KIOS Research and Innovation Center of Excellence

Cutting-edge, multidisciplinary research & innovation in
intelligent systems and networks with emphasis on monitoring, control, management and security of Critical Infrastructures

Mission & Vision

The mission of the KIOS Research and Innovation Center of Excellence (KIOS CoE) is to conduct multidisciplinary research and innovation in the area of Information and Communication Technologies (ICT) with emphasis on the Monitoring, Control, Security and Management of Critical Infrastructures, which include large-scale, complex systems such as power and energy systems, water systems, transportation systems, telecommunication networks and emergency management and response systems.

The Center's vision is to provide an inspiring environment for conducting excellent, cutting-edge research at a global scale, producing new knowledge and advanced engineering and management tools that can be applied to solve timely and real-life problems in the considered Critical Infrastructure Systems (CIS).

The Center was established in 2008 at the University of Cyprus and was subsequently selected by the EU to advance into a Research and Innovation Center of Excellence in 2017. With Imperial College London as an invaluable partner, KIOS has succeeded in securing funding in excess of 40 million euros. This is the largest and most competitive funding to be secured for research and innovation in Cyprus which will be implemented as part of the EU's strategic Horizon 2020 program for "Spreading Excellence and Widening Participation – Teaming".

KIOS CoE strives to create a regional research and innovation ecosystem in the area of ICT, resulting in major economic and societal benefits for Cyprus and Europe as a whole, by cultivating a vibrant research and innovation cluster in high technology areas linking universities, technology companies, end-users, government agencies, as well as enterprise support companies. Towards this direction, a major pillar of KIOS comprises the recently created KIOS Innovation Hub, which involves the significant expansion of the Center's activities in the areas of innovation and technology transfer. This collaborative network is expected to make significant contributions to the promotion of a knowledge-based economy in Cyprus, bringing new employment opportunities in high-tech areas as well as new ideas for economic growth in Cyprus through the design of new products and services.

Research Challenges

Critical infrastructures are defined as an asset or system, which is essential for the maintenance of vital societal functions. The principal examples are electric power systems, water distribution networks, telecommunication networks, transportation systems, as well as systems for emergency management and response. Critical infrastructures provide the foundation on which communities are built and, when properly functioning, they enable economic growth and social well-being. Without these, other basic infrastructures (e.g., banking, hospitals, schools, tourism, etc.) cannot operate as intended.

As urbanisation increases, critical infrastructures worldwide are expanding (often building on existing infrastructure) and are becoming more complex, necessitating greater efficiency and improved capabilities in order to sustain their effective operation. Equipment failures are also occurring more frequently as large segments and components of critical infrastructures become old and outdated. Such failures can lead to serious degradation in performance or, even worse, to cascading overall system failure and breakdown. The safety and security of critical infrastructure systems against malicious attacks and natural disasters are also crucial issues for citizens, businesses and governments who expect that these infrastructures will be protected, providing uninterrupted service 24/7 and under any circumstances. Unexpected events will always occur (accidents, faults etc.) which will create emergency conditions requiring immediate response to prevent fatalities and limit damages.

Research Priorities

The research priorities of the KIOS Center of Excellence address important research and technology challenges in Critical Infrastructure Systems for the development of advanced engineering and management tools, capable of improving the operation, efficiency, reliability, safety and security of these systems. Furthermore, KIOS CoE aims at contributing to the advancement of scientific knowledge in the areas of computational intelligence, intelligent control and intelligent networked embedded system design, and utilizing these methodologies in the developed tools.

Working in close collaboration with operators and end-users of CIS, researchers in the Center have the opportunity to develop a solid understanding of the practical problems encountered in the field, as well as a wealth of available data gathered from different critical infrastructures. This allows them to address problems of practical importance, to implement the solutions on real systems, and to get feedback from experienced end-users.

Research in high-tech areas important to Cyprus and the global economy

Scientific Foundations

- Computational Intelligence & Machine Learning
- Control & Optimization
- Modelling & Simulation
- Intelligent Data Processing
- SW/HW System Design & Integration

Application Areas

- Energy and Power Systems
- Water Systems & Environmental Monitoring
- Intelligent Transportation Systems
- Telecommunication Systems & Networks
- Emergency Management and Response

Research Outcomes

- Intelligent Monitoring & Control
- Resilience, Adaptation & Reconfiguration
- Security, Safety & Trustworthiness
- Big Data Analysis & Management
- Performance & Energy Optimization

Meaning of KIOS

In ancient Greek mythology KIOS ("ΚΟΪΟΣ", in Greek pronounced kee-os) the son of Uranos (Sky) and Gaia (Earth), was the Titan of "questioning intelligence" and the brother of Phoebe, the goddess of "answering intelligence". The two completed one another and acted as the center of all knowledge.

The KIOS Center of Excellence project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 739551 (KIOS CoE).

The KIOS Center of Excellence has received funding from the Government of the Republic of Cyprus through the Directorate General for European Programmes, Coordination and Development.
Complementary funding for the KIOS CoE is also provided by the University of Cyprus.

Other sources of funding for the KIOS Center:

- European Research Council
- Seventh Framework Programme (FP7)
- European Regional Development Fund and the Republic of Cyprus, through the Research Promotion Foundation (New Infrastructure Project/Strategic/0308/26)
- Cyprus Research Promotion Foundation (DESMI 2008, DESMI 2009-10)
- European Science Foundation
- EEA Financial Mechanism and the Norwegian Financial Mechanism
- European Defence Agency

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A world-class Center of Excellence

Key Capabilities

A critical mass of Researchers – Hiring, Education & Training

A key priority of the KIOS Research and Innovation Center of Excellence is the development of a critical mass of highly qualified researchers to work in the high-tech arena. The Center constantly pursuits the recruitment of top-quality candidates, ensuring the retention and advancement of high-performing researchers. Education and training to researchers is provided via numerous activities, including: specialized technical courses and advanced programs in intelligent CIS, training seminars for soft-skills and career development, mobility opportunities at international collaborating institutions, and industrial short-term placements with the KIOS Innovation Hub collaborators.

Critical Infrastructure Systems Test-Beds

The KIOS CoE makes a significant investment in the development of large-scale physical/virtual test-beds for critical infrastructure systems, to enable the efficient, transparent and reliable testing of new software algorithms, hardware components, and new technologies under realistic operating conditions of these systems. This unique and significant infrastructure supports the development of innovative research in the areas of monitoring, control, management and security of critical infrastructures, and enables the pursuit of unprecedented research avenues.

Open Knowledge Framework

The Center promotes a comprehensive framework for Open Knowledge to support and encourage open access, open data, and reproducible research, for the purpose of supporting excellence in research. Opening up access to research results produced by the KIOS CoE researchers beyond the traditional academic dissemination channels raises the visibility of the work carried out at the Center. This also has an impact on the way research is shared and knowledge is managed within the KIOS CoE, thus enhancing scientific excellence. This approach allows other interested parties to build on top of their work and promotes further research, innovation activities and entrepreneurship in the area of CIS.

The KIOS Center of Excellence Research Team

The KIOS CoE brings together a multidisciplinary team of highly motivated and experienced researchers, combining expertise from several key areas. This interdisciplinary expertise enables the Center to develop solutions that address all aspects related to the monitoring, control, management and security of CIS, as well as response management in emergency situations, starting from modelling, design, analysis, real-time implementation, and in-depth investigation of the social, economic and environmental impacts of research.

The KIOS CoE Faculty comprises academics from the Department of Electrical and Computer Engineering of the University of Cyprus. The team is complemented by several affiliate faculty from other Departments of the University of Cyprus, such as the Departments of Economics, Psychology, Civil and Environmental Engineering, Education, Business and Public Administration, Social and Political Sciences, and the Library, as well as faculty from the Department of Electrical and Electronic Engineering at Imperial College London.

Innovation Potential

KIOS INNOVATION HUB

The KIOS Innovation Hub spearheads the innovation and exploitation activities of the KIOS CoE and promotes the development of regional innovation clusters that serve as local innovation ecosystems capable of connecting to global value chains. The Hub promotes collaboration between industry, academia and research organizations in high-tech areas of global importance, via an Industrial Membership Program suitable for CIS operators and regulators, related commercial and governmental organizations and innovative SMEs. Member organizations are beneficiaries and can commercially exploit the research and technology outputs of the KIOS CoE.

Entrepreneurship Network

The innovation ecosystem is complemented by the KIOS CoE Entrepreneurship Network (linked to the KIOS Innovation Hub) to facilitate start-ups, venture capital investments and associated translational activities.

The future building of the UCY School of Engineering which will house the permanent facilities of the KIOS Center of Excellence.

KIOS

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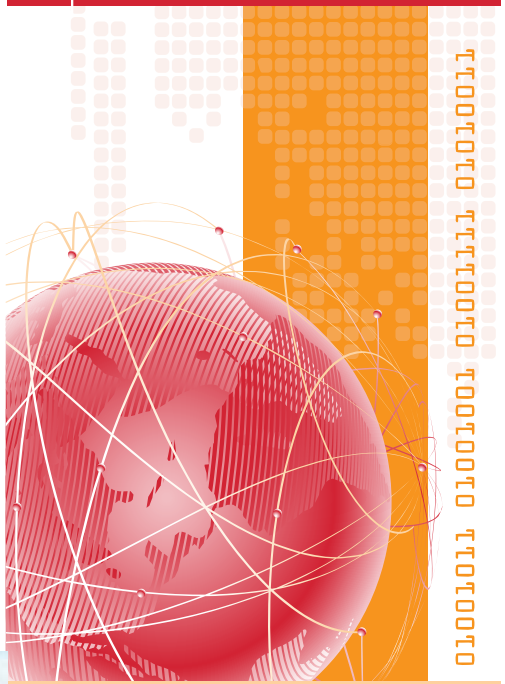

University of Cyprus

www.kios.ucy.ac.cy