FERIT
FACULTY OF ELECTRICAL ENGINEERING, COMPUTER SCIENCE AND INFORMATION TECHNOLOGY **OSIJEK**

# RESEARCH GROUPS

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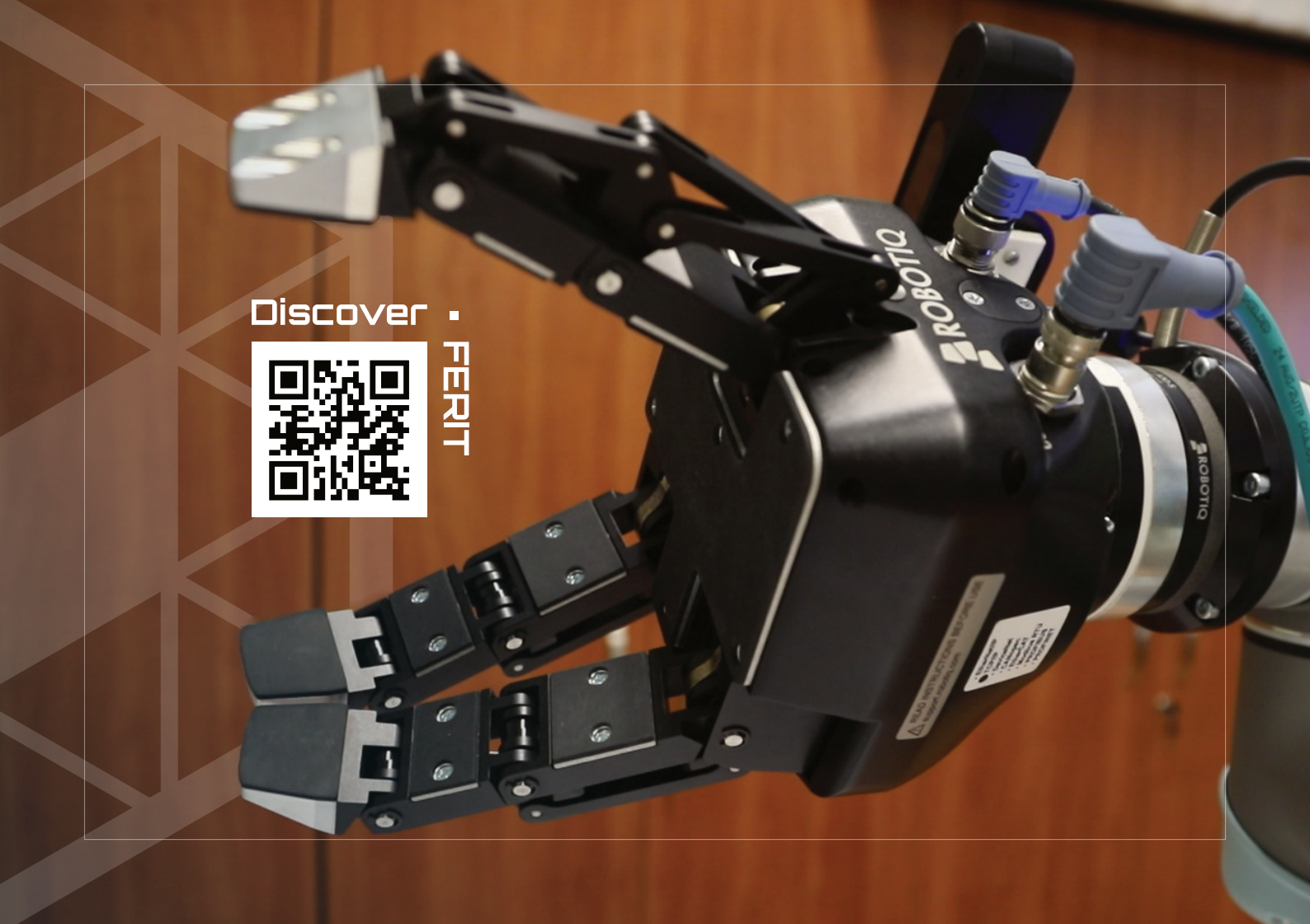
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# About

The Faculty of Electrical Engineering, Computer Science and Information Technology Osijek (FERIT) of Josip Juraj Strossmayer University of Osijek is an academic institution positioned at the intersection of education, research and industry. Research at FERIT follows current global R&D trends and advances knowledge in computer science, information and communication technologies, automation, power engineering, electrical machines, and the automotive sector. FERIT researchers lead and participate in scientific and applied projects in cooperation with industry and academic partners, supported by various funding programmes. These projects generate new knowledge, contribute to technological advancement and enable effective knowledge transfer. The Faculty also regularly organises conferences, seminars, and workshops, fostering innovation and strengthening collaboration at national and international levels.

## FERIT Faculty Management

**Dean**
Full Professor Tomislav Matić, PhD

**Vice-Dean for Science and Postgraduate Studies**
Full Professor Danijel Topić, PhD

**Vice-Dean for Technology and Economic Cooperation**
Full Professor Josip Job, PhD

**Vice-Dean for Education and Student Affairs**
Assistant Professor Ivan Vidović, PhD

**Vice-Dean for Business Affairs and Quality Assurance**
Full Professor Marinko Barukčić, PhD

**Vice-Dean for Projects and International Cooperation**
Full Professor Emmanuel Karlo Nyarko, PhD

## Contact us

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# IG01

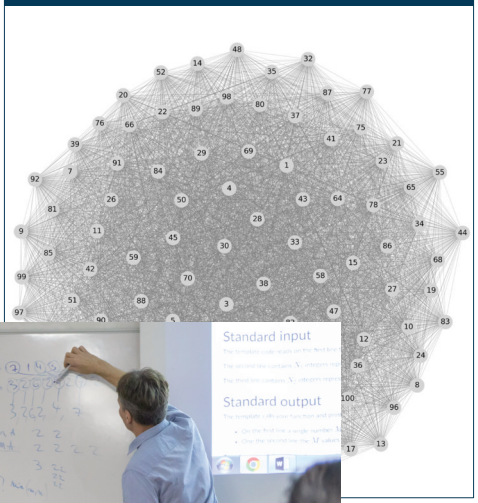
# RESEARCH GROUP FOR ADVANCED TEACHING METHODS IN TECHNICAL SCIENCES

Head of the Research Group

Assistant Professor Tomislav Rudec, PhD

The Research Group for Advanced Teaching Methods in Technical Sciences (IG01), established in 2018 at the Department of Core Courses, FERIT, Josip Juraj Strossmayer University of Osijek, is an interdisciplinary group that addresses contemporary challenges in higher engineering education. The group aims to strengthen students' STEM competencies through interdisciplinary, student-centred, and digitally supported teaching approaches. Its work integrates digital technologies, including artificial intelligence, supported by research-based evaluation of teaching effectiveness. The group focuses on three complementary areas: digitally enhanced technical English instruction, research on modern digital tools and experimental methods in physics education, and

the development of advanced educational methods for advanced programmers and competitive programming. Using mixed research methods, the group evaluates learning outcomes, student attitudes, and performance, supporting innovation, interdisciplinarity, and alignment with national and European digital education strategies.



## Research Areas

- Cutting-edge technologies in teaching English for Specific Purposes (ESP)
- Educational research in the field of physics and other core engineering fields
- Advanced programming
- Soft materials in the fabrication of microstructured components
- Diophantine sets


IG01 ■ More info

IG01 ■ Members

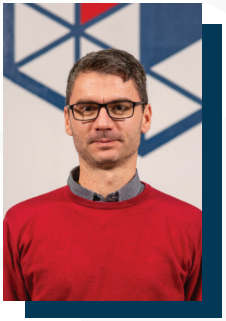
IG01 ■ Publications

# IG02

## RESEARCH GROUP FOR HIGH-PERFORMANCE COMPUTING AND DATA ANALYSIS

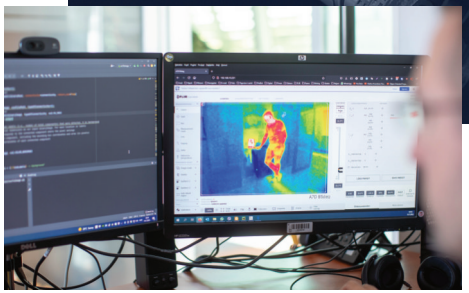
Head of the Research Group

Associate Professor Zdravko Krpić, PhD



The Research Group for High-Performance Computing and Data Analysis (IG02) brings together experienced researchers focused on advanced data-driven systems operating in distributed, resource-constrained, and real-time environments. The group conducts interdisciplinary research at the intersection of multimodal machine learning, data analytics, nature-inspired optimisation in machine learning applications, edge computing, and blockchain technologies. Its work addresses the full lifecycle of intelligent systems, from data acquisition and dataset construction, through model development and optimisation, to secure energy-efficient deployment on distributed and edge architectures. A strong emphasis is placed on real-time anomaly detection, system performance

and energy efficiency, as well as the reliability, security, and interpretability of machine learning models. Selected application domains include fire detection and prevention, leveraging multimodal data sources and real-time analytics for early anomaly identification and risk mitigation. By combining algorithmic research, hardware-aware optimisation, and system-level evaluation, IG02 aims to deliver scalable and practically applicable solutions for industrial and societal challenges.



## Research Areas

- Multimodal machine learning, fire detection and prevention and anomaly detection
- Real-time data analytics and distributed algorithms
- Edge computing and energy-efficient HPC architectures
- Blockchain technologies, consensus mechanisms and data integrity
- Data visualisation, system evaluation and applied analytics

IG02 ■ More info

IG02 ■ Members

IG02 ■ Publications

# IG03

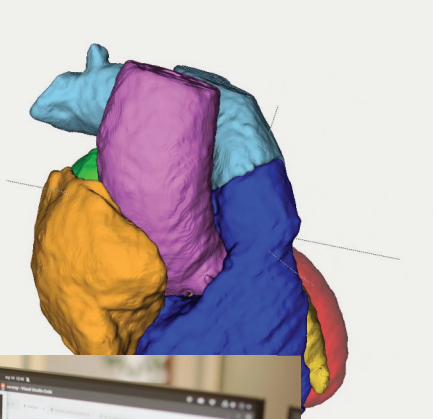
## RESEARCH GROUP FOR COMPUTER SCIENCE AND HUMAN-COMPUTER INTERACTION

Head of the Research Group

Full Professor
Irena Galić, PhD

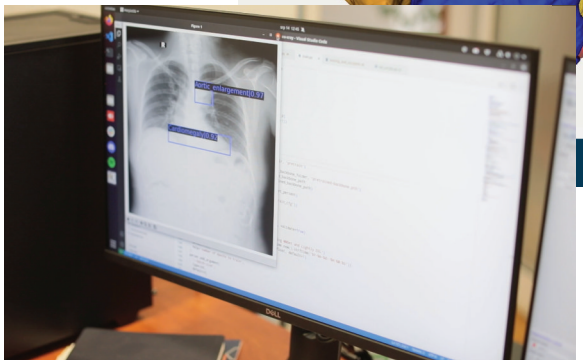
The Research Group for Computing and Human-Computer Interaction (IG03), part of the Faculty of Electrical Engineering, Computer Science and Information Technology Osijek (FERIT), brings together researchers focused on artificial intelligence, image processing, and immersive technologies with emphasis on real-world applicability and societal impact. The group develops advanced deep learning methods for medical image analysis, including automated segmentation and biomarker extraction from CT and MRI scans, as well as extended reality (XR) systems for medical education and surgical planning. A significant focus is placed on intelligent assistive systems for visually impaired individuals, utilising generative models and real-time

object detection. The group also investigates large language models for the Croatian language, AI applications in education, multi-agent systems for autonomous task orchestration, and explainable AI. By combining analytical research with practical applications, IG03 bridges academic innovation with solutions that benefit healthcare, accessibility, and education.



## Research Areas

- Medical image analysis, segmentation, and XR systems for healthcare
- Intelligent assistive systems
- Artificial intelligence and language: LLMs, education, and glotodidactics
- Generative AI and synthetic image generation
- Multi-agent systems and explainable AI



IG03 ■ More info

IG03 ■ Members

IG03 ■ Publications

# IG04

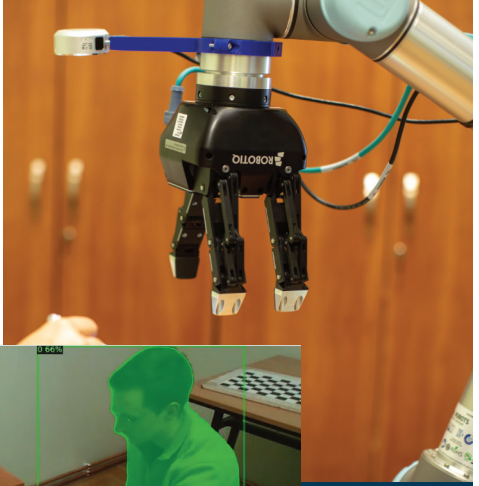
Head of the
Research Group

Full Professor with Tenure
Robert Cupec, PhD

## RESEARCH GROUP FOR INTELLIGENT SYSTEMS AND ROBOTICS

The Research Group for Intelligent Systems and Robotics (IG04) conducts research and development at the intersection of artificial intelligence, robotics, and automation, aiming to design intelligent systems capable of perception, learning, decision-making, and autonomous operation in complex real-world environments. In robotics, the group researches machine perception, robot manipulation, and navigation, targeting applications such as service, assistive, and agricultural robotics. Research in artificial intelligence includes applying AI methods to autonomous driving and quadcopter navigation, with a particular focus on developing object detection systems based on deep neural networks. The group also explores natural language processing and

conducts general research on improving neural network training. In automation, the group focuses on advancing process monitoring and control systems by integrating artificial intelligence techniques that learn from measurement and operational data.



## Research Areas

- Artificial intelligence and machine learning
- Machine perception
- Motion planning for robots and autonomous mobile systems
- Natural language processing
- Process modeling, monitoring and control, soft sensors and fault-tolerant systems

IG04 ■ More info

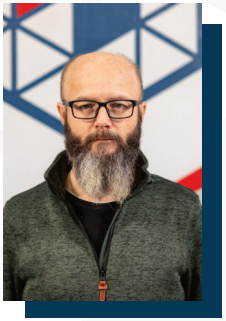
IG04 ■ Members

IG04 ■ Publications

# IG05

Head of the Research Group

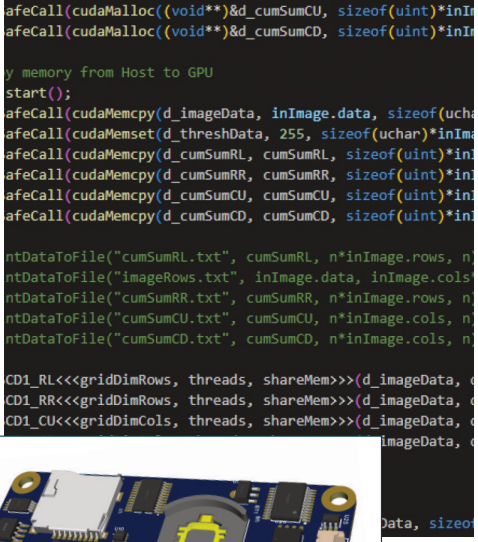
Full Professor Tomislav Keser, PhD

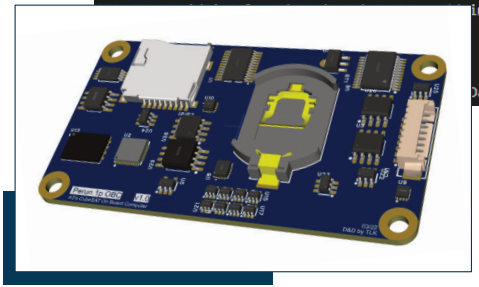


## RESEARCH GROUP FOR COMPUTER ENGINEERING

The Research Group for Computer Engineering (IG05) operates under the Department of Computer Engineering and Intelligent Systems. Scientists in this group work in various areas of design, analysis and development of specific technical and computer system solutions for industrial applications, as well as for specialised technical systems defined by specific tasks. Through interdisciplinary scientific and professional collaboration with other research groups, scientists and businesses from related fields, IG05 conducts advanced research and applies solutions in analysis and design of advanced computer architectures, FPGA and VHDL development and applications, embedded computer and real-time systems, intelligent control and management systems,

development and management of communication networks, advanced web technologies and services, board-level design and integration of computer systems for real-time environments, and adaptation and application of machine learning and artificial intelligence in such systems.



- Computer architecture, design and system analysis; FPGA systems and parallel processing
- Embedded computer systems architecture and application, real-time systems design and developmet; automotive and space application
- Processes and computer systems: reliability, diagnostics and testing
- Design of intelligent systems and computer networks; control systems
- Applied machine learning and artificial intelligent systems; visual data processing and system modelling

## Research Areas

IG05 ■ More info

IG05 ■ Members

IG05 ■ Publications

# IG06

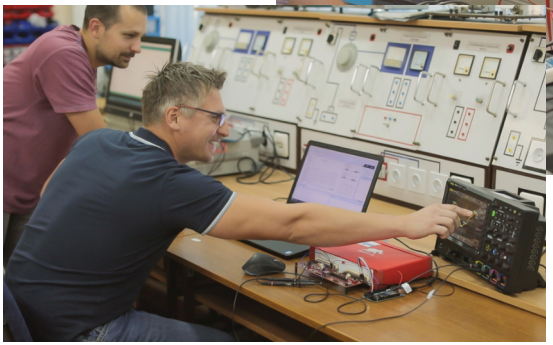
Head of the Research Group

Associate Professor Vedrana Jerković-Štil, PhD

## RESEARCH GROUP FOR ADVANCED INDUSTRIAL SYSTEMS

The Research Group for Advanced Industrial Systems (IG06) is conducting research in the fields of electrical machines, power electronics, electrical and process measurements, materials and industry ecology which are integrated in research of industrial drives as a foundation of industry production. The research is coherent with modern trends in ecology, energy efficiency improvement and digital transformation principles. It also examines the relationship between business logistics and the production process within the context of digital transformation principles. Electrical machines modelling and parameter identification, which is strongly supported by research in the field of numerical methods, as well as advanced electrical drives control methods facilitate

industry drive operation optimisation and energy efficiency improvement. New measurement methods for electrical and non-electrical values in industrial facilities are developed. The research in power electronics is oriented to voltage converter control for energy storage using HIL methods and emulation procedures for electrical energy production process in photo-voltaic systems.



## Research Areas

- Electrical machines, electrical drives control
- Power electronics
- Industrial measurements
- Numerical methods, modelling and parameter estimation
- Materials and industry

IG06 ■ More info

IG06 ■ Members

IG06 ■ Publications

# IG07

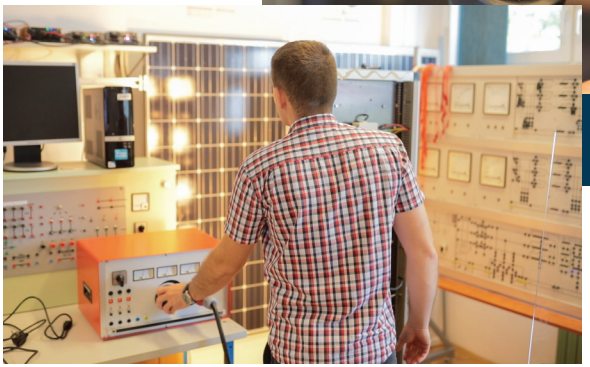
# RESEARCH GROUP FOR ADVANCED POWER TECHNOLOGIES AND SYSTEMS

Head of the Research Group

Full Professor
Goran Knežević, PhD

The Research Group for Advanced Power Technologies and Systems (IG07), established in 2018 at the Department for Power Engineering, FERIT, Josip Juraj Strossmayer University of Osijek, brings together researchers and experts focused on modern power engineering challenges. The group conducts high-quality research and provides expert knowledge in the areas of renewable energy integration, smart power grids and microgrids, electricity markets and power system protection, stability and power quality. IG07 promotes interdisciplinary collaboration to develop advanced optimisation models for the planning, design and operation of power systems with integrated renewable energy sources, including photovoltaic, biomass and biogas plants.

By combining analytical modelling, simulation and field measurements, the group bridges academic research with practical industrial applications, contributing to reliable, efficient and resilient electrical power systems.

## Research Areas

- Renewable energy integration, smart grids and microgrids
- Prosumer-based systems and distribution network management
- Power system analysis, protection, reliability and stability
- Power quality assessment and electromagnetic field measurements

IG07 ■ More info

IG07 ■ Members

IG07 ■ Publications

# IG08

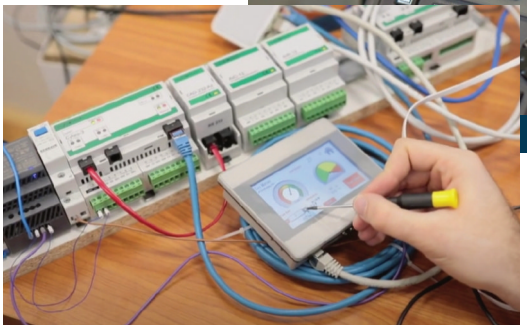
# RESEARCH GROUP FOR INFORMATION AND COMMUNICATION TECHNOLOGIES

Head of the Research Group

Full Professor
Slavko Rupčić, PhD

The Research Group for Information and Communication Technologies (IG08) brings together researchers and experts focused on the development and application of modern information and communication technologies. The group conducts scientific and applied research in the fields of wireless communications, microelectronics, networking technologies and video communications. Research activities include modeling and analysis of communication systems, investigation of electromagnetic (EM) wave propagation, development of wireless transmission systems, as well as measurement and assessment of electromagnetic radiation levels. In the area of microelectronics, IG08 focuses on analogue and digital signal processing, PLD and FPGA programming,

and the development of sensor and control systems. Particular attention is devoted to networking technologies, including quality of service, broadband Internet access and security and privacy in modern wired and wireless networks. Research in video communications is aimed at improving video signal transmission and evaluating users' Quality of Experience (QoE) in fixed and mobile networks.



## Research Areas

- Wireless communications and electromagnetic wave propagation
- Microelectronics, signal processing and sensor systems
- Networking technologies, quality of service, security and privacy
- Video communications and Quality of Experience (QoE)

IG08 ■ More info

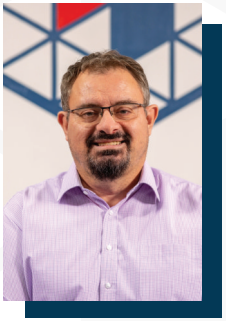
IG08 ■ Members

IG08 ■ Publications

# IG09

Head of the
Research Group

Full Professor with Tenure
Željko Hederić, PhD



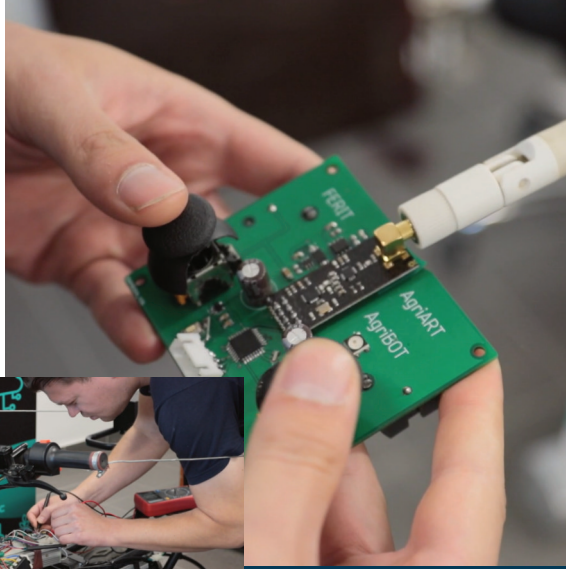
# RESEARCH GROUP FOR INTELLIGENT VEHICLES

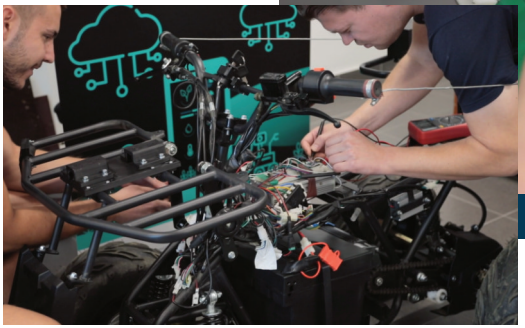
The Research Group for Intelligent Vehicles (IG09) enhances transportation safety, comfort, and sustainability via autonomous vehicles and automated driving. Focus areas include environmental perception, dynamics, control and human interaction in urban settings with vulnerable road users like pedestrians and cyclists. Key research directions are software for autonomous vehicles, covering protocols (CAN, FlexRay), standards (AUTOSAR, ISO 26262), and machine learning for camera image processing. IG09 develops and evaluates algorithms for information dissemination in intelligent transport systems (VANETs), tested via autonomous robotic fire engine with CNNs for thermal/RGB image segmentation.

Special emphasis is placed on energy flow optimisation and efficiency through modeling, inverse problems, and predictive control per EU guidelines.

## Research Areas

- The development of software support for autonomous vehicles
- Algorithms for information dissemination in intelligent transportation systems
- Development of vehicle propulsion systems and auxiliary systems with the aim of optimising energy flows and vehicle energy efficiency



IG09 ■ More info

IG09 ■ Members

IG09 ■ Publications

# IG10

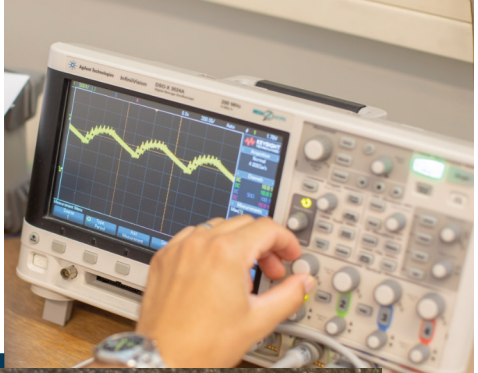
Head of the Research Group

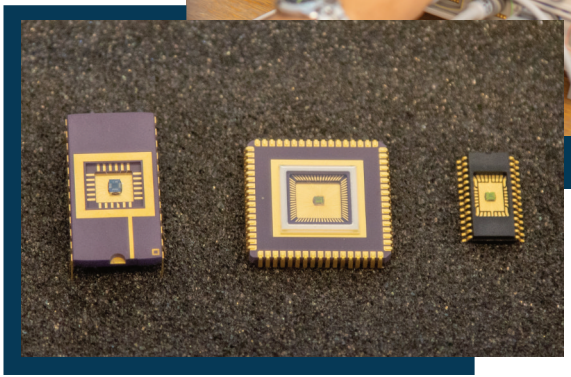
Full Professor Damir Filko, PhD

# RESEARCH GROUP FOR BIOMEDICAL ENGINEERING

The Research Group for Biomedical Engineering (IG10), established in 2018, includes members from the Department of Communications and Department of Computer Engineering and Intelligent Systems, FERIT, Josip Juraj Strossmayer University of Osijek. It brings together researchers and experts focused on electronics and chip design, wireless power transfer, robotics and artificial intelligence. The IG10 research group carries out activities in the field of biomedical engineering, microelectronics, biomedical electronics, wireless communication systems, wireless charging systems, energy harvesting and application of computer vision in robotics, medicine and agriculture. The research group's projects have resulted in the development of integrated circuits, energy-efficient

wireless signal transfer, DC/DC converters based on charge pumps and biological sensing systems which includes wireless measurement of oxygen saturation and temperature. The group also applies computer vision and artificial intelligence to agriculture and medicine, enabling crop row detection, 2D/3D object detection and chronic wound analysis.





## Research Areas

- Chip design
- Wireless communication systems and wireless power transfer
- Microelectronics, biomedical electronics, high voltage electronics
- Computer vision and artificial intelligence applications in agriculture and medicine

IG10 ■ More info

IG10 ■ Members

IG10 ■ Publications

Faculty of Electrical Engineering, Computer Science and Information Technology Osijek
Josip Juraj Strossmayer University Of Osijek
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