

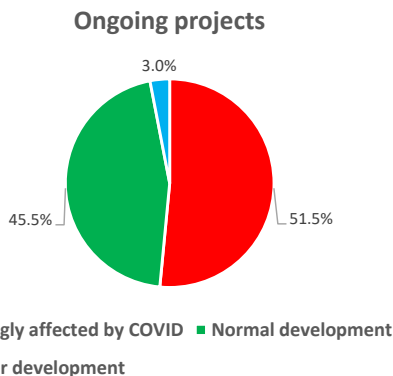


CTS through the first 3 months of COVID-19

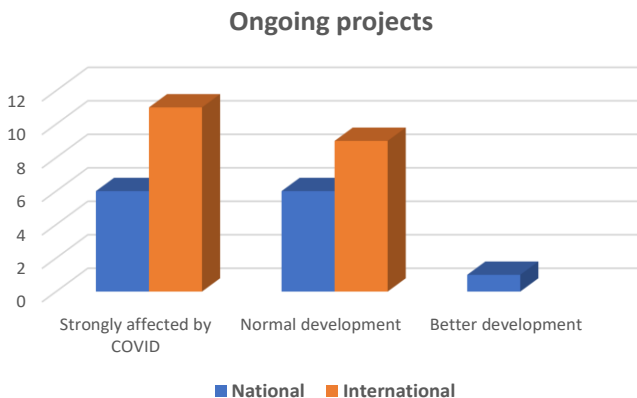
Like most other organizations, CTS had its activities suddenly disrupted by the ongoing COVID-19 pandemic. In order to get some insight on the level of impact, a brief survey was conducted with the various research groups of the center. The findings are briefly summarized below.

Impact on ongoing research projects

Although researchers had to quickly adapt to remote working almost half of the ongoing projects continued their normal developments during these 3 months, as shown below. These numbers are based on a sample of 33 projects.

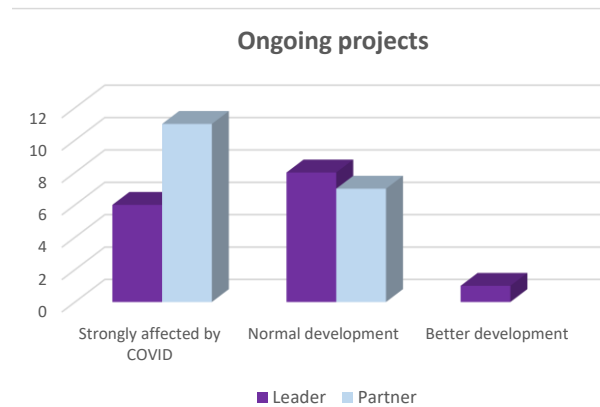


The percentages are not very different when we consider the national versus the international projects.



The case that indicated better development corresponds to a national project, without partners.

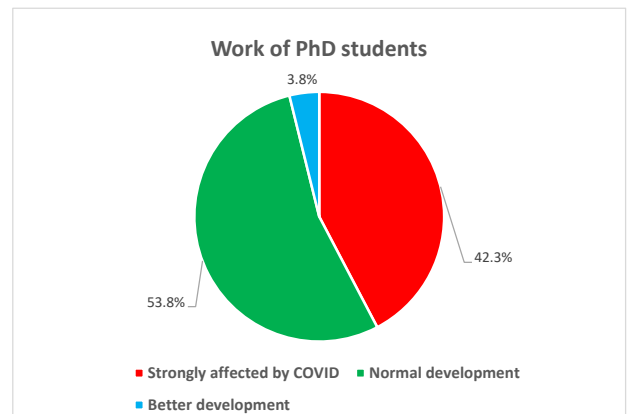
The following diagram shows the distribution when considering projects led by CTS versus projects in which CTS is only a partner.



Impact on the work of PhD students

PhD students are a fundamental pillar of any research center. As such, it is also important to understand how much impact the pandemic had on their work.

From the perspective of the supervisors, the impacts are summarized in the following diagram, based on a partial sample of 52 students.

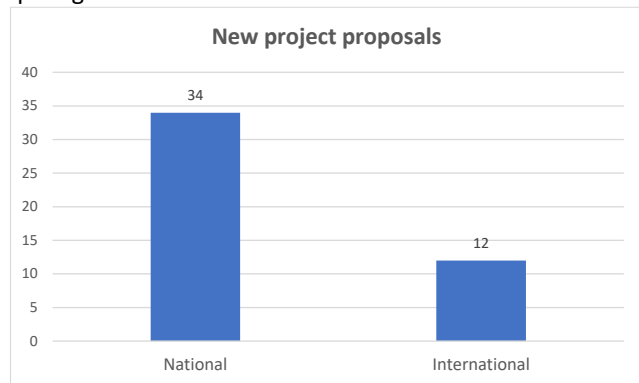


In comparison with the impact on projects, the numbers here are a bit better, as 58% could continue their normal activities. This is probably due to the fact that in many cases the work is carried out in direct connection with the supervisor and not so much dependent on interactions with larger groups.

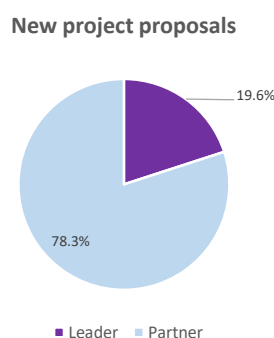
Preparation of new project proposals

This is another important pillar of the activities of a research center and thus it is important to perceive if CTS researchers

could remain engaged in preparing new proposals. Surprisingly quite good numbers could be observed in this dimension.



During these 3 months, CTS researchers were involved in a total of **46 new project proposals**, which is quite remarkable considering the situation. 19.6% of these proposals were led by CTS researchers. In terms of national / international distribution, however, the pattern is symmetric of the tradition of CTS in the last decades.



Of course, many of these proposals were submitted to very competitive programs and at the end what really counts is the number of funded projects. Nevertheless, it is a very positive sign to see that CTS remained very active in planning new initiatives, which opens great hopes for the future.

A good number of proposals (9) are focused on contributions to face COVID-19.

The above figures only reflect the impact over the first 3 months. With a longer disruptive situation the impacts are certainly hard to assess and require new creative ways of working.

Despite all difficulties and the huge effort that most researchers, which are also professors, had to do to quickly adapt to online teaching, the overall results show very positive signs. Besides learning new technologies for remote work and adapting to new working conditions at home, it was also necessary to support families and deal with all uncertainties in this period. As such, I would like to congratulate and thank all of you for showing such resilience in these difficult times. With such energy we can confidently face the future.

Luis Camarinha-Matos
CTS Director

Editorial

Present times are, indeed, strange and unusual times. Due to the pandemic situation we were forced to stay at our homes and obliged to work remotely. We still face hard, difficult and undefined times ahead. Much has been said and there is no point in keep discussing the water under the bridge. Additionally, there is not a general consensus about the present and future actions towards the mitigation of the current situation, either from the social point of view either from its economic implications.

During this time CTS, as other research units and institutes, has tried to adapt to the new situation. It is difficult to assess if the options made were the best ones... Only time will tell... Our students and researchers did their best adapting and pursuing their objectives the best way possible. Some projects were delayed, others extended in time, and others temporarily stopped (fortunately this drastic measure was residual). Nevertheless, and considering that we are reaching the end of the H2020 framework programme, CTS researchers continued elaborating new proposals with their international partners. In house, CTS colleagues, in cooperation with Department of Physics and Department of Mechanical and Industrial Engineering from NOVA School of Science and Technology (FCT NOVA) and other external units, are developing a low-cost ventilator to cope with possible hospital needs under the COVID-19 crisis. We cannot forget the social responsibility that a research unit should also pursue, which in CTS case is a trademark. CTS' health related projects are also in the frontline of our social commitment and engagement.

CTS is prepared to face the new reality, working with other partners involved in its research projects and cooperating in order to help mitigating the current situation, looking at the future with an optimistic view.

João Martins
Communication Officer of CTS

CONTENTS



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- **Editorial2**
- **DoCEIS 20203**
- **YEF-ECE 20207**

New date



**SCIENCE AND
TECHNOLOGY
SUMMIT IN
PORTUGAL**
2-4 NOV. 2020
Lisbon Congress Centre



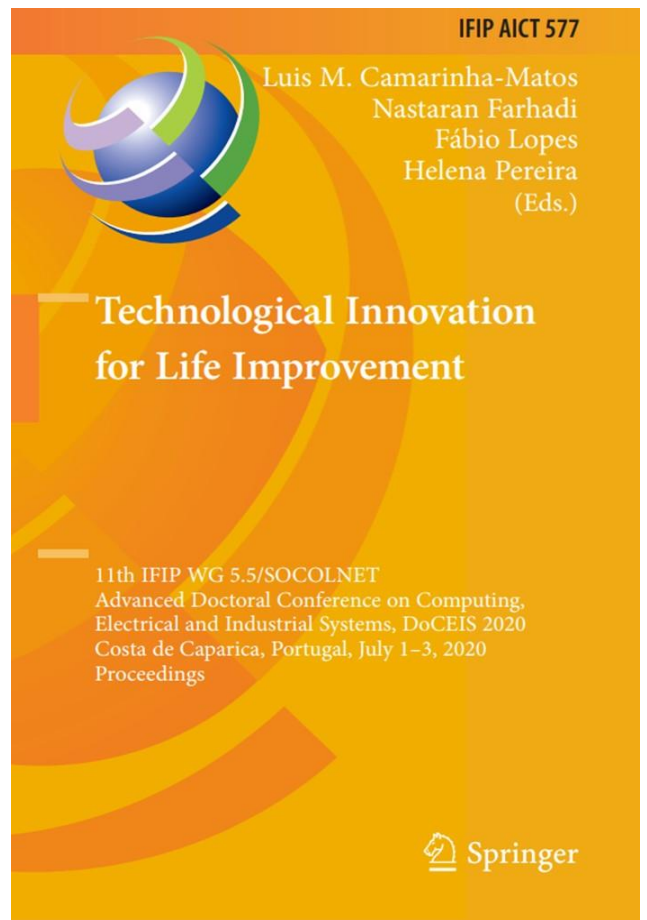
The eleventh edition of the Advanced Doctoral Conference on Computing, Electrical and Industrial Systems, DoCEIS 2020, aims at bringing together PhD students, researchers, and engineers from all over the world, interested in innovative ideas and techniques around **Technological Innovation towards Life Improvement**. Nowadays, life improvement has become a trending topic across different areas due to technological advancements that focus on human wellbeing. Different scientific areas, such as electronics, telecommunications, computing, and energy, are innovating and changing their paradigms to promote a digital-oriented world. Concepts and tools coming from the areas of artificial intelligence, collaborative networks, virtual and augmented reality, machine learning, big data, cyber-physical systems and internet of things, can be adopted to provide a better and sustainable future with high quality of life. The impacts of these technological developments can result in enhancement of health care, environment, manufacturing, transportation, and communication systems across the globe, namely through new products and services. This ongoing digital transformation has a huge potential to facing existing societal challenges, and increasing knowledge, wellbeing, quality of life and collaboration among companies, organizations, people, and systems.

Unfortunately, due to the ongoing COVID-19 pandemic, this year the conference must take place remotely, via **ZOOM** platform.

Proceedings are published by Springer. The YEF-ECE 2020 forum is also organized together with DoCEIS2020.

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

Chair: Luis M. Camarinha-Matos Co-chairs: Luis Gomes, Pedro Pereira, João Goes



Detailed Schedule DoCEIS 2020

Day 1 – Wednesday 1 July 2020

10:00 – 10:30 Opening session

10:30 – 11:30 Keynote 1

Interpretability, Privacy, and Ethics in Intelligent Systems

Catarina Silva

Assistant Professor

Department of Informatics Engineering

University of Coimbra, Portugal

11:30 – 11:40 Break

11:40 – 13:00 Session A

A1 – Decision Systems

Chairs: Amineh Mazandarani, Paula Graça

- **Selecting Normalization Techniques for the Analytical Hierarchy Process**
Nazanin Vafaei, Rita A. Ribeiro and Luis M. Camarinha-Matos
- **ColANet: A UAV Collision Avoidance Dataset**
Dário Pedro, André Mora, João Carvalho, Fábio Azevedo and José Fonseca
- **A Decision-Making Tool to Provide Sustainable Solutions to a Consumer**
Ricardo Santos, J. C. O. Matias and António Abreu
- **A Risk Assessment Model for Decision Making in Innovative Projects**
Vitor Anes, Luis Reis, Elsa Henriques and António Abreu

A2 – Communication Systems

Chairs: Helena Rico Pereira, Omid Nasrollahi

- **Cooperative Communication Mechanisms Applied to Wireless Sensor Network**
Suelen Laurindo, Ricardo Moraes and Carlos Montez
- **Probabilistic Network Coding for Reliable Wireless Sensor Networks**
Eman Al-Hawri, Faraq Al-Tam, Noelia Correia and Alvaro Barradas
- **Joint Channel and Information Estimation on Symbol Decomposition-based Secure Point-to-point Communications**
Akashkumar Rajaram, David Borges, Paulo Montezuma, Rui Dinis, Dushnatha Nalin K. Jayakody and Marko Beko
- **Self-interference in Multi-tap Channels for Full-Duplex Wireless Systems**
Ayman T. Abusabah, Rodolfo Oliveira and Luis Irio

13:00 – 14:00 Break

14:00 – 15:00 Session B

B1 – Collaborative Networks

Chairs: Fabio Seixas Lopes, Luis Alberto Estrada

- **Performance Indicators of a Collaborative Business Ecosystem – A Simulation Study**
Paula Graça and Luis M. Camarinha-Matos
- **Towards a Reference Model for Mass Collaborative Learning**
Majid Zamiri and Luis M. Camarinha-Matos
- **A Framework for Behavioural Change Through Incentivization in a Collaborative Virtual Power Plant Ecosystem**
Kankam O. Adu-Kankam and Luis M. Camarinha-Matos

B2 – Energy Control

Chairs: Leonardo Martins, Filipa Cardoso

- **Prospects for the Improvement of Energy Performance in Agroindustry Using Phase Change Materials**
Carlos Simão, João Murta-Pina, Luís Coelho, João Pássaro, Rui Amaral Lopes, Fernando Reboredo, Tiago Jorge and Diogo Lemos
- **Modeling of Asymmetric Supercapacitor Cells Based on Electrode's Laboratorial Test Data**
Leonardo Malburg and Rita Pereira
- **Design of a SFCL with an Inductive Stage in Series with a Resistive Stage which Transits by Magnetic Field**
Belén Rivera, Alfredo Álvarez and Belén Pérez

15:00 – 15:10 Break

15:10 – 16:10 Session C

C1 – Analysis & Synthesis Algorithms

Chairs: Humberto Queiroz, João Pires

- **Reachability Graph of IOPT Petri Net Models Using CUDA C++ Parallel Application**
Carolina Lagartinho-Oliveira, Filipe Moutinho, and Luís Gomes
- **Automatic Flat-Level Circuit Generation with Genetic Algorithms**
Miguel Campilho-Gomes, Rui Tavares, and João Goes
- **Towards the Detection of Malicious URL and Domain Names Using Machine Learning**
Nastaran Farhadi Ghalati, Nahid Farhady Ghalaty, and José Barata

C2 – Power Transportation

Chairs: Nastaran Farhadi Ghalati, Kankam O. Adu-Kankam

- **Study of Electrical Integrity of Low Voltage Nuclear Power Cables in Case of Plant Life Extension**
Ehtasham Mustafa, Ramy S. A. Afia, Semih Bal and Zoltán Ádám Tamus
- **Investigating the Complex Permittivity of Low Voltage Power Cables Under Different Stresses**
Ramy S. A. Afia, Ehtasham Mustafa, Semih Bal and Zoltán Ádám Tamus
- **Investigation of Power Line Sag Uncertainty in Day-Ahead DLR Forecast Models**
Levente Rácz, Dávid Szabó, Gábor Göcsei and Bálint Németh

16:10 - 17:00 Horizontal Session

- **Using Energy Flexibility to Improve the Grid Interaction of nearly Zero-Energy Buildings**
Rui Amaral Lopes

Day 2 – Thursday 2 July 2020

10:30 – 11:50 Session D

D1 – Digital Twins & Smart Manufacturing

Chairs: Akashkumar Rajaram, Nazanin Vafaei

- **The Role of Digital Twins in Collaborative Cyber-Physical Systems**
Artem A. Nazarenko and Luis M. Camarinha-Matos
- **Production Process Modelling Architecture to Support Improved Cyber-Physical Production Systems**
Fábio A. Seixas-Lopes, Jose Ferreira, Carlos Agostinho and Ricardo Jardim-Goncalves
- **The Impact of Additive Manufacturing on Supply Chain Resilience**
Bardia Naghshineh and Helena Carvalho
- **Big Data Acquisition Architecture: An Industry 4.0 Approach**
Felipe A. Coda, Diolino J. Santos Filho, Fabrício Junqueira and Paulo E. Miyagi

D2 – Power Systems

Chairs: Hugo Antunes, Sonia Hosseinpour

- **Study of Electric Field Emissions in Wireless Energy Transfer**
Elena N. Baikova, R. Melicio, and S. S. Valtchev
- **Scenario Reduction for Stochastic Optimization Applied to Short-Term Trading of PV Power**
Isaias L. R. Gomes, Rui Melicio, and Victor M. F. Mendes
- **Model Predictive Current Control of Switched Reluctance Motor Drive: An Initial Study**
Manuel Pereira and Rui Esteves Araújo
- **A Simple Analysis to Determine the Limits of a CMOS Technology to Implement SC DC-DC Converters**
Ricardo Madeira and Nuno Paulino

11:50 – 12:00 Break

12:00 – 13:00 Keynote 2

Activities of Daily Life (ADL) Recognition via Locomotion & Location Determination

Stefan Poslad

Associate Professor

School of Electronic Engineering and Computer Science

Queen Mary University of London

England

13:00 – 14:00 Break

14:00 – 15:00 Session E

E1 – Optimization Systems

Chairs: Carolina Lagartinho-Oliveira, Ana Ferreira

- **Distributed Approach to Traffic Management Automation Implemented according to IEC 61499**
Dmitry Elkin and Valeriy Vyatkin
- **Formal Verification of IEC 61499 Enhanced with Timed Events**
Viktor Shatrov and Valeriy Vyatkin
- **Thin Film Refractive Index and Thickness**
Paulo Lourenço, Manuela Vieira and Alessandro Fantoni

E2 – Biomedical Analysis & Diagnosis

Chairs: Dario Pedro, Paulo Lourenço

- **Combination of Medical Imaging and Demographic Data for Parkinson's Disease Diagnosis**
Helena Rico Pereira, José Manuel Fonseca and Hugo Alexandre Ferreira
- **Ventricular Assist Device in Health 4.0 Context**
Marcelo Barboza, Fabricio Junqueira, Eduardo Bock, Tarcisio Leão, Jeferson Dias, Jonatas Dias, Marcosiris Pessoa, José Ricardo Souza and Diolino dos Santos
- **RehabVisual: Application on Subjects with Stroke**
Ana Ferreira, Patrícia Santos, Pedro Dias, Amélia Alves, Beatriz Carmo, Filipe Vilhena, Sofia Costa, Cláudia Quaresma and Carla Quintão
- **Development of Raman Fiber Optic Probe for In-vivo Dental Research [Poster]**
Iulian Otel, J. M. Silveira, V. Vassilenko, A. Mata, M. L. Carvalho, J. P. Santos, S. Pessanha

15:10 – 17:00 Panel Session

"My Research for Life Improvement"

Panelists:

Hugo Gamboa - Assistant Professor at Department of Physics, FCT NOVA

Inês Oliveira - Assistant Professor at Department of Electrical and Computer Engineering, FCT NOVA

André Mora - Assistant Professor at Department of Electrical and Computer Engineering, FCT NOVA

Maria Marques - Researcher at CTS UNINOVA

João Pires - PhD Student at Department of Electrical and Computer Engineering, FCT NOVA

João Rodrigues - PhD Student at Department of Physics, FCT NOVA

Moderator: Pedro Pereira

Day 3 – Friday 3 July 2020

10:30 – 11:50 Sessions F + YEF-ECE

F1 - Instrumentation & Health 1

Chairs: Ricardo Madeira, David Borges

- **Algorithm for Automatic Peak Detection and Quantification for GC-IMS Spectra**
Jorge M. Fernandes, Valentina Vassilenko and Paulo H. Santos
- **Algorithm for Automated Segmentation and Feature Extraction of Thermal Images**
Anna A. Poplavska, Valentina B. Vassilenko, Oleksandr A. Poplavskiy, Sergei V. Pavlov and Fernando M. Pimentel-Santos
- **Development and Validation of an Experimental Protocol to Evaluate Posture Control**
Daniel Noronha Osório, Emanuela Teixeira, Fernando Pimentel-Santos, Hugo Silva, Hugo Gamboa and Cláudia Quaresma
- **A Genetic Algorithm to Design Job Rotation Schedules with Low Risk Exposure**
João Rodrigues, Hugo Gamboa, Nafiseh Mollaei, Daniel Osório, Ana Assunção, Carlos Fujão and Filomena Carnide

Opening YEF-ECE 2020

Y1 – Image Processing (YEF-ECE 2020)

Chairs: André Mora

- **Pixel-based and object-based change detection methods for assessing fuel break maintenance**
João E. Pereira-Pires, Valentine Aubard, João M. N. Silva, Rita A. Ribeiro, José M. C. Pereira, José Manuel Fonseca, Manuel L. Campagnolo and André Mora
- **FPGA-based Satellite Image Classification for Water Bodies Detection**
Carlos Garcia, Rui Tavares, André Mora, José Fonseca, Henrique Oliveira and Luís Oliveira
- **Infrared Fire Alarm for Vehicle Protection**
José Curva, Nuno Paulino, João Pedro Oliveira, Luís Oliveira and Henrique Oliveira
- **Assessment of the Opportunity of Using Superconducting Magnetic Energy Storage for Current Harmonic Compensation**
Francisco Luís Simões, Victor Fernão Pires and João Murta Pina

11:50 – 12:00 Break

12:00 – 13:00 Keynote 3

Trends in Renewable Energy Integration in Smart Grids

Theo Tryfonas

Associate Professor

University of Bristol, England

13:00 – 14:00 Break

14:00 – 15:00 Sessions G and YEF-ECE

G1 – Instrumentation & Health

Chairs: Pedro C. Moura, Anna A. Poplavska

- **Real Time Mental Stress Detection through Breath Analysis**
Paulo Santos, Peter Roth, Jorge M. Fernandes, Viktor Fetter and Valentina Vassilenko



4th International Young Engineers Forum on Electrical and Computer Engineering (YEF-ECE 2020)

Innovation in Electrical and Computer Engineering Solutions

Electrical engineers apply electrical and electronic theory to obtain solutions for problems related to the development, design and operation of electrical hardware and software, control systems, electrical machines and communications systems. Computer engineers are concerned with the design, development, and implementation of new and challenging computer technology in a myriad of consumer, industrial, commercial, and military applications. Besides development, design, operations, and research, electrical and computers engineers are typically involved in the manufacture, installation, and maintenance of computational devices, electrical and electronic equipment and systems employed by a wide variety of organizations which produce, use or provide services to such equipment, and ranging from tiny electronic devices to large complex systems.

The International Young Engineers Forum looks for the latest developments and innovative applications in electrical and computer engineering, dealing with systems' design and utilization, looking forward to efficient devices and systems with appropriate control algorithms to meet the needs of business and industry in a global economy. This event will be a unique opportunity for young engineers to connect with each other enabling experience's sharing and to become internationally active.

Proceedings to be published in IEEE Xplore.

<http://sites.uninova.pt/yef-ece>

General chairs; Luis M. Camarinha-Matos, João Martins

Program chairs: Ricardo Gonçalves, Rui Neves-Silva, Rodolfo Oliveira

Publication co-chair: Filipe Moutinho



- **Multi-Sensor Synchronization Model for Sensor Fusion Applied to Innovative Cardiovascular Markers**
Paulo Bonifacio, Valentina Vassilenko, Andreia Serrano, Filipa Cardoso and Stanimir Valtchev
- **Device Development for Evaluation of Gingiva Microcirculation**
Hojat Lotfi, Valentina Vassilenko, Paulo Bonifacio and Bibiana Falcao

Y2 – Power Electronics (YEF-ECE 2020)

Chairs: Anabela Pronto

- **A Novel Topology of Modular Multilevel Bidirectional Non-Isolated dc-dc Converter**
Vitor Monteiro
- **Modular Multilevel Converter in Electrified Railway Systems: Applications of Rail Static Frequency Converters and Rail Power Conditioners**
Mohamed Tanta, Luis Barros, Gabriel Pinto, Antonio Martins and João Afonso
- **Power-Train ECU programming using Rapid Prototyping through Matlab/Simulink**
Carmen Romero-Saiz, María Isabel Milanés-Montero, Enrique Romero-Cadaval and Jaime Pando-Acedo
- **Fault Diagnosis in DC-DC Power Converters Based on Parity Equations**
Willer Jorge Mattos and Rui Araújo
- **Grid-Connected PV System Using a T Type qZS Inverter with an Integral Time Derivative Approach to Ensure MPP and Decoupled Current Control**
Manuel Pina and Vitor Pires

15:00 – 15:10 Break

15:10 – 16:10 Sessions H + YEF-ECE

H1- Instrumentation & Health 3

Chairs: Leonardo Malburg, Ricardo Santos

- **Arterial Stiffness and Central Hemodynamic Assessment by Novel Portable Device**
Andreia Serrano, Valentina Vassilenko, Beatriz Ramalho, Paulo Bonifácio and Anna Poplavská
- **Indoor & Outdoor Air Profiling with GC-IMS**
Pedro C. Moura, Valentina Vassilenko, Jorge M. Fernandes and Paulo H. Santos
- **Idle Tone Detection in Biomedical Signals Using Time-Frequency Techniques**
Filipa E. Cardoso, Arnaldo Batista, Valentina Vassilenko, Andreia Serrano and Manuel Ortigueira

Y3 – Industry & Buildings (YEF-ECE 2020)

Chairs: André Rocha

- **A New Risk Assessment and Management Approach for Agile Projects**
Vitor Anes, António Abreu and Ricardo Santos
- **Industrial Network Topology Generation with Genetic Algorithms**
Christoph Fischer, Maximilian Berndt, Dennis Krummacker, Janis Zemitis, Daniel Fraunholz and Hans Dieter Schotten
- **Forecasting Heating and Cooling Energy Demand in an Office Building using Machine Learning Methods**
Xavier Godinho, Hermano Bernardo, Joao C. Sousa and Filipe Oliveira
- **Demand Response Model for Hardware Implementation**
Bruno Capitão, João Lagarto, Rita Pereira, Pedro Fonte and Paulo Almeida

16:10 – 16:20 Break

16:20 – 16:50 Closing Session & Awards

CTS
Publications
in 2019

Journals	87	=> indexed:	78
Q1	51		
Q2	15		
Other	21		

Conferences	153	=> indexed:	123
A	13		
B	60		
Other	80		
Indexed Scopus	50		
Not indexed	30		

Book chapters	18	=> indexed:	3
Books			
Book edition	5	=> indexed:	3
Patents	4		
Total:	267	=> indexed:	207 78.71%