10 YEARS

Fraunhofer Portugal Challenge

Fraunhofer PORTUGAL

Fraunhofer Portugal Challenge: 10 years awarding national scientific research

Organized since 2010, the Fraunhofer Portugal Challenge has been envisioned to encourage cooperation between industry and the scientific community, motivating and rewarding research of practical utility. In the last 10 years, this idea contest has been awarding students and researchers who best contribute to the philosophy that reinforces the Fraunhofer AICOS' vision: *creating technological solutions with a positive impact on people's lives*, as well as its mission to create *Remarkable Technology / Easy to Use*.

Along the years, the Fraunhofer Portugal Challenge has received hundreds of applications from Universities across the country, as well as from very different research areas, from Health to Agriculture, including Sensors, Mobile Phones, Human Centred Design, Artificial Intelligence, among many others. 10 years awarding science and national research. We invite you to take a short journey through time and discover the winning projects of the various editions.

Applied research is where great ideas meet great skills. The Fraunhofer Portugal Challenge is where applied research meets great young talents!

Dirk Elias
Fraunhofer Portugal Former Director

If solving real world ICT problems in order to generate impact is what you are burning for, then the Fraunhofer Portugal Challenge is the place to go! Now for a decade Fraunhofer Portugal is honoring young talents that are inspired by the competences that they obtained at university driving them into outstanding results. New ideas and fresh thinking of the candidates always has been fascinating! Often it has been the start of a long lasting partnership and sometimes it even marked the beginning of a new strategic research activity. Looking forward to you also making the difference this year!

Liliana Ferreira
Fraunhofer Portugal Director

The Fraunhofer Portugal Challenge's lead role belongs, undoubtedly, to the candidates that brought us new, exciting ideas and accepted the challenge of seeing early-stage research through business glasses. It was a pleasure to watch, in each of the Challenge editions, the bright discussions between the candidates and the external industry experts in a continuous search for the best combination between the business potential and the brilliant scientific advances presented. It was a decade promoting ICT innovation ecosystems, boosting the impact of networks, IoT platforms, bioelectronic devices, multimodal platforms, explainable deep learning, smart fabrics, among others, in people's lives.

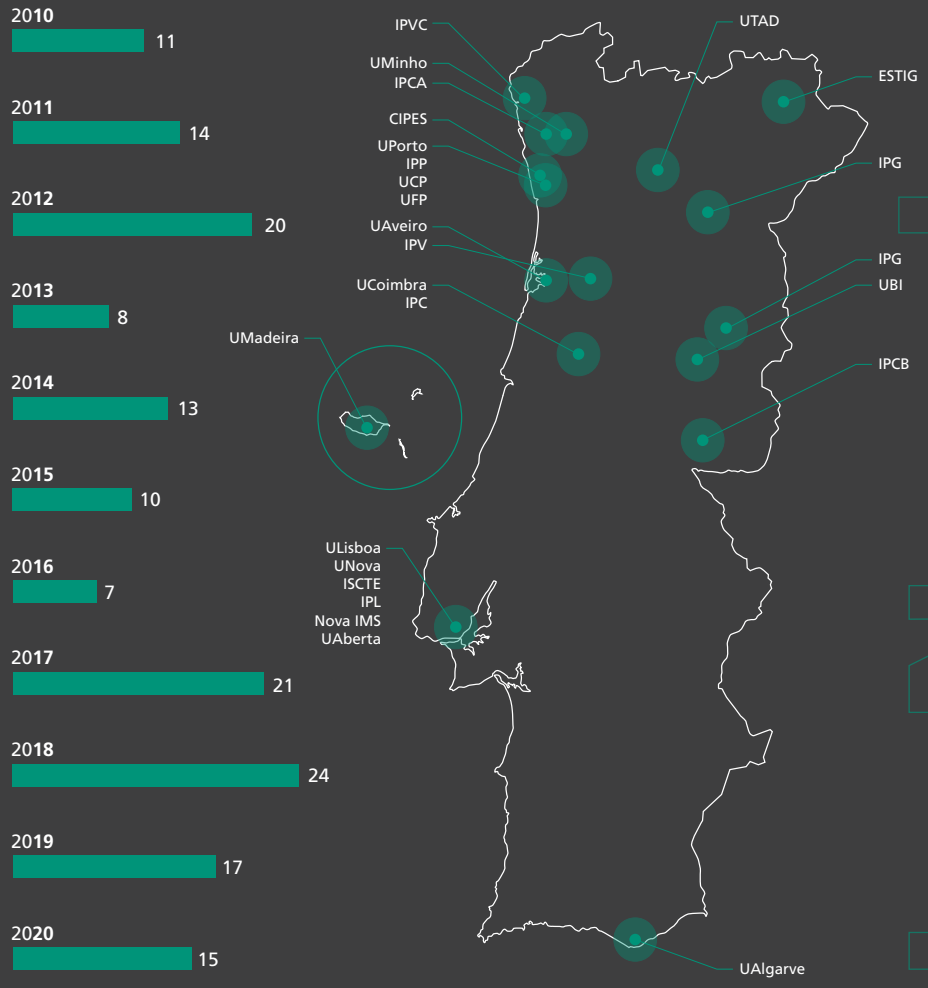
Ten years awarding research of Practical Utility. Ten years searching for the sweet spot between commercial development and early stage research.

Applications

	MSc	PhD	Total
2010	18	3	21
2011	25	6	31
2012	16	11	27
2013	17	4	21
2014	42	28	70
2015	22	19	41
2016	5	9	14
2017	29	7	36
2018	25	21	46
2019	25	15	40
2020	31	16	47

challenge

Universities



numbers

OVER THE

YEARS

Special Invitees

José Novais Barbosa (PhD, Chairman of UPTEC)
Jorge Gonçalves (PhD, Vice Rector at Universidade do Porto)
João José Pinto Ferreira (PhD, FEUP-MIETE)

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Filipe Abrantes (PhD, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

Augusto Esteves
Universidade da Madeira

"Tangible User Interfaces and Embodied Cognition

This thesis proposed, designed, implemented and evaluated Mementos, a Tangible User Interface (TUI) designed to address these problems.

TUIs are an interaction paradigm based on the use of physical objects (or 'handles') that meaningfully represent (and support interaction with) digital information.

Mementos leverages the benefits of tangible interaction: seamless integration with the physical environment, support of real world skills and collaborative activity."

David Navalho
Universidade Nova de Lisboa

"Unified Cooperative Location System

The Unified Cooperative Location System (UCLS) is a modular and extensible Location System, designed for mobile devices, capable of both outdoors and indoors location, including the ability to map indoors symbolic locations (e.g.: Room 125, South Corridor, Science Labs, etc.). It uses the available infrastructure (Wi-Fi access points, cellular towers, GPS), gathering the available raw information available to a common mobile, without the need of specialized hardware.

Community sensing helps users share information, building maps databases faster, while keeping privacy by making the location estimation on the device, instead of relying on external tracking services.

The use of collaborative location allows devices with no location capabilities to obtain information they couldn't otherwise (e.g.: obtain GPS coordinates from nearby devices).

Practical use of Cellular information, enabling very significant accuracy increases when sharing information between at least two devices."

Rui Marinho
Universidade do Minho

"Uma abordagem visual ao Processo Clínico Electrónico

Unstructured, free speech text
Excellent input system, easy to write but difficult to process by computer applications.
Has a low semantic value, which makes it hard to extract "meaning".

More productive for the health care professional:
a) "What you see is what you mean" paradigm. Structured, coded data
Terrible input system, made up with forms but very easy to process;
b) Open to a very dense semantic network, which makes it valuable for knowledge extraction;
c) A burden and tedious task for the health care professional: "Submission and validation" paradigm.

A new visualization concept is born with higher information qualit. No more handwritten notes on paper figures or lengthy text descriptions of clinical content (diagnostic or therapeutic). The health care professional can now pin-point what he sees and where he sees it directly on screen, including procedures, lesions and traumas: "What you see is what you get" paradigm."

Ana Ferreira
Universidade do Porto

"Modelling Access Control for Healthcare Information Systems: How to control access through policies, human processes and legislation

Problem
Access control policies are usually very restrictive AND healthcare professionals may not be able to access the required information when needed, to properly treat a patient.

Solution
BTG-RBAC model – This model integrates the standard Role Based Access Control (RBAC) model and the Break-The-Glass (BTG) concept. This is similar to a fire alarm. In emergency situations the glass can be broken and several procedures are checked afterwards."

Gabriel Fernandes
Universidade de Coimbra

"Parallel Algorithms and Architectures for LDPC Decoding

We propose parallel Low-Density Parity-Check (LDPC) code decoders, that are efficient error correcting codes which allow working close to the Shannon limit.

We propose parallel algorithms and suitable parallel stream-based data structures to solve the computationally intensive problem of LDPC decoding. We propose, develop and assess flexible/programmable LDPC decoder approaches based on multi-core architectures.

The proposed programmable solutions present important advantages when compared against typical hardware dedicated VLSI approaches (which are non-reusable, expensive and consume significant resources)."

MSN

PhD

Special Invitees

João José Pinto Ferreira (PhD, FEUP-MIETE)
Mário Rui Silva (PhD, FEP)

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Liliana Ferreira (PhD, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

Ricardo Fernandes
Universidade de Aveiro

"Design of a battery-free wireless sensor node

Car keys, TV remotes, sensors, cell phones, laptops, (and more) all rely on disposable batteries.

This leads to:
a) billions of batteries discarded every year;
b) significant maintenance costs.

Energy can be obtained from batteries, but it can also be harvested from other sources, such as light, radio waves, piezoelectric materials, and more.

What if these devices could harvest enough energy so that batteries would simply become unnecessary? That would be (really) nice, wouldn't it?"

Flávio Sousa
Instituto Superior Técnico (UL)

"A portable stochastic forest fire modeling tool

A portable smart-phone application is used to remotely issue a fire forecast. Current Fire Front position is assessed locally and data is sent to the server. Other data (terrain, humidity, wind speed) are provided by a GIS framework. All measured data is affected by an error, more specifically, the fire front assessment has a large measurement error which has to be considered in the simulation results by providing an error bar type solution and probability forecast.

Such type of modeling requires Monte Carlo like procedures which are very demanding computational tasks. The solution is using many core parallel computing (Currently Nvidia GPUs) to Speed-up computation."

Waldir Pimenta
Universidade do Minho

"Automated Face Recognition using 3D Shape Extracted from 2D Images

Why attempt computer-based face recognition?
a) to streamline manual processes;
b) to scale up mechanical tasks mugshot database search, 24/7 video surveillance, visual video search…

We propose automatic expression cancellation in 3 steps:
1. extraction of semantic 3D information from 2D images
2. removal of only non-rigid facial deformations from the 3D model
3. projecting the neutralized face back to 2D for regular face recognition"

Daniel Polónia
Universidade de Aveiro

"Electronic marketplace for teleradiology services

The development of telemedicine based solutions has enabled the creation and the development of new healthcare provisioning methods, bringing closer patients and providers, reducing waiting times associated and improving the quality of the service provided. However, the introduction of technological advancements does not always correspond to a reduction in the existing asymmetries at national level in the provision of healthcare.

In the thesis, it is developed a system that allows the creation of a telemedicine electronic marketplace interconnecting players (that re-use solutions already in place) and leveraging the good distribution of equipment at national level. With this market it is possible to maximize the patient and exam prescribing entities satisfaction, whilst the quality of the service provided by the technicians and radiologists is guaranteed and the use of the existing equipment is optimized."

Navin Kumar
Universidade de Aveiro

"Visible light communication systems for road safety applications

Visible Light Communication (VLC) is an emerging, novel and challenging Optical Wireless communication system which utilizes visible spectrum (approx. 390nm-750nm) emitted from light emitting diodes (LEDs).

VLC is becoming an alternative choice for next-generation wireless access technology by offering cheap and unregulated bandwidth and ubiquitous infrastructures support.

This technology is envisioned to be used in a wide range of applications from large size file transfers to road safety traffic information transmission in Intelligent Transportation Systems (ITS) to assist drivers while driving on road.

VLC Systems offer many distinctive (lighting/signaling and Communication simultaneously) and novel applications (minimize road accidents and casualities), both indoor as well as outdoor."

Rui Barbosa
Universidade do Minho

"The intelligent hedge fund

Primary Objective: developing intelligent trading agents that can replace human financial traders and quants.

If successful trading is an actual skill (debatable!), then there is no reason why these agents cannot accomplish that task.

Such agents would possess several advantages over human traders:
a) cheaper (no salary or annual bonus);
b) ability to trade 24 hours a day (with no breaks or vacation time);
c) emotionless trading (not affected by fear or greed), easier to manage (no rogue traders);
d) able to make decisions and place trades much faster.

By combining many intelligent trading agents together, one will end up with a multi-agent system that can act as an autonomous investment fund – an "intelligent" hedge fund!"

10 YEARS
FRAUNHOFER PORTUGAL CHALLENGE

Special Invitees

Miguel Barbosa (MBA, Fraunhofer AICOS)
João José Pinto Ferreira (PhD, FEUP-MIETE)
Jorge Gonçalves (PhD, Vice Rector at Universidade do Porto)

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Liliana Ferreira (PhD, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

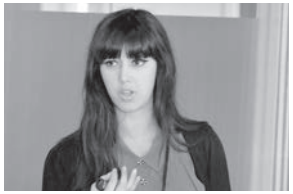
Sara Pimenta
Universidade do Minho

"ABO and Rh Human Blood Typing Device

BLOOD TYPING fundamental test before a Blood Transfusion!

Existing methods/systems have some limitations: subjectivity, high response time (about 30 minutes), no in-situ determination.

Solution
Automatic and portable device to ABO and Rh human blood typing:
a) Increase patient safety due to the automatic test decision;
b) In-situ blood determination;
c) Short response time (less than 5 minutes)."



Mafalda Rocha
Universidade de Aveiro

"Eco-visualization in Design

Can data-visualization alter our consumption habits?
In the state of environmental unsustainability that we are nowadays, is even more pertinent the search for solutions towards reducing domestic consumption, in a way that effectively help families to save and be aware of their environmental impact on the planet.

Eco-visualization in design aims to offer the tools needed for that to happen and promote social awareness towards the environmental issues.

The objective is that people become more informed and act on their own initiative in their homes and their community. By providing artefacts to monitor and report consumption data in real time, in an interactive and functional way, it is intended that there is a change in consumer habits, promoting economic saving and a greater individual social responsibility."

MSc

Samuel Silva
Universidade de Aveiro

"Left Ventricle Functional Analysis from Coronary CT Angiography

The heart is a vital organ in the human body:
a) Analysis of the left ventricle (LV) is of the utmost importance to characterize cardiac function;
b) CT equipment allows acquisition of 10+ image volumes along the cardiac cycle;
c) Coronary evaluation is performed using one image volume (Coron.);
d) LV functional analysis performed using two volumes (end-systole, ES, and end-diastole, ED).

Deliver tools and methods to enable LV assessment encompassing all available data and relying on interactive visualization to support the physician."

Gabriel Pires
Universidade do Minho

"The effective use of brain-computer interfaces in real-world applications

A brain-computer interface (BCI) is an interface that opens a new communication channel independent of the normal output pathways of peripheral nerves and muscles. Brain activity is translated into commands that can be used to control a computer or other input devices. Its application in real-world scenarios poses many challenges, some of them were overcome in this work.

Several BCI systems based on electroencephalography (namely, a neural mechanism designated by P300 event related potential) have been designed fitting the requirements of real-world applications, namely:
a) Effective transfer rates;
b) Minimal time calibration;
c) Asynchronous control (self-paced by user);
d) Gaze-independency;
e) The robustness of the BCI systems here presented allowed us to create effective computer applications such as spelling devices, switch activation, icons selection, and robotic applications such as driving a robotic wheelchair."

José Silva
Universidade de Coimbra

"Rapid Prototyping of Ubiquitous Computing Environments

Ubicomp environments present particular challenges for developers. It is difficult to:
a) perform user testing on early versions of the environment;
b) analyse a given design thoroughly;
c) generalise findings APEX, a tool developed as part of my PhD, enables the rapid prototyping and evaluation of ubicomp environments through;
d) Modelling, Analysis and 3D Simulation.

APEX supports
a) the whole prototyping cycle of ubicomp environments;
b) enabling the early identification of potential user problems and reducing the cost of redesign;
c) evaluation of the usability and social impact of a proposed design;
d) enabling the adaptation of ubicomp environments to specific user needs;
e) an hybrid prototyping approach interchanging; physical and virtual mobile devices;
f) non-programmed avatars vs. programmed avatars;
g) a systematic and exhaustive analysis vs. user exploration of the simulated environment."

PhD

Special Invitees

João José Pinto Ferreira (PhD, FEUP-MIETE)
Sérgio Salústio (BSc, Bosch)
Ana Teresa Tavares Lehmann (PhD, FEP)

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Liliana Ferreira (PhD, Fraunhofer AICOS)
Pedro Almeida (MSc, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

André Santiago
Instituto Superior Técnico (UL)

"Broadband UHF RFID Passive Tag Antenna for Near-Body Operation

Radio-frequency identification (RFID), uses a wireless communication between a base station and a tag antenna attached to an object that allows its identification and/or localization.

a) RFID body antennas are gaining importance in the healthcare sector, specially for patients: identification; localization; monitoring; drug delivery units tracking (e.g. IV bags, pills boxes);
b) RFID tag antennas are already being used for these applications. However, the costs are still high due to the need of batteries. The UHF technology allows circumventing this issue, enabling the design of passive tags (without batteries);
c) The inherent challenge for passive UHF RFID tag antennas is to maintain its radiation characteristics near liquids, metals and also the human body which has a high dielectric permittivity and is highly dissipative;
d) This calls for new tag antenna designs for the referred applications with enough reading range when attached to difficult objects, compatible with different world region frequency bands, low-cost."

André Mourão
Universidade Nova de Lisboa

"NovaEmotions: Enabling affective-interaction in computer applications

Affective-Interaction: What if computers could react to our emotions?

The research hypothesis of this thesis was that affective-interaction can be effectively deployed in real-time applications.

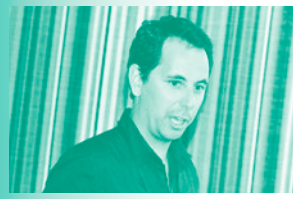
a) The detection of frustration, engagement, attention, etc, can lead to a great paradigm shift in the way humans and computers interact;
b) The contribution of this thesis consists of a robust facial-expression analysis framework for real-time interaction;
c) A proof-of-concept was also implemented: the NovaEmotiöns game."

Inês Machado
Universidade Nova de Lisboa

"Is There Hidden Information in My Movement?

This thesis presents a method for convenient monitoring of detailed ambulatory movements in daily life, by the use of a portable triaxial accelerometer measurement device.

The focus of the work is the discovery of the information hidden in the signals produced by an accelerometer, interpreting them in terms of human movement and identifying clinically relevant parameters from the data."



Ricardo Campos
Universidade do Porto

"Disambiguating Implicit Temporal Queries for Temporal Information Retrieval Applications

Understand the temporal nature of any given implicit temporal query (e.g. Margaret Thatcher) in a way that allows us to reach the temporal disambiguation of the query "on-the-fly".

Use this information to improve search results exploration, namely the clustering and ranking of search results."

António Castro
Universidade do Porto

"A New Approach to Disruption Management in Airline Operations Control

A system (MASDIMA) that provides:

a) Distributed, Decentralized and Autonomous approach to Integrated and Dynamic disruption management in airline operations control;
b) Allows the functional, spatial and physical distribution of roles and the environment;
c) Makes decisions on its own;
d) Some decisions are taken at different nodes of the agents' network.

Includes the three main dimensions of the problem: aircraft, crew and passengers. In real time, several agents are performing in the environment reacting to constant change."

João Guimarães
Universidade do Minho

"A precision grammar for programming biological systems

Creation of abstraction layers in biology that can be developed independently will support the engineering of integrated genetic circuits through the predictable assembly of standard biological parts and modules.

A basic property of genetic networks (systems) concerns the expression of each one of its components (parts).

Therefore, it is crucial to develop rules that enable predictable control of gene expression for these elementary parts that are present in all biological networks."

10 YEARS
FRAUNHOFER PORTUGAL CHALLENGE

2014

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Liliana Ferreira (PhD, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

Special Invitees

Filipe Araújo (MSc, Municipality of Porto)
João José Pinto Ferreira (PhD, FEUP-MIETE)
José Oliveira (MSc, Vodafone Portugal)
Marco Marques (BSc, Bosch Termotecnologia)

Ricardo Eleutério
Universidade Nova de Lisboa

"Microwave Imaging of the Axilla to Aid Breast Cancer Diagnosis

Breast cancer is the second most common cancer worldwide.

In 80% of breast cancer cases, cancer cells metastasise through lymphatic and blood vessels. Lymph node assessment is important for breast cancer staging.

This thesis propose lymph node assessment using Microwave Imaging, which:
a) uses non–ionizing radiation;
b) offers good resolution;
c) avoids compression of the breast;
d) is potentially low–cost.

Evaluation of whether the cancer has spread beyond the breast is crucial to decide what follow-up exams and therapy to follow."

Anna Pompili
Instituto Superior Técnico (UL)

"Speech and language technologies for aphasia therapy

Aphasia – a language disorder.
Major causes
a) CVA, brain tumors / infections;
b) 200.000 new cases in UE each year;
c) most common impairment: difficulty to recall words.

Aphasia recovery
a) speech therapy sessions with naming exercises; e.g.: "Say the name of the object in this picture";
b) frequency and intensity of therapy are key factors;
c) therapy is costly and uncomfortable.

VITHEA: Virtual Therapy for Aphasia Treatment
a) ubiquitous platform for autonomous rehabilitation of aphasia;
b) provides several naming exercises;
c) automatic speech recognition to evaluate patient's answer;
d) text-to-speech to provide vocal feedback via the virtual therapist.

Patient module
a) to perform therapy sessions at home, health care center, anytime.
Clinician module
a) to manage and monitor patient and exercise data."

Karen Duarte
Universidade de Coimbra

"SmartGuia: Shopping Assistant for Blind People

People become part of the ubiquitous network:
a) Individual person becomes the center entity;
b) Objects and people collaborate to fulfill useful tasks;
c) One field where we believe IoP can make a significant difference is for helping people with disabilities."

Paulo de Melo
Instituto Superior Técnico (UL)

"A Novel Functional Electrical Stimulation System and Strategies for Motor Rehabilitation

Every year, 15 million people suffer stroke worldwide. Of these 15 million, 5 million die and another 5 million are permanently disabled.

Develop a surface Functional Electrical Stimulation (FES) active orthosis (neuroprosthesis) and muscle control strategies to promote mobility of the ankle-foot complex and gait rehabilitation in individuals with drop foot.

FES is a technique to restore lost motor functions, by delivering artificially created electrical stimuli to the paralyzed muscles of a patient."

Gilberto Bernardes
Universidade do Porto

"earGram: Composing Music by Selection

Problem
How to recombine a song automatically to generate new and expressive music in real-time?

Solution
Modelling the life cycle of music."

Pydi Ganga
Universidade do Porto

"Transparent and/ or flexible low-cost electronics with a-GIZO TFTs

Main solution(s) that the idea will provide:
a) Backplanes for lighter and thinner flexible displays;
b) Realization of Head-mounted displays;
c) Design of Low-cost RFIDs;
d) Direct integration of circuits (DC-DC converters) with solar panels;
e) Solar vehicles (ex: Bus, car, space crafts) and energy harvesting sy."

Special Invitees

Filipe Araújo (MSc, Municipality of Porto)
João José Pinto Ferreira (PhD, FEUP-MIETE)
Artur Baptista (BSc, Vodafone Portugal)
Marlos Silva (MSc, SONAE)

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Liliana Ferreira (PhD, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

Bruno Ribeiro
Universidade Nova de Lisboa

"SYPEC: Development of New Algorithms of Postural Classification and Correction

The sitting position is frequently adopted by a majority of people in their professional, domestic and leisure activities. However, prolonged maintenance of this position usually leads to the adoption of incorrect postures overloading the musculoskeletal structures of the spine, originating pain and lesions, especially in the lumbar region. The present master's dissertation is incorporated in the development of new classification and correction algorithms inserted in the SYPEC project (SYstem for Posture Evaluation and Correction).

This work aims to demonstrate how algorithmic optimization can be applied to a newly developed prototype to improve posture classification performance.

In this work we also describe a new classification algorithm, which was developed in order to classify the postures using as input the Centre of Pressure, the Posture Adoption Time and the Posture Output from the existing Neural Network Algorithm."

Diana Batista
Instituto Superior Técnico (UL)

"Pervasive ECG monitoring and analysis: a cloud computing approach for user-centered healthcare

Electrocardiograms (ECGs) are a powerful diagnostic tool widely used in clinical practice. A pervasive and continuous ECG data collection paradigm will allow us to gather more information about the heart's condition, while still guarantying user's comfort and a simple acquisition process. In order to do so, it is necessary to develop algorithms to automatize the analysis of records acquired with off-the-person devices.

The global architecture of the proposed pervasive healthcare monitoring system is as follows. ECGs are acquired pervasively through sensors embedded in daily life objects (e.g. keyboards, driving wheels) and sent to the cloud. They are then processed and analyzed in real time. Since we will be dealing with sensitive personal information, protection measures should be envisaged to avoid breach of privacy. Should an emergency situation be detected, a proper alarm system would be triggered."

João Felício
Instituto Superior Técnico (UL)

"Wideband Body-Implantable Antenna for Short-Range High Data Rate Communication

We present a compact body-implantable antenna for low power and high data rate in-body communication.

It is a 15 mm diameter uniplanar printed antenna operating in the 1.4-4.2 GHz band that is intended to be implanted at the surface of the muscle. Due to the antenna's optimum radiation characteristics it enables the transmission of bitrates up to 750 Mbps, like no other device of this kind. The data can be transferred from the antenna to an external reader just by scanning the implant area.

Furthermore, the antenna can be integrated with a transceiver, energy gathering circuit and biocompatible storage devices. Because of these features, it can be used for real-time medical video streaming, which is useful in endoscopies or in emergency situations, possibly saving the implant carrier life."

Sérgio Lopes
Universidade de Aveiro

"Bringing low-cost centimeter-level indoor positioning to conventional smartphones

This work describes the design and implementation of a reliable centimeter-level indoor positioning system fully compatible with a conventional smartphone. The proposed system takes advantage of the smartphone audio I/O and processing capabilities to perform acoustic ranging in the audio band using non-invasive audio signals and it has been developed having in mind applications that require high accuracy, such as augmented reality, virtual reality, gaming, AAL and audio guides.

The system works in a distributed operation mode, i.e. each smartphone is able to obtain its own position using only acoustic signals. To support the positioning system, a Wireless Sensor Network (WSN) of synchronized acoustic beacons is used."

Mário Vairinhos
Universidade de Aveiro

"ATA – Adaptable Tangible Artifacts in Home Environment

Adaptability of the tangible medium presents a number of difficulties, not only technical but also conceptual nature, which have hindered the development and implementation of technologies in the practical field. The problem of adaptability of tangible Media addresses not only technical challenges. In addition to these challenges, the development of adaptable tangible technologies opens, within HCI, a set of unique opportunities and an emerging field of study. Tangible media, unlike what happens with conventional digital content, have physical expression and they are endowed with a body. This one inhabits the space of physical dispositions and are subject to the action of the cultural and social practices which rules other physical objects present in our everyday lives.

The main objective of our research is to discuss a conceptual framework for the phenomenon of adaptability of tangible media and develop a fully functional technology that can serve as an empirical ethnographic study and become a market product."

Hoang Van Xiem
Instituto Superior Técnico (UL)

"A Novel Scalable Video Coding Solution Combining the Predictive and Distributed Paradigms

Multimedia applications have been playing a major role in the current society with video coding technologies largely driving the development of new services and applications to provide increasing quality of experience. These applications typically deploy a powerful video compression engine, following the so-called predictive coding paradigm, largely adopted by the available video coding standards.

Inspired by the strengths of both the predictive and distributed video coding paradigms, this work proposes a novel scalable video coding framework for applications asking for high compression efficiency, low encoding complexity and error resilience by combining the strengths of the HEVC standard at the base layer with the strengths of DVC in the enhancement layers. Following its features, this scalable coding framework is called Distributed Scalable Video Coding (DSVC)."

Fraunhofer lança prémio de investigação científica
Esta competição, com prémios que vão até aos 9 mil euros, vai distinguir alunos de universidades portuguesas que tenham desenvolvido teses de mestrado e de doutoramento de orientação prática nas áreas das Tecnologias de Informação e Comunicação (TICs), Multimédia, e Interação Homem-Máquina

In Diário Económico
2010

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Saltar da academia para o mercado à boleia da "prática" da Fraunhofer
Porto é amanhã palco da final do primeiro concurso em Portugal da gigante europeia de investigação

In Jornal de Negócios
2010

—

Centro de investigação alemão desafia universitários portugueses a serem criativos
Concurso "Fraunhofer Portugal Challenge 2011" já aceita candidaturas

In Ciência Hoje
2011

—

Prémio para mentes brilhantes
Centro de investigação distribui 9 mil euros pelas seis ideias finalistas

In Correio da Manhã
2011

Procuram-se invenções científicas orientadas para o mercado
O centro de investigação Fraunhofer AICOS lançou o concurso de ideias Fraunhofer Portugal Challenge, uma iniciativa que pretende premiar as melhores ideias práticas de estudantes e investigadores de universidades portuguesas

In P24
2011

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Concurso de empreedorismo
Direccionado para estudantes e investigadores portugueses, tem como "grande objetivo a promoção e a recompensa da investigação científica de utilidade prática, orientada para o mercado e que tenha em conta a aplicabilidade das ideias e dos seus resultados na indústria ou no quotidiano das pessoas

In Computerworld
2012

—

Fraunhofer à caça de novas ideias
O gigante alemão de Investigação e Desenvolvimento Científico já tem em marcha a terceira edição do Fraunhofer Portugal Challenge, o desafio visa premiar as melhores ideias de estudantes e investigadores da universidades portuguesas

In Jornal Expresso
2012

Abertas as inscrições para o concurso Fraunhofer Portugal Challenge 2013
O concurso este ano vai na sua 4ª edição, tem como grande objetivo promover e premiar a investigação científica de utilidade prática, orientada para o mercado, e que tenha em conta a aplicabilidade das ideias e dos seus resultados na indústria ou no quotidiano das pessoas

In Diário Económico
2013

—

Fraunhofer premeia ciência
Distinguir os melhores trabalhos de investigação nacionais com utilidade prática é o objetivo do Fraunhofer Portugal Challenge 2014

In Jornal Expresso
2014

—

Fraunhofer Portugal Challenge abre candidaturas
Já arrancou a quinta edição do "Fraunhofer Portugal Challenge", um concurso de ideias organizado anualmente com o intuito de premiar os melhores trabalhos científicos, com carácter prático, desenvolvidos por estudantes e investigadores das universidades portuguesas

In Diário de Aveiro
2014

Fraunhofer Portugal Challenge 2014 elege as melhores ideias científicas
Detectar metástases pela axila e usar estímulos eléctricos para recuperação motora, uma técnica para detecção e monitorização precoce de metástases na axila e um sistema de estímulo eléctrico para recuperação funcional de deficiências motoras. Estas foram as duas ideias que valeram a Ricardo Eleutério e Paulo de Melo os primeiros lugares, respectivamente, nas categorias de Mestrado e Doutoramento da 5ª edição do Fraunhofer Portugal Challenge

In Atlântico Expresso
2014

—

Génios portugueses premiados
Novos métodos de diagnóstico de doenças, videojogos, dispositivos médicos, *softwares* e até motores de busca são alguns dos temas dos trabalhos científicos distinguidos pelo Fraunhofer Portugal Challenge nos últimos anos

In Sábado
2015

—

Manipulação imagens 3D na cirurgia
Projeto usado no HFF foi reconhecido com o primeiro lugar do prémio Fraunhofer Portugal Challenge 2016

In www.sns.gov.pt
2016

Fraunhofer Challenge tem 9 mil euros para as melhores teses
A edição 2016 do Fraunhofer Portugal Challenge já tem as candidaturas abertas: se escreveste uma tese de mestrado ou doutoramento com "utilidade prática" nas áreas das tecnologias da informação e comunicação, multimédia ou "outras ciências conexas", este concurso pode ser para ti

In Jornal Público
2016

—

Fraunhofer Portugal Challenge 2017
A oitava edição do concurso de ideias Fraunhofer Portugal Challenge já está a decorrer e vai distinguir as seias melhores teses de mestrado e doutoramento com prémios científicos no total de 9.000€

In i9 Magazine
2017

—

Internet: Nuno criou uma forma de prever os conteúdos mais populares
Investigador português desenvolveu um método baseado na atenção que os conteúdos recebem nas redes sociais. O que, trocando por miúdos, é a previsão de casos raros. Trabalho valeu o segundo lugar na categoria de doutoramento do Fraunhofer Portugal Challenge 2017

In Jornal Público
2017

Concurso de ideias
Candidaturas para o Fraunhofer Portugal Challenge abertas até domingo

In TVI 24
2018

—

Novos sistema para corrigir distúrbio no pé e tratamento da glioblastoma premiados pela Fraunhofer
As ideias foram avaliadas de acordo com critérios como o grau de inovação, exequibilidade técnica, e potencial de mercado

In Jornal Económico
2018

—

Inovação nas telecomunicações e no diagnóstico da epilepsia premiados pelo Fraunhofer Portugal Challenge
Os vencedores do Fraunhofer Portugal Challenge 2019, que premeia ideias inovadoras de estudantes e investigadores portugueses com uma bolsa total de nove mil euros, foram anunciados esta quinta-feira

In Jornal de Notícias
2019

—

O Fraunhofer Challenge quer premiar teses — e tem nove mil euros para dar
A 11.ª edição do Fraunhofer Portugal Challenge já tem candidaturas abertas e quer distinguir "os melhores trabalhos de investigação com utilidade prática desenvolvidos em Portugal".

In Jornal Público
2020

Jury

Dirk Elias (PhD, Fraunhofer AICOS)
Hugo Gamboa (PhD, Fraunhofer AICOS)
Thomas Luckenbach (PhD, Fraunhofer FOKUS)

Special Invitees

João José Pinto Ferreira (PhD, FEUP-MIETE)
Liliana Ferreira (PhD, Philips Research)
Marlos Silva (MSc, SONAE)
Paulo Calçada (MSc, Municipality of Porto)

Pedro Parreira
Instituto Superior Técnico (UL)

"Novel Spatial Interaction Techniques for Exploring 3D Medical Images

Analyzing 3D medical images and the anatomical structures they contain, demands visualization from any desired perspective. Although conventional methods use mouse and keyboard based controls, it can still be a difficult task, mainly because a 2D interface is used to interact with a 3D object.

We propose a spatial interface based on touchless hand gestures to control a 3D image giving the user control of the volume as if they were interacting with a real physical object."

Bernardo Marques
Universidade de Aveiro

"Physiology assessment tool using Virtual Reality

Our system uses a Virtual Reality (VR) gamification approach to physiological assessment by modulating the response of spider phobic individuals using levels with different VR stimulus exposure supporting hand interaction with the virtual reality environment – spiders included. The individual's reaction is acquired synchronously (ECG, HR, RR, VIDEO, Screenshots, 3D objects tracking, etc.) for post processing.

The solution is affordable and portable for use outside the laboratory."

Jorge Lima
Universidade do Porto

"Argumentation in the Resolution of Passenger Problems using Mobile Devices

System that allows any disrupted passenger in a airline company to participate in the resolution of his problem (delays,...) through a mobile application. Along with the server containing a multi-agent system the mobile application allows the user to receive and analyse several alternatives to his disrupted flight.

There, he can argue with an intelligent agent if whether or not he likes the offered proposals, in order to get an optimal solution, both for the disrupted passenger and the airline."

Miguel Duarte
Intituto Universitário de Lisboa

"Bringing Artificial Intelligence for Swarm Robotics Systems to the Real World

Earth's waterbodies are the basis for a lot of economic activity.

Maritime missions are, however, expensive to carry out. While complex unmanned vehicles have the potential to reduce the cost, they are still expensive to acquire and operate. I propose the use of swarm robotics systems, which are composed of many simple and inexpensive units. In my thesis, I have studied and applied novel control synthesis techniques to enable swarm robotics systems to be used in the real world."

Helena Pereira
Universidade de Coimbra

"Non-Invasive Assessment of Cardiovascular Condition using Vibro-Accelerometric Devices

This research set out to explore new instrumental paradigms for cardiovascular condition evaluation that could support, at a later stage, an efficient clinical tool in the detection and control of individuals at cardiovascular risk.

The main directions established to accomplish this aim were:
a) developing an innovative generation of electromechanical based probes;
b) building dedicated bench test systems;
c) developing signal processing algorithms and d) running a set of bench/in-vivo tests."

Marco Santos
Universidade de Aveiro

"The new concept model is instrumented active orthopedic implants

A new concept model for instrumented orthopaedic implants is proposed: a self-powered instrumented active implant controlled by clinicians capable of delivering personalized biophysical stimuli to target tissue areas.

Such innovation is demanded as current implants are not able to ensure long-term implant survival.

A new cosurface capacitive system was designed for the implementation of novel and innovative personalized stimulatory therapies based on the delivery of electric fields to bone cells."

Jury

Liliana Ferreira (PhD, Fraunhofer AICOS)
Pedro Almeida (MSc, Fraunhofer AICOS)
Filipe Soares (PhD, Fraunhofer AICOS)

Special Invitees

Clara Gonçalves (BSc, UPTEC)
João José Pinto Ferreira (PhD, FEUP-MIETE)
Nuno Carvalho (MSc, Healthcare City)

Rafael Simões
Universidade Nova de Lisboa

"Automated Measurement of Lesion Charge and Cerebral Volume in the Study of Multiple Sclerosis

Multiple sclerosis (MS) is a neurodegenerative disease characterized by demyelination of the central nervous system, being estimated to affect around 2,5 million people worldwide. Depending on lesion location and severity, this disease can lead to a variety of manifestations, which are usually monitored with the Expanded Disability Status Scale (EDSS), a scale that quantifies the MS patient's disability over time.

Brain magnetic resonance imaging (MRI) is the standard method for monitoring and evaluating brain lesions and atrophy levels, known to be correlated with MS prognosis. The brain MRI required by the neurologist is analysed by a clinician specialized in neuroradiology, who will evaluate the exam and produce a clinical report regarding the evolution of the disease. This study aimed to enrich the neuroradiologist exam analysis, by focusing on the development of an automatic brain MRI evaluation tool to be integrated in clinical practice."

João Monteiro
Universidade do Porto

"Improving Health Communication and Personal Information Management

Health literacy is the ability to seek and interpret basic medical information. Physicians tend to overestimate the amount of information that they share with patients, and patients sometimes do not understand that information. Personal health information management (PHIM) consists in the management of all the health information relevant to a patient.

Despite being important topics, many healthcare issues have not been studied in-depth in Portugal.

We studied the population in and around Porto through a questionnaire."

João Ferrão
Universidade Nova de Lisboa

"Low-Cost Colorimetric Enzyme-Free Biosensors for Glucose Detection

This project aims the development of a novel, inexpensive, rapid, enzyme-free, colorimetric Point-ofCare Testing device sensitive to physiological concentrations of glucose.

This project aims the development of a novel, inexpensive, rapid, enzyme-free, colorimetric Point-ofCare."

Nuno Almeida
Universidade de Aveiro

"Multimodal Interaction: Contributions to Simplify Application Development

Humans communicate through multiple senses. The way users interact with applications is changing:
a) widespread availability of new devices and technologies enables richer interaction options;
b) Multimodality may shorten the gap between the user and the ambient;
c) Diverse interaction options potentially increase usability rates and acceptance;
d) This gap reduction is particularly relevant for scenarios such as Ambient Assisted Living (AAL);
e) increasingly relevant in our ageing society;
f) There is an increasing demand for more natural ways of interaction;
g) Speech;
h) Gestures;
i) Gaze.

Development of new applications supporting multiple modalities in a truly multimodal setting requires."

Nuno Moniz
Universidade do Porto

"Prediction and Ranking of Highly Popular Web Content

Anticipate the attention that web content will receive in social media platforms, focusing on highly popular items. For example, the most viewed video/news items of a given day.

Use this information to provide faster and more interesting recommendations of content, using data from official sources (describing the items) and social sources (social feedback concerning the items)."

José Sousa
Universidade de Trás-dos-Montes e Alto Douro

"Using Drones in Road Accidents Investigation: Viability Assessment & Methodology proposal

A car crash investigation takes place in three distinct phases:
a) Data/Information gathering;
b) Analysis;
c) Fact presentation.

Complexity according to the scenario found: high set of information to collect.

It is of vital importance to explore new methodologies to complement or even to replace the current methodology, while ensuring accuracy and maximum safety criteria.

Main objective
Develop an innovative methodology, weather and lighting conditions independent, which is able to provide more comprehensive information on the accident's area, maintaining the accuracy levels."

Jury

Liliana Ferreira (PhD, Fraunhofer AICOS)
Ana Correia de Barros (PhD, Fraunhofer AICOS)
Pablo Oliveira Antonino (PhD, Fraunhofer IESE)

Special Invitees

João José Pinto Ferreira (PhD, FEUP-MIETE)
Marlos Silva (MSc, SONAE)
Nuno Vargas (MSc, MDIF)
Pedro Aguiar (BSc, Ah Business)

Ana Correia
Universidade do Minho

"Functional Electrical Stimulation System for Drop Foot Correction: an AI-based approach

Drop Foot (DF) is a gait disorder that results in a reduced ability or total inability to raise the foot and toe. Our wearable system aims at correcting DF in real-time using Functional Electrical Stimulation (FES).

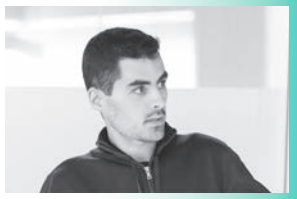
The system is meant to provide a personalized experience for every user, focusing on an assisted-as-needed rehabilitation technique using an Artificial Intelligence (AI) based approach."

Carolina Gouveia
Universidade de Aveiro

"Bio-Radar

The bio-radar system can measure vital signals accurately by using the Doppler effect, that relates the received signal properties with the distance change between the radar antennas and the person's chest-wall. In this work, an acquisition system is developed using a front-end based in Software Defined Radio.

It implements an algorithm for respiratory rate extraction, considering the acquired signal's sensitivity and it is capable to process and display the respiratory signal in real time."



José Dias
Universidade do Minho

"New Generation of Green Printed Lithium-Ion Batteries

The challenges originated by the production of renewable energy, coupled with the advent of industry 4.0, with the smart devices associated with the IoT, entailed the need for an efficient and reliable energy storage technology.

This idea is based on the production of more efficient, sustainable and easily recyclable lithium-ion batteries. The future objective will be the transfer of technology between academia and industry for the dynamization of the mining and manufacturing market in Portugal."

MSc

Sanaz Asgarifar
Universidade do Algarve

"Novel Treatment of Glioblastoma Brain Tumour using Bioelectronic Devices

Glioblastoma is known to be one of the most lethal and untreatable brain tumour.

It is often located in forebrain region (cerebrum) which controls some of the most advanced processes such as speech and emotions.

Treatment is often limited by the tumour location and consequently, it makes GBM a particularly difficult cancer to treat."

Rodrigo Bruno
Instituto Superior Técnico (UL)

"novaVM - Enhanced Java Virtual Machine for Big Data Applications

Big Data platforms are empowering science and industry all over the world. From scientific experiments to online social networks, recent systems require processing and/or storing massive amounts of data.

However, current runtime systems that handle this data were not initially designed to cope the requirements imposed by Big Data platforms. Hence, we propose a new runtime system, novaVM, which, through a set of developed algorithms, improves the performance of current Big Data platforms."

Filipa Ferrada
Universidade Nova de Lisboa

"A Modeling Framework for Assessing Emotions in Collaborative Networks

A modeling framework based on emotions "felt" by organizations is proposed with the aim of bringing another decision management approach to the context of collaborative enterprise networks (CN).

This approach adopts some of the models developed in psychology, sociology and affective computing areas borrowing the concept o human-emotion to the context of CN. A novel simulation model based on system dynamics and agent-based techniques for estimating the emotions present in the CN is also proposed."

PhD

Jury

Liliana Ferreira (PhD, Fraunhofer AICOS)
Hugo Gamboa (PhD, Fraunhofer AICOS)
Pablo Oliveira Antonino (PhD, Fraunhofer IESE)

Special Invitees

João José Pinto Ferreira (PhD, FEUP-MIETE)
Clara Gonçalves (MSc)
Inês Campos Costa (MSc, ANJE)
Patrick Borg Hedley (Lufthansa Group Portugal)
Filipe Josué Oliveira (MBA, Sonae MC)
Ana Ferreira (PhD, CINTESIS – PhD Winner of the Fraunhofer Portugal Challenge 2010)

Catarina Lourenço
Universidade do Porto

"Deep Learning for EEG Analysis in Epilepsy

This work shows the successful application of deep learning techniques for the automation of the diagnosis of epilepsy through the detection of interictal epileptiform discharges in the electroencephalogram (EEG).

Current diagnosis of epilepsy is done by visual analysis of the EEG. However, this is very resource-consuming and the misdiagnosis rate is up to 30%, indicating that both patients and clinicians would benefit from the automation of this process."

Gonçalo Marcelino
Universidade Nova de Lisboa

"A Computational Approach to the Art of Visual Storytelling

For millennia, humanity has been using images to tell visual stories and today there are millions of images available (online and otherwise) with which to create these visual narratives. For news media editors, this means filtering massive amounts of images while trying to combine them in a highly skillful manner to illustrate news pieces.

This work aims to help news editors in this process by studying and automatically creating visual storylines, through state of the art IA methodologies."

Manuel Carneiro
Universidade de Coimbra

"Comfortable Fabric-Based Headband for Forehead EEG Monitoring

Although the acquisition of bio-signals is an established technology, the currently used electrodes for interfacing with the body fail in terms of comfort and conformability to the human skin. In the case of EEG, current long-term solutions are often bulky, expensive and difficult to setup.

The main goal of this work was the implementation of a novel comfortable e-skin based EEG acquisition system with SOTA materials and methods for stretchable electronics and e-textile fabrication."

MSc

Vanessa Duarte
Universidade de Aveiro

"Connecting the Unconnected: The New Era of Satellites

Ubiquitous satellite communications are in a leading position for bridging the digital divide.

Such requires a new generation of communications payloads with large-scale processors for a total capacity of 1Tbit/s.Here, a first-ever demonstration of a real-time photonic processor capable of processing 4 input signals and 5000 times smaller than an identical RF processor is presented.Such a disruption paves the way towards the introduction of booming technologies in satellite services such as IoT."

Ricardo Correia
Universidade de Aveiro

"Passive Backscatter Sensors for IoT Applications

Nowadays, the Wireless Sensor Networks depend on the battery duration of the sensors and there is a renewed interest in creating a passive sensor network scheme. Specially designed radios should be used to reduce power consumption and adapt to the environment in a smart and efficient way.

This proposal will focus on the development of passive sensors based on low power communication (backscatter) with Wireless Power Transfer capabilities used in IoT applications."

João Felício
Instituto Superior Técnico (UL)

"Microwave Breast Imaging Using Dry Setup

We study the feasibility of dry microwave imaging (MWI) setup for breast cancer screening, as an alternative to current imaging modalities.

The non-inclusion of coupling medium, which is common practice in state-of-the-art MWI systems, has profound implications on both hardware and software components.

Here, we tackled these challenges, as to favor hygienic and fast examinations at reduced costs, thus enabling the deployment of this technology in remote locations and portable devices."

PhD

Fraunhofer PORTUGAL | CHALLENGE 2020
Remarkable Technology, Easy to Use

An initiative promoted by
Fraunhofer Center for Assistive Information and Communication Solutions – AICOS