# The 1st AIFORS Workshop on Industry – Academia Collaboration

- organized in collaboration with EDIH Crobohub++

Date: **Tuesday, July 9, 2024**
Venue: **University of Zagreb, Faculty of Electrical Engineering and Computing (UNIZG-FER)**
**Grey Hall, Unska 3, 10000 Zagreb, Croatia**

## Agenda

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| 08:45 – 09:00 | **Registration and welcome** |
| 09:00 – 09:15 | **Ivan Petrović**, *UNIZG-FER, AIFORS coordinator*<br>**Fabio Bonsignorio**, *UNIZG-FER, AIFORS ERA Chair holder*<br>Welcome address, program of the workshop |
| 09:15 – 10:00 | **Paolo Dario**, *BioRobotics Institute, Scuola Superiore Sant'Anna and Coordinator of EDIH ARTES 5.0, Pisa, Italy*<br>Blue sky research in Biorobotics and Bionics is an economic development driver |
| 10:00 – 10:20 | **Hrvoje Džapo**, *UNIZG-FER, Coordinator of EDIH Crobohub++*<br>EDIH CROBOHUB++: Invest Smart, Test First |
| 11:20 – 10:30 | **Emir Imamagić**, *University of Zagreb, University Computing Centre (SRCE)*<br>High-performance computing services for academia and industry |
| 10:30 – 11:00 | **Coffee break** |
| 11:00 – 11:20 | **Fabio Bonsignorio**, *UNIZG-FER, AIFORS ERA Chair holder*<br>AIFORS Lab: Towards a novel deeply bioinspired Physical AI paradigm |
| 11:20 – 11:40 | **Ivan Petrović**, *UNIZG-FER, Head of the LAMOR lab and AIFORS Coordinator*<br>LAMOR lab: Towards reliable long-term robot autonomy in challenging environments |
| 11:40 – 11:55 | **Tomislav Haus**, *VP Software, Gideon Brothers d.o.o.*<br>Intelligent material handling solutions powered by AI and 3D vision |
| 11:55 – 12:10 | **Srđan Kovačević**, *CEO, Orqa d.o.o.*<br>Second chance for western drone ecosystem |
| 12:10 – 12:25 | **Hrvoje Meštrić**, *Director-General of Science and Technology, Ministry of Science, Education and Youth*<br>Programme Competitiveness and Cohesion 2021- 2027 – Forthcoming calls to strengthen the economy by investing in research and innovation |
| 12:25 – 13:30 | **Lunch + poster session** |
| 13:30 – 14:30 | Panel discussion on academia-industry collaboration<br>*Moderators:* **Fabio Bonsignorio** and **Ivan Petrović**<br>*Panelists:*<br>**Paolo Dario**, *BioRobotics Institute, Scuola Superiore Sant'Anna and Coordinator of EDIH ARTES 5.0, Pisa, Italy*<br>**Hrvoje Džapo**, *UNIZG-FER, Coordinator of EDIH Crobohub++*<br>**Hrvoje Meštrić**, *Director-General of Science and Technology, Ministry of Science, Education and Youth*<br>**David Matthew Smith**, *Director General of Ruđer Bošković Institute*<br>**Vedran Bilas**, *Dean of UNIZG-FER*<br>**Tomislav Haus**, *VP Software, Gideon Brothers d.o.o.*<br>**Srđan Kovačević**, *CEO, Orqa d.o.o.* |
| 14:30 – 14:35 | Wrap up of the workshop |

# Brief info about speakers and their talks

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**Paolo Dario** is Emeritus Professor of the Scuola Superiore Sant'Anna in Pisa. Until 2021, he has been a Full professor of Biomedical Robotics and taught courses to PhD students in the BioRobotics PhD Program and Master's students in the M.Sc. Program in Bionics Engineering, jointly organized by the University of Pisa and the Scuola Superiore Sant'Anna.He has been Founding Director (2011 – 2017) of The BioRobotics Institute and Founding Coordinator of the PhD Program in BioRobotics at the Scuola Superiore Sant'Anna. He has served as PhD coordinator till 2019. He served as Pro-Rector for Innovation, Knowledge Transfer and University's Third Mission and as Coordinator of the Department of Excellence in Robotics & AI at the Scuola Superiore Sant'Anna. He is the Scientific Director of the ARTES4.0 Competence Center on Industry 4.0, co-funded by the Italian Ministry of Economic Development (MiSE) and participated by 127 partners (public and private). He has also served on university boards, on National and International Evaluation Committees on research and academic activities, and on many Nationals and International Boards to evaluate candidates for academic positions. Paolo Dario served as President of the IEEE Robotics and Automation Society from 2002-to 2003. He has been General or Program Chair of several large international conferences, including IEEE ICAR, ICRA, IROS and BioRob, which he founded. He is an IEEE Life Fellow, a Fellow of the European Society on Medical and Biological Engineering, and a recipient of many honours and awards.

**Title:** Blue sky research in Biorobotics and Bionics is an economic development driver

**Abstract:** The talk aims to inspire new research and innovation initiatives. It will outline the current trends, opportunities and unsolved problems in robotics research and will highlight the need for a leap forward as that envisioned already years ago by RoboCom Flagship proposal. It will present past experiences and ideas for the future in research and economic and societal exploitation of research results, drawn from the experiences of the Institute of BioRobotics at Scuola Superiore Sant'Anna and of the ARTES 5.0 EDIH. It will briefly discuss the New Deal 2.0 regional development program.

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**Hrvoje Džapo** is a Professor at the Faculty of Electrical Engineering and Computing University of Zagreb (FER). He received his PhD degree at FER in the field of electrical engineering in 2007. Areas of his research and teaching interests encompass measurement technologies, sensors, biomedical engineering, signal processing, and embedded systems. He participated in several research projects and industry collaborations in roles of researcher and project leader. He is currently a project coordinator of EDIH CROBOHUB++ project. He was a founder and head of FER Career Center from 2015 to 2022. He is a senior member of IEEE, IFMBE, and CROBEMPS. He served as a chair of IEEE Instrumentation and Measurement Society Chapter of IEEE Croatia Section 2009-2013, and is currently a co-chair of IEEE Engineering in Medicine and Biology Society (EMBS) Chapter of IEEE Croatia Section. In 2019 he was awarded IEEE Croatia Section Outstanding Educator Award for outstanding contribution to engineering education through connecting the academic sector and industry in the fields of student internships, career development and promotion of student entrepreneurial activities.

**Title:** EDIH CROBOHUB++: Invest Smart, Test First

**Abstract**: European Digital Innovation Hub (EDIH) is new EU mechanism for implementation of Digital Europe Programme (DEP) for digital transformation of the economy and society, targeting micro, small and medium enterprises and public administration. Mission of EDIH CROBOHUB++ is digital transformation of Croatian economy in the fields of manufacturing technologies, smart agriculture, energy and environment, and public administration through tailor-made services of consortium partners. Services related to test-before-invest (TBI) category are particularly beneficial for SMEs to help them to make informed decisions about investments and business growth. In this lecture, EDIH CROBOHUB++ TBI services will be presented, along with some concrete examples how SMEs can benefit for such services, free of charge.

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**Emir Imamagić** has been working at the University Computing Centre (SRCE) for over 20 years in the areas of high-performance computing, distributed and cloud computing and system management and monitoring. Currently working as the Head of Advanced Computing Department. Main responsibilities include managing SRCE's Advanced Computing service that provides national resources supercomputer Supek and advanced cloud computing platform Vrančić, as well as specialized user support for deployment. Participating in several European projects such as EDIH CROBOHUB++, National Competence Centres in the framework of EuroHPC, Croatian Quantum Communication Infrastructure and projects and activities related to the European Open Science Cloud.

**Title:** SRCE Advanced Computing Services

**Abstract**: SRCE has a long tradition of providing Advanced Computing Services such as high-performance computing (HPC) and advanced cloud computing to the academic and scientific community. As a head of the National Competence Centre for HPC and partner in EDIH CROBOHUB++ SRCE builds upon this experience and offers services to SMEs, industry and public administration. In this presentation we will present training, consultation, networking and test before invest services provided by SRCE in EDIH CROBOHUB++.

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**Fabio Bonsignorio** is ERA Chair in AI for Robotics at FER, University of Zagreb, Croatia. He is Founder and CEO of Heron Robots (advanced robotics solutions), see www.heronrobots.com. He has been visiting professor at the Biorobotic Institute of the Scuola Superiore Sant'Anna in Pisa from 2014 to 2019. He has been a professor in the Department of System Engineering and Automation at the University Carlos III of Madrid until 2014. In 2009 he got the Santander Chair of Excellence in Robotics at the same university. He has been working for some 20 years in the high tech industry before joining the research community He coordinates the ShanghAI Lectures (www.shanghailectures.org), initiated by famous University of Zurich Prof.em. Rolf Pfeifer in 2009, since 2013. He initiated the AIFORS Colloquia series (https://sites.google.com/view/aifors-colloquium-2024/home) in 2024. He is developing radical new approaches to design novel deeply biomimicking robots addressing foundational issues in Physical AI. He is a pioneer and has introduced the topic of Reproducibility of results in Robotics and AI. He is a pioneer in the application of blockchain to robotics and IA (smart cities, smart land, smart logistics, circular economy. He coordinates Topic Group of EU Robotics about Experiment Replication, Benchmarking, Challenges and Competitions. He is co-chair IEEE Robotics & Automation Society (RAS) Technical Commitee, TC-PEBRAS (PErformance and Benchmarking of Robotics and Autonomous Systems). He is a Distinguished Lecturer for IEEE Robotics and Automation Society.' Senior Member of IEEE and member of the Order of the Engineers of Genoa, Italy. He coordinated the task force robotics, in the G2net, an EU network studying the application of Machine Learning and Deep Learning to Gravitational wave research, Geophysics and Robotics. He has given invited seminars and talks in many places: MIT Media Lab, Max Planck Institute, Imperial College, Politecnico di Milano in Shenzhen, London, Madrid, Warsaw, San Petersburg, Seoul, Rio Grande do Sul.

**Title:** AIFORS Lab: Towards a novel deeply bioinspired Physical AI paradigm

**Abstract:** Many think that Robotics still needs much more robustness, safety, lower manufacturing costs, and reduced control complexity and effort, while it aims to more and more complex and adaptive behaviors in open-ended environments. A foundational approach to Physical AI, disrupting both Robotics and AI, is often referred to as 'Morphological Computation', i.e., the outsourcing of computation from the controller to body-environment interactions of the system. AIFORS Lab pursues an operational and quantitative approach to 'Morphological Computation'. AIFORS Lab aims to merge those novel methods with novel approaches to machine and deep learning (Information Geometry, Learning on Manifolds, Physics informed Neural Networks, physics aware generative AI) to define a new powerful and disruptive theoretical framework for physical AI. The main application domain will be in soft robotics and distributed robot perception. It is expected that this new framework will help to cope with numerous problems in biomedical applications where

many biological systems and processes at micro/nano scale can be better understood through the lens of Physical AI. We will discuss the opportunities, issues and potential economic and societal impact of our research.

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**Ivan Petrović** is a full professor at the Faculty of Electrical Engineering and Computing, University of Zagreb, Croatia, where he heads the Laboratory for Autonomous Systems and Mobile Robotics - LAMOR (http://lamor.fer.hr). He is also co-director of the Centre of Research Excellence for Data Science and Advanced Cooperative Systems. His research work has been concerned with various aspects of automatic control, state estimation, and machine learning and their application in the control of complex technical systems, with autonomy of mobile robots and vehicles being among his main research interests in the last twenty years. He published his research results as author or co-author of more than 80 papers in scientific journals and more than 220 papers in proceedings of international conferences. He has actively participated as a collaborator or principal investigator in more than 70 research and development projects at national and EU level. The results of his research have been incorporated into several industrial products. He is a fellow of the Croatian Academy of Sciences and Arts and the Croatian Academy of Engineering, Council member of the International Federation of Automatic Control (IFAC), and a permanent board member of the European Conference on Mobile Robots. He is Editor-in-Chief of the Robotics and Autonomous Systems journal and Associate Editor of the Mechatronics journal.

**Title:** LAMOR lab: Towards reliable long-term robot autonomy in challenging environments

**Abstract**: Humans are confronted daily with uncertainties arising from precarious reality. We master complex navigation when walking or driving vehicles in various challenging scenarios. We can also deal with limited and highly noisy perceptual information, e.g. in very low light conditions, in fog and in environments with non-intuitive geometries. Humans have developed strategies to perceive their environment as accurately as necessary and to make the right decisions in the complex world we live in. However, autonomous robots still have a long way to go before they reach this level of autonomy. To this end, autonomous mobile robots need to make autonomous decisions, perform tasks safely and navigate accurately in unsafe environments. This talk will present some of the recent research activities and achievements of the LAMOR lab. The focus will be on our recently developed algorithms for sensor fusion, localization and mapping, motion planning and human intention recognition. I will also present our approach to collaboration with industry and some recent collaborative projects with industrial partners.

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**Tomsilav Haus**, PhD serves as VP of Software at Gideon. Over the past 6 years with the company, he has progressed from a role as a Senior Engineer to leading diverse teams in robotics research, software engineering, and product development. As a PhD graduate from the University of Zagreb Faculty of Electrical Engineering and Computing, Tomislav specialized in Robotics and Automation with a particular focus on unmanned aerial vehicles and mobile robots. His academic pursuits have led him to collaborate as a visiting researcher at the United States Military Academy at West Point. With over 20 papers and two patent applications, Tomislav continues to contribute to the robotic field.

**Title:** Intelligent material handling solutions powered by AI and 3D vision

**Abstract**: In this lecture, we will present autonomous mobile robots that Gideon developed to automate some of the most challenging processes in material handling, such as autonomous trailer (un)loading and case picking. We will show how advanced computer vision powered by AI unlocks capabilities needed for such solutions. Finally, we will give overview of the EU project A-Unit, where successful collaboration between Academia (UNIZG-FER) and industrial partners (Gideon, Mobilisis) led to a development of a novel industrial PC (Autonomy Unit) capable of running the complete software stack needed for vision-based autonomy of a mobile robot.

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**Srđan Kovačević** is the co-founder and CEO of Orqa, one of the world's leading companies in the fields of unmanned and remote vision technologies. In his past life, Srđan was a financial expert with more than 10 years of experience in the financial industry. He started his career in the financial sector at PBZ Invest, where he worked in risk management and compliance, and was the head of the Supervision and Analysis Unit. After that, he became the Chairman of the Board of the Croatian Pension Investment Company (HMID), where he managed the Capital Fund, a stock fund worth 150 million euros. He holds a master's degree from the University of Oxford (MSc in Mathematical Finance) and a graduate degree from the Faculty of Mechanical Engineering and Naval Architecture of the University of Zagreb (B.Sc. Mechanical Engineering). He is an authorized pension fund manager and investment advisor.

**Title:** Second chance for western drone ecosystem

**Abstract**: The process of Decoupling is putting an end to a decade of dominance of Chinese companies in the drone space. This gives western drone ecosystem a second chance at competing in the race for dominance in aerial robotics, and it comes at the time when it is clear that unmanned systems can play a pivotal role in our capability to ensure the security of our democracies.

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**Hrvoje Meštrić** is a research, development and innovation expert with more than 16 years of experience of leading roles in science and innovation public policy, consulting and management. Currently in second mandate as Director-General of Science and Technology Directorate in the Croatian Ministry of Science, Education and Youth (MSEY). Worked also as key expert and team leader on World Bank, UNDP, and EU-financed projects.

**Title:** Programme Competitiveness and Cohesion 2021- 2027 – Forthcoming calls to strengthen the economy by investing in research and innovation

**Abstract**: The Ministry of Science, Education and Youth, in the role of Level 1 Intermediate Body, is responsible for operations that include investments in science and innovation, and which will be financed as part of Priority 1. *Strengthening the economy by investing in research and innovation, by supporting business competitiveness, digitization and developing skills for smart specialization*, which has two specific goals: (i) development and strengthening of research and innovation capacities and application of advanced technologies and (ii) developing skills for smart specialization, industrial transition and entrepreneurship. In this talk, I will present the interventions that will be carried out by the Ministry as part of the specified specific goals with a focus on the forthcoming calls.