

## UNIVERSITY OF PIRAEUS



#### AMERICAN UNIVERSITIES DELEGATION

MONDAY 07/11/2022

Department of Digital Systems



## DEPARTMENT OF DIGITAL SYSTEMS: UNDERGRADUATE PROGRAM

Department's web site: https://www.ds.unipi.gr/en/home-en/

The department's curricula and research cover the areas of digital/network services, big data processing, artificial intelligence, wireless networks, network softwarization and management, security of digital systems, biomedical and health informatics, multimedia systems, e-learning and educational technology, e-government, and techno-economic management.

On this basis, the undergraduate curriculum has a core program of study comprising of 29 courses and 15 electives that result in a major in one of the following areas of study:

- "Telecommunications & Networks" (T&N)
- "Software & Data Systems" (SDS)
- "Computational Infrastructures & Services" (CIS)

and a minor in

• "Systems Security" (SEC) or "Electronic Learning" (EL)



### DEPARTMENT OF DIGITAL SYSTEMS: POSTGRADUATE PROGRAMS

#### The Department of Digital Systems offers the following Postgraduate Study Programs:

- MSc in Information Systems and Services
- MSc in e-Learning
- MSc in Digital Communications and Networks <a href="https://masters.ds.unipi.gr/dcomms/en/">https://masters.ds.unipi.gr/dcomms/en/</a>
- MSc in Digital Systems Security
- MSc in Technoeconomic Management of Telecommunication Systems

https://masters.ds.unipi.gr/technoeconomic/en/

https://mscdss.ds.unipi.gr/en/

https://masters.ds.unipi.gr/elearning/en/

https://masters.ds.unipi.gr/security/en/

MSc in Law and Information and Communication Technologies

https://masters.ds.unipi.gr/MSc\_Law\_ICT/en/

• MSc in Climate Crisis and Information and Communication Technologies

https://masters.ds.unipi.gr/MSc\_Law\_ICT/en/

Inter–University Postgraduate Programme Artificial Intelligence <u>https://msc-ai.iit.demokritos.gr/</u>

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## DEPARTMENT OF DIGITAL SYSTEMS: DEPARTMENT LABORATORIES

#### **Research laboratories**

- Network Oriented Systems and Services Laboratory (NSS) <u>http://nss.ds.unipi.gr/en/</u>
- Telecommunication Networks and Integrated Services (TNS) <u>https://tns.ds.unipi.gr/</u>
- Telecommunication Systems Lab <u>https://tsl.ds.unipi.gr/</u>
- Systems Security Lab <u>https://ssl.ds.unipi.gr/</u>
- Artificial Intelligence <u>http://datacron1.ds.unipi.gr:9083/ai-lab/</u>
- Technologies for Digital Education <u>http://tum.ds.unipi.gr/</u>
- Media Technologies and Intelligent Systems (METIS) <u>http://epinoetic.org/</u>
- Computational Biomedicine Lab <u>http://cbml.ds.unipi.gr/en/</u>
- Digital Health Services Laboratory <a href="http://dhsl.ds.unipi.gr/en/">http://dhsl.ds.unipi.gr/en/</a>
- Laboratory "Environmental and Energy Policies and Systems"



#### DEPARTMENT OF DIGITAL SYSTEMS: CONTACT INFO

Currently, the Department's 22 faculty members participate in 95 research projects. In 8 of them a faculty member of our department is the Project's Coordinator. 45 research projects are European funded projects. For further information on various research areas of interest, we provide the following contact information:

- Network Oriented Systems and Services: Associate Professor Dimos Kyriazis, e-mail: <u>dimos@unipi.gr</u>
- Wireless Systems: Professor Athanasios Kanatas, e-mail: <u>kanatas@unipi.gr</u> and Professor Angeliki Alexiou, e-mail: <u>alexiou@unipi.gr</u>
- Network softwarization and management: Professor Panagiotis Demestichas, e-mail: <u>pdemest@unipi.gr</u>
- Systems Security: Professor Christos Xenakis, e-mail: <u>xenakis@unipi.gr</u> and Professor Kostas Lambrinoudakis, e-mail: <u>clam@unipi.gr</u>
- Artificial Intelligence: Professor George Vouros, e-mail: georgev@unipi.gr
- Computational Biomedicine: Professor Ilias Maglogiannis, e-mail: <u>imaglo@unipi.gr</u>
- Multimedia Systems: Professor Nikitas Sgouros, e-mail: <u>sgouros@unipi.gr</u>
- E-learning: Professor Symeon Retalis, e-mail retal@unipi.gr and Professor Dimitrios Sampson, e-mail sampson@unipi.gr
- eHealth and eGovernment interoperable systems and services: Professor Andriana Prentza, e-mail aprentza@unipi.gr



#### UNIVERSITY OF PIRAEUS Department of Digital Systems Computational Biomedicine Laboratory

The **Computational Biomedicine Research Lab**, within the Department of Digital Systems in University of Piraeus consists of faculty members with PhDs in the area of biomedical informatics and machine learning, who supervise postgraduate research work of highly qualified graduate engineers. The group has great expertise in developing e-health applications and in medical data processing. A number of apps and tools have been developed by the group allowing proper acquisition, coding and transmission of medical data, while also serving as diagnostic adjuncts. Apart from the aforementioned tools, the group has established a repository of medical data consisting mainly of medical images and biosignals of various modalities

# The Laboratory serves the following educational and research subjects:

- Biomedical Engineering and Technology
- Biosignal Processing
- Analysis of Biomedical Images
- Pattern Recognition in Medical Data
- Biosensors Technologies
- Wireless Sensor Networks and Internet of Thing
- Environments for independent living
- Living Labs
- Bioinformatics

#### Contact Info

<u>University of Piraeus</u> <u>Department of Digital Systems</u> Androutsou 150, 18536, Piraeus Greece Tel: <u>+30 210 414 2517</u> Email: <u>imaglo@unipi.gr</u>

## **R&D PROJECTS (SELECTION)**

- PROMISE -Personalization of melanoma therapeutic management through the fusion of systems biology and intelligent data mining methodologies – Greece China Collaboration
- TRANSITION Translating the diagnostic complexity of melanoma into rational therapeutic stratification
- MEDILUDUS Personalized Medical Care through Serious Games and Gamification
- e-LICO "e-Laboratory for \_ Interdisciplinary Collaborative Research in Data Mining and Data-Intensive Sciences European Commission (IST-2007)
- CrowdHEALTH Collective wisdom driving public health policies (H2020)



**Emotion Analysis and Affective Computing** 

Digital Dermoscopy Image Analysis





## PROJECT MANTO: STATE-OF-THE-ART OUTDOOR AND INDOOR SMART-PHONE NAVIGATION APPLICATIONS FOR BLINDS AND VISUALLY IMPAIRED

- Scientific Coordinator: Prof. Apostolos Meliones (<u>https://www.ds.unipi.gr/en/faculty/meliones-en/</u>)
- Funded by National Operational Programme Competitiveness, Entrepreneurship & Innovation EPAnEK 2014-2020
- Project budget: € 331.412,18 Project duration: 25/7/2018-24/9/2021
- Partners: University of Piraeus Research Centre (Coordinator), Lighthouse for the Blind of Greece, Irida Labs
- Project webpage: <u>https://manto.ds.unipi.gr</u>
- 3 pending patents, 26 research publications, ongoing research
- Blind RouteVision Outdoor: Real-time continuous precise user tracking and guidance method for autonomous outdoor blind navigation including public transportation, server-less traffic light field sensor for blind crossing of street intersections, supersonic obstacle detection and avoidance, real-time visual information



 Blind MuseumTourer Indoor: Real-time precise tracking and guidance method for autonomous indoor blind navigation, pilot deployment in the Tactual Museum

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## DATA MANAGEMENT

- MobiSpaces: New Data Spaces for Green Mobility, Funding Agency: European Union, www: https://mobispaces.eu/
- VesselAI: Enabling Maritime Digitalization by Extreme-scale Analytics, AI and Digital Twins, Funding Agency: European Union, www: <u>https://vessel-ai.eu/</u>
- CHOROLOGOS: Semantic Spatio-textual Data Analysis and Processing, Funding Agency: HFRI/GSRT, www: https://www.ds.unipi.gr/chorologos/

Contact Details Associate Prof. Christos Doulkeridis (cdoulk@unipi.gr)

## **E-GOVERNMENT INTEROPERABLE SYSTEMS AND SERVICES**

#### Flagship Projects (selection)

- EU/ICT-PSP CIP Pilot Type A "Pan-European Public Procurement OnLine (PEPPOL)" co-funded by the EC with the aim of simplifying eProcurement across borders by developing technology standards. The PEPPOL project developed specifications and infrastructure for enabling businesses to communicate electronically with any European government institution in the procurement process. The results were handed over to the OpenPeppol AISBL that still governs the Peppol network and operates globally in more than 40 countries.
- EU/ICT-PSP CIP Pilot Type A "Electronic Simple European Networked Services (e-SENS)" co-funded by the EC with the aim to consolidate the work done in previous LSPs, providing generic IT solutions for cross-border communication. e-SENS succeeded in creating a pan-European set of IT building blocks (BBs) for interoperable digital public services. e-SENS worked further and extended eDelivery & eID BBs, provided specification on eProcurement & eInvoicing BBs and handed them over to European Commission (CEF).
- EU/H2020 LSP "The Once Only Principle Project TOOP", funded by the EC with the aim to explore and demonstrate the once-only principle (OOP) across borders, focusing on data from businesses. The TOOP project ran pilots in three different domains, General Business Mobility, Maritime, and eProcurement, across fifteen Member States. The TOOP Solution Architecture was provided as a basis to the EC and the EU MS responsible for the implementation of the OOP (OOTS) in the context of SDGR

Contact Details Prof. Andriana Prentza (aprentza@unipi.gr)

## DATA & CLOUD RESEARCH GROUP: HTTPS://DAC.DS.UNIPI.GR/

#### Analytics in various domains

- Health (risk stratification for co-morbidities)
- Insurance (tailored products based on health risk estimation)
- Finance (personalized portfolio management, SMEs financial plans optimization) € M INFINITECH
- Agriculture / fishery
- Transportation / logistics (dynamic routing based on predictive maintenance outcomes)

#### Research outcomes supporting analytics

- Data interoperability and domain-agnostic data cleaning
- Resources management for big data operations and applications
- Trustworthiness guarantees in data analytics algorithms
- Utilization of edge / fog / 5G resources for analytics





∕⊘iHelp



CYBELE



ATMOSPHERE



## **TELECOMMUNICATIONS SYSTEMS LABORATORY**

#### **Active Projects**

- ARGOS: "ARGOS Conceptual Design Study: Designing a Next-Generation Radio Facility For Multi-Messenger Astronomy" funded by the European Commission under the HORIZON-INFRA-2022-DEV-01 call".
- CitySCAPE: "City-level Cyber-Secure Multimodal Transport Ecosystem", HORIZON 2020-SU-DS-2019 GA# 883321.
- HAMMER: "enabling Hybrid beAmforming and Massive MIMO through IEaRning", experiment funded by Fed4FIRE+, HORIZON 2020.

Contact Details Director of the TSL, Prof. Athanasios Kanatas (kanatas@unipi.gr)

## **BEYOND SHANNON INTELLIGENCE**





Project Professor Christos Xenakis xenakis@unipi.gr

## SealedGRID: Scalable, trustEd, and interoperAble pLatform for sEcureD smart GRID

H2020-MSCA-RISE-2017 – Horizon 2020 Marie Skłodowska-Curie Research and Innovation Staff Exchange

#### Participants (3 Universities and 3 SMEs):

- University of Piraeus Research Center, Greece
- Universidad of Malaga, Spain
- National Inter-University Consortium for Telecommunications, Italy
- BEIA Consult International SRL, Romania
- Neurosoft S.A., Greece
- Fogus Innovations & Services, Greece



# **SealedGRID**

Analysis, design, and optimization of:

Key management and authentication

Trusted computing and privacy protection



>Authorization and security interoperability mechanisms

in the Smart Grid





## **SealedGRID**

## Architecture 1/2

## SealedGRID Components

– Smart Meter (SM)

 $\rightarrow$ Collects electricity consumption readings.

#### Aggregator

→Is intermediate node between the collector and the smart meter.

 $\rightarrow$ Sums the individual readings received by the SMs.

 $\rightarrow$ Transmits the result to the Utility.

#### – Utility

 $\rightarrow$ Calculates the final billing.

 $\rightarrow$  Produces the energy.







Architecture 2/2 Professor Christos Xenakis

## A scalable, highly trusted, and interoperable Smart Grid security platform.



## **SealedGRID**

## Social Media Presence



**SealedGRID** 

Official Web site: <u>https://www.sgrid.eu</u>



**Facebook** @SealedGRIDH2020

Tweeter @SealedGRIDH2020

LinkedIn SealedGRID Project









H2020 – Grant Agreement no. 777996





## SECONDO consortium

Cyprus University of Technology

UBI

GREENWICH

UNIVERSITY OF



UNIVERSITY OF PIRAEUS RESEARCH CENTER

🔚 Greece



H2020-MSCA-RISA-2018-Grant Agreement no. 823997



a Security ECONomics service platform for smart security investments and cyber insurance pricing in the beyonD 2020 netwOrking

- Design and develop an **extended risk analysis metamodel**.
- Design and develop **cost effective risk management** and **optimized security investments based** on the attacking paths.
- Design and develop a **cyber insurance module** that estimates cyber insurance exposure and derives coverage and premiums.
- Use smart contracts and a blockchain to empower cyber insurance claim.
- Assess the **functionality**, **effectiveness** and **efficiency** of the SECONDO platform in real-life scenarios.







## The SECONDO platform



H2020-MSCA-RISA-2018-Grant Agreement no. 823997





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#### **SECONDO Project**

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## SECONDO Project



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# (A) INCOGNITO

IdeNtity verifiCatiOn with privacy-preservinG credeNtIals for anonymous access To Online services



Marie Skłodowska-Curie Research and Innovation Staff Exchange (H2020-MSCA-RISE-2018)



Objectives

# **Qualified Anonymity**

- Identity gets partitioned into attributes
- Fine-grained treatment defined by the user
- Attribute-Based Access Control
- Seamlessly acquisition of identity attributes from Physical ID documents and Online Identities
- User-friendly interaction supported by Artificial Intelligent (AI)



# A INCOGNITO

## **INCOGNITO** Overview





## **INCOGNITO** Architecture





## **INCOGNITO** Project



H2020 -MSCA-RISE-2018 – Grant Agreement no. 824015



## ERATOSTHENES PROJECT

**ERATOSTHENES:** SECURE MANAGEMENT OF IOT DEVICES LIFECYCLE THROUGH IDENTITIES, TRUST AND

DISTRIBUTED LEDGER**S** 

CALL: H2020-SU-DS-2018-2019-2020 / H2020-SU-DS-2020

## ERATOSTHENES Project (objectives)

- Design a Trust Framework and a Reference Architecture to ensure end-to-end trust and identity management in distributed IoT networks
- Design and development of a lightweight, distributed, and dynamic Trust Manager to enhance the trust in large-scale distributed networks of heterogeneous IoT devices
- Design of a decentralized, scalable, efficient and privacy preserving IoT identity management
- Build the lifecycle management and the overall governance layer of the trust network on novel Distributed Ledger Technologies and a hybrid consensus protocol.
- Implement **Smart Contracts** for enforcing **access policies** and **sharing trustworthiness** within the network guaranteeing their transparency, integrity, authenticity, and authority.

# ERATOSTHENES Project (Architecture)



## UPRC'S ROLE IN THE PROJECT

## UPRC IS ONE OF THE TECHNICAL/SCIENTIFIC PARTNERS OF THE ERATOSTHENES PROJECT AND ITS ROLE ENCOMPASSES:

Leading the design and implementation of the Trust Manager & Broker.

Leading the design and implementation of the IoT devices Network Enrollment Mechanism

Involvement in the design and implementation of Cybersecurity exercises and trainings

Involvement in the design and development of the DLT-based Trust Framework enforcement and recovery system

Involvement in the design and development of the Trust network Smart Contracts implementation in IoT context

Participation in the **ERATOSTHENES pilots** through Trust Manager & Broker component.

## ERATOSTHENES WEBSITE & SOCIAL MEDIA

- Project website: <u>https://eratosthenes-project.eu/</u>
- LinkedIn: https://www.linkedin.com/in/eratosthenes-project/
- Twitter: https://twitter.com/eratosthenesprj

## **ERATOSTHENES**

IoT Trust and Identity Management Framework





Πανεπιστήμιο Πειραιώς University of Piraeus



# THANK YOU!