Institute of Control and Computation Engineering

2022 Annual Report

From the Director

The Institute of Control and Computation Engineering (ICCE; in Polish: Instytut Automatyki i Informatyki Stosowanej) was founded in 1955 as the Chair of Automatic Control and Telemechanics by Professor Władysław Findeisen. It was reorganized in 1970 to become the Institute of Automatic Control. Rapid development of microprocessor technology and its impact on the field of control in subsequent years directed the interest of the research staff and students towards computational and algorithmic aspects of control, decision support, man-machine interfaces, network communications etc. This resulted in 1994 in the creation of new educational profiles offered by the Institute and a change of its name to the present one.

The Institute offers courses in Automatic Control and Robotics as well as in Computer Science, both at three levels of education (undergraduate, postgraduate, Ph.D.). We are proud to offer interesting opportunities to our postgraduates, so that they can continue their study and research towards a Ph.D. It is important that our postgraduate and Ph.D. courses are open for candidates with different educational background. Our courses attract more and more candidates who graduated from various universities and with degrees in different fields, not only in Automatic Control and Robotics or in Computer Science. During the last few years we have made an effort to organize and equip new laboratories located in a new part of our building. Currently, all our students benefit from new laboratories, without which it would be impossible to offer a few new courses. This standard educational offer has been supplemented by three postgraduate studies: Management of Information Technology Resources and Project Management organized by dr hab. Andrzej Zalewski as well as Designing Information Systems with Databases organized by prof. Tomasz Traczyk.

Prof. Maciej Ławryńczuk was awarded the title of professor of engineering and technical sciences in the scientific discipline Automation, Electronics and Electrical Engineering. Dr. Mariusz Kaleta and Dr. Mariusz Kamola received D.Sc. degrees (habilitation) in the scientific discipline Information and Communication Technology. Mr. Mohammadreza Azimi received his Ph.D. degree for the thesis entitled *Investigation into the Reliability of Contactless Biometric Systems* (supervised by prof. Andrzej Pacut). Mrs. Ewelina Bartuzi-Trokielewicz received her Ph.D. degree for the thesis entitled *Presentation attack-resistant palm recognition for mobile devices in unconstrained conditions* (supervised by prof. Andrzej Pacut). Mr. Maksym Figat received Ph.D. received his Ph.D. degree for the thesis entitled *Automatic generation of robotic system controllers based on a specification* (supervised by prof. Cezary Zieliński). The first two Ph.D. degrees were obtained in the scientific discipline Information and Communication Technology and the last one in Automation, Electronics and Electrical Engineering.

In 2022, we witnessed some changes in the employment status of our staff. Prof. Maciej Ławryńczuk was employed as a professor, prof. Wojciech Szynkiewicz as an associate professor, Dr. Wojciech Dudek as an assistant professor.

This year the Institute obtained six grants. Three of them are headed by prof. Paweł Domański and financed by Valmet Automation: *Commissioning of a production simulator of a biomass-fired fluidized bed boiler unit for a thermal power plant in Wilno*, *Assessment of the quality of operation of boiler control systems K2 and K7 at Veolia Energia Łódź S.A. plant EC4* and *Implementation of a predictive-diagnostic system for steam balance and distribution in steam network manifolds at JB Energetyka Grupa Azoty Zakłady Azotowe Kędzierzyn (GA ZAK S.A.)*. The following two projects are financed by the Scientific Council of the discipline Automation, Electronics and Electrical Engineering at Warsaw University of Technology. The grant *Computationally efficient predictive control algorithms based on new neural model*

structures is headed by prof. Maciej Ławryńczuk. The grant *Fast predictive control algorithms with alternative maximum cost function: analytical and neural approaches* is headed by Mr. Robert Nebeluk. Finally, the grant *Safe management of intermittent robotic tasks in a changing environment* is headed by Dr. Wojciech Dudek; it is financed by The Excellence Initiative Research University (IDUB) at Warsaw University of Technology.

Dr. Andrzej Stachurski was awarded the Medal of the National Education Commission. Prof. Paweł Domański received the Rector's Award of the 1st Class for his individual scientific achievements while the group led by prof. Maciej Ławryńczuk received the Rector's Award of the 1st Class for their scientific achievements. Dr. Piotr Pałka and Dr. Mariusz Kaleta received the Rector's Awards of the 2st Class for their organizational achievements. It is my pleasure to congratulate all the above for their achievements.

Cezary Zieliński

Spis treści

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1 General Information

The following information about organization of the Institute reflects the situation on December 31, 2022.

1.1 Directors

Professor Cezary Zieliński
Professor Maciej Ławryńczuk, Deputy Director for Research
Professor Tomasz Traczyk, Deputy Director for Academic Affairs

1.2 Organization of the Institute

Complex Systems Group

Leader of the Group:	prof. dr hab. E. Niewiadomska-Szynkiewicz
Group members:	dr P. Arabas, dr hab. M. Kamola, dr hab. A. Karbowski, dr hab. M. Karpowicz, dr A. Kozakiewicz, dr T.J. Kruk
Ph.D. Student:	mgr A. Nwachukwu, mgr B. Laskowska

The main area of interest are problems of modeling, design, control, optimization and simulation of various types of complex real systems, including networks, ad hoc networks, social networks, economic systems and the environment. Research in the field of optimization and control are focused on developing the theory and methodology in applying model predictive control, hierarchical control structures in nonlinear systems with uncertainty, developing methods for solving continuous and discrete time optimization problems (including evolutionary optimization methods and using the arithmetic of intervals), game theory and design theory of complex systems of rules (so-called theory of mechanisms). Research in the field of computer simulation and parallel processing of information concerning such departments as: distributed operating systems, programming of parallel machines in computer networks, clusters, grids and GPUs, the creation of systems for computer-aided design and management. Particular attention is devoted to issues of modeling, management and security in computer networks, including sensor networks and mobile ad hoc networks.

Biometrics and Machine Learning Group (until Oct. 2022)

Leader of the Group:	prof. dr hab. A. Pacut (until Oct. 2022)
Group member:	dr M. Trokielewicz, mgr M. Hałoń

Ph.D. Student: dr E. Bartuzi-Trokielewicz, mgr K. Gabor-Siatkowska, mgr M. Hałoń

Research of the group is centered on biologically inspired information processing and control, including biometrics, machine learning, uncertainty modeling, and biological modeling. Biometrics consists in using personal characteristics for identity recognition. Our research is focused mainly on safety of biometrics software, systems, and applications. In particular, safety issues are investigated for iris, fingerprints, and finger veins. Safety of biometric data storage and exchange and data encryption using biometrics are investigated. Original recognition methodology is developed for iris hand-written signature, 3D face and EEG. Machine learning research is focused on reinforcement learning, applied to adaptive control and multi-agent systems including very large systems and adaptive network routing. Also, learning in neural networks and modeling granularity is investigated.

Robot Programming Group

Leader of the Group: prof. dr hab. C. Zieliński

Group members: dr W. Dudek, dr M. Figat, mgr D. Seredyński, dr hab. W. Szynkiewicz, dr T. Winiarski

Ph.D. Students: mgr J. Karwowski, mgr M. Węgierek, mgr D. Giełdowski

Research of the group is concerned with robot control system design and in particular robot programming methods. The group focuses on robot system architectures, their specification and implementation. Service robots are at the centre of interest. The research encompasses manipulation and grasping, especially two handed manipulation, utilizing force and impedance control. It also deals with mobile robot localization and navigation. Special emphasis is placed on sensor-based motion planning and control of single and multiple robots.

Machine Perception Group

Leader of the Group: prof. dr hab. W. Kasprzak

Group members: dr A. Wilkowski, mgr M. Stefańczyk

Ph.D. Students: mgr P. Piwowarski, mgr P. Szelągowski

The research interests are in pattern recognition and machine learning techniques and their applications to image and speech analysis. Lately, the focus in image analysis is on bridging the semantic gap between object recognition in images/video and ontology-based image and scene representation. For this purpose RGB-D images and 3-D point clouds are intensively being processed. Machine learning techniques are applied for object detection and recognition in images and video, as well as for speech- and speaker recognition. Besides robot perception systems, the eyed application fields are multi-modal human-machine interfaces, automatic surveilance data analysis and biometrics – suitable gesture recognition- and speech/speaker recognition methods are developed and implemented.

Control Engineering Group

Leader of the Group: prof. dr hab. M. Ławryńczuk

Group members: dr P. Chaber, dr hab. P. Domański, mgr J. Gustowski, mgr R. Nebeluk, dr hab. P. Marusak, dr S. Plamowski, prof. dr hab. P. Tatjewski, dr A. Wojtulewicz, mgr K. Zarzycki

Ph.D. Students: mgr M. Okulski, mgr M. Falkowski, mgr D. Rocki

Research of the group concentrates on advanced control engineering techniques and their applications in control of industrial process and in embedded systems. The focus is on

model predictive control algorithms, multilayer optimizing and supervisory control, fault detection and fault-tolerant control. Among others, soft computing methods are used in the considered algorithms (neural networks, fuzzy systems and genetic algorithms). The Advanced Control Systems Laboratory offers the possibility to verify developed theoretical solutions. The laboratory is equipped with a set of test processes. For control of industrial process, a Distributed Control System (DCS) cooperating with a Supervisory Control and Data Acquisition (SCADA) software platform and Programmable Logic Controllers (PLC) are used. For control of embedded systems, microcontrollers equipped with numerous sensors and actuators are used.

Software Engineering Group

Leader of the Group:	dr hab. A. Zalewski
Group members:	mgr K. Borowa, dr S. Kijas, mgr W. Macewicz, dr M. Szlenk, dr A. Ratkowski
Ph.D. Student:	mgr G. Mąkosa

The main area of interest is the development and maintenance of software. Topics include software processes, software analysis and design methods, and the methods for software quality evaluation. New approaches to the assessment of high-level system architecture in the earliest phases of software development are investigated. Methods for architectural decision modeling during the evolution of service-oriented (SOA) systems are developed. Part of the research is aimed at security and trust management issues in distributed open applications.

Operations Research and Management Systems Group

Leader of the Group:	dr hab. K. Pieńkosz
Group members:	dr hab. M. Kaleta, mgr A. Manujło (until Oct. 2022), dr P. Pałka, dr T. Traczyk, dr I. Żółtowska
Ph.D. Students:	mgr M. Drabecki, mgr R. Karpuk

Research of the group is concerned with operation research and structural discrete optimization methods for control and management of discrete processes, including applications in the network structure development, deregulated electric power industry, IP networks, computer integrated manufacturing, etc. The research is focused on market and auctions design, scheduling techniques, efficient structural-based optimization algorithms, time-table generation, strategic and tactical planning, detailed scheduling, and real-time operational control. Also, the object oriented and relational database management systems and CASE methods are investigated to design of the distributed multi-functional heterogeneous information systems.

Optimization and Decision Support Group

Leader of the Group:	dr hab. A. Stachurski
Group members.:	dr J. Granat, dr B. Kozłowski, dr A. Krzemienowski, mgr J. Sobczyk, dr T. Śliwiński
Ph.D. Students:	mgr K. Matela

Research of the group is focused on the theory of distributed and parallel computational methods, and software for optimization. The theory covers a whole area of linear and nonlinear, dynamic, stochastic and multiple criteria problems, and deals with such topics as the sensitivity aspects and the parametric aspects. Another area covers the decision theory,

including the multi-person decisions and the game theory, and deals with software building for decision support and organization and management of computer networks.

1.3   Statistical Data

FACULTY and STAFF	2020 persons	2021 persons	2022 persons
Academic Staff	44(+2)	44(+1)	43(+1)
by titles/degrees			
Professors	5	5	5
D.Sc.-s	9	9	10
Ph.D.-s	20(+2)	21(+1)	20(+1)
M.Sc.-s	10	9	8
Others	0	0	0
by positions			
Professors	7	8	8
Readers	1	0	0
Assistant Professors	21(+2)	22(+1)	26(+1)
Senior Lecturers	5	5	0
Assistants	10	9	9
Ph.D. Students	24	17	11
Technical Staff	1	1	1
Administrative Staff	8	8	7

$+$ – corrections due to persons on long-term leave of absence

ACTIVITIES	2020	2021	2022
Teaching activities			
standard teaching potential, hours	10 755,8	10 220,6	10 149,4
# hours taught	14 449,30	16 328,00	10 345,40
Degrees awarded			
Professor	0	0	1
D.Sc	2	0	2
Ph.D.	2	2	3
M.Sc.	64	69	62
B.Sc.	68	74	51
Research projects			
granted by WUT	6	7	6
granted by State institutions	4	3	3
granted by international institutions	3	2	1
other	5	4	3
Sci.-Tech. publications			
monographs (authored or edited)	3	1	8
chapters in books and proceedings	57	14	25
papers in journals	43	38	34
Reports, abstracts and other papers	0	3	
Conferences			
participation (# of conferences)	7	12	11
participation (# of part. from ICCE)	28	14	23

RESOURCES	2020	2021	2022
Space (sq.m.)			
laboratories	644	644	644
library + seminar room	182	182	182
faculty offices	821	821	821
Computers			
personal computers	235	236	246
Library resources			
books	3 194	2 743	2 752
booklets	3 176	3 176	3 289
journals subscribed	9	9	9

2 Faculty and Staff

Presentation of our faculty starts with Professors Emeriti and continues with Senior Faculty, Supporting Faculty, Ph.D. Students, and Administrative Staff. Senior Faculty includes Professors, Readers, Assistant Professors, and Senior Lecturers. By Supporting Faculty we understand Lecturers, Assistants, Research Associates, and Software Engineers, as well as Technical Staff. The personal information below regards the period of January 1 – December 31, 2018.

2.1 Professors Emeriti

Władysław Findeisen Professor (retired July 1999)

Complex Systems Group

M.Sc. 1949, Ph.D. 1954. Full Professor since 1962.

Founder and Director of ICCE (1955–1981), elected and re-elected Rector of WUT (1981–1985). Member of Polish Academy of Sciences (PAN) since 1971. Doctor Honoris Causa of The City University in London (1984), Warsaw University of Technology (1996), Gdańsk University of Technology (1997), Technische Universität Ilmenau (1998). Chairman of the Social Council to the Primate of Poland (1986–90), Vice-President of the Polish Academy of Sciences (PAN)(1990–1992), Senator of the Republic of Poland (1989–93), President of "Kasa Mianowskiego" (a foundation which sponsors foreign scientists in Poland) (1991–2009). Honored with the Order of the White Eagle (2012).

Radosław Ładziński Professor (retired January 1998)

Complex Systems Group

M.Sc. 1952, Ph.D. 1957 from WUT; the title of Professor of Technical Sciences awarded in 1968.

With WUT since 1949. Vice-Dean of the Faculty of Electronics, (1964–1969), head of the Ph.D. Program in Control Engineering and Computer Science (1977–1981), chairman of the Electronics and Information Technology Committee for Ph.D. Degree in Control and Computer Engineering (1991–1996). As Professor Emeritus author of the programme and the first lecturer of the two basic Undergraduate Courses: *Dynamic System* and *Control*, both taught in English (1998-2007). Parallel working with Institute of Electrical Engineering of Polish Academy of Sciences (PAN) (1955–1962), and with Institute of Automatic Control of PAN (1963–1968). Post-Doctoral Scholar, Royal Institute of Technology, Stockholm, Sweden (1957), British Council Scholar, University of Cambridge, England (1959–60), Visiting Lecturer, Department of Mathematics, University of Ghana, Accra, Ghana (1962–63), Professor of Engineering Science, University of Mosul, Iraq (1970–74), Professor of Engineering Mathematics, Rivers State University of Science and Technology, Port Harcourt, Nigeria (1981–87), Member of Magdalene College, University of Cambridge, England.

Interests: Dynamic systems, control theory, and applied mathematics.

Krzysztof Malinowski Professor (Head of Division, retired Feb. 2019)

Complex Systems Group

room 517, tel. 22 234 7397 and 22 825 0995

K.Malinowski@ia.pw.edu.pl, www.ia.pw.edu.pl/~malinows

M.Sc. 1971, Ph.D. 1974, D.Sc. 1978, the title of Professor of Technical Sciences awarded in 1989, appointed to ordinary professorship in 1994.

With WUT since 1971. Director of ICCE (1984–1996), Dean of the FEIT (1996–1999). Member of the Senate of the Warsaw University of Technology (1993–2002), Chairman of the Senate Committee on Academic Staff (1993–1996 and 1999–2002), Chairman of Senate Committee on Research (1996–1999). Member of the Polish Academy of Sciences (PAN) (Corresponding Member 1998–2016, Full Member 2016–), Member of the Warsaw Scientific Society (TNW), Chairman of the Committee of Automation and Robotics of Polish Academy of Sciences (PAN) (2007–2014, Professor in the Research and Academic Computer Network Institute (NASK), Vice-Chairman of the Scientific Council of NASK (2011–2015), Chairman of Task Group of Ministry of Science and Higher Education for assessment of applications for funding large scale research equipment and constructions (2011–2015), Chairman of the Scientific Council of the Industrial Institute for Automation and Measurements (PIAP), Member of the IFAC Technical Committees on Optimal Control and on Large Scale Systems, Chair of the Council of Provost, Division IV: Engineering Science, Polish Academy of Sciences (2015–2018).

Interests: Hierarchical control, model-based predictive control of nonlinear systems, applications of optimization, management and control of computer networks.

Jerzy Pułaczewski Senior Engineer (retired since October 2003)

Robot Programming Group

M.Sc. 1958, Ph.D. 1965 from WUT.

With WUT since 1956, Deputy Director of ICCE (1972–80 and 1993–96), Deputy Dean of the Faculty of Electronics (1981–87), Chairman of the Departmental Curriculum Committee (1981–90), member of the Senate of Warsaw University of Technology (1987–90). Scholarship in Moscow Electroenergy University (1958–59), the British Council scholarship at Cambridge University, UK (1965–66), visiting researcher at Minneapolis University, Minneapolis, MN (1980–81).

Interests: Digital control algorithms, process modeling and simulation, process control.

Jacek Szymanowski Professor (retired January 2000)

Complex Systems Group

M.Sc. 1962, Ph.D. 1966, D.Sc. 1983 from WUT.

With WUT since 1968. Visiting Professor, Laboratoire d'Automatique de Nantes, Ecole Centrale de Nantes, France, 1992, 1994, 1995, 1996, 1997. Retired since January 2000.

Interests: Simulation of control systems, linear and nonlinear programming, control applications of optimization techniques, operating systems.

Wiesław Traczyk Professor (retired January 2010)

Optimization and Decision Support Group

M.Sc. 1959, Ph.D. 1964, D.Sc. 1969 from WUT, the title of Professor awarded 1983.

With WUT since 1957, Vice-Dean of the Faculty of Electronics (1971–1975), Deputy Director (1975–1981) and Director of ICCE (1981–1984). Member of the Senate of Warsaw University of Technology (1981-1984), Chairman of the Senate Committee of Finances (1981-84). Professor of the University in Port Harcourt, Nigeria (1984-1987), Professor of the Institute of Telecommunications (1997–2006). Chairman of FEIT Committee for Ph.D. Degrees in Automatic Control and Computer Sciences (1990–2005). Head of ICCE Optimization and Decision Support Division (1997-2002).

Interests: Knowledge engineering, expert systems, artificial intelligence.

Eugeniusz Toczyłowski Professor (retired Oct. 2020)

Operations Research and Management Systems Group

room 516, **tel. 22 234 7950**

E.Toczylowski@ia.pw.edu.pl

M.Sc. 1973, Ph.D. 1976, D.Sc. 1989 from WUT, the title of Professor of Technical Sciences awarded in 2004.

With WUT since 1973. Head of Operations Research and Management Systems Division, Vice-Dean of the Faculty of Electronics at WUT (1990–1993), chairman of the Rector's Committee for University Computerization (1993–1999), Advisor to the Dean on Strategic Planning (1993–1996). Head of the Undergraduate Program in Information Systems for Decision Support (1992–2004). Member of the Section on Decision Support (since 1992) and the Section on Knowledge Engineering and Operations Research (2003–) of the Committee of Automation and Robotics of Polish Academy of Sciences, Member of the Scientific Council of the Systems Research Institute (IBS PAN) (since 2002), Member of Consulting Council EnergoProject S.A. (2003–2004), Member of Steering Committee of the Energy Market (2003–2004). Member of the Polish National Council for CO_2 Reduction Emission Program, and Head of the Energy Market Group (2009–), Member of the European Commission DG Advisory Group for Energy Roadmap 2050 (2011–).

Interests: Structural approaches to discrete optimization, operations research and management, management information systems, auction theory, competitive market design under constraints, low carbon economy design.

Andrzej P. Wierzbicki Professor (retired March 2004)

Optimization and Decision Support Group

A.Wierzbicki@ia.pw.edu.pl

M.Sc. 1960, Ph.D. 1964, D.Sc. 1968 from WUT, titles of Professor awarded in 1975 and 1992.

With WUT since 1961, half time since March 1997. Deputy Director of the ICCE (1971-1975), Deputy Dean (1971-1972) and then Dean of FEIT (1975-1978) member of the Senate (1975-1978), member or chairman of many university commissions.

Since 1978 working with the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria and served (1979-1984) as the chairman of the Systems and Decision Sciences Program. Visiting prof. at the University of Minnesota, Minneapolis,

MN, Brown University, Providence, RI (1970–1971), Kyoto University, Japan (1989-1990), Fernuniversitaet Hagen (1985) and Japan Advanced Institute of Science and Technology (2004-2007).

Director of the National Institute of Telecommunications in Poland (1996-2004). Chairman of the Commission of Applied Research of the State Committee for Scientific Research (KBN) (1991–1994). Chairman of the Consulting Panel for Promotion and Policy of Science of State Committee for Scientific Research (KBN) (1994-2000), Member of the Consulting Panel for Computer Infrastructure of Science KBN (1994-2000), Chairman of the Consulting Panel for International Scientific Cooperation of State Committee for Scientific Research (KBN) (2000-2004). Chairman of the Scientific Council of the Industrial Institute for Automation and Measurements (PIAP) (1991-2004), chairman of the Scientific Council of Scientific and Academic Computer Network NASK (1994-2004), and member of the Scientific Council of Institute of System Research (IBS PAN) (1992-2004). Member of the Committee of Automation and Robotics of Polish Academy of Sciences (PAN) (1970-2004). Member of the Committee for Future Studies "Poland 2000+" PAN (since 1986, deputy chairman since 2000). Member and deputy chairman of the Panel for Cooperation with IIASA of PAN.

Member of the Polish Association for the Club of Rome. Member of Polish Mathematical Society (PTM) (since 1975) and of Society of Polish Electrical Engineers (SEP) (1970–2004). Member of the Information Society Technology Advisory Group (ISTAG) of the European Commission (2000-2002). Recipient of George Cantor Award of the Int. Soc. of Multi-Criteria Decision Making for his results in multi-criteria optimization theory and decision support methodology (1992). Recipient of Tomasz Hofmokl Award of NASK for the promotion of informational society, 2005. Recipient of Best Paper Award at the Hawaii International Conference of Systems Science, 2005 for the paper: "Knowledge Creation and Integration: Creative Space and Creative Environments".

Interests: Optimization theory and algorithms, decision theory, decision support systems, negotiation methods and experiences, applications in telecommunication, information society issues, knowledge creation and engineering.

2.2 Senior Faculty

Piotr Arabas Assistant Professor (part-time)

Complex Systems Group
room 573, tel. 22 234 7126
Piotr.Arabas@pw.edu.pl

M.Sc 1996, Ph.D. 2004 from WUT

With WUT since 2002.

Interests: Hierarchical systems, predictive control, management of telecommunication services.

Klara Borowa Assistant

Software Engineering Group
room 562, tel. 22 234 7756
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M.Sc. 2019 from WUT

With WUT since 2019.

Interests: Software engineering, software architecture, architecture decision making, requirements engineering

Patryk Józef Chaber Assistant Professor

Control Engineering Group
room 563, tel. 22 234 7124
patryk.chaber@pw.edu.pl

M.Sc. 2014, Ph.D 2018 from WUT.

Interests: Neural networks, microcontrollers, control algorithms, modelling.

Paweł Domański Professor

Control Engineering Group
room 570, tel. 22 234 7665
Pawel.Domanski@pw.edu.pl

D.Sc. 2018, Ph.D. 1996, D.Sc 2018 from WUT.

With WUT since 1991.

Interests: Adaptive control, intelligent control, fuzzy logic.

Wojciech Dudek Assistant Professor (since Jan. 2022)

Robot Programming Group
room P109, 566, tel. 22 234 7649
wojciech.dudek@pw.edu.pl, https://www.robotyka.ia.pw.edu.pl/team/wdudek

M.Sc 2015, Pb.D. 2021 from WUT

With WUT since 2017

Interests: Mobile robots, navigation, distributed architectures, cloud computing.

Maksym Figat Assistant

Robot Programming Group

room 566, **tel. 22 234 7649**

maksym.figat@pw.edu.pl

M.Sc. 2013 from WUT, Ph.D. 2022 from WUT.

With WUT since 2008.

Interests: methodology of designing robotic control systems, Petri nets, formal language theory, CAD/CAM systems.

Janusz Granat Assistant Professor

Optimization and Decision Support Group

room 560A, **tel. 22 234 7864**

Janusz.Granat@pw.edu.pl, www.ia.pw.edu.pl/~janusz

M.Sc. 1986, Ph.D. 1997 from WUT.

With WUT since 1987, chairman of IFIP Working Group TC 7.6, Optimization-Based Computer Modeling and Design

Interests: Decision support systems, multicriteria decision analysis, data warehouses, decision support in telecommunication industry.

Jerzy Gustowski Assistant

Control Engineering Group

room 525, **tel. 22 234 7699**

Jerzy.Gustowski@pw.edu.pl

M.Sc. 1979 from WUT.

With WUT since 1979.

Interests: Low level software for computer control, interfacing, single-chip microcomputers, PLC controllers.

Michał Hałoń Assistant

Complex Systems Group

room 560, **tel. 22 234 7297**

michal.halon@pw.edu.pl

M.Sc. 2018 from WUT.

With WUT since 2013.

Interests: Biometrics, Computer Vision, Artificial Intelligence.

Mariusz Kaleta Assistant Professor

Operations Research and Management Systems Group

room 561, **tel. 22 234 7123**

Mariusz.Kaleta@pw.edu.pl

M.Sc. 2000, Ph.D. 2005, D.Sc. 2022 from WUT

With WUT since 2003.

Interests: Discrete optimization, operations research and management, decision support in energy market.

Mariusz Kamola Assistant Professor (part-time)

Complex Systems Group

room 573, **tel. 22 234 7126**

Mariusz.Kamola@pw.edu.pl, www.ia.pw.edu.pl/~mkamola

M.Sc. 1997, Ph.D. 2004, D.Sc. 2022 from WUT.

With WUT since 2002.

Interests: Modeling and simulation, optimization, parallel computation, data networks, social networks.

Andrzej Karbowski Assistant Professor

Complex Systems Group

room 572, **tel. 22 234 7632**

Andrzej.Karbowski@pw.edu.pl, www.ia.pw.edu.pl/~karbowsk

M.Sc. 1983, Ph.D. 1990. D.Sc. 2012 from WUT

With WUT since 1983. Research visitor: Politecnico di Milano and Universita di Genova, 1992, Edinburgh Parallel Computing Centre, 2000. Editor of a special issue of the Energies journal: "Mixed-Integer Linear and Nonlinear Programming Methods for Energy Aware Traffic Control in Stationary Networks and Clouds"

Interests: Cybersecurity, large scale systems, distributed computations, optimal control and management in risk conditions, decision support systems, neural networks, environmental systems management, control and decision problems in computer networks.

Michał Karpowicz Assistant Professor (part time)

Complex Systems Group

room 573a, **tel. 22 234 7860**

Michal.Karpowicz@pw.edu.pl, staff.elka.pw.edu.pl/~mkarpowi

M.Sc. 2005, Ph.D. 2010, D.Sc 2020 from WUT

With WUT since 2014

Interests: Control theory, game theory, computer networks, cybersecurity

Włodzimierz Kasprzak Professor

Machine Perception Group

room 565, **tel. 22 234 7866**

Wlodzimierz.Kasprzak@pw.edu.pl, www.ia.pw.edu.pl/~wkasprza

M.Sc. 1981, Ph.D. 1987 from WUT, Dr-Ing. 1997 from Univ. of Erlangen-Nuremberg, D.Sc. 2001 from WUT, the title od Professor awarded in 2014.

With WUT since 1997, Professor since 2005. Member of Polish Section of IAPR.

Interests: Computer vision, speech recognition, pattern classification, signal analysis, artificial intelligence.

Szymon Kijas Assistant Professor (part time)

Software Engineering Group

room 555, **tel. 22 234 7997**

szymon.kijas@pw.edu.pl

Ph.D. 2019 from WUT

With WUT since 2019

Adam Kozakiewicz Assistant Professor (part time)

Complex Systems Group

room 573a, **tel. 22 234 7860**

Adam.Kozakiewicz@pw.edu.pl

M.Sc. 2001, Ph.D. 2008 from WUT

With WUT since 2006.

Interests: Computer networks, distributed computation, network and systems security.

Bartosz Kozłowski Assistant Professor (on leave)

Optimization and Decision Support Group

Bartosz.Kozlowski@pw.edu.pl

M.Sc. 2004 from WUT.

With WUT since 2010.

Interests: Computer networks, data bases, operating systems, programming languages, text processing.

Tomasz Jordan Kruk Assistant Professor

Complex Systems Group

room 530, **tel. 22 234 7922**

Tomasz.Kruk@pw.edu.pl, www.ia.pw.edu.pl/~tkruk

M.Sc. 1994 from Technical University of Gdańsk. Ph.D. 1999 from WUT.

With WUT since 1999. Since 2018 cybersecurity expert of PIIT (The Polish Chamber of Information Technology and Telecommunications)

Interests: Operating systems, computer and network security, distributed systems.

Adam Krzemienowski Assistant Professor

Optimization and Decision Support Group

room 553, **tel. 22 234 7640**

Adam.Krzemienowski@pw.edu.pl

Ph.D. 2007 from WUT.

With WUT since 2007. Visiting Lecturer at the University of Leeds, United Kingdom (2007–2008).

Interests: Optimization and decision support under risk, risk measures, stochastic programming.

Maciej Ławryńczuk Professor (Leader of the Group), (Deputy Director of the Institute)

Control Engineering Group

room 523

Maciej.Lawrynczuk@pw.edu.pl

M.Sc. 1998, Ph.D. 2003, D.Sc. 2013 from WUT, the title of Professor of Technical Sciences awarded in 2022.

With WUT since 2003. Twice awarded of "Gold chalk" ("Złota kreda") award. The coordinator of B.Sc. and M.Sc. studies in automation and robotics since 2011.

Interests: advanced process control algorithms, in particular Model Predictive Control (MPC) algorithms, set-point optimisation algorithms, artificial intelligence and soft computing techniques, in particular neural networks, modelling and simulation.

Andrzej Manujło Assistant (until Oct. 2022)

Operations Research and Management Systems Group

room 556

Andrzej.Manujlo@pw.edu.pl

M.Sc. 2015 from WUT.

With WUT since 2009.

Interests: Machine Learning, Energy Clusters

Piotr Marusak Assistant Professor

Control Engineering Group

room 567, **tel. 22 234 7673**

Piotr.Marusak@pw.edu.pl, www.ia.pw.edu.pl/~pmarusak

M.Sc. 1997, Ph.D. 2003, D.Sc 2020 from WUT.

With WUT since 2002.

Interests: Predictive control of nonlinear systems, digital control algorithms, process modeling and simulation, fuzzy control.

Robert Ryszard Nebeluk Assistant

Control Engineering Group

room 571, **tel. 22 234 7861**

Robert.Nebeluk@pw.edu.pl

M.Sc. 2019 from WUT

With WUT since 2019

Interests: Modelling, control algorithms, optimization, neural networks, machine learning algorithms.

Ewa Niewiadomska-Szynkiewicz Professor, Leader of the Group

Complex Systems Group

room 572a, **tel. 22 234 3650**

Ewa.Szynkiewicz@pw.edu.pl, www.ia.pw.edu.pl/~ens

M.Sc. 1986, Ph.D. 1995, D.Sc. 2005 from WUT, the title of Professor of Technical Science awarded in Feb. 2017. Member of the Foundation for the Promotion of Science Systems Polish Academy of Sciences (2017-)

Research Assistant at the Institute of Geophysics of Polish Academy of Sciences in (1987–1988), with WUT since 1988, Central Mining Institute (GIG) since 2022, NASK in (2001–2022), NASK Director for Research in (2009–2022), Member of Committee on Automatic Control and Robotics of the Polish Academy of Sciences (KAiR PAN) since 2011. Member of the Council for the Foundation of Systemic Sciences PAN since 2016. Member of of the Scientific Council of NASK in (2002–2022), Vice-Chairman in (2008–2009). Member of IEEE.

Interests: Large scale systems, computer simulation, computer aided control systems design, environmental systems management, distributed computations, global optimization, telecommunication systems, ad hoc networks.

Andrzej Pacut Professor, Leader of the Group (part time) (until Oct. 2022)

Biometrics and Machine Learning Group

room 522, **tel. 22 234 7733**

Andrzej.Pacut@pw.edu.pl, www.ia.pw.edu.pl/~pacut

M.Sc. 1969, Ph.D. 1975, D.Sc. 2000 from WUT, the title of Professor of Technical Sciences awarded in December 2010.

With Warsaw University of Technology since 1969, first with the Institute of Mathematics (until 1978) then with ICCE. Visiting Assistant Prof. at Lefschetz Center for Dynamical Systems of Brown University, Providence, RI (1980–1981), Visiting Associate Prof. at Oregon State University, Corvallis, OR (1984 and 1986–1991). Deputy Director of ICCE 1985–1986 and 1993–2005. Senior Member of IEEE. Vice Chairman (2001–2005) and Chairman (2006–2009) of the IEEE Poland Section, Chair of Tech. Committee No. 309 on Biometrics (2010–) and expert of Tech. Committee No. 182 on Information Security in IT Systems (2003–) of Polish Normalization Committee (PKN). Head of the NASK Biometric Laboratories (2003–), member of NASK Research Council (2007–), vice-chair (2009–2011). Member of Scientific Council of Central Laboratory of Criminology (2011–).

Interests: Learning systems, system identification, biometrics, neural modeling, neural networks.

Piotr Pałka Assistant Professor

Operations Research and Management Systems Group

room 554, **tel. 22 234 7648**

Piotr.Palka@pw.edu.pl, http://www.ia.pw.edu.pl/~ppalka

M.Sc. 2005, Ph.D. 2009 from WUT.

With WUT since 2009. Member of the Rector's Team for the Innovative Forms of Education (2014–). Expert of Ministry of Economic Development on Industry Transformation (2016–2017).

Interests: multi-agent systems, agent-based modeling, smart cities, distributed decision systems, auction theory, IoT, innovative forms of education, problem based learning, design thinking.

Krzysztof Pieńkosz Assistant Professor, Leader of the Group

Operations Research and Management Systems Group

room 560a, **tel. 22 234 7864**

Krzysztof.Pienkosz@pw.edu.pl

M.Sc. 1984, Ph.D. 1992, D.Sc. 2011 from WUT.

With the Research Institute of Polish Gas and Oil Company 1984–1986, with WUT since 1986.

Interests: Operations research in particular discrete optimization, combinatorial algorithms, production planning and scheduling in manufacturing systems.

Sebastian Plamowski Assistant Professor

Control Engineering Group

room 567, **tel. 22 234 7673**

Sebastian.Plamowski@pw.edu.pl

M.Sc. 2000, Ph.D. 2006 from WUT.

With WUT since 2015.

Interests: Modeling and simulation, optimization, diagnostics, predictive control, SCADA and DCS systems.

Andrzej Ratkowski Assistant Professor

Software Engineering Group

room 555, **tel. 22 234 7997**

Andrzej.Ratkowski@pw.edu.pl

M.Sc. 2005, Ph.D. 2011 from WUT.

With WUT since 2009.

Interests: Software engineering, Service Oriented Architecture, performance engineering, TT architectures.

Dawid Seredyński Assistant

Robot Programming Group
room 566
Dawid.Seredynski@pw.edu.pl

M.Sc. 2012 from WUT.

With WUT since 2012.

Interests: grasp planning, manipulation planning

Jerzy Sobczyk Assistant

Optimization and Decision Support Group
room 519A, **tel. 22 234 7863**
Jerzy.Sobczyk@pw.edu.pl, www.ia.pw.edu.pl/~jurek

M.Sc. 1985 from WUT.

With WUT since 1984. FEIT Network Administrator.

Interests: Computer networks, system and network administration, programming languages, web applications, parallel and distributed programming, multi-criteria optimization.

Andrzej Stachurski Assistant Professor (Leader of the Group)

Optimization and Decision Support Group
room 553, **tel. 22 234 7640**
Andrzej.Stachurski@pw.edu.pl, www.ia.pw.edu.pl/~stachurs

M.Sc. 1976, Ph.D. 1980, D.Sc 2013 from WUT.

Senior Assistant (1979–80) and then Assistant Professor (1980–92) at the Institute of System Research (IBS PAN), with WUT since 1992. Visiting Professor at the Calabria University, Italy, 1984, Äbo Swedish Academy in Turku, 1987, Jyväskylä University, Finland, 1988, JSPS invitee at the Department of Control Engineering, Osaka University, Japan, 1988–89. Member of Polish Society of Operations and Systems Research. Author and co-author of many scientific papers and reports on optimization algorithms, identification, applications of optimizations in macro-economy modeling and optimal design problems in structural engineering. Co-author of a textbook 'Podstawy optymalizacji' ('Foundations of Optimization') published in 1999. Reviewer of Control & Cybernetics, Optimization, Archives of Control Science, SIAM J. on Optimization, IEEE Concurrency.

Interests: Interests: nonlinear programming, large-scale optimization, applications to the optimal design problems in structural engineering, parallel and distributed calculations in Mathematical Programming.

Maciej Stefańczyk Assistant

Machine Perception Group

room 564, **tel. 22 234 7276**

Maciej.Stefanczyk@pw.edu.pl

M.Sc 2011

With WUT since 2011

Interests: Computer vision, computer graphics.

Marcin Szlenk Assistant Professor

Software Engineering Group

room 555, **tel. 22 234 7997**

Marcin.Szlenk@pw.edu.pl

M.Sc. 2000, Ph.D. 2006 from WUT.

With WUT since 2005.

Interests: Software modeling, programming paradigms.

Wojciech Szynkiewicz Professor (since May 2022)

Robot Programming Group

room 517, **tel. 22 234 7119**

Wojciech.Szynkiewicz@pw.edu.pl

M.Sc. 1985, Ph.D. 1996 from WUT, D.Sc. 2016 from WUT.

With WUT since 1985. Deputy Director of the Research Center for Control and Information-Decision Technology (1999–2003).

Interests: Robotics, multiple robots coordination, robot sensor-based manipulation and motion planning, autonomous navigation, real-time systems.

Tomasz Śliwiński Assistant Professor

Optimization and Decision Support Group

room 561, **tel. 22 234 7123**

Tomasz.Sliwinski@pw.edu.pl

M.Sc. 1999, Ph.D. 2007 from WUT.

With WUT since 2004.

Interests: Discrete optimisation, operations research, decision support.

Piotr Tatjewski Professor (part time)

Control Engineering Group

room 524, **tel. 22 234 7397 and 825 0995**

Piotr.Tatjewski@pw.edu.pl

M.Sc. 1972, Ph.D. 1976, D.Sc. 1988, the title of Professor of Technical Sciences awarded in 2003, appointed to ordinary professorship in 2006

With Warsaw University of Technology since 1972. Head of Control Engineering Group 1991–2015, Deputy Director of ICCE for Academic Affairs (1987–1991), Director of ICCE 1996–2008. Vice Dean for Research of the Faculty (2012–2020). Head of Control and

Software Engineering Division (2006–2021), Head of the Undergraduate Degree Program in Computer Control Systems (1994–1996). DAAD scholarship in 1978 (TU Hanover), SERC research fellow at the City University, London (1986), visiting professor at the University of Birmingham (1992/1993). Member of Committee of Control and Robotics of Polish Academy of Sciences since 2004, Chair of the Automatic Control Systems Section of this Committee (2007–2015), Member of the Control and Robotics Section of the Scientific Research Council (KBN) 1997–2004. Member of Programme Committee of Int. Journal of Applied Mathematics and Computer Science, Journal of Automation, Mobile Robots and Intelligent Systems, Member of Editorial Advisory Board of ISA Transactions (2011–), Expert of Ministry of Education and Science for Educational Standards (2005–2006). Member of EUCA (European Union Control Association) Administrative Council (2008–2011), member of IFAC Technical Committees TC 2.1 and TC 5.4, Member of the Scientific Council of Systems Research Institute of Polish Academy of Sciences (2007–2022), vice-chairman of the Scientific Council (2011–2018). Member of the Polish Central Commision for Degrees and Titles (2017–2020). Member of Team of Experts of Ministry of Education and Science for evaluation of proposals and reports within the programme "PhD with industrial implementation" (2021 –).

Interests: Advanced process control and optimization, model based predictive control, multi-layer control systems, decomposition methods in optimization and control, soft computing methods.

Tomasz Traczyk Professor (Deputy Director of the Institute)

Operations and Systems Research Division,
Operations Research and Management Systems Group

room 518, **tel. 22 234 7750, 6192**

Tomasz.Traczyk@pw.edu.pl, www.ia.pw.edu.pl/~ttraczyk

M.Sc. 1984, Ph.D. 1992 from WUT.

With WUT since 1984.

Interests: Applications of databases in management and control, software for high-energy physics, long-term digital archives.

Mateusz Trokielewicz Assistant Professor (part-time)

Biometric and Machine Learning Group

room 558, tel. 22 234 7805

mateusz.trokielewicz@pw.edu.pl

Interests: biometrics, iris recognition, machine intelligence, pattern recognition

Artur Wilkowski Assistant Professor

Systems Machine Perception Group

room 564, tel. 22 234 7276

Artur.Wilkowski@pw.edu.pl

M.Sc Eng 2004, Phd 2012 from WUT

With WUT since 2006

Interests: Computer vision, Machine learning.

Tomasz Winiarski Assistant Professor

Robot Programming Group
room 566, 012, **tel. 22 234 7649, 22 234 7117**
tomasz.winiarski@pw.edu.pl, http://robotyka.ia.pw.edu.pl/team/twiniarski

M.Sc. 2002, Ph.D. 2009 from WUT.

With WUT since 2004.

Interests: Robot control systems, artificial intelligence, mobile robots, impedance control, manipulator force control, service robots, social robots, systems engineering.

Andrzej Marcin Wojtulewicz Assistant Professor

Control Engineering Group
room 563, **tel. 22 234 7124**
Andrzej.Wojtulewicz@pw.edu.pl

M.Sc. 2014, Ph.D 2020 from WUT

With WUT since 2016

Interests: Control theory, FPGA, microcontoller.

Andrzej Zalewski Assistant Professor, Leader of the Group

Software Engineering Group
room 562, **tel. 22 234 7756**
Andrzej.Zalewski@pw.edu.pl

M.Sc. 1997, Ph.D. 2003, D.Sc 2015 from WUT.

With WUT since 2002. Member of Information Systems Audit and Control Association (ISACA).

Interests: Software engineering, real-time systems, timing requirements, concurrent systems, performance analysis for computer systems, IT project economics.

Krzysztof Zarzycki Assistant

Control Engineering Group
room 571, **tel. 22 234 7861**
krzysztof.zarzycki@pw.edu.pl

M.Sc. 2020 from WUT.

With WUT since 2020.

Interests: Process modelling, model predictive control, neural networks.

Cezary Zieliński Professor, Leader of the Group

Robot Programming Group
room 518A, **tel. 22 234 5102**
Cezary.Zieliński@pw.edu.pl, www.ia.pw.edu.pl/~zielinsk

M.Sc. 1982, Ph.D. 1988, D.Sc. 1996 from WUT, the title of Professor of Technical Sciences awarded in 2012.

With WUT since 1985. Research visitor at Loughborough University of Technology, UK (1990, 1992), Senior Fellow at Nanyang Technological University, Singapore (1999–2001), Secretary of Priority Research Program in Control, Information Technology, and Automation (PATIA) (1994–1999). Member of the Forecast Committee of the Polish Academy of Sciences: Poland 2000 Plus (2003–2007, 2015–). Senior Member of IEEE (2002–), Vice Chairman of the Scientific Committee of the Industrial Research Institute for Automation and Measurement PIAP (2016–2017). Vice Dean for Research and International Cooperation FEIT (2002–2005), Head of ICCE Robot Programming and Pattern Recognition Group since 1996 (currently Robot Programming Group). Member of the board of EURON (European Robotics Network of Excellence, 2004–2008). Deputy Director of ICCE for Research (2005–2008), Director of ICCE (2008–2016), Vice Dean for General Affairs (2016–). Member of the Control and Robotics Committee of the Polish Academy of Sciences (2007–). Editor in Chief of Measurements-Automation-Robotics Technical Sciences Quarterly (PAR) (2017–). Head of Warsaw University of Technology Centre for Priority Research Area Artificial Intelligence and Robotics, established within the Excellence Initiative: Research University (IDUB) programme (2020–)

Interests: Robot programming methods, open-structure robot controllers, behavioral control, digital systems.

Izabela Żółtowska Assistant Professor

Operations Research and Management Systems Group

room 554, **tel. 22 234 7648**

Izabela.Zoltowska@pw.edu.pl, home.elka.pw.edu.pl/~imilenko

M.Sc. 2000, Ph.D. 2006 from WUT.

With WUT since 2005.

Interests: Operations, planning and economics of electric energy systems, optimization theory and its applications.

2.3 Supporting Faculty and Staff

Włodzimierz Macewicz Senior Software Engineer

Software Engineering Group

room 525, **tel. 22 234 7699**

Wlodzimierz.Macewicz@pw.edu.pl

M.Sc. from WUT.

With WUT since 1983.

Interests: Computer networks, data bases, operating systems, programming languages, text processing.

2.4   Ph.D. Students

Ewelina Bartuzi Ph.D. Student (until Dec. 2022)

Biometrics and Machine Learning Group
room 558/559, tel. 22 234 7805
ebartuzi@elka.pw.edu.pl

Supervisor: Andrzej Pacut

Mariusz Drabecki Ph.D. Student

Operations Research and Management Systems Group
room 556, tel. 22 234 7125
mariusz.drabecki.dokt@pw.edu.pl

Supervisor: Eugeniusz Toczyłowski

Michał Falkowski Ph.D. Student

Control Engineering Group
michal.falkowski.dokt@pw.edu.pl

Supervisor:

Paweł Domański

Karolina Gabor-Siatkowska Ph.D. Student

Biometrics and Machine Learning Group
room 558, tel. 22 234 7805
karolina.gabor-siatkowska.dokt@pw.edu.pl

Supervisor: Andrzej Pacut

Michał Hałoń Ph.D. Student

Biometrics and Machine Learning Group
room 558, tel. 22 234 7805
michal.halon.dokt@pw.edu.pl

Supervisor: Andrzej Pacut

Daniel Giełdowski Ph.D. Student

Robot Programming Group
daniel.gieldowski.dokt@pw.edu.pl

Supervisor: Wojciech Szynkiewicz

Radian Karpuk Ph.D. Student (until April 2022)

Operations Research and Management Systems Group
radian.karpuk.dokt@pw.edu.pl

Supervisor: Eugeniusz Toczyłowski

Jarosław Karwowski Ph.D. Student

Robot Programming Group
jaroslaw.karwowski.dokt@pw.edu.pl

Supervisor: Wojciech Szynkiewicz

Barbara Laskowska Ph.D. Student

Complex Systems Group
barbara.laskowska.dokt@pw.edu.pl

Supervisor: Ewa Niewiadomska-Szymkiewicz

Kamila Matela Ph.D. Student

Optimization and Decision Support Group
Kamila.Matela@pw.edu.pl

Supervisor: Eugeniusz Toczyłowski

Andrzej Manujło Ph.D. Student (until May 2022)

Operations Research and Management Systems Group
room 556, tel. **22 2347125**
andrzej.manujło@pw.edu.pl

Supervisor:

Eugeniusz Toczyłowski

Grzegorz Mąkosa Ph.D. Student (until May 2022)

Software Engineering Group
room 556, tel. **22 234 7125**

Supervisor: Andrzej Zalewski

Anthony Nwachukwu Ph.D. Student

Complex Systems Group
Anthony.Nwachukwu.dokt@pw.edu.pl

Supervisor: Andrzej Karbowski

Michał Okulski Ph.D. Student

Control Engineering Group
room 571, tel. **22 234 7861**
michal.okulski@pw.edu.pl

Supervisor: Maciej Ławryńczuk

Paweł Piwowarski Ph.D. Student

Machine Perception Group
pawel.piwowarski@pw.edu.pl

Supervisor: Włodzimierz Kasprzak

Dariusz Rocki Ph.D. Student (until April 2022)

Control Engineering Group
dariusz.rocki.dokt@pw.edu.pl

Supervisor: Paweł Domański

Paweł Szelągowski Ph.D. Student (until April 2022)

Machine Perception Group
room
pawel.szelagowski.dokt@pw.edu.pl

Supervisor:

Włodzimierz Kasprzak

Maciej Węgierek Ph.D. Student (until April 2022)

Robot Programming Group
room 564, tel. 22 234 7276
maciej.wegierek.dokt@pw.edu.pl

Supervisor: Cezary Zieliński

2.5   Administrative and Technical Staff

Elżbieta Matyjasiak Secretary, Main office.

room 521, **tel. 22 234 7397, 22 825 0995**
Elzbieta.Matyjasiak@pw.edu.pl

M.Sc. 2002 from Warsaw School of Management and Marketing.

Katarzyna Newelska-Pedowicz (from July 2022).

room 521, **tel. 22 234 7397**
Katarzyna.Pedowicz@pw.edu.pl

M.Sc. 2008 from Cardinal Stefan Wyszyński University in Warsaw.

Jolanta Niedbało Office support (until Aug. 2022).

room 521, **tel. 22 234 7397**
J.Niedbalo@ia.pw.edu.pl

Agnieszka Paprocka Finances support (until July 2022).

room 526 Agnieszka.Paprocka@pw.edu.pl

M.Sc. 2008 from Cardinal Stefan Wyszyński University in Warsaw.

Sylwia Piskorska R&D Specialist (part time).

room 530, **tel. 22 234 6156**
Sylwia.Piskorska@pw.edu.pl

M.Sc.2002 from Technical University of Gdańsk

Dorota Podniesińska Menager, Finances.

room 526, **tel. 22 234 6096**
Dorota.Podniesinska@pw.edu.pl

M.Sc. 2007 from the M.Skłodowska-Curie Warsaw Academy

Agnieszka Słojewska Finances specialist.

room 526, **tel. 22 234 7122**
Agnieszka.Slojewska@pw.edu.pl

baccalaureate 2005 from Leon Kozmiński Academy of Entrepreneurship and Management

Alicja Trojanowska Secretary, Student affairs.

room 518, **tel. 22 234 7750**
Alicja.Trojanowska@pw.edu.pl

baccalaureate 2012 from WUT.

Beata Woźniak Manager, Administration.

room 521a, **tel. 22 234 7397**
Beata.Wozniak@pw.edu.pl

M.Sc. 1993 from Warsaw University.

3 Teaching Activities – Academic Year 2020/2021

3.1 Undergraduate and Graduate Studies

3.1.1 Fall

Course Title	Lecturer	Hours per sem.	Course code	Notes
Computer Systems for Control and Measurement	T. Winiarski	60	103A-INxxx-ISP-SKPS	
Computer Vision	A. Wilkowski	45	1130-EMARO-MSA-1006	for EMARO+ programme
Control Equipment	T. Winiarski	45	103A-ARxxx-ISP-APA	
Control Theory	M. Karpowicz	60	103D-ARxxx-MSP-TST	
Data Modelling	T. Traczyk	45	103A-INISY-MSP-MODA	
Decision Support	J. Granat	60	103B-INSID-ISP-WDEC	
Decision Support			639B-INSWS-MEP-WDEUZ	for the WUT Distance Learning Center
Development of Control Systems (Group Project)		75	103A-ARxxx-ISP-PUST	
Discrete Optimization Methods	I. Żółtowska	45	103A-INISY-MSP-MOD	
Dynamic Systems and Control	P. Domański		103A-CTxxx-ISA-EDYCO	
Formal Specification and Functional Programs	M. Szlenk	45	103B-INxxx-MSP-SPOP	
Fundamentals of Control Systems	M. Ławryńczuk	45	103A-ARxxx-ISP-PODA	
Fundamentals of Information Technology	A. Wilkowski	45	1060-GI000-ISP-1004	for the Faculty of Geodesy and Cartography
Image and Speech Recognition	W. Kasprzak	60	103A-CTCSN-MSA-EIASR	
Image and Speech Recognition	W. Kasprzak	60	1120-INSZI-MSA-0113	for the Faculty of Mathematics and Information Science
Implementation and Maintenance of IT Systems	A. Ratkowski	60	103A-INIOP-ISP-WUS	
Intelligent Robot Systems	C. Zieliński	45	103A-ARxxx-DSP-ISR	
Introduction to Automatic Control, Electronics and Telecommunication	M. Ławryńczuk	45	103A-INxxx-ISP-WAET	
Introduction to Management Systems	K. Pieńkosz	75	103A-INxxx-ISP-WSYZ	
Introduction to Robotics	W. Szynkiewicz	60	103A-ARxxx-ISP-WR	
Mathematical Modelling	M. Kaleta	60	103A-INISY-MSP-MOM	
Microprocessor Systems in Process Control	P. Chaber	60	103B-ARxxx-ISP-SMS	
Modelling and Control of Manipulators	C. Zieliński	60	1130-EMARO-MSA-1002	for EMARO+ programme
Modelling and Control of Robots	C. Zieliński	45	103A-ARxxx-DSP-MORO	
Neural Networks	A. Pacut	60	103B-INSID-MSP-SNR	
Numerical Methods	P. Marusak	60	103A-CTxxx-ISA-ENUME	
Numerical Methods	P. Tatjewski	45	103B-INxxx-ISP-MNUM	
Object-Oriented Programming	T. Śliwiński	60	103B-INxxx-ISP-PROI	

Course Title	Lecturer	Hours per sem.	Course code	Notes
Operating Systems	T. Kruk	60	103B-INxxx-ISP-SOI	
Optimization Algorithms and Methods	A. Stachurski	60	103B-ARxxx-DSP-AMO	
Optimization Algorithms and Methods	A. Stachurski	60	6603A-KDPL-AMO	
Organization and Management of Software Projects			639B-INxxx-MEP-OZPUZ	for the WUT Distance Learning Center
Parallel and Distributed Programming			639B-INxxx-MEP-PRRUZ	for the WUT Distance Learning Center
Parallel and Distributed Programming	E. Niewiadomska-Szynkiewicz	60	103B-INISY-MSP-PORR	
Programmable Logic Controllers	J. Gustowski	45	103B-INSID-ISP-SP	
Programming Fundamentals	M. Kaleta	60	103A-CTxxx-ISA-EPFU	
Real-time Systems	T. Kruk	75	1130-EMARO-MSA-1003	for EMARO+ programme
Research Project	P. Pałka	60	103A-INISY-MSP-PBAD	
Robot Control and Simulation		60	103A-ARxxx-ISP-STERO	
Robot Programming Methods	C. Zieliński	60	103A-INISY-MSP-ERPM	
Signal Processing	W. Kasprzak	45	1130-EMARO-MSA-1004	for EMARO+ programme
Software Engineering	M. Szlenk	45	103C-INIIT-ISP-IOP	
Software Project Management	K. Pieńkosz	45	103D-INxxx-ISP-ZPI	
Synthesis of Decision Mechanisms			639B-INSWS-MEP-SMDUZ	for the WUT Distance Learning Center
System Architecture and Integration	A. Ratkowski	45	103A-INxxx-MSP-AIS	
Team Project 1		60	103A-INxxx-ISP-PZSP1	
Team Project 2	I. Żółtowska	116	103A-INxxx-ISP-PZSP2	
Techniques for Social Network Analysis	P. Arabas	60	103A-INSID-MSP-TASS	
Unix System and TCP/IP Network Administration	J. Sobczyk	60	103B-INSID-ISP-ASU	

3.1.2 Spring

Course Title	Lecturer	Hours per sem.	Course code	Notes
Advanced Process Control Techniques	P. Tatjewski	60	103C-ARxxx-MSP-TAP	
Algorithms and Data Structures	A. Zalewski	90	103D-INxxx-ISP-AISDI	
Anatomy of Robots	T. Winiarski	45	103A-ARxxx-ISP-ANRO	
Artifficial Inteligence Methods			639A-ETIKO-IEP-MESZ	for the WUT Distance Learning Center
Artificial Intelligence	W. Kasprzak	45	1130-EMARO-MSA-2005	for EMARO+ programme
Biometrics Authentication	M. Trokielewicz	45	103B-IBxxx-ISP-BIT	
Biometrics Authentication	M. Trokielewicz	45	103B-IBxxx-ISP-BIT	

Course Title	Lecturer	Hours per sem.	Course code	Notes
Case Studies (Biometry)	M. Trokielewicz	30	1120-MASMA-NSP-0241	for the Faculty of Mathematics and Information Science
Computer Management Systems	J. Granat		639B-INSWS-MEP-ISZUZ	for the WUT Distance Learning Center
Computer Networks	J. Sobczyk	60	103B-CTxxx-ISA-ECONE	
Computer Networks	J. Sobczyk	45	1030-IN000-ISP-0638	for the Faculty of Mathematics and Information Science
Computer Networks	J. Sobczyk	60	103C-INxxx-ISP-SKM	
Computer Systems for Control and Measurement	T. Winiarski	60	103A-INxxx-ISP-SKPS	
Computer Vision Techniques	A. Wilkowski	60	103A-INISY-MSP-TWM	
Cybersecurity – Social and Organization Security	A. Zalewski	60	103A-CBxxx-ISP-BESPO	
Data Bases 2	T. Traczyk	45	103C-INxxx-ISP-BD2	
Data Stream Processing and Data Science	J. Granat	75	103A-INISY-MSP-PSD	
Databases	T. Traczyk	15	1060-GI000-ISP-2009	for the Faculty of Geodesy and Cartography
Databases and Data Warehouses	T. Traczyk	45	1050-FTEDM-MSP-1BHD	for the Faculty of Physics
DCS and SCADA Systems	S. Plamowski	60	103A-ARxxx-ISP-DCS	
Diagnosis of Industrial Processes	S. Plamowski	45	103A-ARxxx-ISP-DIPR	
Dynamic Systems and Control	R. Nebeluk		103A-CTxxx-ISA-EDYCO	
Engineering Prototyping in Automatic Control and Robotics		60	103A-ARxxx-ISP-PIAR	
Essentials of Informatics and Programming	T. Śliwiński	75	103A-INxxx-ISP-PIPR	
Fundamentals of Operation Research	K. Pieńkosz	45	103B-ARxxx-ISP-POBO	
Implementation and Maintenance of IT Systems	A. Ratkowski	60	103A-INIOP-ISP-WUS	
Intelligent Machines	W. Dudek	75	103A-INSZI-ISP-IMA	
Internet System Architectures and Technologies			639B-INSWS-MEP-ATSUZ	for the WUT Distance Learning Center
Introduction to Automatic Control, Electronics and Telecommunication	P. Marusak	45	103A-INxxx-ISP-WAET	
Introduction to Management Systems	K. Pieńkosz	75	103A-INxxx-ISP-WSYZ	
Introduction to Robotics	W. Szynkiewicz	60	103A-ARxxx-ISP-WR	
Machine Perception	W. Kasprzak	60	103B-INSZI-ISP-PERM	
Management and Scheduling	I. Żółtowska	60	103B-INxxx-ISP-ZAH	
Management Information Systems	J. Granat	60	103B-INxxx-ISP-SIZ	
Mathematical Modelling	M. Kaleta	60	103A-INISY-MSP-MOM	

Course Title	Lecturer	Hours per sem.	Course code	Notes
Microprocessor Techniques 1	A. Manujło	30	1130-AR000-ISP-4019	for the Faculty of Power and Aeronautical Engineering
Mobile Robots	W. Szynkiewicz	60	1130-EMARO-MSA-2004	for EMARO+ programme
Modeling and Identification	P. Domański	60	103A-ARxxx-ISP-MODI	
Networked Intelligent Devices	M. Kamola	60	103A-INISY-MSP-SIU	
Numerical Methods	P. Tatjewski	45	103B-INxxx-ISP-MNUM	
Operating Systems	T. Kruk	60	103B-CSCSN-ISA-EOPSY	
Optimization Techniques	-. —	30	1130-EMARO-MSA-2008	for EMARO+ programme
Organization and Management of Software Projects			639B-INxxx-MEP-OZPUZ	for the WUT Distance Learning Center
Parallel Numerical Methods	A. Stachurski	60	103A-CSCSN-MSA-EPNM	
Pattern Recognition Algorithms	W. Kasprzak	60	6603A-KDPL-ARW	
Process Control	M. Ławryńczuk	60	103B-ARxxx-ISP-STP	
Programmable Logic Controllers	J. Gustowski	45	103B-INSID-ISP-SP	
Programming Fundamentals	M. Kaleta	60	103A-CTxxx-ISA-EPFU	
Programming Paradigms	M. Szlenk	45	103A-INxxx-ISP-PARP	
Reliable, Scalable and Maintainable IT Systems	T. Kruk	45	103A-INISY-MSP-ERSMS	
Research Project	P. Pałka	60	103A-INISY-MSP-PBAD	
Robot Programming Methods	C. Zieliński	60	1130-EMARO-MSA-2003	for EMARO+ programme
Smart Computer Techniques	W. Kasprzak		639B-INxxx-MEP-ITOUZ	for the WUT Distance Learning Center
Software Project Management	K. Pieńkosz	45	103D-INxxx-ISP-ZPI	
System Architecture and Integration	A. Ratkowski	45	103A-INxxx-MSP-AIS	
Team Project 2	I. Żółtowska	116	103A-INxxx-ISP-PZSP2	
Unix System and TCP/IP Network Administration	J. Sobczyk	60	103B-INSID-ISP-ASU	

3.2 Extramural Graduate Studies

Postgraduate studies **IT Resources Management: architectures, processes, standards, quality** are designed to provide students with current knowledge necessary for successful management of IT in modern organizations. The programme comprises: IT project management, quality standards and assurance systems, development methodologies, system testing, IT audit, business process modeling, system architectures and managerial skills. The classes take form of lectures, workshops, exercises and laboratories.

Postgraduate studies **Project Management: Standards, Practice, Techniques and Tools** merge theoretical knowledge with practical skills necessary for successful project management. The program encompasses: business case and project efficiency assessment, basic project management standards: PMBoK, PRINCE2, IPMA, specialized project management methods e.g. for IT (software development methods including agile approaches), automotive or construction industries, soft-skills like facilitation, negotiations, conflict management, public relations for project management, hard skills like project planning, scheduling, budgeting.

Postgraduate studies **Designing Information Systems with Databases** are intended for IT specialists, who want to acquire new skills in field of design and development of databases and information systems based on them. The programme contains: modeling of processes and data structures, basics of databases usage, engineering of information systems, data management systems, development of applications in systems with databases. The classes take form of lectures and laboratories.

3.3 Graduate Distance Learning

Starting from academic year 2005/2006 our institute is involved in graduate distance learning programme of WUT (named **OKNO**). We coordinate two specializations: Engineering of Internet Systems and Decision and Management Support Systems. The graduates of the first one are prepared for designing, implementing and taking care of complex information technology and computing systems using possibilities offered by contemporary computer networks. They have also ability to manage the layers of technology involved in the next generation of massive system deployments. The graduates of the latter are prepared for designing and implementing software systems which assist in managing, planning and decision making. Their skills and knowledge enable to manage the layers of technology involved in the new generation of intelligent systems empowering every aspect of business operations. First Ms.Sc. degree was awarded in the year 2008.

4 Projects

[PR1] NCBiR Grant APAKT No. CYBERSECIDENT/455132/III/NCBR/2020: **Online child abuse reacting system emphasizing child pornography**

Granting period: 01–06–2020 31–05–2023.

Principal investigator: Włodzimierz Kasprzak. Investigator: Wojciech Szynkiewicz, Artur Wilkowski, Maciej Stefańczyk.

Aim of the project: The research goal of the APAKT project is to develop artificial intelligence methods for analyzing threats in cyberspace consisting of the offering of multi-media content (including attacking by such content) and texts depicting the sexual exploitation of children, namely, a pornographic content involving children, erotic content involving children, pornographic content with created child's image (hereinafter referred to as illegal content) and adult pornography that in an obvious way threatens children (hereinafter referred to as the sensitive content). It is expected to use deep neural networks and other machine learning techniques supported by classic techniques of automatic recognition and verification of multi-media content (text, image, video, sound).

Expected results: The practical result of the APAKT project will take teh form of computational tools for analyzing threats related to the propagation of illegal and sensitive content in cyberspace, using automatically created models of their classification, which are built using modern techniques of artificial intelligence and pattern recognition. The content classification will be built into a hotline system that reacts to child pornography and monitors the infrastructure employed to these attacks.

Keywords: child pornography, cyberspace security, classification, deep neural networks

[PR2] NCBR Grant LaVA No. CYBERSECIDENT/488240/IV/NCBR/2021: **Laboratory for Vulnerability Analysis (LaVA) of stationary and mobile IT devices and algorithms and software**

Granting period: 01-05-2021 31-12-2023.

Principal investigator: Wojciech Szynkiewicz. Investigators: Krzysztof Cabaj, Patryk Chaber, Wojciech Dudek, Daniel Giełdowski, Maciej Ławryńczuk, Piotr Marusak, Robert Nebeluk, Sebastian Plamowski, Andrzej Wojtulewicz, Krzysztof Zarzycki, Cezary Zieliński.

Aim of the project: The project's main objective is to build a vulnerability analysis laboratory equipped with an experimental laboratory station for testing vulnerabilities, devices, and software; vulnerability scanning in IT systems using innovative methods developed during the project; tools for static analysis of applications and behavioural analysis. The project will develop a coherent methodology for conducting security research on next-generation ICT network backbone components (in particular 5G), mobile devices and applications, Internet of Things systems, and Cyber-Physical Systems. Important results of the project will also include new methodologies for vulnerability detection of advanced control algorithms based on artificial intelligence techniques. Methods and algorithms developed within the project will contribute to the automatic identification of vulnerabilities in exploited software.

Keywords: vulnerability, cyber security, lab, IT device testing, software testing

[PR3] NCN Grant No. 505/00808/1031: **Using depth data for perspective correction of RGB descriptors**

Granting period: 28–03–2018 27–03–2023.

Principal investigator: Maciej Stefańczyk.

Aim of the project: In almost every service-robotics task, that requires cooperating with people or working in human environment, one of the key aspects is object recognition. In contrast to structured factory environments, where objects are placed in specific places (e.g. on conveyors) objects in house may be placed virtually anywhere. They can be also occluded (by other objects), distorted (e.g. creased box or bag) or deformed in anyway. Thus, robust object recognition methods are required. A lot of objects, that people cope with every day, contain distinct texture. For textured objects the existing recognition and localization methods rely on matching feature point sets of object's model to the points extracted from current scene. There is, however, crucial problem in this approach measurement distortions (scaling, rotation, perspective). Current algorithms cope with some of those problems, but there are no universal methods for distortion removal in object recognition task. The biggest problem is, undoubtedly, perspective distortion. In case, when measurements are supplemented with depth maps (aligned with color image) it is possible to calculate surface characteristics of the object around the keypoint. This information can then be used to apply perspective correction either to image itself or, if possible, inside feature descriptor algorithm. This additional step, in general, can be applied to any RGB descriptor, making them robust against perspective distortions and, as a result, making object detection and localization algorithms work better.

Expected results: Research in the project will start from recreation of already carried out feasibility studies (described in following section) and creation of initial algorithm version working with planar or nearly planar surfaces. Next, more surface types will be added, with spherical and cylindrical for example. For every surface types mathematical models of reprojection to camera frame and rejection of unstable points will be created. In parallel to those tasks, preparation of testing environment will be carried out. This includes preparation of simulator and gathering multiple test images (extension of object database). Last task is algorithms testing itself. This will be interleaved with theoretical and implementation works.

Keywords: computer vision, image processing, object recognition, feature points, descriptors, RGB-D

[PR4] NCN Grant SHENG 1 No. UMO-2018/30/Q/HS4/00764: **Advancing methodology of integrated decision-making support for sustainable development**

Granting period: 21–08–2019 20–08–2023.

Project in association with Systems Research Institute of the Polish Academy of Sciences and collaboration with the East China University of Science and Technology.

Principal investigator: Janusz Granat

Aim of the project: The overall project objective is to advance methods for science-based decision-making support in key problems of sustainable development, especially in trade-off analysis between attainable goals for economic efficiency, quality of environment, and human well-being. The overall objective is decomposed into the following Operational Objectives (OOs), each advancing methods in specific elements of Multi-Criteria Analysis (MCA) and verifying the developed methods through applications to real-life complex problems:

OO-1: Fairness. Build into the MCA methods minimizing inequalities in representing interests of diverse stakeholders. Verify the approach on multi-level supply chain in the China energy system model.

OO-2: Robust portfolios. Develop effective methods for handling uncertain factors of technological advancement and market prices. Verify the methods on technology portfolios with China's energy systems.

OO-3: Pareto set analysis. Develop methods for representing efficient-solutions' subsets fitting diverse preferences. Verify the methods on the China's model focused on decarbonization of energy-intensive industries.

OO-4: Post-interactive analysis. Develop methods for supporting users in effective selection of manageable subsets of Pareto-solutions that fit best diverse user preferences on attainable goals for competing criteria. Verify the approach on the China's energy system models.

Expected results: Rational decision-making, especially related to sustainable development, requires consistent consideration of societal and industrial problems that are increasingly complex and involve analysis of conflicts and synergies between diverse attainable goals for criteria measuring the development, such as various types costs and key elements of human well-being (e.g., availability of energy, clean water, as well as health impacts, quality of environment). Here, effective and efficient MCA methods are indispensable. Science, understood as organized knowledge, provides methods for integrating knowledge into model representations of relations between possible decisions and consequences of their implementation, as well as for knowledge creation through the model MCA. However, despite much progress in model-based decisionmaking support, some elements of the MCA still inadequately support problem analysis, which results in oversimplifications of the analysis, and thus hampers the effectiveness of the decision-making support. The project will, by filling the gaps in the MCA methods, not only provide effective methods for solving problems in sustainable development but also improve the basis for further development of science.

Keywords: sustainable development, decision-making support, multi-criteria analysis, fairness, uncertainty, robust.

[PR5] Warsaw University of Technology Centre for Priority Research Area Artificial Intelligence and Robotics Grant No. 504/04496/1031/45.010201: **Look & learn: Skill acquisition by a companion robot based on task demonstration**

Granting period: 10–07–2020 30–06–2022.

Principal investigator: Wojciech Szynkiewicz. Investigators from ICCE: Patryk Chaber, Paweł D. Domański, Wojciech Dudek, Maksym Figat, Włodzimierz Kasprzak, Maciej Ławryńczuk, Piotr Marusak, Robert Nebeluk, Piotr Pałka, Dawid Seredyński, Maciej Stefańczyk, Maciej Węgierek, Artur Wilkowski, Tomasz Winiarski, Cezary Zieliński.

Aim of the project: The aim of the project is to develop key technologies and methods necessary to construct a companion robot control system. A robot of this type must not only operate autonomously in home or office environments, but also interact socially with humans. The project is focused on the most important research issues related to robot programming by demonstration. The robot learns from examples of tasks performed by humans (look-and-learn). The way to delegate tasks to the robot must be easy to master by unskilled users.

Expected results: The result of the research work will be the structure of the robot control system that will contain modules responsible for: knowledge representation and processing, task planning and control of robot effectors and receptors. Knowledge representation module will take into account perception, i.e. the results of processing of current observation of the environment. The methods developed in the project will be experimentally verified on real robots.

Keywords: robot companion, programming by demonstration, skills, control system

[PR6] Warsaw University of Technology Centre for Priority Research Area Artificial Intelligence and Robotics Grant No. 504/04496/1031/45.010601: **WUT Experts for Engineering and Scientific Projects (E2SP) at NICA**

Granting period: 07-07-2020 30–06–2022.

Principal investigator: Maciej Ławryńczuk. Investigators from ICCE: Patryk Chaber, Paweł D. Domański, Robert Nebeluk, Sebastian Plamowski, Tomasz Traczyk, Andrzej Wojtulewicz, Krzysztof Zarzycki.

Aim of the project: The purpose of the e-PIN project is to significantly develop the participation of WUT in the Nuclotron based Ion Collider fAcility (NICA) project being developed in Joint Institute for Nuclear Research (JINR), including participation in scientific research as part of both experiments, Monte-Carlo simulation of heavy-ion collisions, development of model predictions for physical processes and detector parameters, and a very wide contribution to design, construction, commissioning and use of all elements of the detection systems.

Expected results: Development of model predictions for nuclear collisions at NICA energies, and their registration process by MPD detector systems. Support of the monitoring of test equipment installation by EqDb (Equipment Database). SCADA WinCC SIEMENS for MPD. ECS Experiment Control System for NICA-MPD-PLATFORM. Support Systems for MPD. MCORD electronic muon subsystem. MPD thermal stabilisation.

Keywords: Joint Institute for Nuclear Research, Nuclotron-based Ion Collider fAcility, ion collision physics, measurement electronics, experiment support systems

[PR7] **Warsaw University of Technology Centre for Priority Research Area Artificial Intelligence and Robotics Grant No. 504/04496/1031/45.010202: Safety-aware Management of robot's Interruptible Tasks in dynamic environments (SMIT)**

Granting period: 03–01–2022 31–12–2023.

Principal investigator: Wojciech Dudek, Other investigators: Tomasz Winiarski (WUT), Maciej Stefańczyk (WUT), Daniel GIełdowski (WUT).

Aim of the project: The project aims to develop methods to schedule service robot tasks considering exogenous agents moving around and changing the environment. The principal methods under consideration incorporate machine learning algorithms for task request schedules and task execution time estimations. Therefore, the work requires optimised tools for teaching machine learning algorithms constituting part of a service mobile robot controller. The research is conducted in cooperation with PAL Robotics company, the producer of the popular service robot TIAGo. Expected results: As part of the first phase of the research, the tools generating simulated environments and human trajectories were developed. With their use database of environments and scenarios where generated humans move around was created. The scenarios can be executed to represent various situations the robot may encounter. A metamodel for designing and developing a robotic system with simulation is also proposed. The essential advantage of the metamodel is the quantitative evaluation of the system in terms of the integrity between simulated and physical parts. Finally, the first phase ended with testing machine learning algorithms for robot task selection. As part of the second phase of the research, it is planned to decompose the scheduling problem into task execution time estimation, task request prediction, and task selection and development of optimised algorithms for the particular subproblems.

Keywords: robot system development, system engineering, machine learning, scheduling.

[PR8] **Scientific Council for the Discipline of Automatic Control, Electronics and Electrical Engineering Grant No. 504 /04764/ 1031 /43. 022201: Computationally efficient model predictive control algorithms based on new structures of neural models.**

Granting period: 06–05–2022 31–12–2023.

Principal investigator: Maciej Ławryńczuk. Investigator: Krzysztof Zarzycki.

Aim of the project: The aim of the project is to develop computationally efficient nonlinear predictive control algorithms in which new neural models will be used for prediction. Effectiveness of Long Short-Term Memory (LSTM) and Gate Recurrent Units (GRU) structures will be evaluated. To obtain a computationally simple solution, the model or the predicted trajectory will be linearized which will lead to a quadratic optimization task. Expected results: An accepted article for an open access journal with a minimum score of 70 points, with the ultimate goal of 100+ points. An accepted paper in a foreign conference. Significant advancement of the PhD dissertation.

Keywords: Model predictive control, neural networks, nonlinear models, optimisation.

[PR9] **Scientific Council for the Discipline of Automatic Control, Electronics and Electrical Engineering Grant No. 504 /04764/ 1031 /43. 022202: Fast model predictive control algorithms with alternative maximum cost function: analytical and neural approaches.**

Granting period: 06–05–2022 31–12–2023.

Principal investigator: Robert Nebeluk. Investigator: Maciej Ławryńczuk.

Aim of the project: The aim of the project is to develop computationally efficient. nonlinear predictive control algorithms with alternative maximum cost function. Two approaches will be considered: analytical formulation and neural approximation. For considered cost-function, the rudimentary nonlinear optimization problem will be transformed to a computationally simple quadratic task. The results will be compared with the classical solution relying on the quadratic cost-function.

Expected results: An accepted article for an open access journal with a minimum score of 70 points, with the ultimate goal of 100+ points. An accepted paper in a foreign conference. Significant advancement of the PhD dissertation. Keywords: Model predictive control, nonlinear models, optimisation.

[PR10] Warsaw University of Technology Centre for Priority Research Area Artificial Intelligence and Robotics Grant No. 504450100039: **Development of artificial intelligence algorithms in the study of archival digital images from the crime scene**

Granting period: 01.2021-12.2022

Principal investigator: Dorota Zawieska, Other investigators: Kamila Barbara Kalinowska (WUT), Artur Wilkowski (WUT), Jakub Markiewicz (WUT), Robert Sitnik (WUT), Patryk Kot (Liverpool John Moores University), Mogomed Muradov (Liverpool John Moores University)

Aim of the project: The aim of the project is to develop a methodology for the use of image processing algorithms and Deep Neural Networks in the process of detecting and classifying injuries on the outer skin of the body on the basis of postmortem images of victims of criminal incidents. The research is conducted in cooperation with the Department of Forensic Medicine (abbr. ZMS) of the Medical University of Warsaw and Liverpool John Moores University

Expected results: As part of the first phase of the research, the proprietary TIP (Tissue-Injuries of Postmortem dataset) database was developed with over 150,000 digital

images obtained as a result of the scientific internship of one of the contractors at the Department of Forensic Medicine of the Medical University of Warsaw. There was also proposed and experimentally verified a method for injury detection and classification. As part of the second phase of the research, it is planned to develop 3D model of the human body silhouette and to combine it with injury detection and classification results obtained during the first phase of the research into a common model.

Keywords: postmortem imaging, injury detection, injury classification, pathology, forensic pathology

[PR11] Research agreements with Sąd Okręgowy w Warszawie, Sąd Okręgowy w Lublinie, Sąd Okręgowy w Rzeszowie and Sąd Okręgowy w Krakowie: **Expert opinions on the information systems and servises.**

Principal investigator: Andrzej Zalewski.

[PR12] **Commercial project for Valmet Automation No. 501210102786: Control performance assessment study for boiler K2 and K7 aiming at future boiler optimization implementation.**

Period: 30–11–2022 15–12–2022.

Principal investigator: Paweł D. Domański. Investigators: Robert Nebeluk.

Aim of the project: The control feasibility study aimed at the base control loops assessing the possibility to implement boiler optimization for Veolia Energia Łódź SA, EC4 at boilers K2 and K7.

Expected results: The control performance assessment study document.

Keywords: boiler optimization, control assessment, KPIs.

[PR13] **Commercial project for Valmet Automation No. 501210102741: Reverse engineering and the startup of the unit simulator for the CFB boiler at CHP Vilnius.**

Period: 04–10–2022 30–06–2023.

Principal investigator: Paweł D. Domański

Aim of the project: The reverse engineering and the preparation of the documentation for the Waste to Energy fluidized bed boiler at the Combined Heating Plant Vilnius, Lithuania.

Expected results: Product documentation.

Keywords: Waste to Energy, fluidized bed boiler, symulator.

[PR14] **Commercial project for Valmet Automation No. 501210102787: Implementation of the predictive and diagnostic system for the steam distribution system at GA ZAK S.A.**

Period: 30–11–2022 31–05–2023.

Principal investigator: Paweł D. Domański. Investigators: Robert Nebeluk, Krzysztof Zarzycki, Patryk Chaber.

Aim of the project: The analysis of the steam distribution system, the preparation of the short-term steam consumption models and the evaluation of the statistical anomaly prediction system.

Expected results: prediction models and anomaly detection software.

Keywords: steam network, anomaly detection, short-term predictions.

5   Degrees Awarded

5.1   Ph.D. Degrees

Advisor: **Cezary Zieliński**

Maksym Figat
Automatic generation of robotic system controllers based on a specification
Thesis defended on October 19, 2022

Advisor: **Andrzej Pacut**

Ewelina Bartuzi-Trokielewicz
Presentation attack-resistant palm recognition for mobile devices in unconstrained conditions
Thesis defended on November 17, 2022

Mohammadreza Azimi
Investigation into the Reliability of Contactless Biometric Systems
Thesis defended on April 25, 2022

5.2   M.Sc. Degrees

Advisor: **K. Borowa**

M. Białek
Narzędzie wspomagające analizę transkrypcji nagrań
Degree awarded on June 2022

I. Gołoś
System do raportowania wyników testów
Degree awarded on June 2022

Advisor: **P. Chaber**

M. Banasik
Opracowanie języka do zarządzania eksperymentami dot. regulacji w systemach wbudowanych
Degree awarded on February 2022

J. Ciemięga
Projekt i realizacja stanowiska szkoleniowo-badawczego, wykorzystującego komponenty serii ctrIX firmy Bosch Rexroth do zastosowań w Przemyśle 4.0
Degree awarded on February 2022 (praca utajnona)

A. Solawa
Opracowanie oprogramowania na systemy wbudowane do testowania urządzeń z wykorzys-

taniem protokołu MODBUS RTU
Degree awarded on February 2022

K. Stpiczyńska
Opracowanie języka do zarządzania eksperymentami dot. regulacji w systemach wbudowanych
Degree awarded on February 2022

J. Szczytko
Wizualizacja danych pomiarowych z wykorzystaniem trójwymiarowej siatki LED
Degree awarded on September 2022

Advisor: **P. Domański**

W. Szerszeń
Realizacja łącza radiowego przekazującego dane monitorujące pomiędzy platformą mobilną a kokpitem sterującym
Degree awarded on February 2022

Advisor: **W. Grabski**

M. Figurski
System zarządzania instalacją inteligentnego domu
Degree awarded on June 2022

Advisor: **J. Gustowski**

Łukasz
B. System prywatnej komunikacji tekstowej w sieci lokalnej
Degree awarded on February 2022

S. Kubiszewski
Aplikacja do archiwizacji i przeglądania zdjęć na urządzenia mobilne z systemem Android
Degree awarded on February 2022

M. Pansevich
Medical social network
Degree awarded on February 2022

Advisor: **A. Janicki**

A. Zawadzka
Stworzenie polskiej adaptacji narzędzia Coh-Metrix w zakresie wybranych metryk
Degree awarded on October 2022

Advisor: **M. Kaleta**

F. Czermiński
Modelowanie systemu elektroenergetycznego przy scenariuszu wzrostu liczy instalacji fotowoltaicznych
Degree awarded on June 2022

M. Kaliński
Automatyzacja wyborów do Samorządu Studentów PW: identyfikacja, projekt, implementacja

i diagnostyka systemu
Degree awarded on September 2022

P. Martyniuk
Projekt i implementacja chatbota wspierającego obsługę spraw studenckich
Degree awarded on June 2022

Advisor: **W. Kasprzak**

M. Dudzisz
Rozpoznawanie słów kluczowych w sygnale mowy z wykorzystaniem kodera neuronowego
Degree awarded on September 2022

P. Kostrzeński
Opracowanie kodera fonemów języka polskiego z wykorzystaniem głębokich sieci neuronowych
Degree awarded on September 2022

Advisor: **T. Kruk**

M. Bukało
Koncepcje EDR i Zero Trust Security
Degree awarded on September 2022

Advisor: **A. Krzemienowski**

K. Kukiełka
System wspomagania decyzji do wyboru odpornego portfela inwestycyjnego
Degree awarded on March 2022

Advisor: **H. Kułakowski**

M. Kiljan
Aplikacja webowa wspomagająca proces magazynowania wykorzystująca algorytm ML do rozpoznawania produktów ze zdjęcia
Degree awarded on February 2022

Advisor: **M. Ławryńczuk**

J. Bocheński
Stanowisko laboratoryjne lewitacji: konstrukcja, identyfikacja modelu i regulacja
Degree awarded on September 2022 (with honors)

Advisor: **M. Modrzejewski**

M. Rokita
System przetwarzania danych lokalizacyjnych w czasie rzeczywistym
Degree awarded on February 2022

Advisor: **E. Niewiadomska-Szynkiewicz**

A. Pyrka
Platforma blockchain do wynajmu wakacyjnego
Degree awarded on June 2022

Łukasz
S. Platforma transakcyjna inteligentnych urządzeń z wykorzystaniem technologii rozproszonych rejestrów i mikrokontrolerów
Degree awarded on June 2022

W. Zieliński
Aplikacja blockchain do automatycznej rezerwacji i płatności w portach jachtowych
Degree awarded on February 2022

Advisor: **P. Pałka**

M. Karpowicz
Kreowanie strategii marketingowej na podstawie analizy wieloagentowego modelu społeczeństwa
Degree awarded on September 2022

K. Kipa
Aplikacja wspierająca podejmowanie decyzji w systemach aukcyjnych
Degree awarded on September 2022

L. Wrońska
Aplikacja mobilna z elementem grywalizacji wspierająca budowanie świadomości ekologicznej
Degree awarded on June 2022

Advisor: **S. Plamowski**

M. Kruk
Aplikacja do prezentacji trendów wartości procesowych wraz z miarami statystycznymi
Degree awarded on February 2022

P. Rzewnicki
Aplikacja do budowy modeli i analizy trendów wartości procesowych
Degree awarded on February 2022

Advisor: **A. Ratkowski**

M. Bieńkowski
Skalowalny system wspierający platformę do prowadzenia spotkań w czasie rzeczywistym z wykorzystaniem interaktywnej tablicy
Degree awarded on February 2022

J. Kieżun
Aplikacja mobilna w technologii hybrydowej (Flutter) wraz z komponentami backendowymi w technologii .NET Core w chmurze Google Cloud, skalowalnymi przy użyciu Kubernetes
Degree awarded on June 2022

J. Komorowski
Aplikacja mobilna w technologii hybrydowej wraz z komponentami backendowymi w chmurze

Google Cloud - część backendowa
Degree awarded on September 2022

K. Kryczka
Aplikacja w technologii hybrydowej do komunikacji w czasie rzeczywistym z systemem spotkań i interaktywną tablicą
Degree awarded on February 2022

K. Lubiszewski
Aplikacja mobilna w technologii hybrydowej (np. React Native) wraz z komponentami backendowymi w chmurze Google Cloud
Degree awarded on September 2022

N. Orzechowski
Aplikacja umożliwiająca skanowanie systemów DCS/SCADA oraz baza podatności urządzeń automatyki
Degree awarded on February 2022

Advisor: **S. Stefańczyk**

D. Chmielewiec
Wykorzystanie oprogramowania do modelowania 3D w procesie uczenia głębokich sieci neuronowych
Degree awarded on February 2022

K. Kostecki
Rozpoznawanie luster i szyb na potrzeby tworzenia semantycznej mapy otoczenia
Degree awarded on February 2022

I. Obrępalski
Analiza porównawcza współczesnych sensorów 3D
Degree awarded on September 2022

Advisor: **M. Szlenk**

M. Pruk
Tworzenie graficznego interfejsu użytkownika przy użyciu wzorca trybu natychmiastowego
Degree awarded on June 2022

Advisor: **T. Winiarski**

H. Kowalski
Platforma sprzętowo-programowa Miniryśboard V5
Degree awarded on February 2022

I. Rudnicki
Poszukiwanie przedmiotu o nieznanym a priori położeniu przez robota
Degree awarded on February 2022

Advisor: **A. Wojtulewicz**

B. Goławski
Bezpieczny system sterowania i akwizycji danych z urządzeń wykonawczych oraz czujników w

strukturach typu smart-home
Degree awarded on February 2022

J. Gruszecki
Opracowanie sieciowego modułu wielokanałowej regulacji temperatury
Degree awarded on June 2022

M. Lipiński
Szerokopasmowa głowica detekcyjna bazująca na mikrofonach w technologii MEMS, PDM oraz FFT
Degree awarded on September 2022

M. Wojtkowski
Opracowanie systemu cyfrowego do numerycznego sterowania silników krokowych na bazie technologii CNC. Interpreter komend typu GCODE
Degree awarded on September 2022

Advisor: **A. Zalewski**

Łukasz
G. Wyszukiwanie plagiatów/klonów kodu w publicznie dostępnych źródłach
Degree awarded on September 2022

Advisor: **I. Żółtowska**

B. Janowski
Opracowanie aplikacji do analizy i wizualizacji upakowania paczek na paletach
Degree awarded on September 2022

F. Mazur
Aplikacja do rozpoznawania struktury grafu z obrazu rastrowego
Degree awarded on February 2022

M. Parafiniuk
Rozwój aplikacji do modelowania algorytmu podziału i ograniczeń na potrzeby dydaktyczne
Degree awarded on March 2022

5.3   B.Sc. Degrees

Advisor: **P. Arabas**

P. Cisło
Analizy dynamiki forum internetowego
Degree awarded on October 2022 (with honors)

T. Jóźwik
Numeryczna symulacja energooszczędnych algorytmów routingu dla klastrów obliczeniowych
Degree awarded on August 2022 (with honors)

Advisor: **A. Buchowicz**

M. Nawój
Analiza porównawcza metod redukcji szumów w obrazach cyfrowych
Degree awarded on October 2022 (OKNO)

Advisor: **T. Czarnecki**

T. Zdybel
Bezpieczeństwo aplikacji opartych o mikroserwisy w środowisku Azure
Degree awarded on October 2022 (OKNO)

Advisor: **P. Domański**

P. Detko
Wykorzystanie kamery RGB-D do zadania oznaczania i śledzienia celów dla autonomicznej platformy mobilnej
Degree awarded on October 2022

M. Grochowina
Wykorzystanie właściwości światłowodów w aparaturze kontrolno-pomiarowej na postawie systemu kontroli wycieku na rurociągu przemysłowym
Degree awarded on February 2022

P. Kacperski
Kokpit sterowniczy dla pojazdu autonomicznego
Degree awarded on February 2022

B. Kawka
Weryfikacja możliwości regulacji mocy za pomocą farmy wiatrowej
Degree awarded on October 2022

Advisor: **G. Gliński**

A. Karwowski
Sieciowy system do wyszukiwania i rekomendacji książek na podstawie ich zdjęć
Degree awarded on June 2022 (OKNO)

Advisor: **J. Granat**

A. Mrozowska
Wykorzystanie bazy danych NoSQL w hurtowniach danych
Degree awarded on October 2022

K. Zagórski
Metody aproksymacji zbioru rozwiązań w zadaniach analizy wielokryterialnej
Degree awarded on October 2022

Advisor: **K. Hryniów**

A. Kubań
Identyfikacja zagrożeń online
Degree awarded on March 2022 (OKNO)

Advisor: **M. Kaleta**

M. Górecka
Metoda wspomagania decyzji związanych z wprowadzaniem działań niefarmaceutycznych w czasie epidemii
Degree awarded on October 2022

M. Zych
Uwzględnienie kryterium ekonomicznego w planowaniu działań niefarmaceutycznych
Degree awarded on October 2022

Advisor: **M. Kamola**

G. Kuduk
Rozproszone uczenie maszynowe w sieci mikrokontrolerów
Degree awarded on November 2022

T. Słuszniak
Monitorowanie poziomu zanieczyszczenia hałasem stref miejskich w oparciu o system rozproszony z przetwarzaniem danych na krawędzi
Degree awarded on March 2022

M. Sołtysiak
Predykcja chorób roślin
Degree awarded on October 2022

Advisor: **W. Kasprzak**

B. Jankowski
Modelowanie i rozpoznawanie aktywności osoby w sekwencji wideo z wykorzystaniem technik uczenia maszynowego
Degree awarded on March 2022

S. Puchała
Modelowanie i rozpoznawanie interakcji pary osób w sekwencji wideo z wykorzystaniem rekurencyjnych sieci neuronowych
Degree awarded on March 2022

Advisor: **S. Kijas**

M. Suchocki
Analiza porównawcza wdrożenia automatyzacji procesów Ciągłej Integracji i Ciągłego Dostarczania w Jenkins i Azure DevOps
Degree awarded on October 2022 (OKNO)

Advisor: **B. Konarzewski**

K. Midura
Modelowanie transportu radionuklidów w atmosferze z wykorzystaniem sieci neuronowej
Degree awarded on October 2022 (OKNO)

Advisor: **P. Korpas**

P. Kubacki
Projektowanie aplikacji webowej z wykorzystaniem makiety urządzenia
Degree awarded on October 2022 (OKNO)

Advisor: **T. Kruk**

S. Kamoda
Wykorzystanie chmury obliczeniowej przez firmy z sektora finansowego w kontekście zgodności z krajowym prawodawstwem oraz branżowymi standardami
Degree awarded on October 2022

K. Kaptur
Cyberbezpieczeństwo systemu wspomagającego zarządzanie flotą aut opartego o IoT i chmurę obliczeniową
Degree awarded on March 2022 (OKNO)

R. Koguciuk
Bezpieczne zdalne przeprowadzenie testów programistycznych
Degree awarded on March 2022

T. Mazur
Architektura zbierania zapisów aplikacji w klastrze Kubernetes
Degree awarded on October 2022 (with honors)

M. Mozolewski
Zarządzanie metadanymi węzłów klastra Kubernetes z wykorzystaniem operatora
Degree awarded on October 2022

K. Patro
Analiza strategii organizacji kodu źródłowego w systemach kontroli wersji
Degree awarded on March 2022 (OKNO, with honors)

Advisor: **A Krzemienowski**

A. Pylkevych
Analiza porównawcza wybranych kwantylowych miar ryzyka w optymalizacji portfela inwestycyjnego
Degree awarded on October 2022

Advisor: **M. Ławryńczuk**

J. Morawski
Sieci neuronowe ELM w modelach Winera i regulacji predykcyjnej
Degree awarded on October 2022

K. Seweryn
Projekt i wykonanie stanowiska laboratoryjnego kulka na płaszczyźnie
Degree awarded on March 2022

R. Tuzimek
Konstrukcja oraz algorytmy sterowania gaśniczego robota mobilnego
Degree awarded on October 2022

Advisor: **J. Mulawka**

K. Paczuski
System rekomendacji dla strukturalnych opisów radiologicznych
Degree awarded on October 2022

Advisor: **E. Niewiadomska-Szynkiewicz**

R. Gryta
Modelowanie użytkownika urządzenia mobilnego na podstawie danych zbieranych z urządzenia
Degree awarded on June 2022

M. Kowalczewski
Modelowanie i optymalizacja zużycia energii w bezprzewodowych sieciach sensorowych
Degree awarded on October 2022

M. Nawrot
Energooszczędna alokacja zadań w chmurach obliczeniowych
Degree awarded on March 2022

Advisor: **P. Pałka**

M. Fijałkowski
Opracowanie szkieletu ramowego projektowania systemów grywalizacji
Degree awarded on October 2022

Advisor: **S. Plamowski**

D. Petrykowski
Algorytmy do wspomagania handlu na rynkach walutowych
Degree awarded on February 2022

J. Zgorzelski
Wpływ metody projektowania na koszt wytworzenia i utrzymania systemu bezpieczeństwa
Degree awarded on March 2022

Advisor: **G. Protaziuk**

S. Jelonkiewicz
Analiza porównawcza architektur monolitycznej oraz mikroserwisowej
Degree awarded on March 2022 (OKNO)

Advisor: **A. Ratkowski**

M. Citko
Wykorzystanie analizy składniowej do wykrywania zapachów kodu w aplikacjach na system Android
Degree awarded on March 2022 (OKNO)

S. Wacławiec
The use of RFID technology in retail sales as a barcode substitute. RFID system prototype with product localization software.
Degree awarded on June 2022 (OKNO)

T. Wiwała
Synchronizacja danych offline we współczesnych aplikacjach mobilnych
Degree awarded on March 2022

Advisor: **R. Roszczyk**

P. Kowalski
Analiza wydajności aplikacji webowych w oparciu o mechanizmy testowania automatycznego
Degree awarded on October 2022 (OKNO)

Advisor: **R. Sitnik**

J. Banaszkiewicz
Ocena dokładności i powtarzalności rejestrowania ruchu metodą bezznacznikową przy użyciu sieci neuronowych
Degree awarded on March 2022

Advisor: **M. Szlenk**

T. Kot
Tworzenie edytorów projekcji (ang.projectional editor) przy użyciu Meta Programming System
Degree awarded on March 2022

Advisor: **W. Szynkiewicz**

B. Bok
System podejmowania decyzji robotów podczas meczu piłki nożnej
Degree awarded on October 2022

Advisor: **Ż. Świderska-Chadaj**

R. Karp
Generacja danych graficznych z wykorzystaniem generatywnych sieci współzawodniczących
Degree awarded on March 2022 (OKNO)

Advisor: **T. Trzciński**

T. Szczepański
Classification and bias analysis based on chest X-rays of patients with COVID-19
Degree awarded on March 2022

Advisor: **A. Wilkowski**

M. Dolicher
Wizyjny system inwentaryzacji biblioteki
Degree awarded on October 2022

J. Pietrowcew
Rozpoznawanie aktywności osób w sekwencjach wideo przy użyciu cech niskopoziomowych
Degree awarded on October 2022

Advisor: **T. Winiarski**

A. Jaworska
Symulacja zrobotyzowanej autonomicznej linii produkcyjnej
Degree awarded on March 2022

Advisor: **P. Witoński**

R. Lechowicz
Analiza porównawcza systemów internetowych polskich klubów piłkarskich
Degree awarded on June 2022 (OKNO)

Advisor: **P. Wnuk**

A. Pietrzak
Techniki udostępniania API urządzeń pracujących w sieci lokalnej z dostępem do Internetu, bez konieczności rekonfiguracji urządzeń sieciowych wraz z przykładową implementacją
Degree awarded on October 2022 (OKNO)

Advisor: **A. Wojtulewicz**

M. Kędzierski
Zaawansowane metody sterowania trójfazowymi silnikami asynchronicznymi
Degree awarded on October 2022

Advisor: **A. Zalewski**

P. Połatyński
Wspomaganie podejmowania decyzji architektonicznych z wykorzystaniem metod BigData oraz sieci społecznościowych
Degree awarded on October 2022

M. Pomiankiewicz
Funkcjonowanie zespołów scrumowych – studium przypadku
Degree awarded on March 2022

T. Wojewoda
Funkcjonowanie zespołów deweloperskich w wytwarzaniu oprogramowania metodykami zwinnymi – systematyczny przegląd literatury
Degree awarded on March 2022 (OKNO)

Advisor: **I. Żółtowska**

S. Balcerowski
Możliwości zastosowania technologii FaaS w aplikacjach opartych o architekturę mikroserwisów
Degree awarded on March 2022 (OKNO)

F. Bielecki
Rozwój środowiska symulacyjnego dla testowania algorytmów równoważenia obciążeń w sieci Mobile Edge Computing
Degree awarded on March 2022 (OKNO)

M. Biśtyga
Analiza możliwości wykorzystania architektury rozproszonej w systemach automatycznego monitoringu wizyjnego
Degree awarded on October 2022 (OKNO)

A. Dziedziczak
Opracowanie algorytmów i analiza wykrywania anomalii w ruchu drogowym
Degree awarded on October 2022 (OKNO)

6   Publications

6.1   Scientific or Technical Books

[B1] R. Szewczyk, C. Zieliński, and M. Kaliczyńska, Eds., *Automation 2022: New Solutions and Technologies for Automation, Robotics and Measurement Techniques*, ser. Advances in Intelligent Systems and Computing, 2022, vol. 1427.

[B2] E. Niewiadomska-Szynkiewicz, M. Marks, P. P. Arabas, and A. Sikora, *Bezprzewodowe sieci czujników w internecie rzeczy Modele - Algorytmy - Protokoły*, 2022.

[B3] M. Ławryńczuk, *Nonlinear Predictive Control Using Wiener Models*. Cham: Springer International Publishing, 2022.

[B4] P. Domański, Y. Chen, and M. Ławryńczuk, Eds., *Outliers in Control Engineering. Fractional Calculus Perspective*, ser. Fractional Calculus in Applied Sciences and Engineering, 2022, vol. 10.

[B5] P. Chaber, R. Nebeluk, A. Wojtulewicz, and K. Zarzycki, *Podstawy automatyki. Ćwiczenia laboratoryjne*, Warszawa, 2022.

[B6] A. Mazur and C. Zieliński, Eds., *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, 2022, no. 197.

[B7] J. Gustowski and A. Wojtulewicz, *Sterowniki programowalne. Ćwiczenia laboratoryjne*, Warszawa, 2022.

[B8] S. Plamowski and A. Wojtulewicz, *Systemy DCS i SCADA*, Warszawa, 2022.

6.2   Scientific and Technical Papers in Books

[P1] K. Chachuła and M. Stefańczyk, "The utilization of spherical camera in simulation for service robotics", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 17–26.

[P2] P. Domański, Y. Chen, and M. Ławryńczuk, "1 outliers in control engineering-they exist, like it or not", in *Outliers in Control Engineering. Fractional Calculus Perspective*, ser. Fractional Calculus in Applied Sciences and Engineering, P. Domański, Y. Chen, and M. Ławryńczuk, Eds., 2022, vol. 10, pp. 1–24.

[P3] P. Domański and M. Ławryńczuk, "6 study on robustness of nonlinear model predictive control performance assessment", in *Outliers in Control Engineering. Fractional Calculus Perspective*, ser. Fractional Calculus in Applied Sciences and Engineering, P. Domański, Y. Chen, and M. Ławryńczuk, Eds., 2022, vol. 10, pp. 115–132.

[P4] W. A. Dudek, "Uproszczony model systemu sterowania robota rozważnie zarządzającego przerywalnymi zadaniami", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 127–136.

[P5] M. Figat and C. Zieliński, "Meta-model systemów robotycznych", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 233–242.

[P6] D. Giełdowski, W. Szynkiewicz, and W. A. Dudek, "Badanie podatności systemu sterowania robota wykorzystującego głębokie uczenie ze wzmocnieniem", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 105–114.

[P7] D. Gruszczyński and M. Stefańczyk, "Active fall prevention: robotic vision in elderly care", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 27–38.

[P8] W. Kasprzak, V.-K. Do, and P. Piwowarski, "Mixture of pose experts for interaction classification in video", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 5–16.

[P9] K. Lis, W. Szynkiewicz, E. Niewiadomska-Szynkiewicz, and K. A. Ciecierski, "Wykrywanie anomalii w zachowaniu robota usługowego z wykorzystaniem sieci lstm", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 211–222.

[P10] K. Liu, Y. Chen, and P. Domański, "10 a novel method for control performance assessment with fractional-order signal processing", in *Outliers in Control Engineering. Fractional Calculus Perspective*, ser. Fractional Calculus in Applied Sciences and Engineering, P. Domański, Y. Chen, and M. Ławryńczuk, Eds., 2022, vol. 10, pp. 167–186.

[P11] K. Liu, Y. Chen, and P. Domański, "9 control performance assessment of the system with fractional-order dynamics", in *Outliers in Control Engineering. Fractional Calculus Perspective*, ser. Fractional Calculus in Applied Sciences and Engineering, P. Domański, Y. Chen, and M. Ławryńczuk, Eds., 2022, vol. 10, pp. 157–166.

[P12] A. Manujło, "Możliwość przyśpieszenia nauki poprzez zastosowanie podprogowych bodźców afektywnych", in *Wiedza i Innowacje wiWAT 2021*, M. Szyłkowska, Ed., 2022, pp. 128–138.

[P13] M. W. Okoński and P. Domański, "11 study on oscillation detection robustness and outlier filtering impact", in *Outliers in Control Engineering. Fractional Calculus Perspective*, ser. Fractional Calculus in Applied Sciences and Engineering, P. Domański, Y. Chen, and M. Ławryńczuk, Eds., 2022, vol. 10, pp. 187–218.

[P14] K. Pieńkosz, "Problem wyznaczania minimalnego zbioru ścieżek", in *Automatyzacja procesów dyskretnych : Teoria i zastosowania. Tom I*, A. Świerniak and J. Krystek, Eds., 2022, pp. 143–150.

[P15] T. Winiarski and D. Seredyński, "Earl – dziedzinowy język opisu systemów cyberfizycznych", in *Postępy Robotyki, Tom I i II. Prace Naukowe Politechniki Warszawskiej, Elektronika*, ser. Prace Naukowe Politechniki Warszawskiej. Elektronika, A. Mazur and C. Zieliński, Eds., 2022, no. 197, pp. 223–232.

[P16] C. Zieliński, "Nastawienie do wiedzy i edukacji społeczeństw chińskiego kręgu kulturowego", in *Ewolucja cywilizacyjnej roli i społecznego odbioru nauki. Część 2*, J. Lubacz, Ed. Instytut Problemów Współczesnej Cywilizacji im. Marka Dietricha, 2022, pp. 55–72.

6.3 Conference Proceedings

[P1] G. Kuduk, M. Bekas, B. Wąsowska, and P. Pałka, "Analysis of tools used for implementation Of a knowledge base based on an ontology for a service robot in a kitchen environment", in *Systematic Innovation Partnerships with Artificial Intelligence and Information Technology*, ser. IFIP Advances in Information and Communication Technology, R. M. Nowak, J. Chrząszcz, and S. Brad, Eds., vol. 655, 2022, pp. 315–327.

[P2] D. Miedziński, P. Rodo, K. Kaczmarek, M. Sochacki, and M. Hałoń, "Proportional navigation missile guidance using image recognition", in *9th European Conference for Aeronautics and Space Sciences (EUCASS) proceedings*, M. Sochacki, Ed. EUCASS, 2022, pp. 1–15.

[P3] R. Nebeluk and M. Ławryńczuk, "Fast nonlinear model predictive control using a custom cost-function: Preliminary results", in *Proceedings of the 30th Mediterranean Conference on Control and Automation (MED)*, 2022, pp. 13–18.

[P4] R. Olszewski, P. Pałka, and A. Wendland, "Agent-based modeling as a tool for predicting the spatial-temporal diffusion of the covid-19 pandemic", in *Proceedings of the 2021 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, 2022, pp. 1–5.

[P5] R. Olszewski, P. Pałka, and A. Wendland, "Or optimization in the authorities, business and citizens triangle – application of cooperative game theory and spatial information modeling", in *Proceedings of the 2021 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, 2022, pp. 1–5.

[P6] K. Zarzycki and M. Ławryńczuk, "Fast nonlinear model predictive control using lstm networks: A model linearisation approach", in *Proceedings of the 30th Mediterranean Conference on Control and Automation (MED)*, 2022, pp. 1–6.

[P7] K. Borowa, M. Jarek, G. Mystkowska, W. Paszko, and A. Zalewski, "Debiasing architectural decision-making: A workshop-based training approach", in *Software Architecture. ECSA 2022*, I. Gerostathopoulos, G. Lewis, T. Batista, and T. Bures, Eds., 2022, pp. 159–166.

[P8] W. Kasprzak, V.-K. Do, and P. Piwowarski, "A lightweight approach to two-person interaction classification in sparse image sequences", in *Proceedings of the 17th Conference on Computer Science and Intelligence Systems (FedCSIS)*, ser. Annals of Computer Science and Information Systems, M. Ganzha, L. A. Maciaszek, M. Paprzycki, and M. Ślęzak, Eds., vol. 30. Polskie Towarzystwo Informatyczne, 2022, pp. 1–10.

[P9] M. Korycinski, K. A. Ciecierski, and E. Niewiadomska-Szynkiewicz, "Neural fiber prediction with deep learning", in *2022 18th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob)*, 2022, pp. 1–5.

[P10] T. Lehmann, P. Paziewski, and A. Pacut, "Face and silhouette based age estimation for child detection system", in *Communication Papers of the 17th Conference on Computer Science and Intelligence Systems*, ser. Annals of Computer Science and Information Systems, M. Ganzha, L. A. Maciaszek, M. Paprzycki, and D. Ślęzak, Eds., vol. 32. Polskie Towarzystwo Informatyczne, 2022, pp. 39–43.

6.4 Scientific and Technical Papers in Journals

[J1] V. Abgaryan, G. H. Kasprowicz, A. Kisiel, M. Ławryńczuk, M. Milewicz-Zalewska, M. J. Peryt, S. Plamowski, J. Pluta, K. Poźniak, F. Protoklitow, P. Rokita, R. Romaniuk, K. Rosłon,

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