

ENERGY RESEARCH

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CENTRO**ALGORITMI**



Centro ALGORITMI is a research unit of the School of Engineering, University of Minho, that develops R&D activity in Information and Communications Technology, Electronics and Systems Engineering

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Our origins date back to the late 1970s, with the creation of the Center for Systems Science and Engineering (CCES). Some researchers, in the 1990s, identified the need for new research classes in three main areas: Information Systems and Technologies, Electronic and Systems Engineering. There, in November 1992, CCES was renamed "**ALGORITMI Center**" to reflect its new mission.



As a **multi-disciplinary Research Unit**, with an international presence, ALGORITMI Research Center maintains **research activities and projects** with universities and research centers **all around the world**.



The center is focused on:

- enhancing its international publications track record;
- increasing its funding track record;
- supporting researchers applying for funding and project management;
- increasing its potential for sustainable development through external funding and/or commercialization of its research outputs;
- adding value to its overall research strategy;
- contributing to regional and national economic development;
- enhancing the quality of the postgraduate offer.



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Escola de Engenharia
Universidade do Minho

ALGORITMI Research Center has made several significant contributions across various domains:

- ✓ strategic industry partnerships
- ✓ sustainability projects
- ✓ interdisciplinary research initiatives
- ✓ leadership in AI and data science
- ✓ innovative technology development
- ✓ leading to numerous patents
- ✓ strong publication record in high-impact journals and international conferences.



ALGORITMI coordinates **nine doctoral programs**
in our core research areas.

It is specially targeted for **preparing PhDs students** for an
advanced engineering career in industry.

- ✓ Informatics
- ✓ Doctoral Program in Industrial and Systems Engineering
- ✓ Doctoral Program in Electronics and Computer Engineering
- ✓ Doctoral Program in Information Systems and Technology
- ✓ Doctoral Program in Biomedical Engineering
- ✓ MAP-Doctoral Program in Computer Science
- ✓ MAP- Doctoral Program in Telecommunications



ALGORITMI activity is spreading into **six major fields**:





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The **SEOR Group** works in the field of Operational Research, tackling complex engineering systems with innovative methodologies.

Committed to excellence, it advances both fundamental and applied research, driving impactful solutions across multiple domains.

SEOR members work with multidisciplinary teams in environmental, manufacturing, and health science due to their **mathematical modeling and optimization expertise.**

APPLICATION
ANALYSIS SYSTEMS
SAFETY OPERATIONAL
RESEARCH
STATISTICS SEOR
INDUSTRY DECISION ALGORITHMS
ENGINEERING DEVELOPMENT
EVOLUTIONARY
COMPUTATIONAL



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The **IST Group** embraces three main areas:



IST in organizations and in society, focused on the adoption and exploration of IT in organizational/social contexts and on developing grounded design knowledge for enhancing IT-driven features.

Adaptive and intelligent IST, focused on intelligent systems that use data to enhance individual or organizational work (e.g., Business Intelligence and Decision Support).

ONTOLOGIES
SYSTEMS SECURITY
INFORMATION SERVICES
BUSINESS INTELLIGENCE
OPENDATA
PROCESS MANAGEMENT
MODELING APPROACHES
KNOWLEDGE MANAGEMENT

Engineering and management of software-based IST, addressing the engineering and management processes for building and deploying information systems and data.



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The **IEM Group** focus is on Modelling, Organization and Management of Industrial and Services Systems including:

- ✓ Industrial Systems Design & Management;
- ✓ Supply-chain Logistics and Transportation Systems;
- ✓ Economics and Management of Engineering Systems;
- ✓ Ergonomics and Human Factors
- ✓ Reliability, maintenance management

With applications to the **industrial and service systems, manufacturing, social, health, water and energy sectors.**

NUMERICAL SIMULATION
OPERATIONS MANAGEMENT
PRODUCTION CONTROL SURVEYS MODELING
HEMODYNAMICS
INDUSTRY 4.0
BLOOD **TEACHING** DECISION MAKING
LEAN HEALTHCARE ELETRIC UTILITIES
SUSTAINABILITY
FLOW DINAMICS
HUMAN FACTORS



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The **CCPM Group** embraces different subgroups (Computer Communications and Networks (CCN), Urban Computing Laboratory (UCL), EngageLab (at the intersection of Arts and ICT), which represent **complementary scientific areas**:

- ✓ Multimedia Services and Internet Engineering
- ✓ Wired and Wireless Networks and Protocols
- ✓ Vehicular Networks and Applications
- ✓ Internet of Things Technologies and Applications; Smart Cities
- ✓ Cybersecurity
- ✓ Extended Reality, Visual Computing





The **CST Group** relies on high quality research in advanced computing technologies and applications. This contribute to the resolution of complex problems in several fields of knowledge and to address societal challenges.

CST core scientific areas include:



- Artificial Intelligence and Data Science
- Knowledge Engineering
- Intelligent Systems
- Language Processing

Applied computing

- Medical Informatics
- The Law
- Computational Science and Engineering
- Computational linguistics
- Digital preservation
- Ambient Intelligence
- Autonomous Vehicles

- ✓ Artificial Intelligence and Data Science
- ✓ Knowledge Engineering
- ✓ Intelligent Systems
- ✓ Language Processing



The **IE Group** is organized in three main areas:

Control, Automation and Robotics (CAR)

Human-robot and robot-robot interaction; social robotics; mechatronics prototypes systems.

Energy and Power Electronics (GEPE)

Electric mobility; renewable energy systems; power quality; smart grids, energy storage, wireless power transfer.

Embedded Systems (ESRG)

Secure IoT edge devices with ARM TrustZone to ensure secure boot, endpoint identity, and secure updates.





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Some ENERGY research

E2GO: European funded Doctoral Network - Researching new cost-effective solutions for battery buffered fast-charging station



E2GO

E2GO: a European funded MSCA Doctoral Network

RESEARCHING NEW COST-EFFECTIVE SOLUTIONS FOR BATTERY
BUFFERED FAST-CHARGING STATION

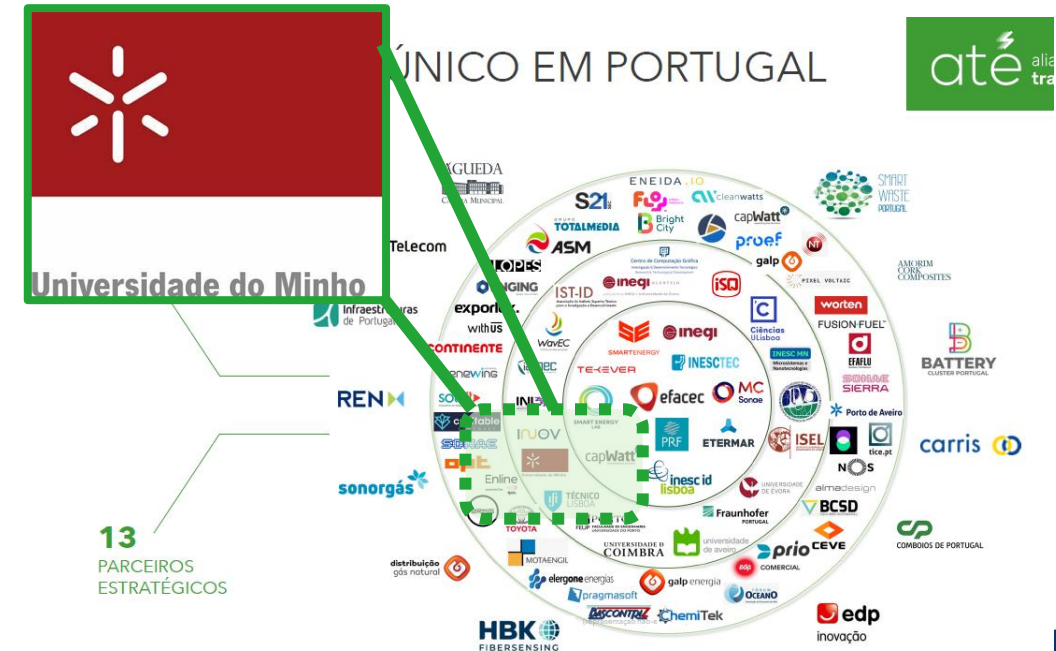
<https://www.e2go-project.eu/>

Some ENERGY research

ATE - Aliança para a Transição Energética
(Development of High Power EV Battery Chargers)

atē aliança para a
transição energética

“...development of POWER
ELECTRONICS, specifically laboratory
prototypes and digital control
systems, which will be coordinated in
conjunction with the other project
partners...”





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Some ENERGY research

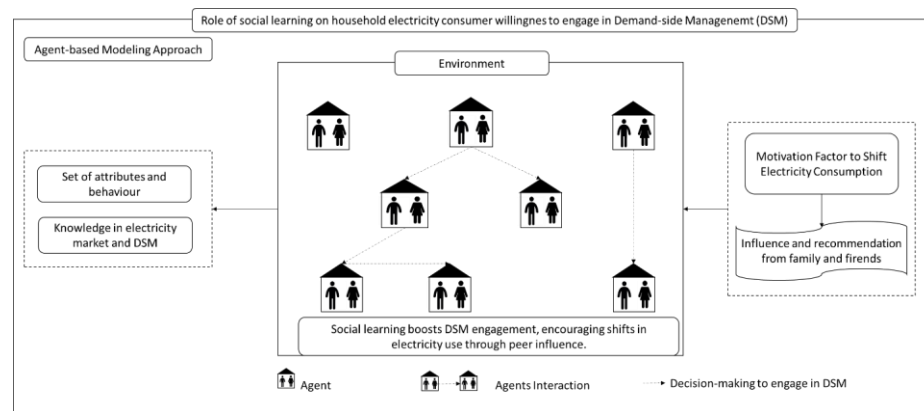
Cidades Inteligentes e Neutras em Clima: Mobilidade, Energia e Conectividade para um Futuro Sustentável (Intelligent and climate neutral cities)

Focusing on the interconnected areas of (1) digitalization and connectivity, (2) energy and mobility, (3) infrastructure and urban services, and (4) last-mile logistics (LMD)

Leveraging different emerging technologies and their integration, such as **AI, IoT, Big Data, and smart grids**, the project **optimizes energy** resources, reduces emissions, and enhances urban quality of life.

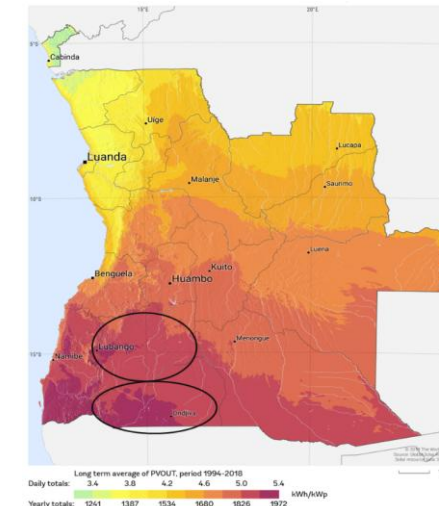
Some ENERGY research

Agent-based modelling for consumer behavior and energy markets



Golmaryami, Sara, Nunes, M.L., Ferreira, Paula (2024) "The role of social learning on consumers' willingness to engage in demand-side management: An agent-based modelling approach" Smart Energy, 14, 100138
<https://doi.org/10.1016/j.segy.2024.100138>

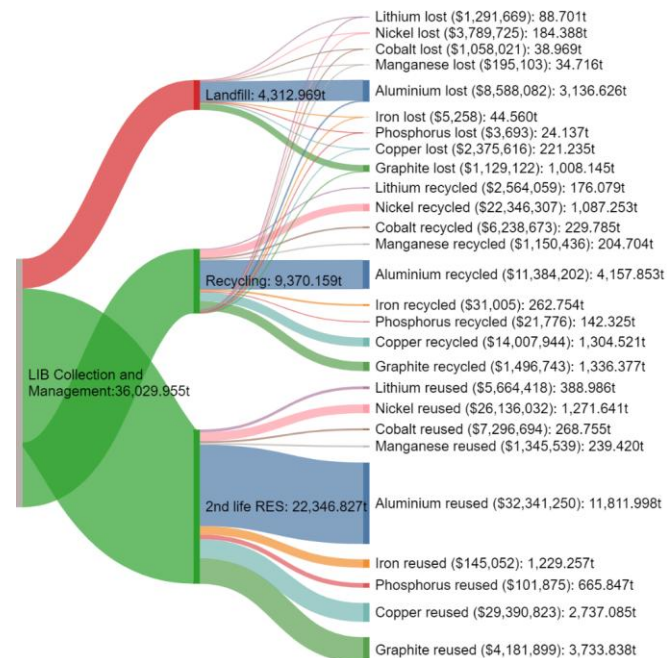
Off-grid Photovoltaic Projects for Schools and Health Posts in Angola



Mbumba, B., Vieira, F., & Ferreira, Paula. (2024). Evaluation of Off-grid Photovoltaic Projects for Schools and Health Posts in Angola. Journal of Sustainable Development of Energy, Water and Environment Systems, 12(4), 1–21. <https://doi.org/10.13044/j.sdewes.d12.0524>

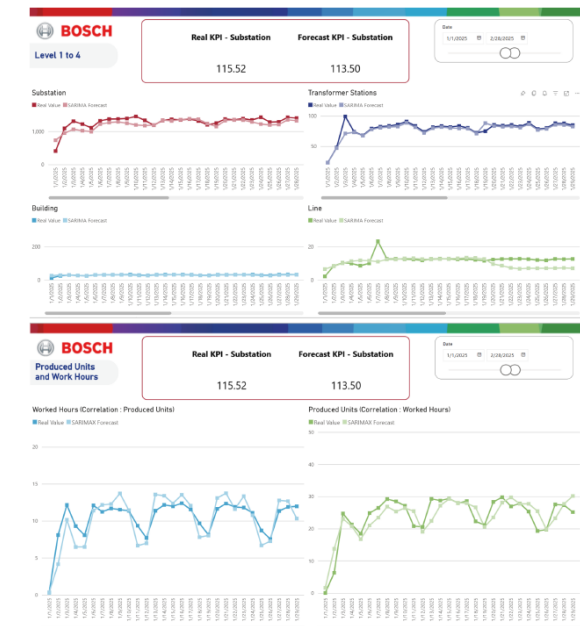
Some ENERGY research

Economic and Environmental Assessment of Circularity in End-of-Life Batteries



Mikus, Francisco, Jório, Marcela, Ferreira, Paula (2025) "Economic and Environmental Assessment of Circularity in End-of-Life Batteries" Environment, Development & Sustainability (accepted for publication)

Modeling for Smart Energy Consumption



Ferreira, L. et al. (2026). Time Series Modeling for Smart Energy Consumption in Industry 4.0. In: Valente de Oliveira, J., Leite, J., Rodrigues, J., Dias, J., Cardoso, P. (eds) Progress in Artificial Intelligence. EPIA 2025. Lecture Notes in Computer Science(), vol 16121. Springer, Cham. https://doi.org/10.1007/978-3-032-05176-9_18



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