

# EURECA-PRO Open Science Forum

## 26-28 June 2023

**Monday, 26.06**

**12:00-13:00** Hamid Reza Karimi:

*Intelligent Fault Diagnosis for Rotating Machinery*

<https://youtube.com/live/57y7Q-HmJD0>

**14:00-15:00** Piotr Szynekarczyk:

*Mobile Robots that Save Lives. Practical Applications and Latest Development Trends.*

[https://youtube.com/live/5w-34M\\_8w8I](https://youtube.com/live/5w-34M_8w8I)

**Tuesday, 27.06**

**08:30-09:30** Witold Pedrycz:

*Pursuing Frontiers of Machine Learning: Technology and Society*

<https://youtube.com/live/D3ULqITnX5w>

**12:00-12:30** Marek Gabryś:

*Business Models and Technology Convergence*

**12:30-13:00** Zbigniew Gała, Krzysztof Sprawnik:

*Clear and Consistent Way Towards Industry 4.0 with Euvic and Google Production Optimization Solutions*

<https://youtube.com/live/BQPi7RLlcds>

**Wednesday, 27.06**

**08:30-09:30** Ewa Niewiadomska-Szykiewicz:

*Energy-efficient wireless sensor networks: models, algorithms, applications.*

<https://youtube.com/live/ckDuEYzp05Y>

# EURECA-PRO Open Science Forum

Monday, 26.06

12:00-13:00 **Hamid Reza Karimi**

*Politecnico di Milano*

<https://youtube.com/live/57y7Q-HmJD0>

## Mobile Robots That Save Lives. Real World Applications And Recent Developments

Industry 4.0 has enabled the automation of process improvements and decision making based on the collection of large amounts of plant data. Due to the economic advantages of maintenance optimization, there is significant interest from both academia and industry on the topic of fault detection and prognostics for complex systems. The objective of this speech is to address some challenges and recent results on fault diagnosis of mechanical systems, with a focus on advanced artificial intelligence algorithms developments. Specifically, different deep learning models such as deep supervised, unsupervised and reinforcement learning algorithms are examined to establish a trustworthy intelligence fault diagnosis model. The talk will be concluded with some concluding remarks on both technical and practical aspects of intelligent fault diagnosis in identifying the fault types in rotary machines.

# EURECA-PRO Open Science Forum

Monday, 26.06

14:00-15:00 **Piotr Szyrkarczyk**

*Industrial Research Institute for  
Automation and Measurements*

[https://youtube.com/live/5w-34M\\_8w8I](https://youtube.com/live/5w-34M_8w8I)

## Mobile Robots That Save Lives. Real World Applications And Recent Developments

Since the beginning there has been a constant evolution in the development of mobile robots used in the army, police and in other similar application areas. There are also new tactics to use them. At first, these were very simple devices created as a result of the personal involvement of police pyrotechnicians, later these works were institutionalized and mobile robots became more advanced. For many later years, the shape of these designs was mainly the result of technical conditions. As a result of further - ongoing - development, mobile robots began to have functionalities increasingly resulting from the needs of users and the tactics of their use. As a result of this process, the range of robot applications has expanded significantly in recent years. This is related to both technological progress and the increase in the awareness of users who more and more clearly see the legitimacy of replacing humans with robotic systems in some tasks, and also see the benefits of cooperation between humans and robots.

Just before year 2000 there was designed in Łukasiewicz - PIAP institute first Polish mobile robot for police bomb squads. Since then many new robots were designed in Łukasiewicz - PIAP institute. Hundreds of those robots are now in use worldwide. Among robots made by other companies, also those designed in Poland will be examples of development trends in this special applications field.



# EURECA-PRO Open Science Forum

Tuesday, 27.06

08:30-09:30 **Witold Pedrycz**

*University of Alberta*

<https://youtube.com/live/D3ULqITnX5w>

## Pursuing Frontiers of Machine Learning: Technology and Society

Over the recent years, we have been witnessing spectacular achievements of Artificial Intelligence and Machine Learning (ML), in particular. We have seen highly visible accomplishments encountered in natural language processing and computer vision impacting numerous areas of human endeavours. Being driven inherently by the technologically advanced learning and architectural developments, ML constructs are highly impactful coming with far reaching consequences; just to mention autonomous vehicles, health care imaging, decision-making processes in critical areas, among others.

We advocate that the design and analysis of ML constructs have to be carried out in a holistic manner by identifying and addressing a series of central and unavoidable societal quests. The key challenges on the list of interest concerns interpretability, energy awareness (being also lucidly identified on the agenda of green AI), efficient quantification of quality of ML constructs, their brittleness and conceptual stability coming hand in hand with the varying levels of abstraction. The credibility of ML models is also of concern to the society. The above stated quests are highly intertwined and exhibit relationships with the technological end of ML. As such, they deserve prudent attention, in particular when a multicriterial facet of the problem is considered.

# EURECA-PRO Open Science Forum

Tuesday, 27.06

12:00-12:30 **Marek Gabryś**  
**AIUT**

12:30-13:00 **Zbigniew Gała**  
**EUVIC**

**Krzysztof Sprawnik**  
**Google**

<https://youtube.com/live/BQPi7RLlcds>

## Clear and Consistent Way Towards Industry 4.0 with Euvic and Google Production Optimization Solutions

Euvic Solutions S.A and Google has been actively involved in the development of Industry 4.0, which is also known as the Fourth Industrial Revolution. This revolution involves the integration of advanced digital technologies such as the Internet of Things (IoT), big data analytics, artificial intelligence, and machine learning into manufacturing processes.

As part of its Industry 4.0 initiative, Google has developed several tools and solutions that help manufacturers improve their operations and optimize their processes. One such tool is The Manufacturing Data Engine, uses machine learning algorithms to analyze large volumes of data in real-time, providing manufacturers with valuable insights into their operations. This enables manufacturers to make data-driven decisions, identify patterns and trends, and make continuous improvements to their processes. Overall, the Manufacturing Data Engine is an important tool for manufacturers looking to embrace Industry 4.0 and take advantage of the benefits of digital transformation.

# EURECA-PRO Open Science Forum

Wednesday, 28.06

08:30-09:30 **Ewa Niewiadomska-Szynkiewicz**

*Warsaw University of Technology*

<https://youtube.com/live/ckDuEYzp05Y>

## Energy-Efficient Wireless Sensor Networks: Models, Algorithms, Applications

Progress in hardware and networking technologies enables the large-scale deployment of collaborating smart devices and the creation of modern data acquisition systems. Recently, tremendous interest can be seen in the design and development of wireless sensor networks (WSNs), i.e., self-configuring networks built from numerous embedded devices equipped with a Central Processing Unit (CPU), radio transceiver and sensing modules. Such systems that utilize ad hoc networking – a new paradigm of communication where all wireless devices exchange data and communicate with each other in a collaborative way to achieve a common goal can significantly enhance the capability to sense and control physical environments. The potential applications contain comprehensive surrounding monitoring, unmanned space exploration, disaster management, object tracking, surveillance systems, etc. Rising demand for capabilities of sensing systems, lack of fixed network infrastructure, and limited energy and computation resources of their components provoke a broad spectrum of hardware and software engineering challenges involving high quality and secure communication, optimal deployment, localization, energy-efficiency, self-operability, scalability, performance and security. To meet these needs, various methods are used and implemented, resulting in the development of novel communication protocols, data acquisition algorithms, deployment techniques, localization schemes and computation architectures.