UNIVERSITY of INFORMATION
TECHNOLOGY and MANAGEMENT
in Rzeszow, POLAND

FACULTY OF APPLIED COMPUTER SCIENCE

of the University of
Information Technology
and Management
based in Rzeszów

ORGANIZATIONAL STRUCTURE |
DESCRIPTIONS OF FIELDS OF STUDY |
SCIENTIFIC RESEARCH | PUBLICATIONS |
RESEARCH AND TEACHING LABORATORIES

FACULTY OF APPLIED IT

of the University of Information Technology and Management based in Rzeszów

SCIENTIFIC CATEGORY IN PARAMETRIC EVALUATION of the Ministry of Science and Higher Education for the years 2013–2016

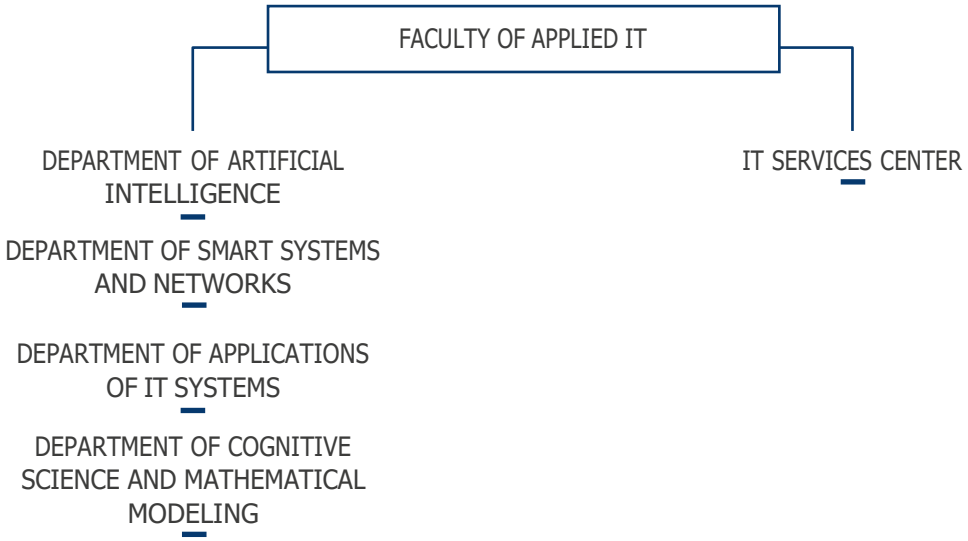
Organizational units subordinated from 1/10/2019 to the Faculty of Applied IT until 30/09/2019 operated within the Faculty of Applied IT, which during the last categorization obtained **category B.**

Main scientific disciplines at the Faculty of Applied IT:

- Technical informatics and telecommunications;
- Information Technology;
- Mathematics.

ORGANIZATIONAL STRUCTURE OF THE FACULTY OF IT (since 1.10.2019)

In the structure of Faculty of Applied IT there are research and teaching units (departments) and services center.



FIELDS OF STUDY CONDUCTED WITHIN THE FACULTY OF APPLIED IT

FIRST-CYCLE STUDIES

Information Technology – full-time and part-time studies
- Engineering studies – in Polish
- Bachelor's studies – in English

SECOND-CYCLE STUDIES

Information Technology – full-time and part-time studies (in Polish and English)

DESCRIPTIONS OF FIELDS OF STUDY

INFORMATION TECHNOLOGY

Information Technology is a very modern and dynamically developing field of knowledge. Students who study Information Technology will, in the future, participate in the creation of new technologies and IT tools.

The rapid development of new technologies and modern devices requiring specialized software pose new challenges to IT specialists, which creates very good work and development perspectives for graduates in this field. The field of Information Technology includes full-time and part-time, first- and second-cycle studies. Classes are implemented on the Polish and English-language paths. The concept of education in the field of Information Technology is directly related to the mission of the University, aiming at educating comprehensive and creative specialists for the needs of external stakeholders and conducting research in the field of Information Technology, telecommunications contributing to the development of science and economy.

Activities related to education in the field of Information Technology relate in particular to the implementation of the University's strategic objectives. The extensive use of active teaching methods in the plan and program of studies makes the learning process more practical and provides conditions for the development of students' competence and creativity.

The education program in the field of Information Technology focuses on implementing content related to algorithmic and computational thinking. Studies in this field familiarize students with practical knowledge of the methods and technologies used by computer specialists. The studies enable acquisition of theoretical and practical knowledge in the field of the latest IT solutions used in various areas of life.

Classes are conducted by renowned scientists as well as specialists with many years of professional experience. An important part of classes are conducted by practitioners. Research and teaching staff are engaged in cooperation with business entities in the implementation of projects and diploma theses, which raises the qualifications of the staff and stimulates their innovative activities.

The first-cycle studies program for the field of Information Technology provides students with the acquisition of general engineering competence in the areas of: mathematical analysis and algebra, numerical methods, set theory and discrete mathematics, basic physics, entrepreneurship and management, as well as intellectual property protection. Major-related competences are obtained as part of education modules covering key issues for modern IT, both in terms of hardware and software, including software modeling, object-oriented programming, internet programming, etc. Also discussed are the issues of security and data protection in computer systems and IT project management. In addition to theory, the student during laboratory and project classes develops practical skills in the field of object and internet programming, software modeling, and network infrastructure management. In addition, great emphasis is placed on teamwork skills and familiarizing students with various team work management methodologies. Practical classes during studies are conducted in cooperation with IT companies. During their studies, students may, in addition to choosing a specialty, choose subjects from the offer of elective subjects, thus shaping their development path tailored to their interests.

Second-cycle studies are aimed at expanding the knowledge acquired at the first-cycle studies and to prepare the student to solve research and scientific problems. Information Technology studies at UITM are characterized by a wide range of practical classes, including 960 hours of professional practice.

In the field of Information Technology the following specialties are offered:

***At first-cycle engineering studies** conducted in the Polish language:*

COMPUTER GAMES ENGINEERING

The aim of this specialty is to educate a professional team of engineers, experts in the process of computer game production, possessing specialized knowledge and skills in the field of computer graphics creation in games, computer games design, game production management and applied programming technologies in game production. The specialty covers a wide range of issues constituting the production cycle of computer games as well as issues in the field of organization and management of the production process. During classes there is used professional software such as Adobe Photoshop, Illustrator, 3ds Max, Unreal Engine, CRYENGINE. Classes are conducted by both qualified university employees and specialists from well-known companies from the gaming industry.

Graduates will be prepared to work primarily on the dynamically developing market of computer games as: game designers, graphic designers, animators, programmers. They can also find work in many similar industries connected with creating virtual spaces and simulations for prototype and educational purposes.

INTERNET AND MOBILE TECHNOLOGIES

The aim of education in this specialty is to prepare specialists in the field of languages, techniques, tools and methodology for creating internet applications and systems, starting from creating web pages, portals, websites, through designing and implementing internet database systems, hypermedia systems and advanced network applications. Students gain practical knowledge in the field of application development skills for mobile devices and e-business applications, as well as learn about the legal aspects of the Internet and issues related to network security and data protection, design, implementation, implementation and operation of internet applications and systems.

Specialization classes are conducted according to programs consulted with partners of the faculty and by practitioners – engineers employed in IT companies in our region. Graduates of this specialization are prepared to work in IT companies designing and implementing internet applications and systems, companies operating in the field of e-commerce and e-services, departments dealing with the promotion and marketing of companies on the Internet as well as institutions and offices implementing online customer service systems.

PROGRAMMING

The aim of education in this specialty is to prepare IT specialists in programming, ranging from basic issues such as compilation theory, syntax and semantics of programming languages, through programming at the operating system level, to the creation of extensive business applications in a network environment. Particularly strong emphasis is placed on the ability to solve problems within group projects. As part of the classes there are provided technical trainings in modern languages and programming environments, based on training programs of such companies as: Adobe, Apple, Cisco, Microsoft, WMware, Oracle; students can get international certificates; use modern laboratories and computer equipment; participate in commercial projects conducted by the University and its partners. The study program includes, among others: object-oriented programming, data storage and processing, technical training (selected programming language), advanced programming technologies. Specialization classes are conducted according to programs consulted with partners of the faculty and by practitioners – engineers employed in IT companies in our region.

Graduates of this specialization are prepared to take up work in IT companies at: creation and development of existing IT systems, creating software and documentation, monitoring the quality of IT products or creating and maintaining source code standards and documentation. Students also acquire knowledge and skills in programming as part of a separate education path implemented since the first semester of studies.

ADVANCED PROGRAMMING

The specialty is implemented within the "Knowledge Education Development" operational project. Thanks to additional funding, the programming specialty has been enriched with additional courses related to the certification of leaders on the programming technology market. As part of this program, students will receive extended knowledge and skills from three C # technologies, Java and Python, and learn about the use of these languages in areas such as the Internet of Things, creating web applications and mobile applications. In addition, the program includes additional courses in the field of databases. Students within the specialization will take selected certification exams related to the program being implemented.

ICT

The aim of education in this specialty is to prepare specialists in the field of ICT. The specialty is a response to the demand on the labor market for specialists involved in the design, implementation and maintenance of computer networks, telecommunications infrastructure including access networks and wireless networks solutions.

The specialty program is based on the well-known and respected Cisco Networking Academy CCNA Routing and Switching program, which ensures that skills and knowledge match current technology trends and demand. Thanks to this, graduates of this specialization can take the certification exam and obtain the CCNA R&S certificate. Classes in the specialization are conducted by experienced instructors in laboratories equipped with real network equipment. They carry out laboratory exercises reflecting the real working conditions of a computer network engineer. Graduates of this specialization are prepared to design and build telecommunications systems for end recipients (companies and other institutions). After this specialization, graduates find employment in companies and other entities maintaining ICT infrastructure.

IoT TECHNOLOGIES (INTERNET OF THINGS)

The aim of education in this specialty is to prepare specialists in the field of design and implementation of systems in the Internet of Things technology. The specialty is a response to the technological trends in IT and related disciplines, and to the growing demand for specialists in this field.

The specialty program covers, among others, the design and management of computer networks, which are the foundation of the Internet, IoT network and system security, sensor networks, solutions for intelligent buildings and cities (Smart City) as well as elements of analytics and Big Data.

Graduates of this specialization are prepared to design and build Internet of Things systems. In addition, their skills are related to the management and operation of modern networks including network infrastructure, they can develop in programming of intelligent systems, IoT data analytics and processing. After this specialization, graduates find employment in companies designing and implementing intelligent IT systems, maintaining computer networks or they run their own business activities.

At first cycle studies *– undergraduate, conducted in the English language:*

NETWORK TECHNOLOGIES

The aim of the specialty is to transfer skills related to the design, implementation and maintenance of network infrastructure in companies and other institutions. The specialty program is based on the well-known and respected Cisco Networking Academy CCNA Routing and Switching program, which ensures that skills and knowledge match current technology trends and demand. Thanks to this, graduates of this specialization can take the certification exam and obtain the CCNA R&S certificate. Classes in the specialization are conducted by experienced instructors in laboratories equipped with real network equipment. They carry out laboratory exercises reflecting the real working conditions of a computer network engineer.

ADVANCED NETWORK TECHNOLOGIES

This is a new specialty that will replace Network Technologies from 2020. The new specialty is based on the new CCNA R&S version 7 program, adapting the specialty program to changes in certification. The program is also supplemented with an additional course in operating systems and the Internet of Things technology. The specialty assumes that every graduate of the specialty will obtain the CCNA R&S certificate, and that is why within classes there are conducted additional workshops preparing for certification, and the exam itself is offered at the Pearson VUE examination center.

PROGRAMMING

The aim of education in this specialty is to prepare IT specialists in programming, ranging from basic issues such as compilation theory, syntax and semantics of programming languages, through programming at the operating system level, to the creation of complex business applications in a network environment. Particularly strong emphasis is placed on the ability to solve problems within group projects. As part of the classes there are provided technical trainings in modern languages and programming environments, based on training programs of such companies as: Adobe, Apple, Cisco, Microsoft, WMware, Oracle; students can get international certificates; use modern laboratories and computer equipment; participate in commercial projects conducted by the University and its partners.

The study program includes, among others: Programming languages, Requirements engineering, CASE tool methodology, Software development techniques. Specialization classes are conducted according to programs consulted with partners of the faculty and by practitioners – engineers employed in IT companies in our region.

Graduates of this specialization are prepared to take up work in IT companies at: creation and development of existing IT systems, creating software and documentation, monitoring the quality of IT products or creating and maintaining source code standards and documentation.

COMPUTER GRAPHICS

The specialty prepares IT specialists to carry out tasks related to the design and implementation of multimedia systems and focuses on transferring the skills of creating raster and vector graphics in advanced computer software. The specialty also includes courses in graphic design of computer animation as well as post production and special effects. Classes take place in specialized laboratories equipped with professional software for creating and processing 2 and 3D graphics as well as animation for film processing.

GAME PRODUCTION

This is a new specialty that replaces the existing one (computer graphics). The aim of this specialty is to educate a professional team of engineers, experts in the process of computer game production, possessing specialized knowledge and skills in the field of creating computer graphics in games, designing computer games, managing game production and applied programming technologies in game production. The specialty covers a wide range of issues constituting the production cycle of computer games as well as issues in the field of organization and management of the production process. During classes there is used professional software such as Adobe Photoshop, Illustrator, 3ds Max, Unreal Engine, CRYENGINE. Classes are conducted by both qualified university employees and specialists from well-known companies from the gaming industry. Graduates will be prepared to work primarily on the dynamically developing computer games market as: game designers, graphic designers, animators, programmers. You can also find work in many similar industries connected with creating virtual spaces and simulations for prototype and educational purposes.

At second-cycle studies *– master's studies, conducted in the Polish language:*

IT ANALYTICS IN BUSINESS

The aim of the specialty is to familiarize students with the essence of business analytics, its possible applications and the most important techniques and tools that can be used to solve problems occurring in modern companies and to make decisions based on large data sets.

As part of the specialty, skills are acquired in planning, implementing and applying the most popular program environments in key areas of business analytics – descriptive, prescriptive and predictive analytics. Modeling, analysis and re-engineering of business processes constitute a very important area included in the specialty program.

According to the latest research conducted by Computerworld, in Poland, 78% of leaders and 70% of companies that are the most important entities in the industry use the methods, techniques and tools of business analytics. Graduates of the IT analytics specialization in business will find employment in these companies. Companies from our region are looking for specialists in the field of IT analytics in business.

Thematic scope for the specialty includes, among others, the following issues:

- Preparation of data and conducting analyses based on methods and techniques of descriptive statistics;
- Tools enabling the analysis of data recorded at various levels of detail and data visualization techniques using various forms of presentation (charts, managerial desks, infographics, mind maps);
- Methods of forecasting and of carrying out What if? analysis.
- Techniques, methods and tools to optimize key process indicators from an organizational perspective;
- The process of creating analytical models for linear and nonlinear problems, activities related to the optimization of created models and the analysis of sensitivity and interpretation of the results obtained;
- Techniques for modeling decision-making situations and solving business problems using computer simulation;
- Analysis of large data sets using data mining techniques and methods (Data Mining);
- Modeling, analysis and optimization of company business processes.

The selected thematic scope of the specialization program allows preparation for effective and efficient use of business intelligence tools as support for typical activities carried out by the management staff at each of the organizational levels – operational, tactical and strategic – both from the perspective of creating information and knowledge based on data , planning and implementation of IT infrastructure for business analytics, as well as optimal organization of tasks within business processes and planning of corrective actions using the latest solutions in the field of information and communication technologies.

As University, we have extensive experience in the field of IT systems employed in management and related fields used in business analytics, and we have practitioners who conduct classes in this field. We have a rich infrastructure thanks to which it is possible to carry out complex exercises in practice. Students can develop their interests in laboratories within scientific clubs and additional classes preparing for certificates. Pearson VUE and Prometric examination centers are located in our University, thanks to which you can obtain a chosen international certificate on the spot.

Thanks to the cooperation with the international BorgWarner group, the program of our studies reflects the skills required from candidates to work in companies. There is an opportunity to implement internships and gain experience in the profession. People who graduate from this specialty have a chance to be employed in many companies.

SECURITY AND COMPUTER NETWORKS – CISCO

The specialty allows you to acquire practical skills in the area of design and implementation of the latest network technologies, as well as the implementation of security policies for computer systems and networks. Knowledge and skills in computer networks and its security are sought after in the labor market. The specialty based on Cisco training programs guarantees their high quality and technological up-to-dateness.

After completing this specialization, students are prepared to solve problems in complex computer networks with applied information security systems. This goal is achieved thanks to the implementation of classes based on Cisco Academy's proven teaching programs such as CCNA, CCNA Security and CCNP as well as experienced teaching staff.

The study program covers issues related to, among others, security of electronic operations; scalable computer networks; monitoring the flow of electronic information; data centers.

As part of the specialization, students develop their knowledge and skills by participating in classes in specialized laboratories, implementing a study program enriched with training programs within the Cisco Networking Academy:

- Computer and ICT networks design laboratory;
- Physics, optoelectronics and telecommunications surveying laboratory;
- CISCO network technology laboratory;
- MICROSOFT, NOVELL, ORACLE, VMWARE, CITRIX computer laboratory;
- CISCO SYSTEMS computer laboratory (CCNA);
- CISCO SYSTEMS computer laboratory (CCNP);
- CISCO SYSTEMS computer laboratory, enabling education at the Cybersecurity, Wireless, VoIP levels.

Graduates of this specialization are prepared to work in companies and institutions in which the network and services infrastructure is maintained. They are prepared to solve problems related to the operation and management of network systems as well as network and information security.

GRAPHICS IN DIGITAL ENTERTAINMENT

The digital entertainment industry is one of the most dynamically developing and most profitable branches of industry related to the use of computer technology. It covers both the production of computer games and the film industry. On the global market, products of this type sell in millions of copies, which translates into high revenues of the companies creating them. That is why highly qualified computer graphic designers specializing in modeling of stage elements, character creation, animation, lighting, video editing and interface design are very much valued and sought after. The specialty offers the acquisition of both theoretical and practical foundations related to the design and direction of games and animated films. A large part of the studies will involve the creation of projects, including team projects, implemented using specialized equipment available only in professional film studios.

SOFTWARE PRODUCTION ENGINEERING

The specialty will prepare qualified specialists for work in programming companies, which are one of the most important and absorbent labor markets for IT graduates. Studies at our university provide an opportunity to learn both theoretical foundations related to a given subject, as well as to gain, highly valued by employers, practical skills which are acquired during the implementation of a number of projects.

Within the specialty, practical classes are carried out in the field of: software development workshop; design patterns and application architecture; programming project management methodologies, conducted by both qualified scientific and teaching staff, as well as practitioners with extensive experience working in reputable programming companies.

In the teaching process there are used computer laboratories that enable work on modern equipment and access to the latest software. Access to authorized training materials is offered on the basis of which students can prepare for taking certification exams.

Graduates of this specialization are prepared to work in programming teams creating software with a wide range of applications. At the same time, they are able to use the latest solutions currently available on the market, related to both the software development itself as well as the design process and product creation management.

CYBERSECURITY

– a separate educational path implemented since the first semester of full-time second-cycle studies in the field of Information Technology

Cybersecurity, a separate education path, is a response to the security challenges in cyberspace, in which almost every business entity operates. Companies, state institutions, local government units, the army, health care and others need more and more advanced protection in cyberspace.

It prepares specialists who will manage security, design and implement security techniques as well as monitor and analyze IT systems from a security point of view.

The demand for specialists in this field is growing due to the increase in threats, but also due to the tightening national and European legal regulations and requirements imposed on economic entities.

As part of the specialty, a group of subjects is implemented through which students explore knowledge and skills related to information security management, sociological and legal aspects, and technical security measures. Students will be familiarized with such issues as: authentication, authorization and digital signature; sociological and legal aspects of security; program and technical security measures; resource virtualization and distributed computing; security audit and monitoring of information systems. Students learn about security policies, their design and implementation. As part of the courses implemented in the specialty there will be continued Cisco CCNA Security and CCNA Cybersecurity Operations courses will be conducted.

Graduates of this specialization are prepared to work in companies, local government units, state institutions, health care units as an information security administrator, security systems engineer, security analyst and others.

At second-cycle studies *– master's studies, conducted in the English language:*

COMPUTER NETWORKS

As part of this specialty, knowledge and skills in the field of design, implementation and maintenance of computer networks are deepened. The program prepares graduates for tasks that require solving practical problems such as optimization, modeling, security issues, solving network infrastructure problems (failures), creating and working with documentation. The use of new solutions, scaling, etc. As part of the specialty, students develop their knowledge and skills by participating in classes in specialized laboratories, implementing a study program enriched with training programs within the Cisco Networking Academy:

- Computer and ICT networks design laboratory;
- Physics, optoelectronics and telecommunications surveying laboratory;
- MICROSOFT, NOVELL, ORACLE, VMWARE, CITRIX computer laboratory;
- CISCO SYSTEMS computer laboratory (CCNA);
- CISCO SYSTEMS computer laboratory (CCNP);
- CISCO SYSTEMS computer laboratory, enabling education at the Cybersecurity, Wireless, VoIP levels.

Graduates of this specialty are prepared to work in companies and institutions in which the network and services infrastructure is maintained. They are prepared to solve problems related to the operation and management of network systems as well as network and information security.

SOFTWARE DEVELOPMENT TECHNOLOGIES

The specialty will prepare qualified specialists for work in programming companies, which are one of the most important and absorbent labor markets for IT graduates. Studies at our university provide an opportunity to learn both theoretical foundations related to a given subject, as well as gain practical skills highly valued by employers which are acquired during the implementation of a number of projects.

Within the specialty, practical classes are carried out in the field of: low-level programming, digital circuit programming and high-level programming technologies, conducted by both qualified scientific and teaching staff as well as practitioners with extensive experience working in reputable programming companies.

In the teaching process there are used computer laboratories that enable work on modern equipment and access to the latest software. Access to authorized training materials is offered on the basis of which students can prepare for taking certification exams.

Graduates of this specialization are prepared to work in programming teams creating software with a wide range of applications. At the same time, they are able to use the latest solutions currently available on the market, related to both the software development itself as well as the design process and product creation management.

SCIENTIFIC RESEARCH

SCIENTIFIC AND RESEARCH PROJECTS FINANCED FROM EXTERNAL SOURCES

A team of scientists from the University of Information Technology and Management in Rzeszów developed new solutions in the field of computer intelligence – deep learning. These achievements were noticed by the Minister of Science and Higher Education and were included in the publication "Osiągnięcia polskiej nauki 2016" (Achievements of Polish Science 2016).

>> Wersja PDF

"AISOK" Automatic Intelligent Customer Service System using speech recognition, voice biometrics and "Big-Data" data analysis

Project manager on the side of UITM: **dr inż. Leszek Gajecki**

The aim of the project is to develop and prepare for the implementation of the prototype of the Automatic Intelligent Customer Service System (AISOK) for PGNiG notification hotlines, using innovative speech recognition, voice biometrics and artificial intelligence mechanisms.

The project is implemented by a consortium of three entities:

- Institute of Bioorganic Chemistry of the Polish Academy of Sciences Poznań Supercomputing and Networking Center (PSNC) affiliated to the IPC PAS
- University of Information Technology and Management in Rzeszów
- Emerline Sp. z o.o. – Warsaw

Period of implementation: **01.09.2019–30.08.2022**
Financing: **National Center for Research and Development (NCBIR) PO Intelligent Development**

"Digital solutions for automatic skin cancer diagnosis"

Project manager on the Polish side: **prof. J. W. Grzymała-Busse**,
on the German side: **prof. Jens Haueisen**

The aim of the project is to develop methods and algorithms for image processing that will support the diagnosis of malignant melanoma performed by dermatologists and general practitioners, providing objective and reliable results.

It will be implemented in cooperation with Technische Universität Ilmenau and the company JensLab.

Period of implementation: **05.2019–04.2022**
Financing: **: National Center for Research and Development (NCBiR)**

"Developing of effective mechanisms for robot perception using motivated learning and self-organizing associative memory"

Project manager: **prof. dr hab. Janusz Starzyk**

The main aim of the research proposed in the project is to develop new effective perception mechanisms using the generalized idea of Motivated Learning (ML) and new associative learning and reasoning mechanisms. The research results achieved under this project will allow building modern cognitive systems which, based on specific needs, are conditionally and intelligently capable of defining associations and forming the knowledge needed to achieve the set goals.

Period of implementation: **15.03.2017–14.03.2020**
Financing: **National Science Center OPUS program**

"IVA service platform of virtual voice agents for emergency call hotlines automation"

Project manager on the side of UITM: **dr inż. Leszek Gajecki**

The research team from UITM participated together with the Poznań Supercomputing and Networking Center in the Haxon Telecom research and development project.

Its main aim on the side of the UITM team was to improve the quality of speech recognition by the latest computational techniques.

Period of implementation: **2017–2018**
Financing: **National Center for Research and Development (NCBiR)**

"A new approach to effective training of complex intelligent systems"

Project manager: **prof. dr hab. B. Wilamowski**

Successful completion of the project can solve many scientific and practical problems by replacing the traditional design approach with a new learning approach. This alternative method can have a broader meaning by finding solutions to many problems that until now were impossible to solve with traditional methods.

Period of implementation: **20.01.2016–25.06.2019**
Financing: **National Science Center OPUS program**

Intelligent non-linear systems with shallow and deep architectures

Manager: **prof. dr hab. inż. Bogdan Wilamowski**

Recent research shows that the most popular architectures such as SLP (Single-Layer Perception) (MLP with one hidden layer) have very limited capabilities. For example, with a network of 10 SLP neurons, you can solve a Parity-9 problem while a FCC (Fully Connected Cascade) network with the same number of neurons allows you to solve Parity-1023 problems. Unfortunately, popular learning algorithms (including the LM algorithm) are not capable of teaching this type of compact and powerful architectures. The problems associated with the use of traditional neural networks pushed scientists to look for other directions, such as fuzzy systems, SVM (Support Vector Machine) or ELM (Extreme Learning Machines). Meanwhile, it turns out that these complex problems can be solved using new compact architectures. Therefore, research in the project focused on networks with new compact architectures and new learning algorithms.

Period of implementation: **16.07.2014–15.01.2017**
Financing: **National Science Center OPUS program**

Physarum Chip: Growing Computers from Slime Mould

The project coordinator was: **University of the West of England, Bristol (UK)**

Research project implemented under the 7th Framework Program. The aim of the research was to develop an object-oriented programming language for calculations carried out using Physarum Polycephalum.

Physarum polycephalum is a single-celled primary organism belonging to the order of Physarales, subclass Myxogastromycetidae, class Myxomycetes, cluster Myxostelida. The properties of this organism can be used, among others, in the construction of a biological computer. Particular attention was paid to selected approaches to model the behavior of Physarum Polycephalum in the programming language.

Termin realizacji: **03.2013–02.2016**

Organization of semantic and episodic memory in motivated learning of robots

Project manager: **prof. nadzw. dr hab. Janusz Starzyk**

The main aim of the project was to design mechanisms of creating and organizing semantic and episodic memory in motivated learning (ML) beyond the current state of knowledge. Based on such mechanisms, you can build the memories of autonomous systems operating in a changing complex environment.

Period of implementation: **30.08.2012–29.08.2015**
Financing: **National Science Center OPUS program**

Intelligent methods of analyzing opportunities and threats in the education process

Manager: **dr Marek Jaszuk**

As part of the project, there were developed algorithms for creating semantic models based on empirical data from the education process. The work led to the creation of a methodology for automatically creating a student model that could be the basis for an analytical system reinforcing the management of the teaching process. The developed methodology is based on data mining and machine learning algorithms. The uniqueness of the created solution is based on the full automation of creating a semantic model. The method is universal and can be used in many areas not related to the education process.

Period of implementation: **1.06.2013–30.04.2015**
Financing: **Regional Operational Program of the Podkarpackie Province for the years 2007–2013**

Neural and immunological support for analysis and synthesis of models of technical objects based on structures using rare graphs in the conditions of incomplete information

Manager: **dr inż. Mirosław Hajder**

Description: The initiative, which is the subject of this project, aimed to conduct research on the evaluation of the effectiveness of analysis of catastrophic natural phenomena supported by neural networks and immune systems using incomplete knowledge about the course of phenomena. The main aim of the research was to develop disaster theory, in particular with regard to the stability of complex systems, to evaluate the effectiveness of specified analysis methods, and to develop hybrid research methods.

Period of implementation: **01.06.2014–31.03.2015**
Financing: **Regional Operational Program of the Podkarpackie Province for the years 2007–2013**

New methods of analyzing and optimizing the architecture of complex telecommunications networks of the next generation

Manager: **dr inż. Paweł Różycki**

Current knowledge about the impact of the architecture of complex backbone networks of the next generation on their functioning is incomplete and insufficient, especially in a multi-domain, multi-layer environment. Hence there is a need to develop methods for analyzing this type of network and to indicate ways to optimize its architecture. The problem is difficult because considerations of networks are still at the conceptual stage and the only possibility to verify the proposed methods are computer simulations.

The aim of the project was to develop new multi-criteria algorithms to optimize the architecture of complex systems and to propose methods of analysis.

Period of implementation: **01.06.2014–31.03.2015**
Financing: **Regional Operational Program of the Podkarpackie Province for the years 2007–2013**

REDEEMING 'INNOVATION VOUCHERS'

Employees of the Faculty of Applied IT provide research services on behalf of entities outside the higher education and science system. In 2019 they implement:

Landeo Sp. z o.o.

Research service consisting in the development of a new product in the form of an innovative hardware and software solution of a remotely managed intelligent machine – an entrance gate that eliminates the problems of residents of guarded / closed estates.

Motum Marcin Leszczyński

Research service consisting in the development of a design project and design of a new innovative construction of an automated machine for cutting in many planes.

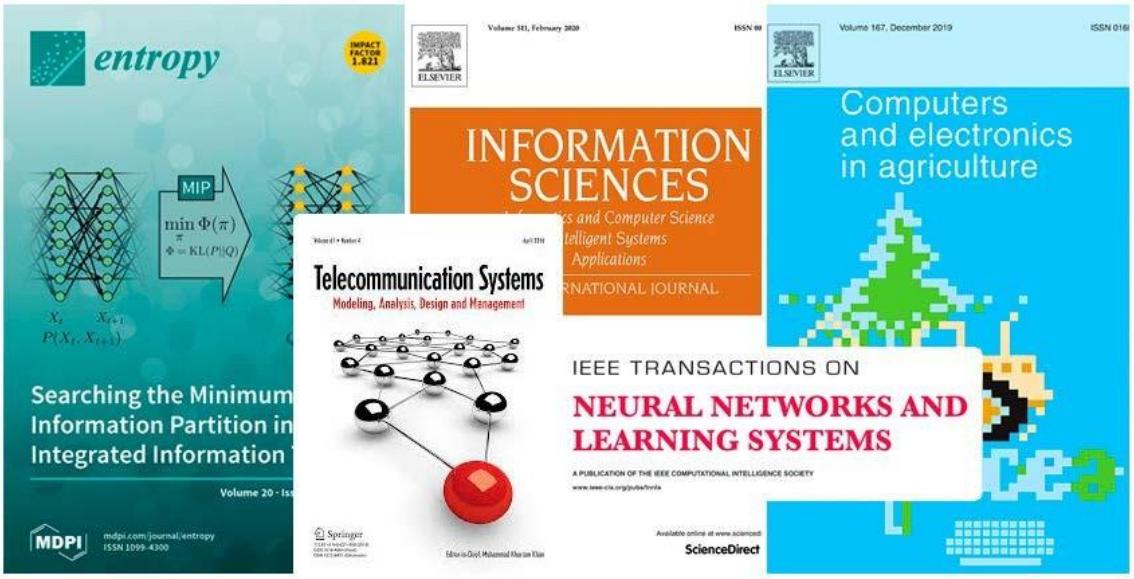
INA Sp. z o.o.

Research service consisting in the development of an innovative technology for the production of the mixer spiral using an automated section of the spiral segments of the mixing and unloading system of the truck concrete mixer.

ITS Technology Solveo Sp z o.o. Sp. k.

Research service consisting in the development of a prototype based on evolutionary algorithms of a driver work plan generator in public transport management systems.

PUBLICATIONS



The results of the research are published by employees of the Faculty of Applied IT in journals indexed in international databases.

List of selected publications of employees of Faculty of Applied IT in 2017–2019:

Gu, Hejun; Cao, Yuxia; Elahi, Ehsan; Jha, Sunil Kumar. Human health damages related to air pollution in China. ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, 2019, 26.13: 13115-13125. ISSN 0944-1344

Krutys, Paweł; Gomółka, Zbigniew; Twaróg, Bogusław; Żesławska, Ewa. Synchronization of the vector state estimation methods with unmeasurable coordinates for intelligent water quality monitoring systems in the river. JOURNAL OF HYDROLOGY, 2019, 572: 352-363. ISSN 0022-1694

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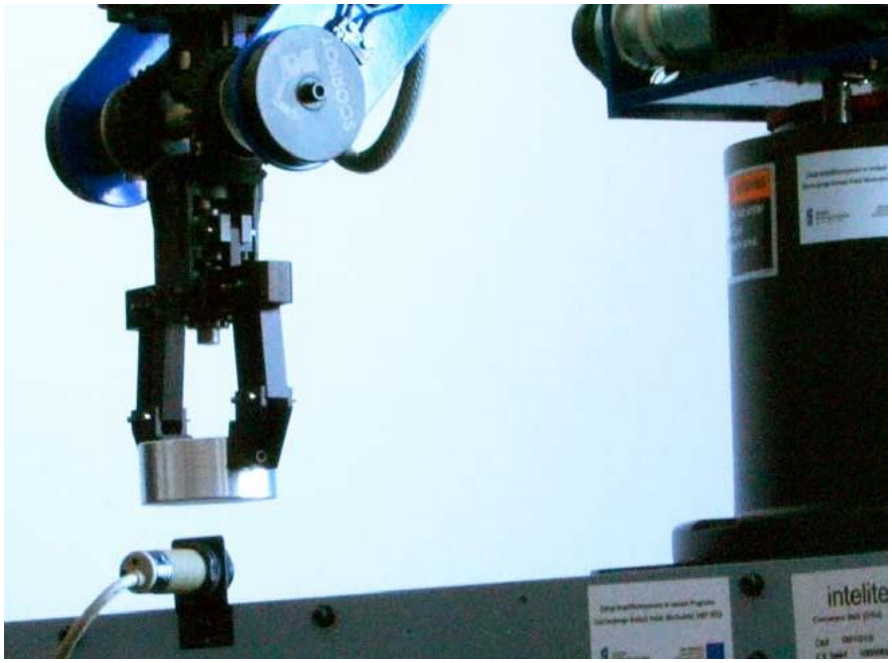
RESEARCH AND TEACHING LABORATORIES



ARTIFICIAL INTELLIGENCE LABORATORY

The laboratory conducts research on AI algorithms in the field of knowledge engineering and services in the field of data mining.

In particular, research is being carried out on sets whose elements are described by means of incomplete descriptors. Lack of complete information about real world objects is a typical situation. An object may have an incomplete description for a variety of reasons. For example, some features of the object may have been registered at the time of observation, but were later erased or missing. They may also not have been registered due to the immateriality or immateriality of the concept to which the object belongs. In addition, it happens very often that an object belongs to more than one concept. Another type of uncertainty arises – what is this object actually? An example is the situation in which two doctors – based on identical symptoms – make different diagnoses. The laboratory enables building expert systems working in this type of uncertain environments. The tools for their induction are developed and the essence of uncertainty is explored.

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Building of the International Education Center

AUTOMATION AND ROBOTICS LABORATORY

The teaching Laboratory of automation and robotics was established as a response to the market demand for specialists in robot programming and automation of technological processes.

This laboratory hosts, among others: classes in Programmable digital circuits. Information Technology students will obtain competences in the field of tools and methods for designing digital systems, implementation of digital systems in programmable logical structures, and the ability to use computer-aided design tools to create digital systems. During classes in the subject of Application of IT in automation and robotics, the student becomes acquainted with the principles of operation of selected automation devices as well as selected robot constructions and relationships connecting the control layer (IT) with equipment (technical aspects). Information Technology students pursuing this subject will acquire the necessary skills in robot programming and programmable logic controllers.

For more information visit our website.

LABORATORY OF ADVANCED NETWORK TECHNOLOGIES AND WIRELESS TECHNOLOGIES

The laboratory of advanced network technologies and wireless technologies serves the transfer of knowledge both on the basics of building modern computer networks as well as advanced techniques for securing traflc between these networks or ensuring the quality of transmission.

The laboratory was created for specialists in the field of design, implementation and configuration of LAN and WAN computer networks. The main goal of the laboratory was to spread knowledge and skills among students in the field of configuration, maintenance and security of computer networks.

The laboratory is prepared to conduct trainings as part of the Cisco Network Academy, and in particular: trainings at the level of CCNA (Cisco Certified Network Associate), CCNP (Cisco Certified Network Professional), as well as in the field of network security (preparation for CCSP certification), telephony IP (preparation for CCVP certification) and wireless technologies (preparation for CWNE certification), based on NETLab technology. This laboratory provides technical facilities for the implementation of master's theses in the field of computer networks. Appropriate technical equipment of the laboratory enables the creation of new subjects and types of training, and in the case of already conducted classes and diploma theses, it will ensure the possibility of their implementation at the highest level.

The laboratory makes possible the implementation of research in:

- computer networks design;
- network traffic analysis and modeling;
- self-similarity research;
- optimization of network protocols;
- research on the security of wired and wireless networks.

Through classes in the laboratory and access to professional equipment, students can prepare for obtaining professional certificates:

- Cisco Certified Networking Associate (CCNA);
- Cisco Certified Network Professional (CCNP);
- Cisco Firewall Specialist;
- Cisco Wireless LAN Support Specialist;
- CompTIA Linux+;
- CompTIA A+;
- CompTIA Network+;
- CompTIA Security+;
- CompTIA Server+.

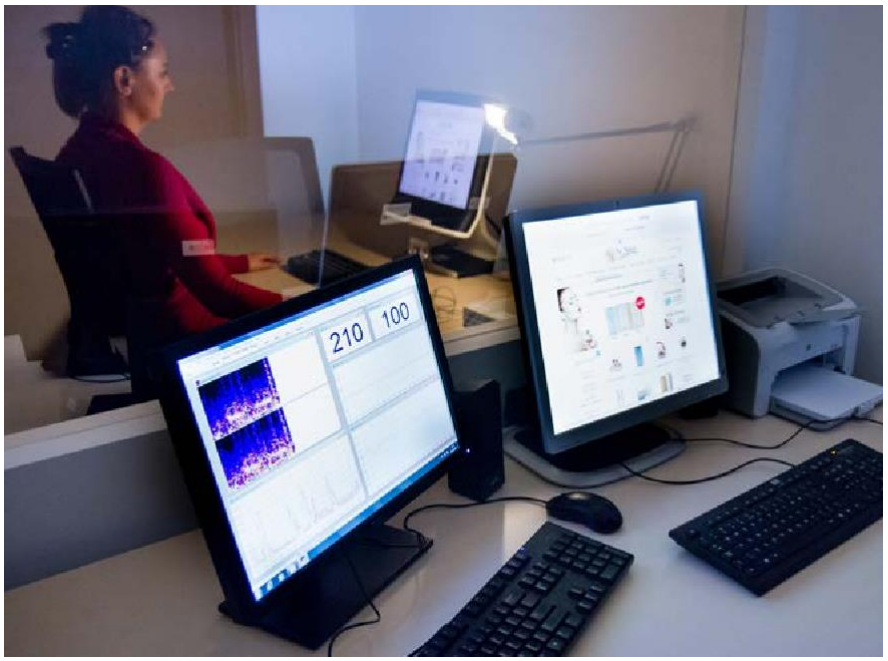
For more information visit our website.

NEUROCOGNITIVE LABORATORY

The main tasks carried out under LEN include:

- conducting research in the field of broadly understood neurocognitive ergonomics;
- familiarizing students with issues related to the possibility of applying the achievements of psychology, cognitive science and neuroscience during the design process with particular emphasis on research into the usability of computer applications;
- implementation of projects aimed at adapting (optimizing) the human environment to his cognitive abilities.

Classes at the Laboratory of Neurocognitive Ergonomics allow students to familiarize themselves with issues related to the practical application of the achievements of psychology, cognitive science and neuroscience in the design of interactive computer systems and internet applications, as well as various visual / graphic stimuli.



What opportunities does LNE gives to scientists?

Research carried out from the Laboratory of Neurocognitive Ergonomics covers an interdisciplinary area bringing together the interests of ergonomics, medical informatics (acquisition and exploration of biosignals), psychology, cognitive science and neururoscience.

Research carried out in the laboratory includes the following issues:

- **perception of works of art:**
  research in the field of neuroesthetics,
  research on the possibility of using art (painting) as a visual stimulus in the diagnosis and therapy of neuropsychological disorders (including emotional disorders, phobias, etc.);
- **perception of text and graphic elements:**
  diagnosing disorders appearing in the reading process,
  optimizing hypertext structures,
  optimization of content of school textbooks;
- **acquisition and exploration of biosignals:**
  research on the possibilities of data mining via eyetracking, research on methods of searching for patterns in data obtained by electroencephalography and neuroimaging;
- effectiveness of analytical methods used in the process of analyzing the complexity of navigation structures and screen computer applications;
- neuromarketing.

For more information visit our website.

IT SERVICES CENTER

The IT Services Center has a comprehensive offer in the field of broadly understood computerization. Based on many years of experience and knowledge of solutions from world leaders in the IT industry, it carries out works in the field of design, implementation and maintenance of computer networks as well as research work aimed at creating innovative products.

In the years 2008–2019, several hundred various implementation and research IT projects were implemented as part of CUI, including, ones on behalf of the Employment Offices, Aeronaval de Construcciones e Instalaciones S.A., Haxon Telecom sp.z o.o..

The IT Services Center is certified by Microsoft – MCSA (Microsoft Certified Systems Administrator), MCSE (Microsoft Certified Systems Engineer), MCDBA (Microsoft Cerified Database Administrator), MCSD (Microsoft Cerified Solution Developer) and Cisco – CCNA (Cisco Certified Network Associate), CCNP (Cisco Certified Network Professional), HPE and Novell.

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