

DISTRIBUTED SYSTEMS RESEARCH LABORATORY

Contact details

Name	Distributed Systems Research Laboratory
Acronym	DSRL
Logo	
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Areas of expertise

DSRL has extensive experience in many fields of the distributed systems related research areas such as:

- Energy efficiency in large scale distributed systems
- IoT and Blockchain technology
- Ambient assisted living (AAL)
- Big data analytics and Machine Learning
- Multidisciplinary optimization
- Complex systems modelling, simulation, optimization and adaptation
- Bio-inspired optimization

DSRL carries out research activities within several EU HE / EU H2020 / PNIII projects and has developed techniques and tools for (i) nonlinear programming optimization of systems energy efficiency, (ii) energy flexibility assessment and budgeting, (iii) Demand Response load profile forecasting and estimation, (iv) load shifting/scheduling for energy consumption reduction, and (v) optimization of IT resources energy consumption. In the modelling and simulation domain DSRL has investigated and developed techniques for modelling of complex systems, machine learning for information extraction and decision making, multi-objective and multi-criteria problems solving using mathematical models and what-if model simulation. In relation with blockchain technology, DSRL has experience in the development of distributed shared ledgers, smart contracts, distributed peer to peer control and distributed consensus which has been successfully applied in domains such as management of smart grids and demand-response programs, ecosystem management and payment of ecosystem services trading, circular economy and smart manufacturing.

Team

Prof. Dr. Eng. T. Cioara, Prof. Dr. Eng. I. Salomie, Prof. Dr. Eng. I. Anghel, Assoc. Prof. Dr. Eng. V. Chifu, Assist. Prof. Dr. Eng. C. Pop, Assist. Prof. Dr. Eng. M. Antal, Assist. Prof. Dr. Eng. C. Antal, PhD Stud. Eng. D. Mitrea, PhD Stud. Eng. L. Todorean, PhD Stud. Eng. A. Rancea, PhD Stud. Eng. O. Marin, Eng. G. Antonesi

Representative projects

- **DEDALUS** - Data-driven Residential Energy Carrier-agnostic Demand Response Tools and Multi-value Services, HORIZON-CL5-2022-D4-01 (2023-2026).
- **BRIGHT** - Boosting DR through increased community-level consumer engagement by combining Data-driven and blockchain technology Tools with social science approaches and multi-value service design, H2020 LC-SC3-EC-3-2020 (2020-2023), <https://www.brightproject.eu/>
- **engAGE** - Managing cognitive decline through theatre therapy, Artificial intelligence and social robots driven interventions, AAL-2021, (2021-2024), <https://engage-aal-project.eu/>
- **H2HCare** - Social robot-based solution for elders' Care management and coaching after discharge from Hospital to Home, AAL-2019, (2020-2023), <https://h2hcare-aal.eu/>
- **ReMember-Me** - Smart assistant to prevent and detect cognitive decline, promote cognitive function and social inclusion among older adults, AAL-2019, (2020-2023), <https://www.rememberme-aal.eu/>
- **Increasing the involvement of energy consumers at the level community by combining technologies of data analysis and blockchain**, PP H2020 10/2021, (2021-2023), <https://dsrl.eu/BRIGHT-PP10-2021/>
- **ReMind** - Robotic ePartner for Multitarget Innovative activation of people with Dementia, AAL-2017, (2018-2021)
- **eDREAM** - enabling new Demand Response Advanced, Market oriented and Secure technologies, solutions and business models, H2020, (2018 - 2021)

- **CoolDC** - Data Centers Liquid Cooling: Novel Techniques for Optimal Thermal Flexibility Shifting and on-demand Waste Heat Re-use, PN-III-P1-1.1-PD-2019-0154, (2020-2022)
- **CATALYST** – Converting DCs in Energy Flexibility Ecosystems, H2020, (2017-2020)
- **MedGuide** - Integrated System for Coordinated Polypharmacy management in Elders with Dementia, AAL-2016-052, (2017-2019)
- **Distributed systems technology and services for electronic registration, transacting and processing of assets**, DSRL-MONTRAN USA, (2016-2019), ID 20143/2016
- **Eco2Cloud** – Technologies for efficient management and scheduling of cloud resources in cloud for reducing Alps data centre energy consumption, PNCDI III – BG (2016-2018)
- **OptiPlan** – Technologies for Digitalization, Analysis and Optimization of Manufacturing of Flow Regulators and Monitors at Emerson Factory, PNCDI III – BG (2016-2018)
- **GEYSER** - Green nEtened Data Centres as Energy ProSumErs in smaRt city environments, EU FP7, (2013-2016)
- **Elders-UP!** - Adaptive system for enabling the elderly collaborative knowledge transference to small companies, EU FP7 – PNCDI/II, Active and Assisted Living Programme AAL-2013-6, (2014-2016)
- **DIET4Elders** - Dynamic Nutrition Behaviour Awareness System for the Elders, EU FP7 – PNCDI/II, Active and Assisted Living Programme AAL-2012-5, (2013-2016)
- **GAMES** - Green Active Management of Energy in IT Service centres, EU FP7, ICT-2009-6.3: ICT for Energy efficiency, (2010-2012)

Significant results

The most representative publications of the past 5 years:

1. M. Antal, V. Mihailescu, T. Cioara, I. Anghel, Blockchain-Based Distributed Federated Learning in Smart Grid. **Mathematics** 2022, 10, 4499 **WoS Q1**
2. C. B. Pop, T. Cioara, I. Anghel, M. Antal, V. R. Chifu, C. Antal, I. Salomie, Review of bio-inspired optimization applications in renewable-powered smart grids: Emerging population-based metaheuristic. **Energy Reports**, Vol. 8, 2022, ISSN 2352-4847 **WoS Q2**
3. C. Antal, T. Cioara, M. Antal, V. Mihailescu, D. Mitrea, I. Anghel, I. Salomie, G. Raveduto, M. Bertoncini, V. Croce, T. Bragatto, F. Carere, F. Bellesini, Blockchain based decentralized local energy flexibility market, **Energy Reports**, Volume 7, 2021, Pages 5269-5288, ISSN 2352-4847 **WoS Q2**
4. T. Cioara, M. Antal, V. T. Mihailescu, C. D. Antal, I. Anghel and D. Mitrea, Blockchain-Based Decentralized Virtual Power Plants of Small Prosumers, in **IEEE Access**, vol. 9, pp. 29490-29504, 2021 **WoS Q2**
5. I. Anghel, T. Cioara, D. Moldovan, M. Antal, C.D. Pop, I. Salomie, C.B. Pop, V. Chifu, Smart Environments and Social Robots for Age-Friendly Integrated Care Services. **Int. J. Environ. Res. Public Health** 2020, 17, 3801. **WoS Q1**
6. M. Antal, C. Pop, T. Cioara, I. Anghel, I. Salomie, F. Pop, A system of systems approach for data centers optimization and integration into smart energy grids, **Future Generation Computer Systems**, 2020, ISSN 0167-739X. **WoS Q1**
7. T. Cioara, I. Anghel, I. Salomie, M. Antal, C. Pop, M. Bertoncini, D. Arnone, F. Pop, Exploiting data centres energy flexibility in smart cities: Business scenarios, **Information Sciences**, 2019, ISSN 0020-0255 **WoS Q1**
8. M. Antal, C. Pop, T. Petrican, A. V. Vesa, T. Cioara, I. Anghel, I. Salomie, E. Niewiadomska-Szynkiewicz, MoSiCS: Modeling, simulation and optimization of complex systems – A case study on energy efficient datacenters, **Simulation Modelling Practice and Theory**, 2019, ISSN 1569-190X **WoS Q1**
9. C. Pop, T. Cioara, M. Antal, I. Anghel, I. Salomie and M. Bertoncini, Blockchain Based Decentralized Management of Demand Response Programs in Smart Energy Grids, **Sensors** 2018, 18(1), 162. > 500 citations, **WoS Q2**
10. T. Cioara, I. Anghel, M. Bertoncini, I. Salomie, D. Arnone, M. Mammina, T. Velivassaki, M. Antal, Optimized Flexibility Management enacting Data Centres Participation in Smart Demand Response Programs, **Future Generation Computer Systems**, Volume 78, Part 1, 2018, Pages 330-342. **WoS Q1**

Technological services (<https://eeris.eu/ERIF-2000-000B-1205>):

1. Management and decentralization of the smart grid
2. Energy efficiency and multidisciplinary optimization
3. Green clouds
4. Digital twins of complex systems
5. Big data analytics platforms

The offer addressed to the economic environment

Research & development	Core research areas: distributed systems, blockchain, big data and machine learning, ambient assisted living. Support services in: IoT and healthcare, smart grid management, intelligent systems, data centres operation, linear and nonlinear systems optimization.
Consulting	Consulting activities for companies, institutions, international organizations, and government bodies.
Training	Training courses in the following domains: distributed ledger technologies, programming techniques, web applications development, big data pipelines.

Last updated: January 2023