Zone Ventilation Systems Based On Leader-Follower Consensus

Mingwei Su, Yuntao Liu, Can Cui and Jing Xue

Y4 – Control Systems

ETDA a tool for the development of e-tongues

Tiago Reis, Maria Fino and Maria Raposo

Monitoring Roadside Traffic Enforcement Equipment within SoT and ISoS Frameworks

Bruno Serras, Carlos Goncalves, A. Luís Osório and Tiago Dias

Blockchain Technology for E-Notary in Collaborative Networks

João Goulão and Ana Inês Oliveira

Collaborative Networks to Support Emergency Situations

Cláudio Morais and Ana Inês Oliveira

Toward an integrated and supported machine learning process

César Alejandro Achig Ramirez, Guillermo Chinarro Álvarez, Hugo Alexer Parada Gelvez, Javier Andión and Juan C. Dueñas

Navigation for a mobile robot to inspect aircraft

Thanavin Mansakul, Ip-Shing Fan and Gilbert Tang

<https://yef-ece.deec.fct.unl.pt/>

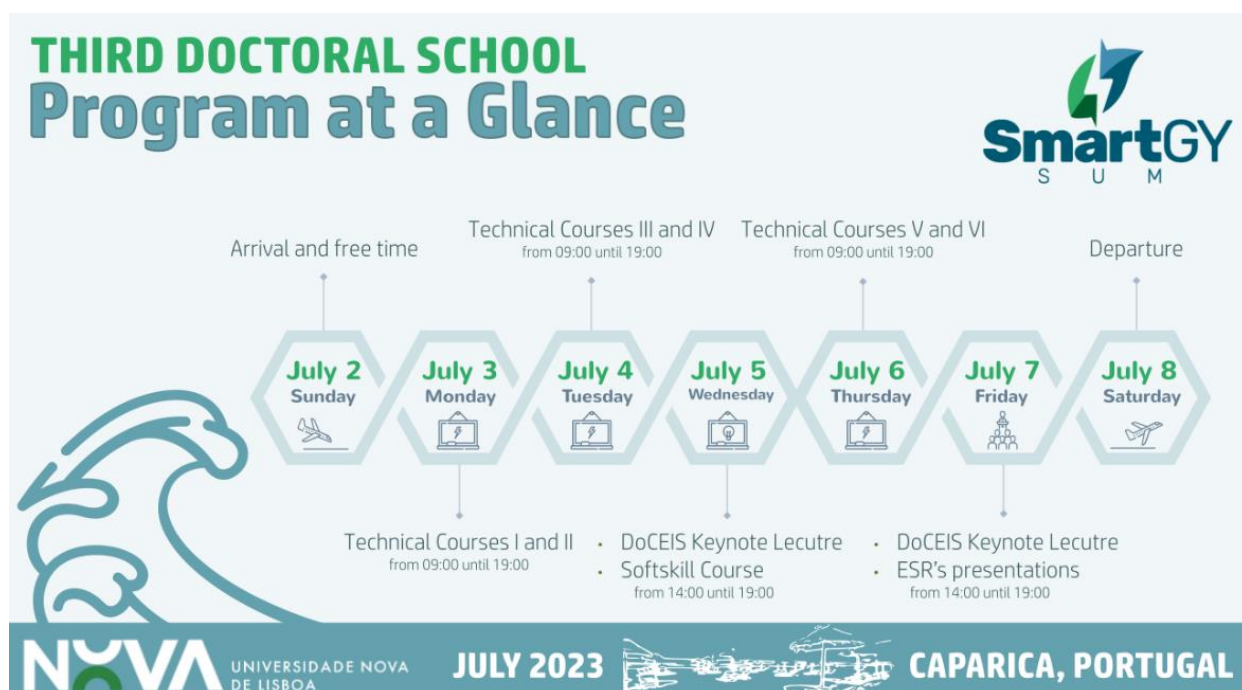


Proceedings of YEF-ECE 2023, including the papers presented at the event, will be proposed to be published by IEEE and included in IEEE Xplore Digital Library.



Doctoral Summer School

The 3rd Doctoral School of the European Training Network project SMARTGYsum is organized in our campus in the same week of DoCEIS 2023/YEF-ECE 2023.



<https://smartgysum.eu/Home/TThirdSchool>

The school includes two sessions contributed by CTS members:

- Technical course on Collaborative Networks (L. M. Camarinha-Matos, A. I. Oliveira)
- Special course on Research Ethics and Proposal Writing (L. M. Camarinha-Matos, F. Ferrada).

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