

CENTRE FOR TELECOMMUNICATIONS AND MULTIMEDIA

SCOPE AND ACTIVITY FOR 2021

RCCI/2021-10-06

from knowledge
generation to
science-based
innovation



CENTRE ORGANISATION

Coordination

(Jaime Cardoso | Filipe Ribeiro)

Coordination Council
(Coordination | Area Leaders)

Scientific Council
(All CTM's PhD)

Representatives in INESCTEC Scientific Council
(Henrique Salgado | Paula Viana)

Secretariat
(Renata Rodrigues)

Operational Areas



Optical and
Electronic Technologies

(Luís Pessoa)



Wireless
Networks

(Rui Campos)



Multimedia
Communications Technologies

(Paula Viana)



Visual Computing and
Machine Intelligence

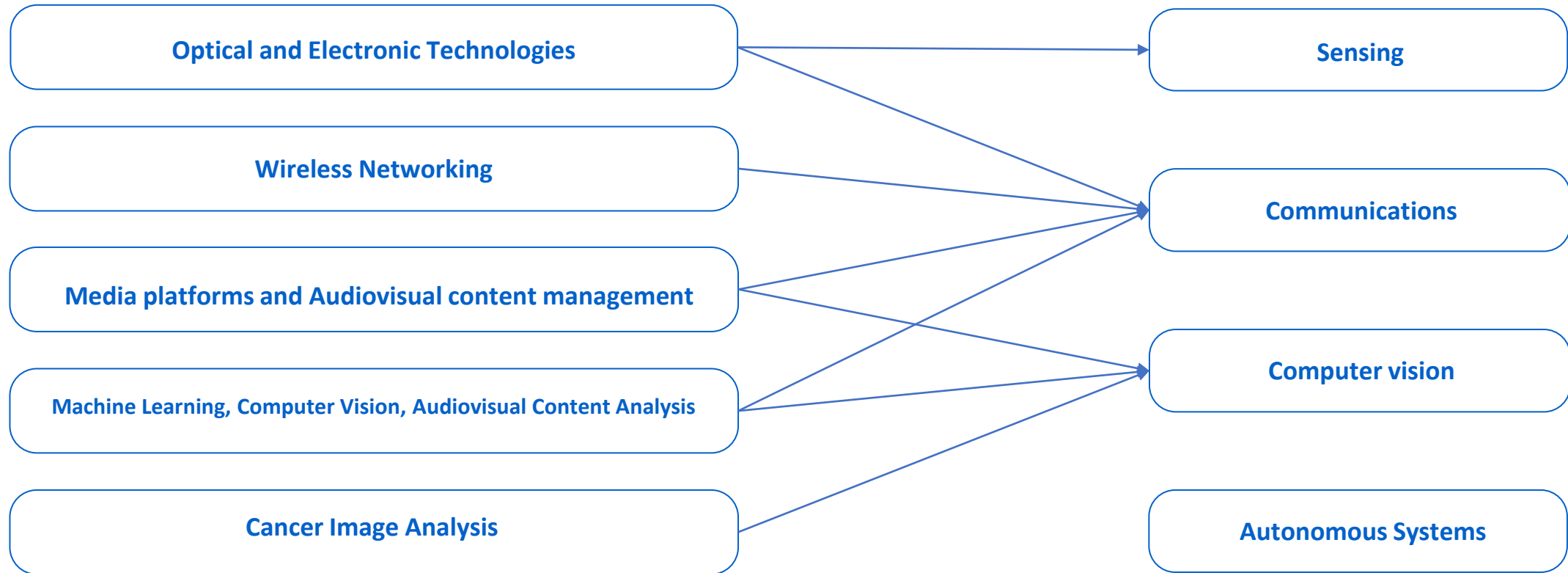
(Hélder Oliveira)

RESEARCH LINES

CTM



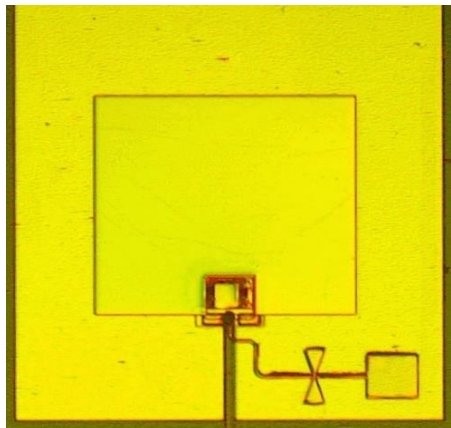
NETWORKED INTELLIGENT SYSTEMS



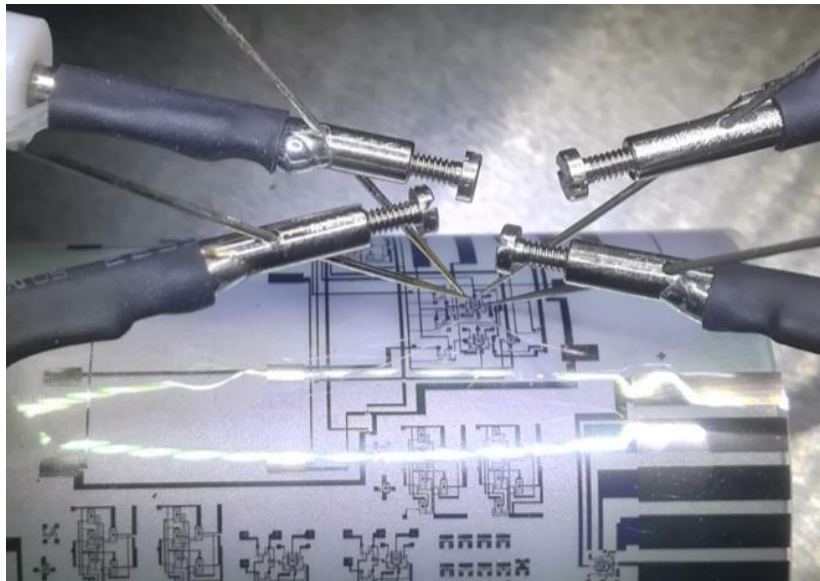
RESEARCH LINES

➤ OPTICAL AND ELECTRONIC TECHNOLOGIES

- RF/microwave and mm-wave antennas and devices and optical/wireless interfaces
- Thin film electronics towards neuromorphic computing architectures
- Reconfigurable electronics for adaptive transparent acceleration (from software to hardware - FPGA)
- Study of solitons and wave stability in different media



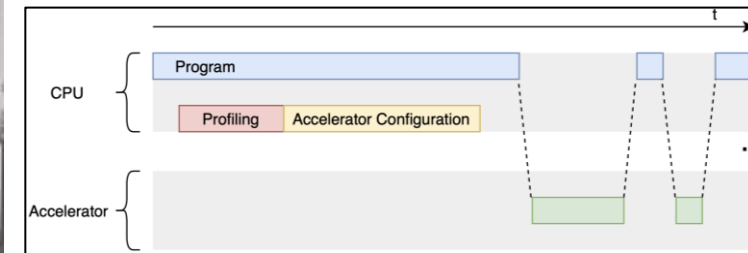
Planar antenna with optical interface for wireless communications at 300 GHz



Thin-film electronics for in-memory computation



Microwave cavity for cork moisture measurement



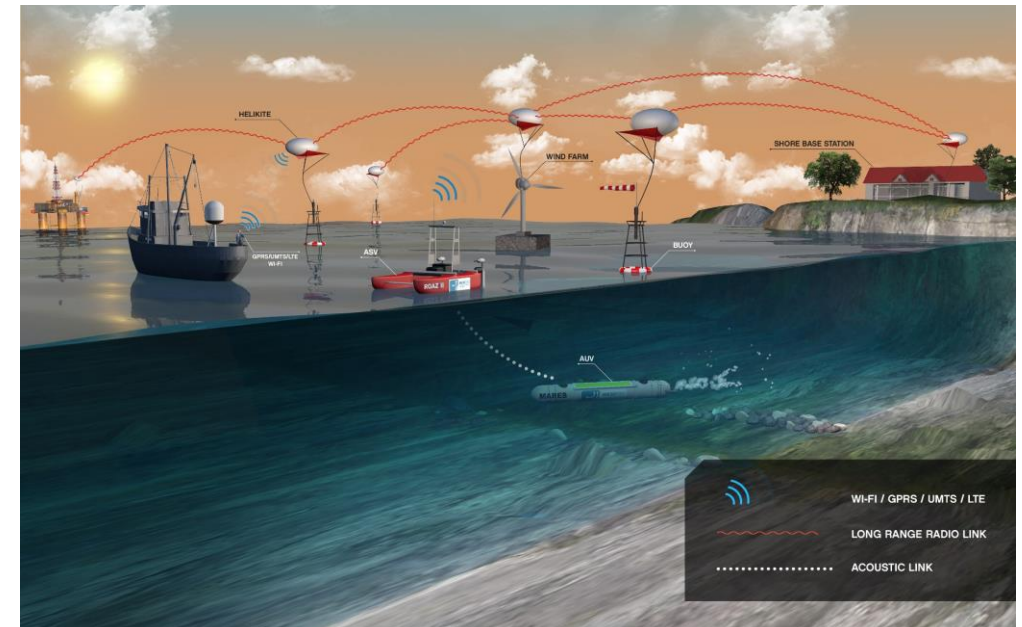
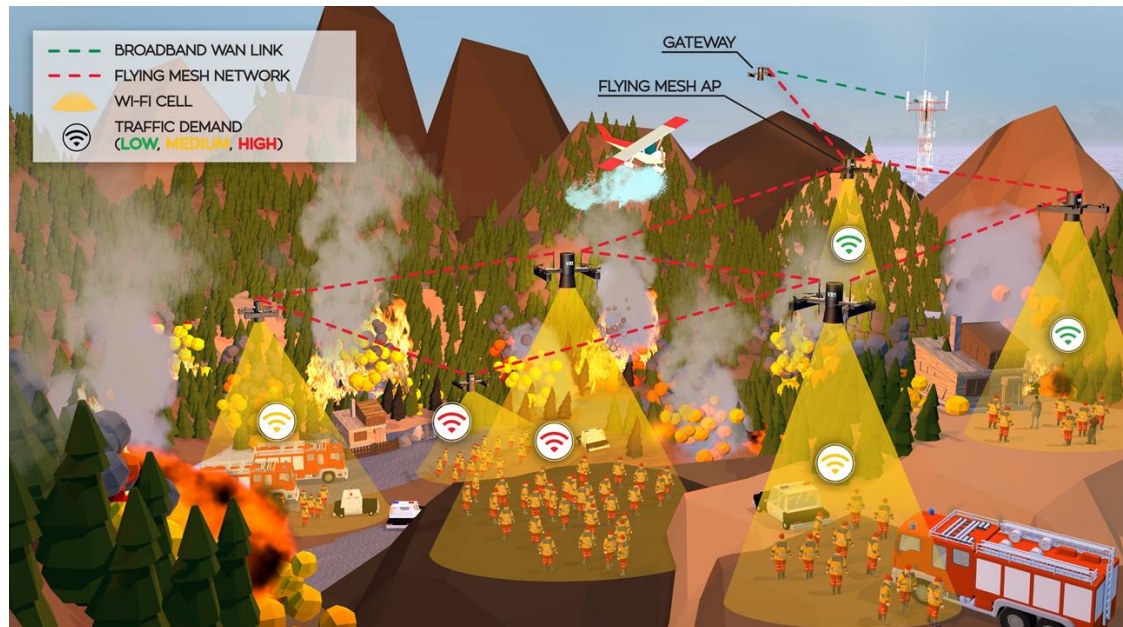
Transparent code acceleration with FPGA for HPC platforms

RESEARCH LINES

➤ WIRELESS NETWORKING

- Wireless networking for **extreme environments** - aerial, sea, underwater
 - Building upon Wi-Fi, 5G (towards 6G), and IoT wireless technologies
- **Self-learning** wireless networks using AI/ML techniques
- **Data-driven models** based on ML techniques - Wireless Network Digital Twins

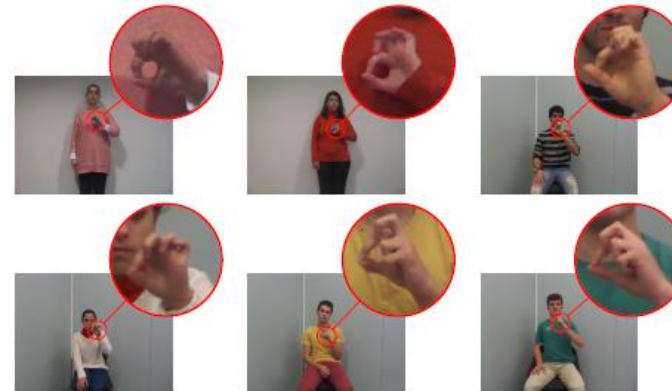
ns-3
NETWORK SIMULATOR



RESEARCH LINES

➤ MACHINE LEARNING, COMPUTER VISION AND AUDIOVISUAL CONTENT ANALYSIS

- New architectures of Machine/Deep learning models
 - Explainable and uncertainty aware deep learning architectures
 - Domain Adaptation
 - Domain knowledge and data integration
- Compression and acceleration of Deep CV
- Multimodal learning
- Efficient annotation Learning
- Open World Learning



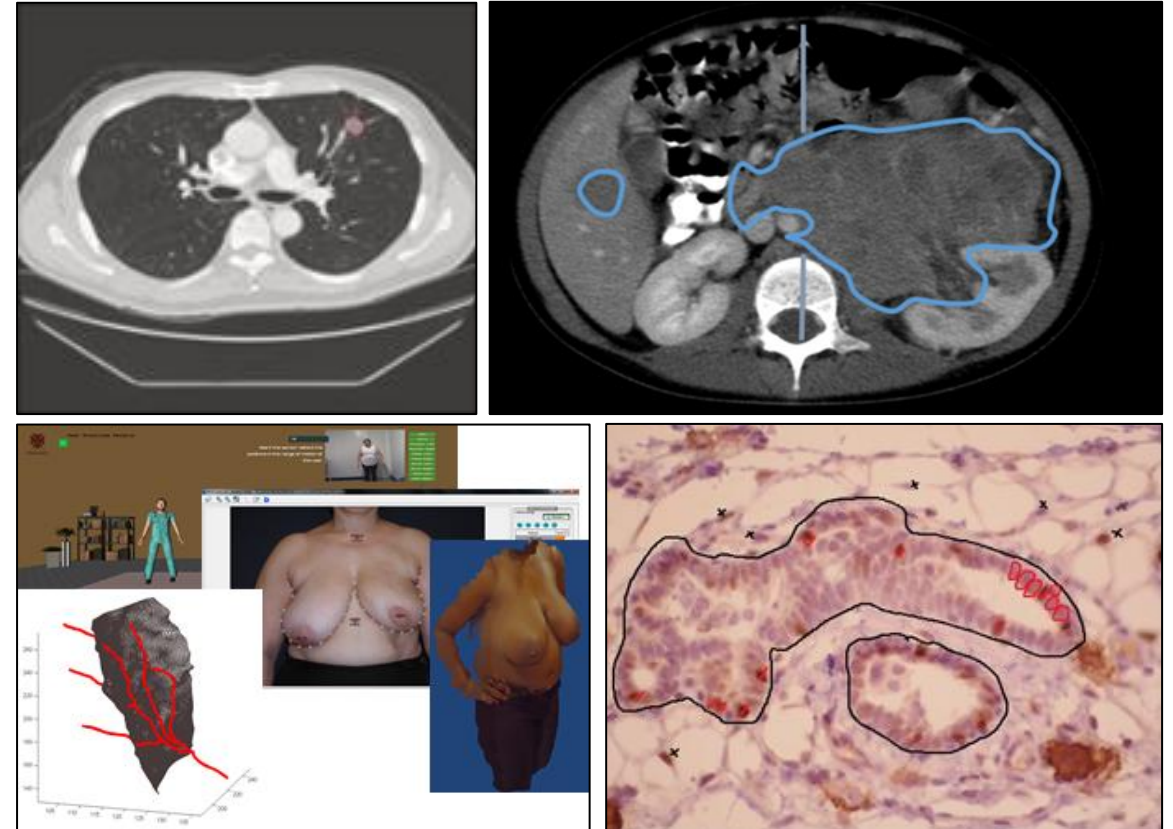
For medical decision support, well-being, biometrics, biological imaging, autonomous driving, advanced driver help systems, video analytics systems, entertainment, media industries, sports, and arts



RESEARCH LINES

➤ CANCER IMAGE ANALYSIS

- Screening
- Computational Pathology
- Malignancy/aggressiveness prediction
- Biomarker prediction
- Surgery planning and evaluation
- Treatment vs Outcome assessment/prediction
- Quality of Life Assessment
- Rehabilitation

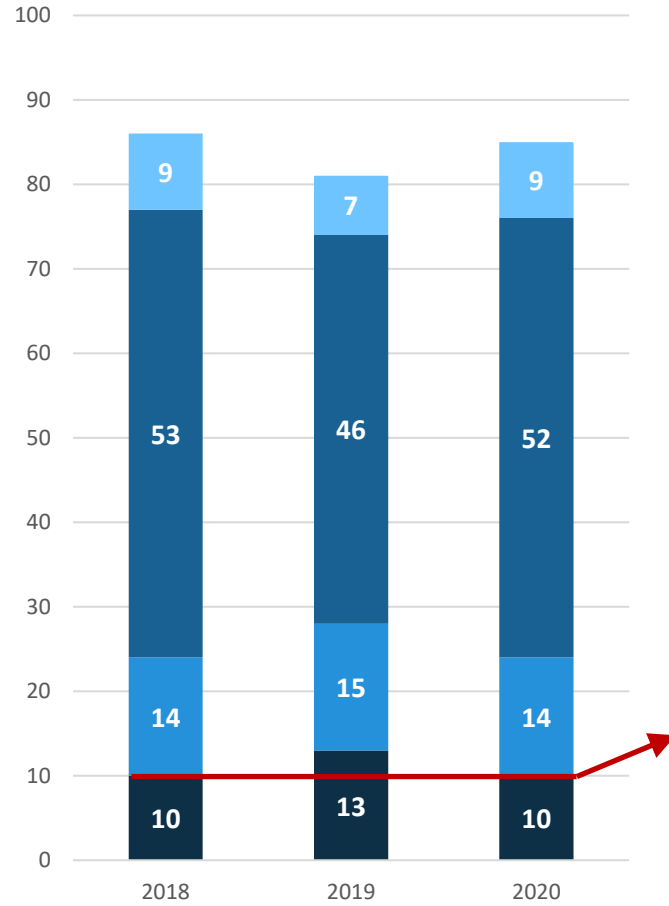


- **Pathologies** - Breast, Cervical, Colo-Rectal, Lung, Pancreatic, Neuroblastoma

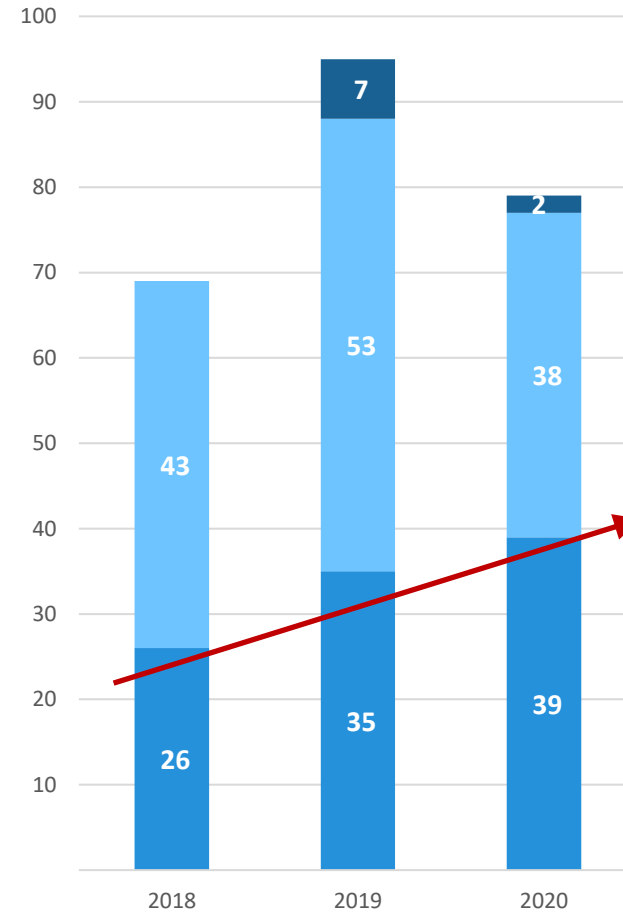
INNOVATION ACTIVITIES AND APPLICATION AREAS

	TEC4 AGRO-FOOD	TEC4 ENERGY	TEC4 HEALTH	TEC4 INDUSTRY	TEC4 SEA	TEC4 OTHERS
Design of radio/microwave systems	Potencial	Potencial	Potencial	Activity	Activity	- ICT - Telecom
Design of (micro)electronic systems	Activity	-	Activity	Activity	Activity	- ICT
Design of narrowband and broadband wireless networks	Activity	Activity	Potencial	Activity	Activity	- ICT - Telecom
Design of multi-hop, on-demand wireless networks	Activity	Potencial	Potencial	Potencial	Activity	- ICT - Telecom
Design of wireless networks for autonomous vehicles	Potencial	Potencial	Potencial	Potencial	Activity	- Mobility
Context-aware personalised multimedia applications	-	Activity	-	Potencial	-	- Media - Sports
Multimedia content management and visualisation	Activity	Potencial	Potencial	Potencial	Potencial	- Media - Sports
Computer Vision and AI based solutions for multimedia-based applications	Potencial	Potencial	Activity	-	Potencial	- Media - Sports
Computer Vision and AI in medicine and biometrics and autonomous driving	Potencial	-	Activity	Activity	Potencial	- Mobility
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TEAM AND ACTIVITY | PUBLICATIONS



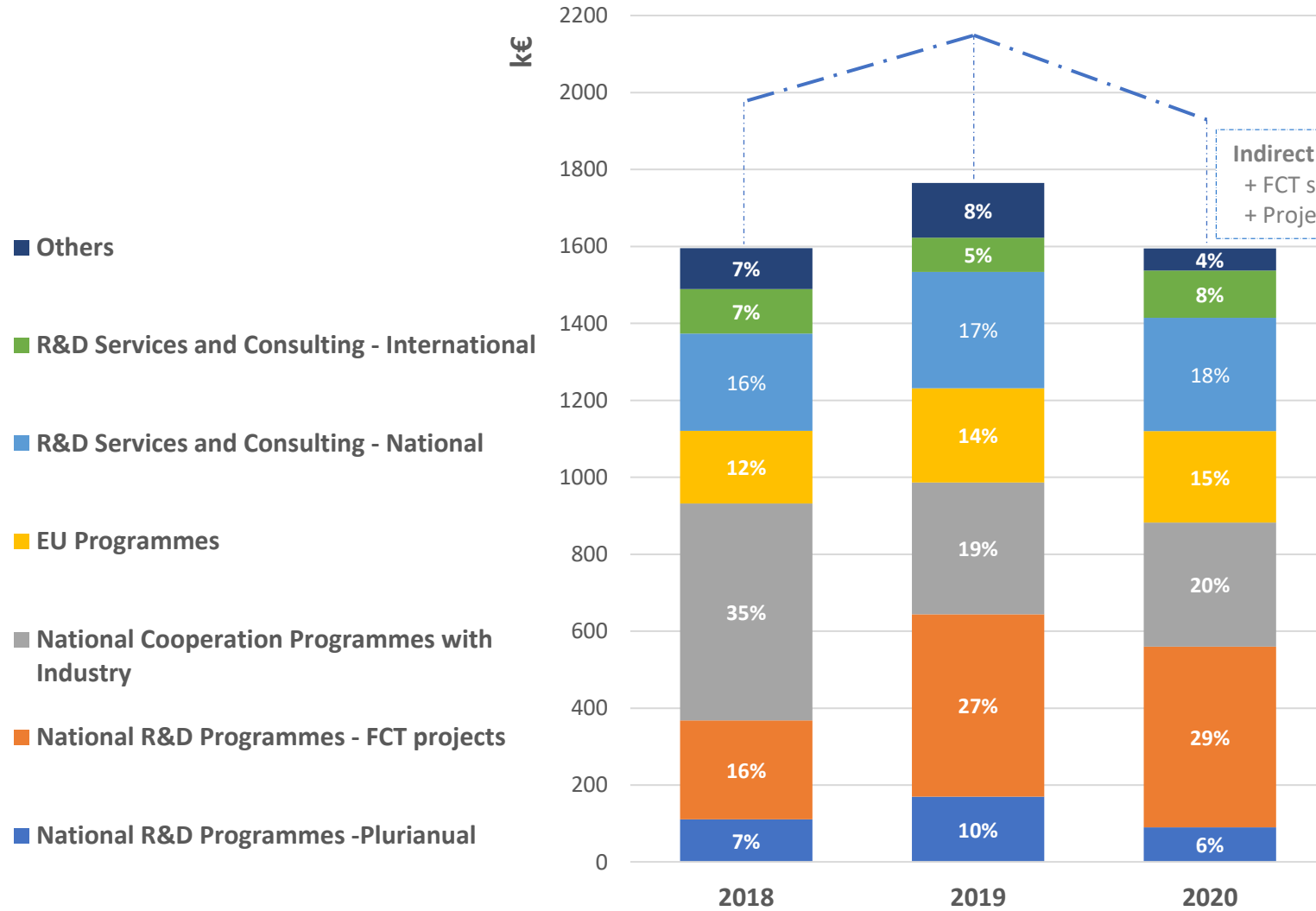
■ R&D Employees ■ Academic Staff
■ Grant Holders and Trainees ■ Affiliated Researchers



■ Indexed Journals ■ Indexed Conferences
■ Books ■ Book Chapters

TEAM AND ACTIVITY | FINANCIAL

Centre **total** activity in €



Acumulated Values [2018 - 2020]

Income:	4 955 k€
Operational Cost:	3 614 k€
Operational Margin:	1 341 k€ -> 37,1%
Total Margin:	346 k€ -> 9,6%

OBJECTIVES & ACTIONS AND THEIR ACHIEVEMENT IN 2021

OBJ1 – More High-quality publications

OBJ3 – Increase CTM research capacity / talent and recruitment

OBJ2 – Increase International visibility and reputation

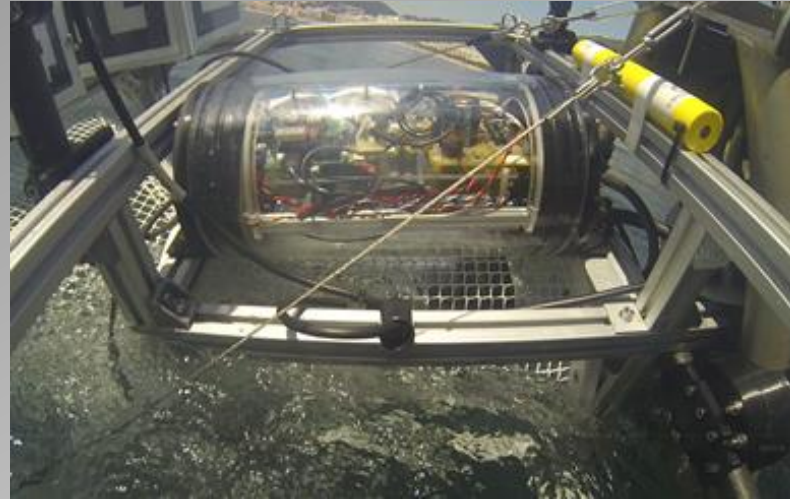
OBJ4 – Upgrade and modernise CTM laboratory

OBJ #	Action	Expected Outcomes	Status
1, 3	Submission of FCT scholarship application and Summer Internship Proposals (as part of the CTM Summer Internships Program)	At least 4 new PhD students	surpassed
1 - 3	Engage students in research activities to exploit <u>new scientific areas</u>	9 MSc theses	Ongoing (likely to be surpassed) [40+ master theses; 10+ exploring emerging topics]
2, 3	Organise CTM Open Day	Create new partnerships with industry, new joint research ventures, reach general public	CTM Open Day took place in May 2021. New partnerships initiated (e.g. Univ. Oulu)
2, 3	Develop prototypes to be used as a proof of concept;	Proof-of-concept prototypes	ContentProduction@QSPsummit2021 Grow_demo@Sesimbra
2	Maintain a CTM policy for the participation in high quality conferences and international focused events by senior researchers	New joint research ventures, increase the participation in the technical committees of conferences and increase the chances of becoming organisers of top conferences	+ external events 2021
3	Organise CTM “Open Days”, through the establishment of a schedule of open days with laboratory visits and demonstration of Prototypes	Attract new students and researchers	Ciência Viva; NEEEC; CTM Summer internships; CTMeetUP / Pizza Session; CTM Best MSc Thesis Award
4; (1-3)	Reserve budget for construction	Full communications laboratory upgrade	Ongoing



PROTOTYPE DEMOS

FCT GROW – Demo
@Sesimbra



QSP Summit 2021
@Matosinhos



[Link](#)

EXTERNAL EVENTS (CO)/ORGANISED



AIME 2021
19th International Conference on Artificial Intelligence in Medicine
Online (Hosted at Porto, Portugal) June 15-18, 2021



EUCNC | 6G Summit
Virtual Conference (Porto, Portugal) ■ 8-11 June 2021



Workshop on Interpretability of Machine Intelligence in Medical Image Computing at MICCAI 2021
September 27 - October 1, 2021 // Strasbourg, France



CDpath
ICCV 2021
WORKSHOP ON COMPUTATIONAL CHALLENGES IN DIGITAL PATHOLOGY
October 11, 2021 | Online event



CIBB 2021
the 17th International Conference on Computational Intelligence Methods for Bioinformatics and Biostatistics
15-17 November, 2021 online



MICCAI Hackathon
How can we bridge the gap to the clinics and move MICCAI methods towards clinical application? Come up with ideas and suggestions at the MICCAI Hackathon!
On the weekend of October 23/24, 2021
with a kick-off as a satellite event at the MICCAI conference on Monday, September 27, 2021



VISUM 2021
9th EDITION OF THE VISION UNDERSTANDING & MACHINE INTELLIGENCE SUMMER SCHOOL
July 02-09, 2021 | Fully Virtual Event



xAI4 BIOMETRICS
WACV 2022
2ND WORKSHOP ON EXPLAINABLE & INTERPRETABLE ARTIFICIAL INTELLIGENCE FOR BIOMETRICS AT WACV 2022
4 January 2022, Waikoloa HI, USA

+3000 participants in 2021

LABORATORY UPGRADE – ONGOING

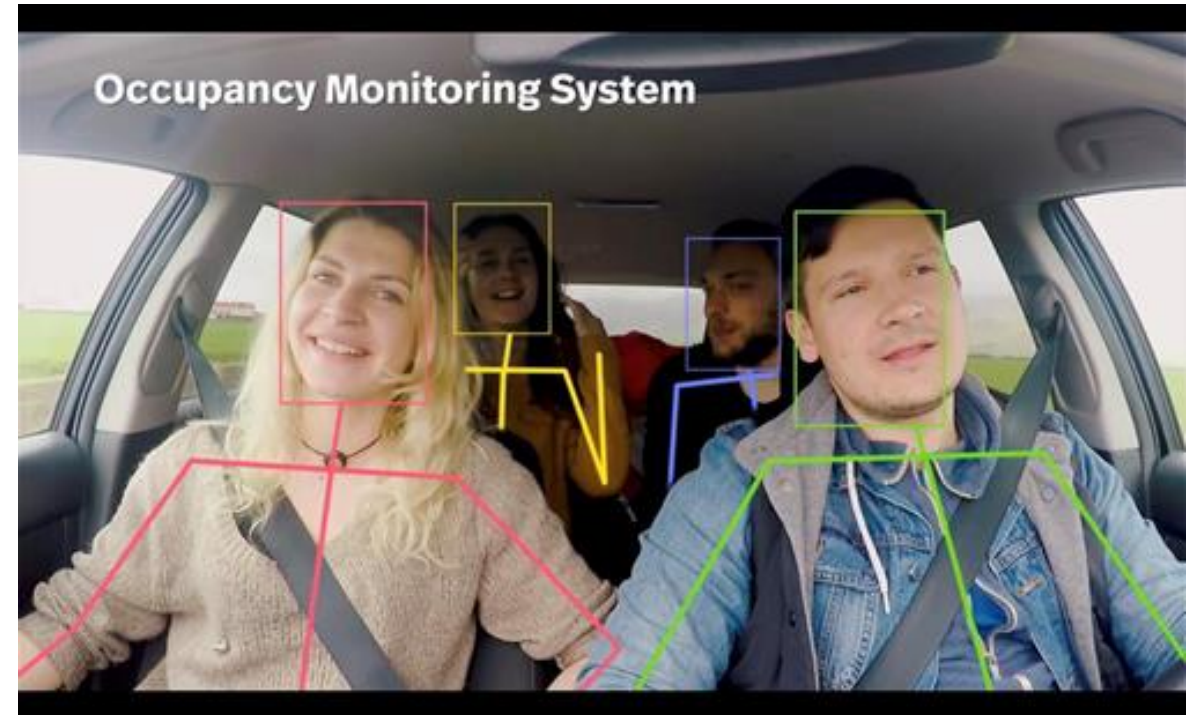




FLAGSHIP PROJECTS

➤ EASYRIDE (2020 – 2021)

- P2020: Bosch Car Multimedia
- R&D Contract with INESC TEC - CTM



Successful mapping of passenger activity has far-reaching implications for both user experience (UX) and safety functions in autonomous vehicles (AVs)

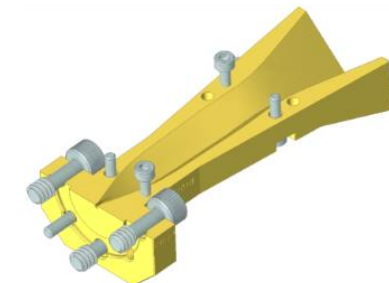
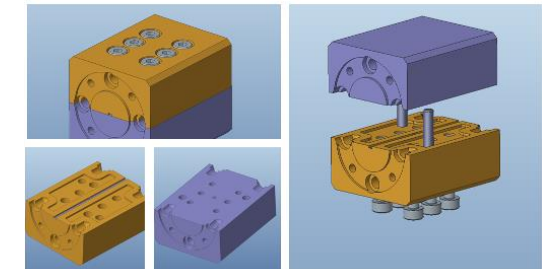
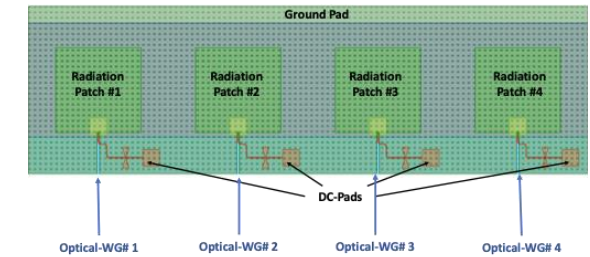
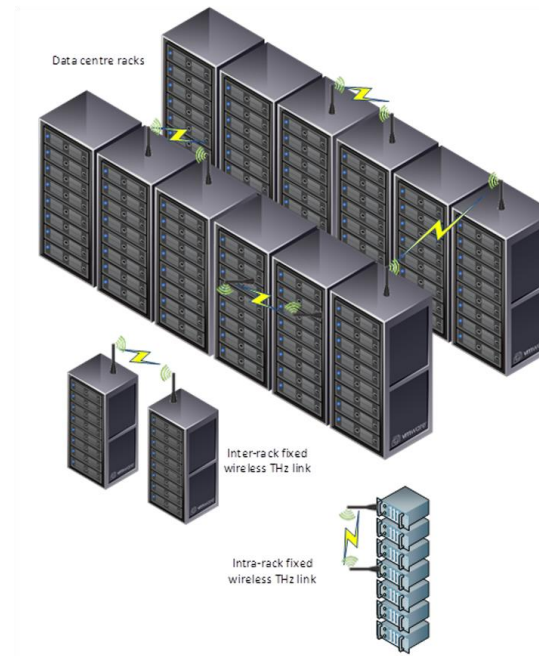
Activity recognition of passengers in autonomous vehicles

FLAGSHIP PROJECTS

➤ TERAPOD (2017 – 2021)

- H2020 project
- Coordinator: WIT (Ireland)
- Partners: INESC TEC (CTM), companies, end-users

Novel microwave devices and antennas
Targeting 300 GHz frequency band



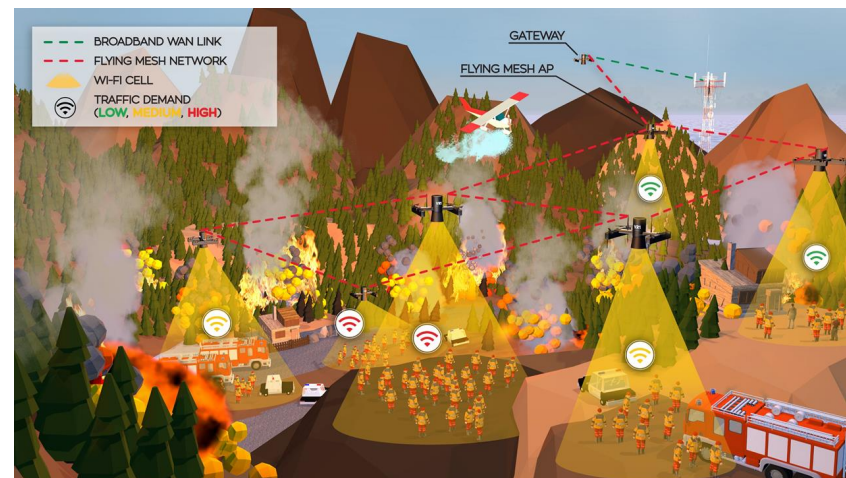
FLAGSHIP PROJECTS

➤ RESPONDRONE (2019-2022)

- H2020 project
- Coordinator: DLR (DE)
- Partners: INESC TEC (CTM), companies, end-users

Develop **integrated solution for first responders** to easily **operate several drones** with multiple synchronized missions to enhance their **situation assessment capacity** and **own protection**

On-demand airborne communications using **position-controlled drones**





FLAGSHIP PROJECTS

➤ TAMI (2020 – 2023)

- Transparent Artificial Medical Intelligence
- CMU-Portugal Project
- Partners: INESC TEC (CTM & C-BER), First Solutions, Fraunhofer, ARS Norte, CMU

Research Explainable AI Methods for Medicine



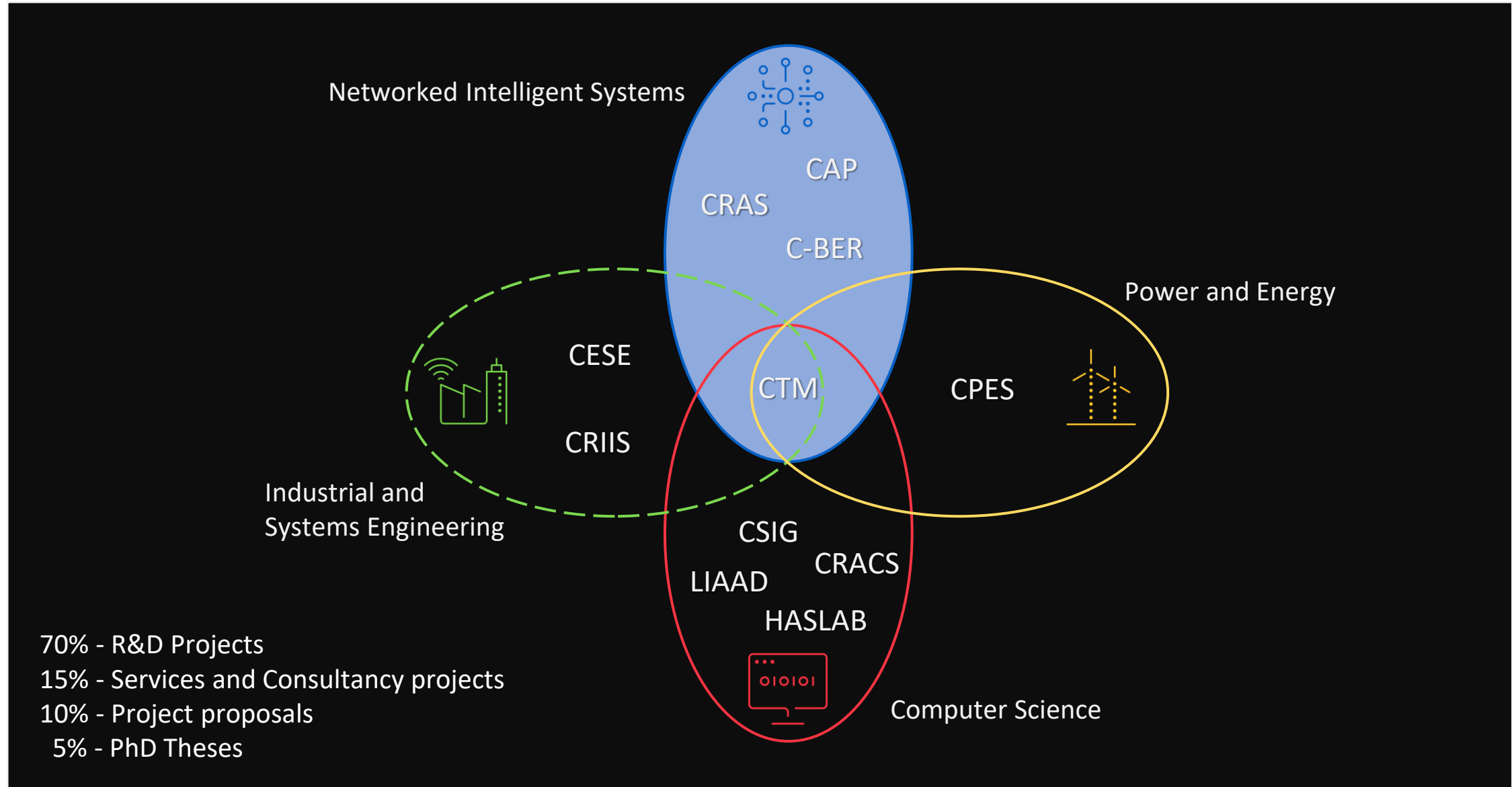
Create a new platform (based on AI methods) that will provide healthcare actors the access to results of four main imagiological exams:

- Glaucoma, Cervical Cytology, Cervical Colposcopy and Chest X-Ray.

MAIN EXTERNAL PARTNERS (2018 – 2020)



COLABORATIONS WITH CENTRES (2018-2020)



ARE WE ON THE RIGHT TRACK?





More details after a ...



Thank you!