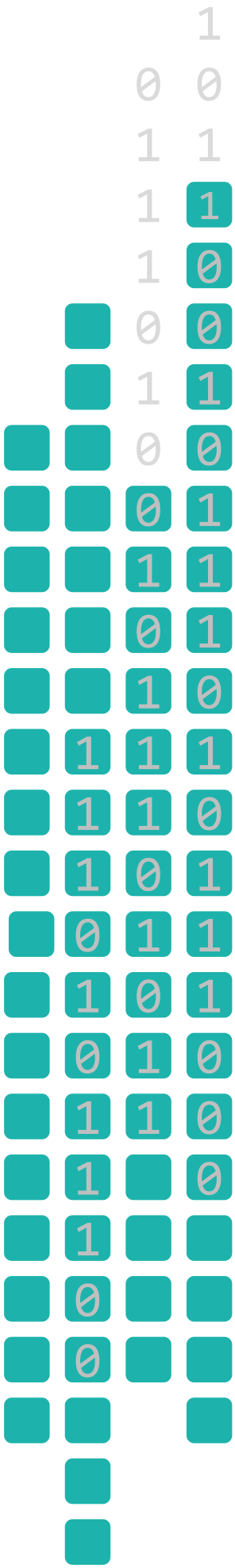
KIOS

KIOS Research Center for Intelligent Systems and Networks

Activity Report 2011 - 2014

University of Cyprus



The KIOS Research Center for Intelligent Systems and Networks is committed to cutting-edge, interdisciplinary research in intelligent monitoring, optimization, and management of complex, safety-critical systems.

KIOS Activity Report 2011 -2014

State of the KIOS Research Center

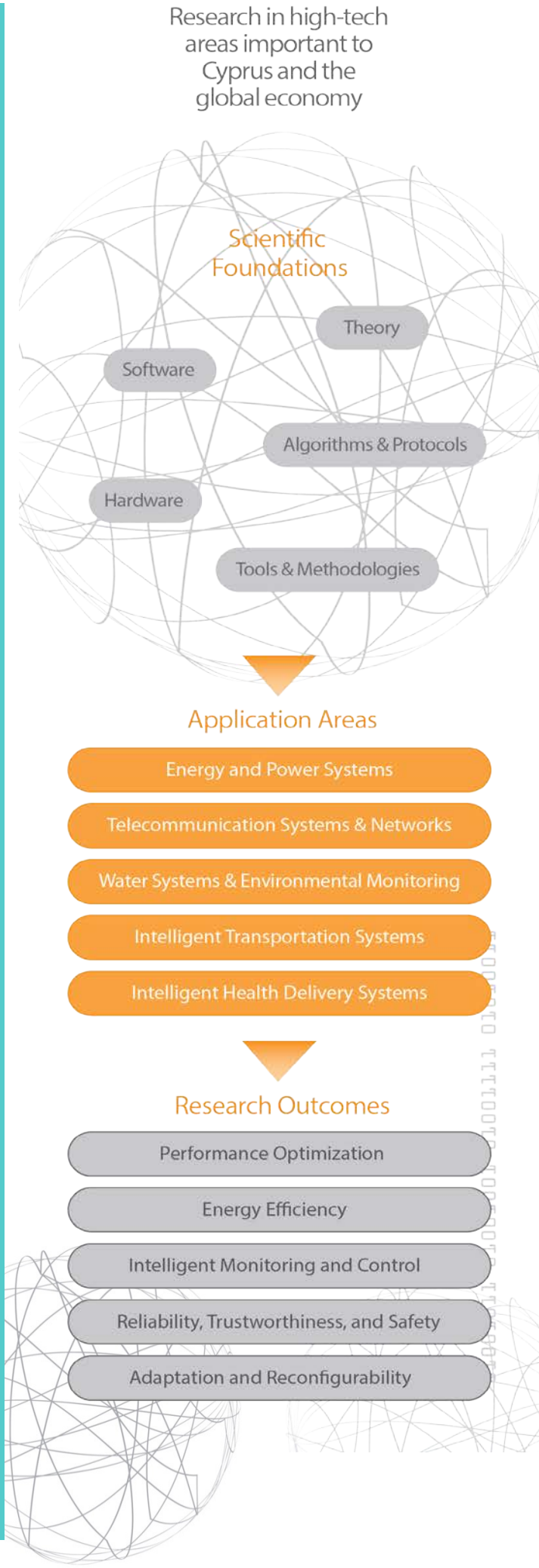
The KIOS Research Center for Intelligent Systems and Networks was established in 2008 within the University of Cyprus and is in its sixth year of operation. The Center is now a leading research center in Cyprus with strong international standing.

KIOS delivers cutting-edge, interdisciplinary research in intelligent monitoring, optimization, and management of complex, safety-critical systems.

The Center's research priorities are to develop advanced engineering and management tools for large- scale critical infrastructure systems, such as telecommunication networks, electric power systems, healthcare delivery systems, and environmental resource management systems.

KIOS collaborates with 200 organizations worldwide and by 2013 has participated in over 56 research projects.

The Center currently employs more than 70 researchers funded by several external research projects.



Message from the Rector

The University of Cyprus recognizes the significant role that research and technological development could play in a rapidly changing global economy. A University which excels in research can play a pivotal role in helping to shape healthy economies and societies. Now more than ever, while we face particular challenges, our participation in research could prove significant for the promotion of a knowledge-based economy in Cyprus, ultimately benefiting the Cyprus educational system, the high-tech industry, and the society at large.

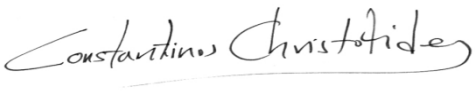
Indeed, research contributes significantly towards tackling, major societal challenges which are of global importance, such as environmental sustainability, energy and resource scarcity, health and ageing. Research is also a driver for innovation in products, services, business and social processes and can help to create new jobs and improve standards of living.

As a relatively young institution, the University has built a reputation as a progressive leader and partner in research based collaboration at EU levels. The University's international research activity has helped to increase the level of research being undertaken in Cyprus, which in turn has enriched the depth and quality of the academic and learning experience of its students, mentoring them so as to become highly qualified specialists and professionals.

The KIOS Research Center for Intelligent Systems and Networks is one of the 11 research centers currently operating at the University of Cyprus. By all accounts, KIOS is considered to be a leading research center in Cyprus in the area of Information and Communication Technologies (ICT). It is a vibrant research center which has made notable contributions to the wider global research agenda in the area of intelligent systems and networks. This is reflected in the quantity and the quality of its research, as well as the research profile of KIOS amongst its international peers.

KIOS is an excellent best-practice model, where a team of committed faculty members and their enthusiastic research teams have achieved significant success, including the ERC Advanced Grant awarded to the KIOS Director, Professor Marios Polycarpou. This was the first ERC Advanced Grant to be awarded to the University of Cyprus. Other achievements include the KIOS participation in EU programmes, research collaboration with international technology companies and international patents arising from research work undertaken at KIOS. Most importantly, and as a result of these accomplishments, the KIOS Research Center, now employs up to 80 researchers at various stages of their research careers, providing an avenue for qualified and motivated young people to pursue successful careers.

I praise KIOS for its outstanding research achievements and international distinction. I am confident that the Center will continue to grow, impacting positively on the reputation of the University. I am also confident that the Center's valuable contribution will enhance our efforts to strengthen our national economy whilst utilizing the expertise of young talented people.



Message from the Director

Directors Message

The KIOS Research Center for Intelligent Systems and Networks was established in February 2008 on the basis of an ambitious long-term vision of becoming a leading Center of Excellence in the field of Information and Communication Technologies (ICT). Key objectives of the KIOS Research Center are to create an inspiring environment where a critical mass of researchers can work synergistically and to contribute towards the technology transfer and the promotion of a knowledge-based economy in Cyprus via the creation of new jobs in high-tech areas and the development of new products and services.

Last year, KIOS celebrated its fifth anniversary, in the presence of the President of the Republic of Cyprus, Mr. Nikos Anastasiades. Since its inception, the Center contributed actively to the advancement of knowledge in its focused areas of research, acquiring an excellent reputation within the international scientific communities.

Several of the Center's researchers have attained significant, international honors, including prestigious awards from international journals, the ERC, as well as Microsoft Research. During this time, the Center has secured more than 60 research funded programs, totaling around €15 million Euros from EU funding. With these research grants, the KIOS Research Center has employed more than 80 researchers, to undertake important research in key technological areas of importance to Cyprus and the global economy.

The KIOS Research Center seeks to respond to significant global challenges which are relevant to people's quality of life and to economic growth. Indeed, one of the key challenges in ICT is the integration of networked computing with physical systems and processes. Such integration is leading to a new generation of devices and intelligent systems that can adapt to malfunctions, cooperate and evolve during operation to become more efficient, fault tolerant and trustworthy. This exciting and challenging new research area is the main focus of the Center, both in terms of fundamental (basic) research as well as in applications, such as energy and power systems, communications, water networks, transportation, and healthcare delivery.

I would like to take this opportunity to sincerely acknowledge the support of the University of Cyprus, who believe in the strong potential of the KIOS Research Center and have empowered its growth. It is important to note that the biggest asset of the Center are its people. This includes the select team of colleagues who dedicated their time to help initiate the KIOS Research Center from the ground up, and everybody involved in the Center for helping it achieve international stature.

We hope that you will find this report informative. For further information about the Center please visit the KIOS website**, www.kios.ac.cy**, or come and visit us in person.

Sincerely,

Marios Polycarpou, IEEE Fellow
Director, KIOS Research Center
Professor, Electrical and Computer Engineering

ERC Advanced Grant

A major achievement for KIOS is the ERC Advanced Grant awarded to the Center's Director Professor Marios Polycarpou in 2012. This is the most prestigious research funding award given by the European Research Council (ERC). The main aim of ERC Advanced Grants is to allow exceptional established research leaders to pursue ground-breaking, high-risk projects that open new directions in their respective research fields or other domains.

Increased number of EU Funds to support research

The participation of the KIOS Research Center in large EU research projects has increased significantly in the last few years. In the last two years alone, 8 new EU funded research projects started at KIOS. These projects involve significant research collaboration at EU level to address global research challenges and priorities in the areas related to the management and security of critical infrastructures, intelligent healthcare systems, and high-performance computing.

On a national level, 7 new projects started during this period to address key research challenges in the areas of power system integrity and stability, the management of the quality of water distribution, evaluation of optical communication networks, and the development of high-performance hardware. The projects were funded by the Cyprus Research Promotion Foundation through the Framework Programme for Research, Technological Development and Innovation 2009-10 (DESMI 2009-2010).

Proven Success in Coordinating large EU funded projects

In 2013, the KIOS Research Center successfully completed two large EU funded projects, demonstrating its ability to coordinate and manage large international research undertakings. The FP7 project iSense received spe cial praise from external evaluators and by the European Commission. With an overall budget of over €4 million it is the first FP7 collaborative project of this size to be coordinated by the University of Cyprus.Furthermore, the success of the COST Action IntelliCIS network is considered as best practice example by the ESF COST Action Team. This is a strong indication of the positive contributions of the KIOS Research Center in promoting research at the European level and providing the opportunity for Cyprus to coordinate EU-level research. Both projects are the first of their type to be coordinated by the University of Cyprus, whilst the COST Action was the first to be led by a Cyprus based organization.

Growing Number of Researchers

The funding has enabled the employment of a significant number of talented young researchers, who have the opportunity to participate in state-of-the-art research programs in fields that can spur significant technological growth.

KIOS-Industry relations are also growing

KIOS has strong research collaborations with international industrial partners worldwide. Several of the research programs being delivered at KIOS aim to improve knowledge transfer between public research and industry with a focus on the exploitation of research results. Moreover, KIOS researchers have also been working on New and Emerging Technologies for industrial partners seeking specialist expertise.

Research Activities

The research aims of the KIOS Research Center are to:

- *Conduct high-quality research in modern cutting-edge scientific and technological fields*

- *Provide an inspiring environment for conducting high-quality research and stimulate interdisciplinary interaction between researchers*

- *Develop a critical mass of researchers working synergistically in the area of intelligent systems and networks*

European Research Council
Established by the European Commission
Supporting top researchers from anywhere in the world

SEVENTH FRAMEWORK PROGRAMME

KIOS Research Output

KIOS continues to generate new research knowledge of international stature in the area of information and communication technologies.

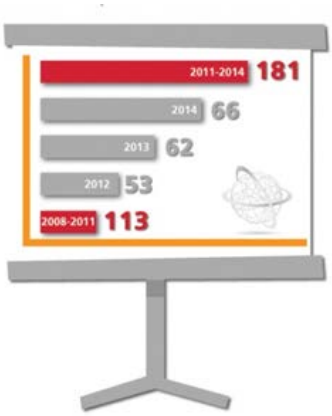
Scientific dissemination has been a key priority for the KIOS Research Center as it helps to build the Center's reputation within scientific communities. This is essential and a critical success factor for a developing research center and in building a significant reputation within the international scientific communities.

Peer Reviewed Journal Publications

Academic journals serve as forums for the introduction and presentation for scrutiny of new research.

The KIOS research team has published in over 145 peer-reviewed or refereed journals. In the period of 2011-2014, the KIOS Research Center journal publication record has seen a twofold increase.

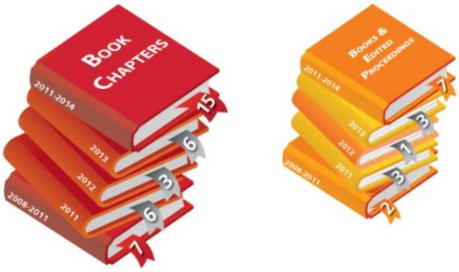
Conference Proceedings



Conferences are a major source of cutting edge research, particularly in science and engineering.

The number of papers and posters being presented at international scientific conferences has increased significantly. The KIOS Research Center has published 294 papers in Conference Proceedings. The figure indicates a marked increase in the number of publications.

Books & Book Chapters



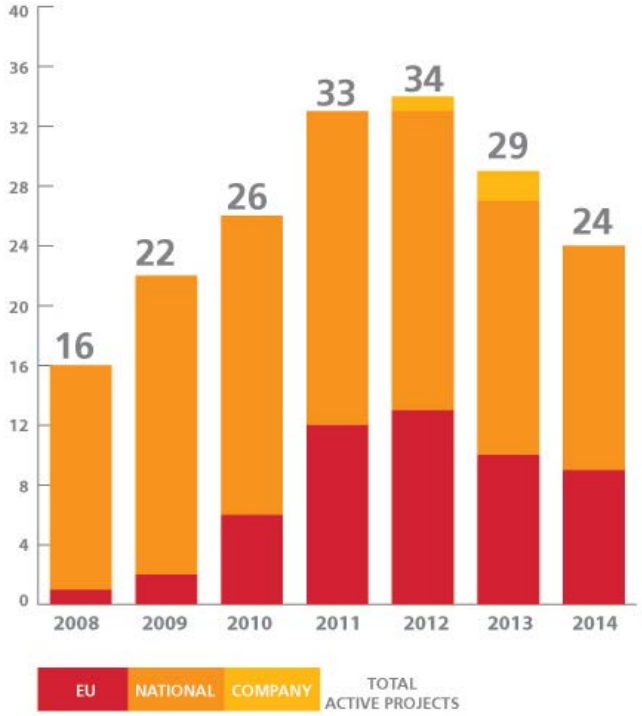
Books are often the first point of call for academics, students and practitioners. Books gather together perspectives and provide focus on a topic or approach related to a specific research focus, thereby laying down a marker in an area.

The KIOS Faculty and Researchers have published in a number of books and books chapters in several of the KIOS Research domains.

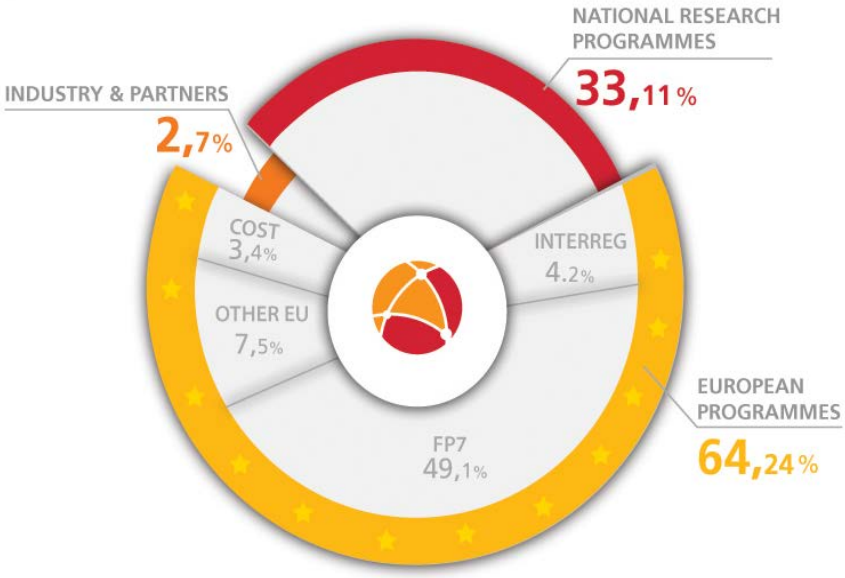
The figures indicate that there has been a twofold increase in the number of Book Chapters and a threefold increase in the number of Books and Books Chapters published by the members of the KIOS Research Team.

EXTERNALLY FUNDED RESEARCH PROGRAMS

KIOS has coordinated and/or participated in 56 research projects funded by international and national sources.



The majority of research funding originates from EU sources, representing 64 % of the research project funding at KIOS.

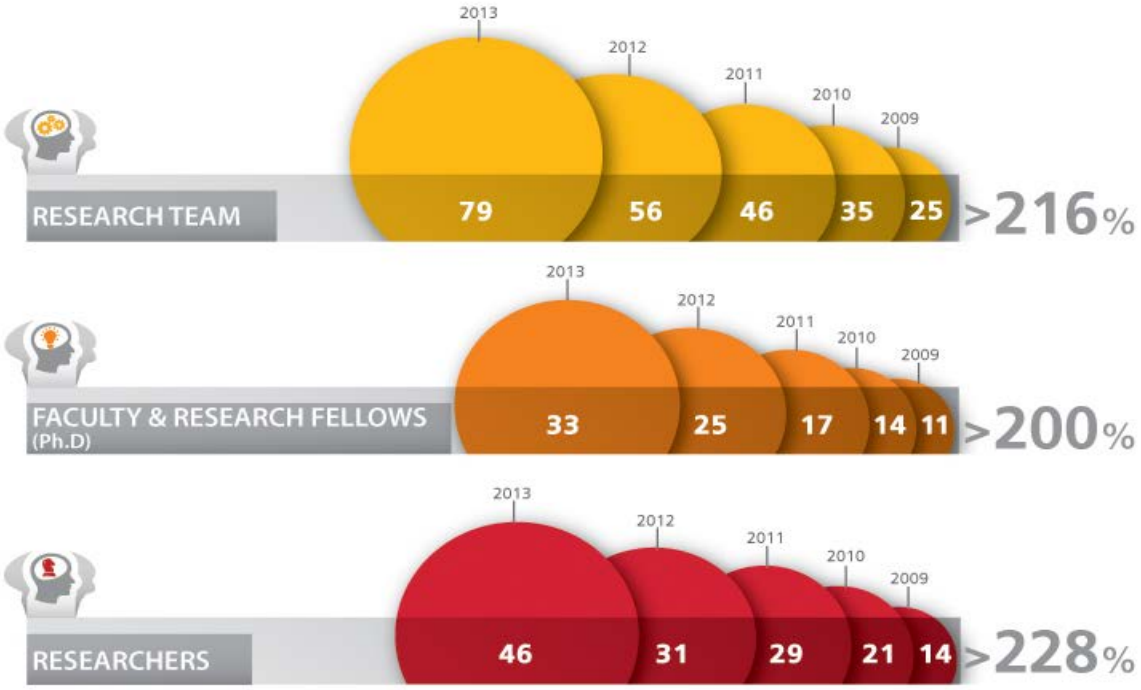


EXPERTISE & EXCELLENCE

"The most significant asset of the KIOS Research Center is its people"
Professor Marios Polycarpou, Director of the KIOS Research Center.

The multidisciplinary Research Team at KIOS brings together researchers specializing in a wide range of fundamental areas, such as systems and control, distributed systems and algorithms, graph theory and optimization, computational intelligence, fault diagnosis and fault tolerance, as well as simulation and hardware tools (e.g., sensor networks and embedded systems) in an attempt to provide holistic and viable solutions for a variety of critical systems.

KIOS has provided a promising avenue for young qualified and motivated researchers to pursue successful careers by creating new job opportunities in the high-tech arena and attracting new researchers to Cyprus.



There has been a steady increase in the number of researchers participating in research activities at KIOS, with an increase in the number of researchers from one academic year to the next (including an impressive threefold increase in the number of postdoctoral researchers).Over the years the KIOS Research Center has developed an excellent reputation for offering exciting research opportunities for researchers from Cyprus and other countries worldwide (e.g., UK, France, India, Spain, Romania, Greece, Australia, and the USA). Moreover, many of the Post-Doctoral Researchers and PhD students who have graduated, from leading Universities such as the Imperial College (UK), Kings College (UK), the University of Cambridge have chosen to work at KIOS. Others have benefited from the experiences gained from working at KIOS to obtain significant research positions at internationally leading research institutions such as Imperial College London and Supélec in France.

Research Programs

Currently, the KIOS Research Center is involved in a number of multi-disciplinary research projects to develop holistic and viable solutions for a variety of problems affecting critical systems. The KIOS research team has carried out cutting-edge interdisciplinary research in intelligent monitoring, optimization, and management of complex safety- critical systems.

KIOS develops intelligent system approaches, suitable for a wide spectrum of applications addressing issues in critical infrastructures including:

- **POWER SYSTEMS**
- **COMMUNICATION NETWORKS**
- **WATER DISTRIBUTION NETWORKS**
- **TRANSPORTATION SYSTEMS**
- **HEALTH-CARE DELIVERY SYSTEMS**

Monitoring and control of critical infrastructure systems is a timely and urgent research issue worldwide. In order to contribute to this globally relevant research challenge, research has focused on various aspects of Monitoring and control of critical systems.

This area is becoming increasingly more challenging as a consequence of the fact that the size and complexity of such systems are steadily growing. Furthermore, the performance objectives have been expanded from the traditional goal of achieving smooth system operation to having high levels of accuracy, efficiency and fault tolerance. The security of such systems has to be enhanced not only for handling accidents (for example due to human error) but also for handling possible intentional attempts to interrupt the operation of such critical systems.

KIOS research activity includes projects with relevant outcomes in:

- **FAULT-DIAGNOSIS**
- **SECURITY OF CRITICAL INFRASTRUCTURES**
- **MANAGEMENT OF CRITICAL INFRASTRUCTURES & LARGE NETWORKS**
- **INTELLIGENT SYSTEMS IN HEALTHCARE**

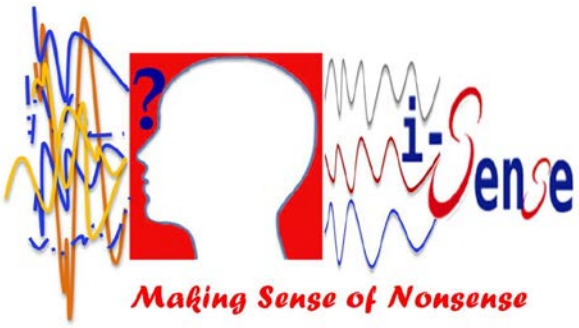
FAULT-DIAGNOSIS

Modern society relies on the availability and smooth operation of complex engineering systems. Examples include electric power systems, water distributions networks, manufacturing processes, transportation systems, robotic systems, etc. The emergence of networked embedded systems and sensor/actuator networks has facilitated the development of advanced monitoring and control applications, where a large amount of sensor data is collected and processed in real-time in order to activate the appropriate actuators and achieve the desired control objectives. The need for such advanced monitoring and control algorithms is becoming more crucial and challenging as engineering systems are becoming more complex, large-scale, and distributed. New sensor/actuator devices are continually being developed at reduced costs and in larger quantities, while traditional monitoring and control specifications and objectives are being expanded to include new system aspects such as energy efficiency, environmental impact, and security.

However, in situations where a fault arises in some of the components (e.g., sensors, actuators, communication links), or an unexpected event occurs in the environment, this may lead to a serious degradation in performance or, even worse, to an overall system failure. Standard feedback control systems are typically not able to handle abrupt significant changes in the dynamics due to a fault or persistent erroneous sensor data, while in some cases the feedback controller may contribute to "hiding" incipient faults that develop slowly over time, until it is too late to prevent a serious system failure. The issues of fault detection, diagnosis, and automatic recovery will become even more crucial in the future as engineering systems become more interconnected, distributed, and interacting, while at the same time they will be required to function under more demanding operating conditions and in more unstructured environments.

Fault-Adaptive Monitoring and Control of Complex Distributed Dynamical Systems

FAULT-ADAPTIVE is a pioneering research initiative, aimed at designing and analyzing "smart" algorithms for real-time data processing, capable of improving the performance and fault tolerance of critical infrastructures such as power distribution systems, water systems and transportation networks. The project contributes to the need for a systematic framework to enhance the reliability, fault-tolerance, and sustainability of complex distributed dynamical systems. The research involves the development of tools and the design of methodologies capable of facilitating early detection and accommodation of "small" faults or unexpected events, before they cause significant disruption or complete system failures in complex distributed dynamical systems.



The EU- FP7 project, iSense, focused on innovative cognitive fault diagnosis approaches that can learn characteristics or system dynamics of the monitored environment and adapt their behaviour and predict missing or inconsistent data to achieve fault tolerant monitoring and control. Theproject focused on solutions to prevent situations where a relatively "small" fault in one or more components (e.g., sensor, actuator, communication link) may cause an overall system failure. This is achieved through a set of algorithms to detect faults (and where possible anticipate them), identify and isolate them as soon as possible, and accommodate for them in future decisions or actuator actions.

SECURITY OF CRITICAL INFRASTRUCTURES

Whilst most Europeans are able to go about their daily lives in relative safety, our societies are facing serious security challenges that are growing in scale and sophistication. Many of these challenges have an impact both on individual countries, and on the European Union as a whole. As critical infrastructures (e.g., water distribution networks, power distribution networks, transportation networks, health care delivery systems) and the vital services they provide become increasingly dependent on technology, they are more susceptible to attacks and failures and their security is of paramount importance. When critical infrastructures fail, the consequences can be devastating, in societal, health, and economic terms. Disruptions to one of these systems – through deliberate attacks, natural disasters, or technical failures – could cause major economic and social damage. To complicate matters, a failure in one infrastructure could lead to failures in other sectors as well, causing a cascade effect, because of the synergistic effect of critical infrastructure industries on each other. For example, if a large geographical area experiences a blackout for an extended period of time, this may cause problems in the transportation, telecommunication, as well as water distribution networks, resulting in potentially huge economic and societal costs. Moreover, these interdependencies often transcend borders as well as sectors, thus making it very difficult for a single EU State to tackle such attacks or failures individually.

The ERC Advanced Grant **"Fault-Adaptive Monitoring and Control of Complex Distributed Dynamical Systems"** (**Fault-Adaptive)** is particularly relevant to this research area. The issues of fault detection, diagnosis and automatic recovery are especially important as these complex engineering systems are required to operate under more demanding operating conditions and more unstructured environments. The development of tools and the design of methodologies that would facilitate early detection and accommodation of "small" faults or unexpected events, before they cause significant disruption or complete system fa ilures in complex distributed dynamical systems, is particularly important.

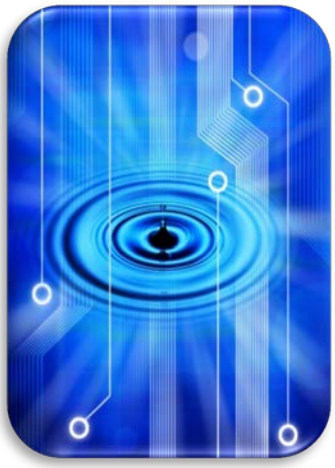
Improving the resilience of Critical Infrastructures has become an increasingly important global civil security concern. Critical Infrastructure networks must be resilient and ready to cope with unexpected emergency situations. The **"Critical Infrastructure Preparedness and Resilience Research Network" (CIPRNet)** is a large Network of Excellence established to improve the resilience of Critical Infrastructures, an important global civil security concern. The Network's aim is to establish mechanisms capable of supporting authorities and critical infrastructure owners to respond swiftly and efficiently to complex emergencies affecting or originating from Critical Infrastructures. CIPRNet is employing advanced modelling, simulation, and analysis capabilities to support more effective responses to disasters and emergencies that affect or originate from multiple critical infrastructure failures. Such competences will enable decision-makers and operators to analyze the various possible courses of action, perform "what if" analysis, and study possible short- and - long term consequences of their decisions.

The European project **"Online Identification of Failure and Attack on Interdependent Critical Infrastructures" (FACIES)** aims to develop and validate techniques which can ensure precise identification of critical infrastructure failures and help to reduce the proliferation of risks posed by the failures and attacks of critical infrastructures.

MANAGEMENT OF CRITICAL INFRASTRUCTURES & LARGE NETWORKS

Everyday life relies heavily on the reliable operation and intelligent management of large-scale critical infrastructures, such as electric power systems, telecommunication networks, and water distribution networks. The design, monitoring, control and security of such systems are becoming increasingly challenging as their size, complexity and interactions are steadily growing. The sheer scale of these infrastructures, the complexity of their networks, the interaction with internal and external perturbations, as well as the interdependencies between infrastructures, make the management of these resources strenuously challenging. The innovative intelligent approaches developed at the KIOS Research Center aim to develop technology for more efficient management and operation of these infrastructures.

WATER SYSTEMS



The project **"Efficient Integrated Real-time Monitoring and Control of Drinking Water Networks" (EFFINET)**, is an EU FP7 research project to help address significant challenges in the management of urban water distribution systems. EFFINET's aim is to develop an integrated software package to enable water utilities to monitor and control the distribution of drinking water more efficiently. The project addresses three main management problems in urban water systems - optimal operational control, real-time monitoring, and demand forecasting/management. The viability of the system will be piloted and tested on water distribution networks in Barcelona (Spain) and Lemesos (Cyprus).

One of the continuous challenges facing the various institutions of public health is the regular monitoring and control of the quality of potable water. Even though the quality of the water that exits the treatment station is in general very high, the quality of water that is actually delivered to the consumer may not be as high for various reasons. The project "**Innovative System for Intelligent on-line Monitoring of Potable Water Quality at Consumer Sites" (WaterALERT)** aims to design and develop a system that is capable of continuously monitoring the quality of potable water delivered to the consumers. This system uses Wireless Sensor Networks technology to allow the monitoring of qualitative water parameters that can be easily measured such as turbidity, pH, electric conductivity, dissolved oxygen, free residual chloride, temperature, etc. The sensor network collects the measurements and combines the information in order to make decisions that concern the quality of the consumed water in real time.

POWER SYSTEMS

Power systems, are complex, interconnected systems, often suffer from temporary or permanent faults or contingency scenarios. Designing, monitoring, and controlling such systems is becoming increasingly more challenging as their size, complexity and interactions are steadily growing. Furthermore, the performance objectives are expanding from the traditional goal of achieving smooth network operation to having high levels of security, accuracy, reliability, and fault tolerance.

The aim of the project **"Enhancement of Power System Integrity and Stability using Novel Sensing Technologies" (STABILITY)** is to develop methodologies for the enhancement of power system integrity and stability using novel sensing technologies. The prevention of voltage instability phenomena that lead into blackouts is a main subject of the project, achieved through the development of novel controlled islanding methodologies. The results of this project will have a significant impact on the field of security, monitoring, and control of power systems preventing devastating incidents such as the blackout in North America in Aug. 2003 where 40 million people in the USA and 10 million people in Canada were left in the dark.

The project **"Formulation of the Next Generation State Estimator by utilizing Synchronized Phasor Measurements" (HYBRID)** was formed to address the need to provide real-time, accurate, and reliable information for the states of the power system through an advanced state estimator that could be the cornerstone of a future real-time wide-area monitoring system. The proposed state estimator is expected to have enhanced accuracy as well as better convergence, immunity to bad measurements, and high adaptability in abrupt changes in the power system network configuration.

It is expected that the full packet of the developed state estimator could be eventually used by the local Transmission System Operator (TSO) whose collaboration in this project is active, enhancing the reliability of the Cyprus power system.

The project **"Use of Telecommunications and GPS Technology for the Real-time Wide-area Monitoring and Control of Power Systems" (WideView)** addresses some of the issues associated with the effective and efficient monitoring of power system infrastructures. The operating conditions as well as the network topology of a power system may change frequently due to complex interconnections and deregulated energy markets. Real-time information regarding the operating states is therefore very important for reliable and secure operation. The supervisory control and data acquisition (SCADA) system relies on conventional measurements such as the power flow, power injection, voltage, and current measurements is inherently slow in nature, and fails to provide a real-time picture of the power system. The integration of the Global Positioning System (GPS) technology to the measurement units of power system quantities has led to the design of an an innovative measurement unit , Phasor Measurement Unit (PMU), that due to the integrated GPS receiver can measure extremely accurate voltage and current phasors.

TELECOMMUNICATION SYSTEMS

Optical communications have become the dominant medium for high-speed communication, mainly due to the vast amount of bandwidth available and the very low-bit error rates achievable, compared to their copper wire predecessors. As networks evolve to support more bandwidth intensive applications, and as rich multimedia and real-time services become more popular, next generation infrastructures are expected to support traffic that will be heterogeneous in nature with both unicast and multicast applications (e.g., high-definition television, video conferencing, interactive distance learning, live auctions, distributed games, and video-on-demand, etc.).

The project **"Novel Design and Simulation Software Tool for Provisioning and Restoration of Broadcast and Multicast Connections in Optical Mesh Networks" (MultiBroad)** investigated the problems of provisioning and survivability for transparent mesh optical networks that support multicast, as well as broadcast applications. Novel provisioning techniques are developed to provide solutions with lower blocking probability and lower cost compared to existing techniques. Furthermore, multicast/broadcast protection schemes are devised that are capacity efficient and fast compared to traditional link- and path-based approaches. The algorithms designed will be incorporated in a software simulation/design tool that can be utilized by network designers and researchers to design and evaluate the performance of core mesh optical networks when such applications are present.

The **project AUTOWINFI (Autonomic Wireless Networking for the Future Internet through Distributed Policy-Based Management**), developed technology for more pervasive and trustworthy network and service Infrastructures. The technology contributed to the ongoing design of the Future Internet (FI) helping the fully integration of mobile and wireless networks in a simplified, automated, and scalable manner.

INTELLIGENT SYSTEMS IN HEALTHCARE

KIOS Researchers also focus on research to enable the development of technologies for enhancing healthcare delivery and/or improving diagnosis, monitoring, or treatment of diseases or medical conditions affecting a large population of patients. Such technologies can help improve the quality of healthcare delivered and offer significant cost reductions to healthcare delivery systems.

Healthcare systems have an essential role to play in response to emergency situations which endanger the health and wellbeing of individuals, but during large-scale events, resources are over stretched. Large-scale disaster incidents such as the earthquake in Haiti, the Fukushima tsunami, and even the very recent hurricane Sandy that hit the US east coast, or health epidemics like the 2009 H1N1 influenza pandemic, Ebola virus, put extreme pressure on the capacity of emergency response of medical systems and highlight the important role of coordination between health services to respond to mass medical emergencies and casualty incidents.

The EU research project ***COncORDE ("Development of Coordination Mechanisms during Different Kinds of Emergencies")*** aims to develop to develop technology that can help medical services to be better prepared and able to respond to emergency situations appropriately and efficiently. The aim is to develop a Decision Support System (DSS) system with appropriate technological innovations, capable of strengthening the preparedness and interoperability of medical services during an emergency situation. The tool will lead to improvements in emergency management and crisis management systems and will assist decision-makers to extract reliable intelligence to guide their actions.

Cancer is one of the most serious global health problems, particularly in developed countries where it exhibits increasing trends. One of the most active research areas related to oncological diseases is the utilization of advanced computational methods and tools for better understanding the underlying mechanisms, early diagnosis of the disease, as well as the optimization of cancer therapy in a personalized (patient specific) context. The wide use of such tools has not yet been realized, partly due to the lack of validation of the mathematical models that have been developed with experimental and clinical data. The Cross-border Cooperation Program "INTERREG" 2007-2013 project "**Technology for Improved Diagnosis and Personalized Optimal Therapy of Oncological Diseases" (YPERTHEN)** is to develop computational tools to assist with the diagnosis and personalized optimal therapy of oncological diseases. Multi-scale dynamic models of cancer progression take into account several important factors and scenarios include patient characteristics, the response of the immune system, metastatic effects, etc.

The project **"Multi-potent Theronostic Molecules Targeting Colorectal Cancer" (PHOTAVGIA)** investigates a break-through solution for improved management of colorectal cancer and potentially other malignancies whose cells express specific molecules which belong to the epidermal growth factor family of receptors (EGFR). PHOTAVGIA (meaning luminiscence) develops a novel group of pharmaceuticals which have both therapeutic and diagnostic qualities. This type of pharmaceuticalis, is categorized as "theranostic", have the ability to target cancer cells, enable "diagnosis" whilst simultaneously having a therapeutic effect (therapy). In addition, the theranostic agent will enable the targeting of specific markers of the disease, allowing for earlier and targeted therapy, better treatment, as well as helping to reduce side-effects, and better prognosis.

HIGH-PERFORMANCE HARDWARE

Efficient and effective management of critical infrastructures requires monitoring and analysis of large volumes of data under a variety of conditions. Such situations require specialized hardware which can provide both the required processing power but also the reliability and resilience to undertake these important tasks. In order to provide complete and comprehensive solutions KIOS researchers are also exploring the development of high-performance computing platforms, robust electronics, and autonomous robots.

Advancements in healthcare and ecology, key aspects to improving the quality of life, are heavily dependent on high-performance, real-time, computation systems. Such systems are necessary to compute extremely complicated algorithms, used by biologists and doctors worldwide, for example in the development of more effective drugs and accurate prediction models for ecosystems. Supercomputers or large clusters of computers are the only solutions capable of providing the ever-increasing computational power required by these applications. However, such systems are large and expensive, with high-energy consumption. The excessive cost of implementing and maintaining such systems, limits their presence only to a small number of research facilities worldwide.

The project **"High-Performance, Cost Effective Supercomputer for Biological, Ecological and Medical Research" (EVAGORAS)** aims to create a high -performance, green, supercomputer, exploiting recent advances in FPGA technology, which will be utilized for analyzing computationally intensive biological and ecological models. The resulting EVAGORAS supercomputer will be a powerful computational engine that will further improve the quality of research in the fields of biology, medicine, and ecology. Besides the performance gains, the proposed system is a green technology as well, as it will consume around 20% less energy and has significantly lower maintenance cost than other systems used for the same purposes.

In a few years millions of robots will be used in various application areas that will all be navigated in an autonomous manner based on 3D video capture; such robots can be efficiently and inexpensively built using innovative highly-flexible infrastructure. The *Eurostars* project "**Reconfigurable Ultra-Autonomous Novel Robots (RUNNER)"** developed an innovative prototype to improve the perceptions of highly autonomous Robots. The prototype utilizes high-end reconfigurable devices to allow for extremely higher performance and power-efficient processing when implementing data manipulation methods such as 3D sensing/matching schemes as well as template and feature-based object recognition algorithms, while they can be reconfigured on real-time. The developed reconfigurable platform prototype also has cross-domain applicability.

KIOS Collaborations

The KIOS Research Center actively encourages collaboration between industry, academia, and research organizations in high-tech areas of both global and local importance.

Our goal is to apply the results and methodologies developed through our research to partner industries and organizations, through mutually beneficial collaboration.

The Center's collaborators range from world-renowned academic institutions, in Europe and the United States to large industrial partners and small and medium size enterprises who are seeking solutions to real- life problems.

"In today's global world, generating new knowledge and turning it into new products and services is crucial to maintain and enhance the EU's competitiveness. Innovation and excellence will positively impact on our lives in very different ways: through improved medicines, more efficient and sustainable energy resources, and with new technological solutions to protect our environment or to guarantee the security of the citizens. Transforming the results of scientific research into new commercial products is, however, a complex process involving a broad range of actors. We need to ensure that researchers and industry work closely together and maximize the social and economic benefits of new ideas."

European Commission Communication, Improving knowledge transfer between research institutions and industry across Europe.

Knowledge Transfer & Exploitation of Research Results

The KIOS Research Center actively participates in collaboration between industry, academia, and research organizations in high-tech areas of both global and local importance. These collaborations involve the transfer of research findings, skills, and competence to industry so they are able to transform them into economic outcomes and/or improve public services.

In recent years, KIOS collaborations have evolved to include tailored research for a commercial/ public entity wishing to exploit innovative research and/or wishing to sanction research for new and emerging technologies.

NEW AND EMERGING TECHNOLOGY FOR INDUSTRY

New state-of-the-art technology for "Smart" mobile phones has been exploited for commercial purposes by a large international hardware and software company in Taiwan. The innovative system ***Airplace,*** which is the product of collaboration between two research groups at the University of Cyprus, enables a very precise identification of the location of persons or objects in large indoor spaces, where the use of GPS is not possible. ***Airplace*** is an Android smartphone platform for real-time positioning and tracking inside large buildings (e.g., airports, museums, shopping malls, universities).

The system operates using existing WiFi infrastructure within buildings and exploits signal strength measurements from surrounding WiFi access points which are received by the mobile device during positioning. These features enable easier and cheaper installation of the indoor positioning system in large buildings, whilst at the same time facilitating fast and efficient access to anyone who owns a smartphone and wishes to use the system. The massive availability of mobile devices combined with the fact that people tend to spend most of their time in indoor environments, has created the need for "smart" electronic systems capable of processing and transmitting information within buildings. *The Airplace indoor positioning system on Android smartphones, won the Best Demo (1st Prize) at the 13th IEEE International Conference on Mobile Data Management (MDM'12), IEEE Computer Society, which took place in Bangalore India on July 23-26 2012.*

INTERNATIONAL PATENT FOR ELECTRICITY GENERATION SYSTEM - ZERO CO_2 EMISSIONS

An innovative method for generating electricity with zero CO_2 emissions has been developed at KIOS which has been awarded an international patent. The

Patents play an increasingly important role in innovation and economic performance. They lead to increased commercialization of inventions derived from scientific research generating greater benefits to society

technology is cutting edge with a distinguishing feature: the power output can be regulated, unlike the power output of conventional renewable energy systems whose output varies depending on the availability of wind or solar irradiation. Due to the novel configuration proposed, the electric energy out of this system will be clean, green, and regulated. The successful development of this technology contributes to the target set by the European Union for energy generation using renewable sources, as well as targets for CO_2 emissions, not only in Cyprus, but also in the rest of Europe.*This technology was developed as part of a research project, entitled ZeroCO_2 financed by a grant from Norway through the Norwegian Financial Mechanism, the Republic of Cyprus, and the University of Cyprus.*

Collaboration with Industry & End-Users

KIOS continues to cultivate its collaborations with industrial companies and public service authorities responsible for the management of critical infrastructure and related provision of services to the public. The aim of these sector specific collaborations is to enable technology and knowledge transfer between academia and industry to address key challenges facing critical infrastructure sectors.

COLLABORATION WITH SME'S

KIOS also collaborates with a number of SMEs to develop advanced technological solutions to transform research findings, skills, and competences into economic outcomes. Notable examples of collaborations resulting in improved and marketable technology include collaboration with Cyprus based technology companies such as SignalGeneriX Ltd and P.G. Solvenet Services Ltd. The results of this collaboration have included: a prototype system that can initiate warnings to electric utility maintenance personnel if objects (mainly vegetation) approach electric power transmission lines thus avoiding major forest fires; and an innovative system for intelligent monitoring of the quality of water delivered to consumers).

COLLABORATION WITH INDUSTRIAL PARTNERS

KIOS collaborations also include leading industrial partners such as IBM Ireland, STMicrolectronics, SIVECO, Danieli. The aims of these collaborations are to enhance the possibilities of uptake for the research and technologies developed at KIOS. These collaborations blend the scientific know-how of the KIOS research team with end-user perspectives and expertise from industrial partners, in order to enhance the application potential of technology.

SECTOR SPECIFIC COLLABORATION

In Cyprus, the KIOS Research Center collaborates closely with public sector departments such as the Electricity Authority of Cyprus (EAC), the Ministry of Communication and Works, the Transmission System Operator, and the Water Development Department of the Ministry of Agriculture, National Resources and Environment, Republic of Cyprus. These collaborations have been extremely successful, often resulting in funding for joint research projects and formal partnerships through mutually beneficial Memorandums of Understanding (MoUs). Research collaborations also exist with the Ministry of Health, as well as several hospitals, and clinics.

The ultimate goal is to enable the safe and efficient operation of power systems, communication networks, water distribution networks, transportation systems, and health-care delivery systems.

Water Systems

The management of water resources and their quality is an important issue for Cyprus and of increasing importance globally. The application of Information and Communication Technologies can offer new and improved possibilities for the enhanced management of Water Resources, especially for the efficient management and monitoring of water distribution systems (e.g., the detection and isolation of leakages, energy efficiency solutions for water distribution networks, improvements in the safety of the networks and detection, isolation, and mitigation of possible contamination events).

KIOS has signed Memorandums of Understanding with the Cyprus Water Development Department (Ministry of Agriculture, Natural Resources and Environment) and the Limassol Water Board. They work in partnership to improve the efficiency and management of water systems in Cyprus. Special emphasis is given to the design and implementation of embedded systems for quality control and fault diagnosis in water systems. Together they work in joint EU funded research proposals and on tailored research and technology support.

Power Industry

KIOS collaborates closely with the Electricity Authority of Cyprus (EAC) and the Cyprus Transmission System Operator (TSO). This bilateral collaboration focuses on the research needs of the power industry in Cyprus, as well as towards new and emerging research fields that are of interest to the two organizations in the near-and long-term future.

Researchers at KIOS have worked on a number of specific research problems related to power systems, including techniques which can improve the state estimation process in power systems and mechanisms to ensure the optimal economic dispatch of the EAC generating units within the new context of the deregulated electricity market. KIOS also works on the synchronization and fault-ride through control of renewable energy systems (e.g., wind and photovoltaic systems) which is of critical importance in efforts to increase the penetration of renewable energy technologies in conventional power grids.

Telecommunications Industry

KIOS has a long-standing collaboration with PrimeTel PLC, the largest private telecommunication company in Cyprus. This research collaboration has focused on a number of topics related to the fast, efficient, and reliable provisioning to enable carriers such as PrimeTel to fix services to end-users in an uninterrupted manner. Such quality-of-service (QoS) issues have become an important requirement for the operation of telecommunication networks and a key research priority for the EU's DIGITAL AGENDA EUROPE.

International Connections

The KIOS Research Center participates actively in the international research arena, collaborating with international partners to address global research challenges and priorities in the areas of ICT, Security, Energy, Health, and the Environment.

KIOS collaborates with 200 organizations worldwide

The Research Center has a strong network of collaborators, including several internationally recognized research institutions, pooling expertise and working together with these institutions on large research undertakings. It actively participates in international cross-sectoral and multi-disciplinary research projects, which contribute significantly to technological advancement. Collaborators include Arizona State University, Boston University, ETH Zurich, Ecole Polytechnique Federale de Lausanne, FraunhoferGeorgia Institute of Technology, Imperial College, John Hopkins University, Politecnico di Milano, University of Birmingham, University of Malaga, University of Patras, Universitat Politècnica de Catalunya, University Campus Biomedico Rome, and many more.

International collaborations have helped to create a greater pool of expertise that can be drawn upon to solve specific research problems and opportunities from which knowledge transfer can occur. These collaborations have steered KIOS researchers towards new and emerging global research fields that will be of interest to KIOS partners in the near-and long-term future.

Examples of sector specific collaborations:

In the area of ***Transportation Networks***,_KIOS has long-standing collaborations with leading academic and research institutions in the field such as with Boston University and ETH Zurich. KIOS researchers have also benefited from scientific missions to leading universities such as Intelligent Transportation Systems Centre and Testbed, at the University of Toronto, focusing on integrated intelligent control of urban and highway transportation networks.

Telecommunications related collaborations have occurred with The City University of New York in the area of converged fiber-wireless access network architectures. The focus of this collaboration is on the development of all critical elements necessary for the implementation of a high-capacity, high-performance, cost-effective, converged fixed-mobile access networking solution.

In the area of ***Power Systems*** there are also ongoing collaborations with electric utilities and industries in Europe and the United States, with a focus on the implementation of the technologies developed in actual industrial settings.

Scientific Conferences

Faculty at the KIOS Research Center have collaborated with international partners to co-organize a number of workshops held Cyprus enabling researchers and collaborators in Cyprus to benefit from the expertise and know-how of world - renowned scientists in fields relevant to the KIOS Research Center and its collaborators.

CRITIS 2014 Conference on Security of Critical Infrastructure Systems

The 9th International Conference on Critical Information Infrastructures Security (CRITIS 2014) was held in Limassol, Cyprus. CRITIS 2014 was co-organized by the KIOS Research Center for Intelligent Systems and Networks. CRITIS brings together researchers and professionals from academia, industry and governmental organizations working in the field of the security of critical infrastructure systems.

Grand Challenges of Computational Intelligence Current & Future Trends, Nicosia, Cyprus.

The international workshop on "Grand Challenges of Computational Intelligence" took place at the University of Cyprus in September 2012. The workshop, organized by the international organization IEEE Computational Intelligence Society and the KIOS Research Center, was dedicated to the exploration of existing and future trends and provided an inspiration about upcoming grand challenges in Computational Intelligence.

Speakers at the workshop included 9 leading experts in Computational Intelligence (from the USA, Japan, Chile, the UK, Belgium, and Ireland) presenting various dimensions and interpretations of existing and future global challenges in the field.

Control and Adaptation Workshop: A 30-Year Journey, Larnaca, Cyprus.

The KIOS Research Center co-organized the workshop "Control and Adaptation: A 30-Year Journey". The workshop honored the 60th birthday of pioneer researcher Professor Petros Ioannou who is an important figurehead in the field of adaptive control. Professor Ioannou's important research contributions have generated major theoretical and technological advances in the field of adaptive control. The adaptive control field has grown to be one of the most well-established in terms of algorithms, design techniques, and analytical tools.

KIOS Annual Workshop, Nicosia, Cyprus

The KIOS Workshop has been held annually since 2011 to enable interaction between research teams and promote information exchange and multidisciplinary collaboration. In 2014, KIOS celebrated its 5th yearanniversary in the presence of the President of the Republic of Cyprus and included expert guest speakers such as the Minister of Health, Professor Phillipos Patsallis.

Honors & Awards

International Recognition

The quality of research is judged by many factors, including the extent of funding, the quantity and quality of publications, and the recognition it receives from the scientific community.

The KIOS research team has received international recognition for its high-quality research by several groups of peers. It has come in the form of prestigious awards and prizes which serve to underpin the Center's commitment to excellence, including:

- *ERC Advanced Grant*
- *IEEE recognition*
- *Best paper, poster and demo awards*
- *EU panel organization*

President of the IEEE Computational Intelligence Society

Prof. Marios M. Polycarpou served as the President of the IEEE Computational Intelligence Society, for the two-year period between January 1, 2012–December 31, 2013. This is a very prestigious position of international recognition. It is only the second time in the history of IEEE CIS that the president of the society is from outside North America.

ERC Advanced Grant Awarded to Director of KIOS, Professor Marios Polycarpou

Professor Marios Polycarpou, Director of the KIOS Research Center for Intelligent Systems and Networks at the University of Cyprus, has been awarded the ERC Advanced Grant, the most prestigious research funding award given by the European Research Council (ERC).

Each year, ERC Advanced Grants are awarded on average to 8 scientists in all areas of Electrical and Computer Engineering, following an extremely competitive selection process. The ERC Advanced Grant awarded to Prof. M. Polycarpou attests to his excellent international academic standing and impressive research contributions.

Innovative Technology wins prestigious prize from Microsoft Research

The research team from the University of Cyprus ranked 2nd worldwide in the Indoor Localization Contest organized by Microsoft Research (USA) for localizing a mobile device in indoor spaces, such as airports, shopping malls, or other public spaces. The innovative system for real-time geolocation and tracking inside buildings that was jointly developed by the KIOS Research Center and the Department of Computer Science, both at the University of Cyprus, and the high-tech company Cywee Ltd. (Taiwan), The systems won the 2nd place award in its category, winning high profile teams from China, USA, UK, Germany, Singapore, and numerous other companies from Brazil, Poland, India, and the USA. This is a significant success for KIOS , illustrating that the research and technology developed in Cyprus can attain high international standards, capable of contributing to global technological advancement.

Distinguished International Award for KIOS Researcher Markos Asprou

Markos Asprou, a Ph.D. student at the University of Cyprus and a KIOS Researcher, has received a prestigious, international award which is given to a select number of Graduate students each year. The Graduate Fellowship Award is given by the Instrumentation and Measurement Society (http://ieee-ims.org/) of the Institute of Electrical and Electronics Engineers (IEEE). The selection process for this award is extremely competitive, with large numbers of applications being received from student members of the IEEE around the world. This year, the award was given to three candidates only. The other two candidates selected for the award, originate from universities in the USA.

The award comes in the form of a grant to undertake important research in the area of Instrumentation and Measurement. This is a significant recognition of the quality and level of research being undertaken by the KIOS Research Team.

Best-Paper Award for KIOS Researchers at the 8th International Conference on Critical Information Infrastructures Security (CRITIS 2013)

A Best-Paper Award was awarded for the paper "Minimizing the Impact of In-band Jamming Attacks in WDM Optical Networks" by KIOS Center members K. Manousakis and G. Ellinas, that appeared in the 8th International Conference on Critical Information Infrastructures Security (CRITIS 2013) in Amsterdam, The Netherlands.
The award demonstrates the high-quality research undertaken at the Center and provides international visibility and recognition for the research performed in Cyprus in the field of Information and Communications Technologies (ICT) and in particular in the areas of Critical Information Infrastructures Security.

Best-Demo Award at the 13th IEEE International Conference on Mobile Data Management (MDM 2012)

A collaborative research effort between the KIOS Research Center and the Department of Computer Science at the University of Cyprus, won the Best Demo at the 13th IEEE International Conference on Mobile Data Management (MDM'12), IEEE Computer Society, which took place in Bangalore, India on July 23-26, 2012.The 1st prize was awarded for the demonstration of the newly designed Airplace indoor positioning system on Android smartphones.

Publication details: C. Laoudias, G. Constantinou, M. Constantinides, S. Nicolaou, D. Zeinalipour-Yazti, C. G. Panayiotou, "The Airplace Indoor Positioning Platform for Android Smartphones", 13th IEEE International Conference on Mobile Data Management (MDM'12), IEEE Computer Society, Bangalore, India, July 23-26, 2012.

Best Poster Award for KIOS Researcher at the IEEE 17th International Conference on Optical Network Design and Modeling (ONDM 2013)

A Best Poster Award was awarded for the paper "A Converged Optical Wireless Architecture for Mobile Backhaul Networks" by K. Ramantas, K. Vlachos, G. Ellinas, and A. Hadjiantonis for collaborative work by the University of Patras, the KIOS Research Center at the University of Cyprus, and the University of Nicosia, that appeared in the IEEE 17th International Conference on Optical Network Design and Modeling (ONDM 2013) in Brest, France. This work is part of the research program "Converged Fixed-Mobile Networking Transport Infrastructure for Next-Generation Broadband Access", that addresses architecture and networking issues related to the development of an optical-wireless access network infrastructure.

Summer Internship for KIOS Researcher at the European Organization for Nuclear Research (CERN)

KIOS Researcher Yiannis Tofis was one of 100 young researchers selected from over 2000 applications to participate in the CERN (the European Organization for Nuclear Research) internship programme, in the summer of 2012.
The European Organization for Nuclear Research (CERN) is one of the world's largest and most respected centers for scientific research. It is the world's top particle physics research center and the birthplace of the World Wide Web (WWW).

KIOS Outreach

Informing on Research, Communicating Results, Inspiring New Researchers

KIOS Researchers are active in informing the general public to the results of their research.

The Center also strives to create an inquisitive and growing research culture among young scientists and the community at large.

The Center's outreach efforts include:

- *Undergraduate Research Opportunity Program (UROP)*
- *School visits*
- *Industry sponsored research positions*
- *Newsletters*
- *Press articles*
- *EU Researcher Night*

Informing on Research - Reporting on Results

The KIOS Research Center endeavors to keep its stakeholders, partners, and the wider public informed about its research activities and results. Emphasis is given to raising awareness and disseminating research results to the wider public in order to encourage widespread appreciation of the values and benefits of research within the society. KIOS has provided regular updates on its activities through specific measures that have become essential to the organization's operations.

Research at KIOS also received considerable attention from the national media wishing to report on the potential impact of the research conducted in the Center. This has resulted in several special feature articles and guest television appearances from the KIOS research team.

KIOS Website

The Center maintains a website (http://www.kios.ucy.ac.cy/). The website is updated regularly with details on new research projects, research results, and other Center news. With approximately 25000 visits annually (10000 unique visitors), the website is a significant mechanism for informing on KIOS research news and activities.

KIOS Newsletters

KIOS issues Newsletters regularly to update its readers on the latest scientific activities of the Center including details on research results, new projects, and other relevant scientific research news. It has proven to be an effective method to keep collaborators and partners informed. Issues are sent to over 1000 subscribers including members of the scientific community in Cyprus and the world, as well as members of the public, government officials, and key decision makers.

Media

Details of the research news at KIOS have also been published in the mainstream press at national and international levels. This included a number of articles in the leading national newspapers with large readership numbers, several special feature articles, and guest television appearances from the KIOS research team. News articles have also been published in international press, as well as in Special Issue magazines which are circulated internationally and/or in countries outside Cyprus Overall there have been 143 recorded news articles and reports in the publishing press during the period of this report. There have also been 13 TV and Radio appearances introducing research to the general public.

Young Scientists

Undergraduate Research Opportunities Program

Every year, during the summer, the KIOS Research Center runs the Undergraduate Research Opportunities Program (UROP). The program's aim is to encourage young people (undergraduate students from Cyprus and abroad) to participate in real research projects, to nurture the skills, experience, and confidence required for such an endeavor, and encourage a culture of science and innovation among the brightest of students.

The students participate in research relevant to the KIOS research activities including areas such as renewable energy, ICT for health, telecommunication and transportation networks. UROP, has operated for 6 years and has been an integral part of the outreach activities of KIOS since it was formally established. Between 2009 and 2013, a total of 24 students successfully completed the program.

KIOS Researcher Sponsored by Cyprus-based Company Signal GeneriX

Yiannis Argyrou was sponsored by SignalGeneriX Ltd to complete his Masters at the KIOS Researcher Center and the Department of Electrical and Computer Engineering. Upon completion of his Masters he was offered employment at the company.

SignalGeneriX Ltd is a Cypriot R&D company doing cutting edge research and development in the fields of Digital Signal Processing (DSP) and Communications. Ranked by the EU as the top research performing company in Cyprus SignalGeneriX Ltd collaborates with KIOS on several research initiatives.

School Visits

The KIOS Research Center often facilitates school visits to the Center, where young students are given the opportunity to meet researchers and learn about various dimensions of the research and technology be ing undertaken at KIOS. A number of the KIOS Faculty and Researchers have also given talks to pupils at schools in various areas of Cyprus.

Outreach & Raising Awareness

On-line Educational Video!

Dr. Demetrios Eliades, Post-Doctoral Researcher at the KIOS Researcher Center of the University of Cyprus and the company Zedem Media produced an award-winning video entitled “An Egg Boiling Fuzzy Logic Robot”, that successfully uses animation to explain Fuzzy Logic and the applications of this methodology to everyday life. The video won First Prize from IEEE Computational Intelligence Society in an international competition.

http://www.youtube.com/watch?v=J_Q5X0nTmrA

Learning to Communicate Research

A number of KIOS Researchers participated in a special workshop organized by the University of Cyprus for the research community of the University. The workshop was organized to introduce dissemination approaches and mechanisms to help researchers to introduce their research and results to the wider public.

Researcher’s Night Annually - 2011, 2012, 2013, 2014

During this period the KIOS Research Center participated, two Researchers’ Night events organized in Cyprus as part of an EU-wide campaign. The campaign, which takes place every year in more than 350 European cities simultaneously, brings researchers directly into contact with the public, to show the important role research plays in society. The event taking place in late September had an estimated participation of 2,500 visitors.

In these events over 20 members of the KIOS research team demonstrated the capabilities of different types of research initiatives and technological prototypes in a format that would easily attract the attention of participants.

Shaping Policy, Sharing Results & Best Practice

EU informal Competitiveness Council

As the holder of an ERC Advanced Grant, the Director of KIOS Professor Marios Polycarpou KIOS was one of two Cypriot grant holders invited to speak at the EU Informal Competitiveness Council (Research), a high level ministerial meeting organized as part of the Cyprus Presidency of the Council of the European Union. This is the first time ever that ERC grantees were invited to speak about the benefits of research to the EU research ministers, as they gathered to discuss research policy during the Council meeting in Nicosia on 19 July 2012.

KIOS led ESF COST Action IntelliCIS - "Best-Practice Example" to MEPs



Professor Elias Kyriakides, member of the KIOS faculty and Coordinator of the ESF-COST Action IC0806 IntelliCIS, was invited to speak to members of the European Parliament and officials from the European Commission and Council, at a special conference organized at the European Parliament offices in Brussels. The workshops entitled "A European Landscape of research funds – Achievement in FP7 & prospect in Horizon 2020" was organized by the European Parliament Panel for Science and Technology Options Assessment Body and the COST Action Offices.

Intelligent Monitoring, Control and Security of Critical Infrastructure Systems

The COST Action IntelliCIS network has brought together 188 scientists from Europe and beyond, providing an ideal avenue for researchers to share knowledge and enhance their expertise though collaboration. During its four years of operation the Action hosted 8 IntelliCIS workshops, two training schools, 45 research staff exchanges and over 250 recorded related publications.

Sharing Experiences on Transnational Innovation Projects

Professor Theocharis Theocharides, member of the KIOS Faculty, was invited to share his expertise at an event coordinated by the Cyprus Research Promotion Foundation to support businesses and research organizations to apply for funds available under this research program. There is a strong emphasis within the EU on knowledge transfer and Prof. Theocharides experience in working collaboratively with industrial partners to develop marketable technology, was utilized to encourage similar collaborations to occur in Cyprus and beyond. *Professor Theocharis Theocharides is an expert evaluator for the program and was a member of the coordinating team for a large Eurostars project.*

Center of Excellence

The KIOS Research Center strives to establish itself as a Center of Excellence in the scientific arena. It builds on the strengths and multi-disciplinary capabilities of its researchers and its expanding infrastructure to:

- *Address challenging scientific and techno-logical problems*
- *Be a reputable protagonist in the niche area of intelligent networked embedded systems*
- *Provide a promising avenue for qualified and motivated researchers to pursue successful careers*

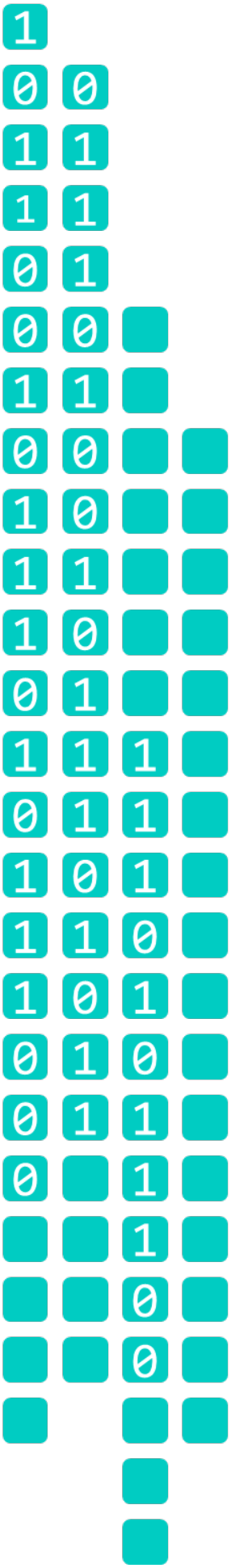
Striving for Excellence

The KIOS Research Center strives to be a leading Center of Excellence in the field of information and communication technologies. We strive to make significant contributions to the knowledge-based economy in Cyprus via the creation of new jobs in high-tech areas and the design of new products and services.

The KIOS Research Center is a medium size research center with an excellent reputation within the international scientific communities. The Center participates actively in the international research arena and makes significant contributions to global research challenges and priorities in the areas of ICT, Security, Energy, Health, and the Environment.

The research and application domains relevant to KIOS continue to be high priorities in research and technology agendas, providing opportunities for high-quality, global, research collaboration. Future priorities for KIOS are to ensure that the Center has the capacity to develop, evolve, and grow in ways that enable its research team to respond to emerging research opportunities and challenges:
More specifically in the short- and long-term future the Center's priorities are to:

- Participate actively in the international research arena and make significant contributions to global research challenges and priorities in the areas of ICT, Security, Energy, Transport, Health, and the Environment.
- Maintain high-quality standards and excellence in its research.
- Promote multidisciplinary research and collaboration, to achieve integration between theory and applications.
- Provide a promising avenue for qualified and motivated researchers to pursue successful careers by creating new job opportunities in the high-tech arena and attracting new and outstanding researchers to Cyprus.
- Promote efforts for knowledge and technology transfer between academia and industry, and for the exploitation of research results.
- Emphasis will be given to ensure that these collaborations steer the Center towards the research needs of industry in Cyprus, as well as towards new and emerging global research fields that will be of interest to KIOS partners in the near and long-term future.
- Continue efforts to strengthen existing collaborations and develop new ones amongst the KIOS research team and its external partners so it is better able to address challenging scientific and technological problems within the constantly evolving research arena.



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