11. R&D CONFERENCE - DIGITAL BOOKLET

29th January 2026, ETH Zurich

The Swissmem R&D Conference brings together leading representatives from industry, research, and innovation to discuss current challenges and future trends in the tech industry. It offers a unique platform for exchanging knowledge, best practices, and new impulses from applied research and industrial practice. Take the opportunity to expand your network and help strengthen the innovative power of the Swiss tech industry.

Note: The information contained is based on data provided by the speakers themselves. Version 1.0 | Zurich, 22th January 2026

Dear conference participants, dear speakers, dear sponsors, dear partners,

We would like to extend our sincere thanks to all our sponsors, speakers, and participants for their valuable contribution to the Swissmem R&D Conference. Your commitment, expertise, and engagement make this conference a unique platform for exchange, inspiration, and collaboration between industry and research. Our sponsors and partners provide the essential support that enables us to realize this event at such a high level of quality, and our speakers enrich the program with their outstanding insights, experience, and innovative perspectives.

We would also like to point out that all information presented in this booklet has been submitted directly by the speakers themselves and reflects their respective contributions. At the end of the booklet, you will also find a list of presentations that were not selected for the program, provided that the authors agreed to their publication, in order to acknowledge the high quality and diversity of all submitted contributions.

We also thank all participants for their active involvement and for shaping this conference through open discussions, curiosity, and a strong spirit of collaboration. It is this diverse and dynamic community that transforms the conference into a true meeting point for innovation and progress within the Swiss tech industry.

We wish you inspiring conversations, successful networking, and many valuable impulses for future projects. Enjoy the conference and make the most of the opportunities it offers.

Best regards,
Marvin Schuster

Note: The information contained is based on data provided by the speakers themselves. Version 1.0 | Zurich, 22th January 2026

SWISSMEM

Services of the Innovation Department from Swissmem

Swissmem's Innovation Department provides targeted and practice-oriented support to help our Swissmem member companies turn innovative potential into competitive advantage. Especially tailored to the needs of small and medium-sized enterprises (SMEs) in the MEM industry, the division's services address common innovation barriers such as limited **internal resources**, lack of **specialized knowledge**, and fragmented access to **funding** or **research partners**.

The services can be grouped into four strategic pillars:

- **Technology Scouting & Trend Monitoring**
  Through structured research and insights, we identify relevant technological and regulatory trends. Members benefit from early information on emerging developments. Regular updates and access to Swissmem's curated startup matrix help companies anticipate disruptions and discover relevant new players early on.

- **Networking & Cooperation Facilitation**
  We actively connect companies with research institutions, universities, and startups to foster collaboration and accelerate innovation. Whether through targeted matchmaking, expert groups, or structured event formats, these networks enable faster access to know-how, market intelligence, and implementation partners.

- **Funding & Innovation Support**
  We offer guidance on national and European funding opportunities, including Innosuisse, Horizon Europe and other funding. We help members choosing a funding instrument, applying, aligning with funding criteria, and building strong consortia.

- **Knowledge Exchange & Events**
  We organize high-impact knowledge formats such as the annual R&D Conference, the Swissmem Startup Day, and thematic deep-dive workshops. These events provide inspiration, peer learning, and actionable insights. They also offer direct access to best practices on how innovations are successfully implemented in the industrial environment and contact with key decision-makers from industry and academia.

The services are designed to reduce complexity, increase efficiency, and strengthen the innovation capacity of the Swiss industry. By combining trend insights, partner access, and funding guidance, Swissmem empowers its members to innovate with focus and confidence.

For more information, do not hesitate to contact us:

Digitalization, Innovation, Technology

Dr. Marvin Schuster
Head of Department
m.schuster@swissmem.ch

Dr. Adam Gontarz
Head of Division
a.gontarz@swissmem.ch

Pfingstweidstrasse 102
8005 Zurich
Phone +41 44 384 41 11

Note: The information contained is based on data provided by the speakers themselves. Version 1.0 | Zurich, 22th January 2026

SWISSMEM

Note: The information contained is based on data provided by the speakers themselves. Version 1.0 | Zurich, 22th January 2026

SWISSMEM

Program (numbers are hyperlinks):

Zeit	Nr.	Topic	Speaker
13.00		Welcome, Swissmem and ETH Zürich	Dr. Adam Gontarz, Prof. Dr. Effy Vayena
13.10	0	Keynote, ETH Zürich	Prof. Dr. Markus Bambach
13.25	0	Keynote, United Machining Solutions	Christoph Plüss
13.40		Plenum Session «The Challenges of Industry»	HPH G2, 1st floor
	1	Helbling Technik AG	Stefan von Bergen
	2	Siemens Schweiz AG	Dr. Michael Kiy
	3	Kellenberger Switzerland AG	Michael Egeter
	4	Reishauer AG	Dr. Maximilian Zimmer
	5	Agathon AG	Dr. Stephan Scholze
	6	Belimo Automation AG	Dr. Elena Cortona
	7	ABB Research Center	Till Rümenapp
	8	Bystronic Group	Dr. Christoph Rüttimann
	9	Maxon Motor AG	Stephan Keller
	10	Innosuisse	Fabian Käser
14.35		**Coffee break and Networking**	
15.15		**Parallel sessions**	**Detailed program on page 2**
16.30		**Apéro and poster session**	

AI, Automation & Digital Twins

Auditorium / Room HPH G2, 1st floor

Presenter Philip Hauri

11 The EU Data Act: Opportunities and Future Perspectives for Data-Driven Organizations	Marc Strittmatter, Susana Maria Soriano	**Data Act Pioneer**
12 Seamless Material Flow for Smarter Flexible Manufacturing	Simone Miele	**OST**
13 Unlocking Hidden Factory Knowledge: How AI Transforms Metal Machining	Pascal Weber	**Manukai AG**
14 Automating CNC tool inspection with AI	Alex Lichtenberger	**Technum GmbH**
15 Benchmarking Foundation Models for Industrial Time-Series Forecasting: Performance, Constraints, and the Path to Generalization	Ayumi Katsuya	**HES-SO**
16 Combining Physics-based and Data-driven Modeling for Building Energy Systems	Leandro von Krannichfeldt	**EPFL**
17 Unlock hidden savings in your supply chain	Philip Sieber-Gasser	**Besso AG**
18 Digital Twin for Robotic Manufacturing Applications	Sascha Weikert	**inspire AG**
19 Wireless Mesh Networks Routing Optimization using Machine Learning and Deep Learning	Yann Charbon	**HEIG-VD**
20 Free from Real Data: Synthetic-Driven Assembly Step Recognition	Hui Zhang	**inspire AG**
21Computer vision for high-mix, low-volume production	Jonas Conrad	**Sentinus AG**
23 Multiview – AI-Integrated Optical Inspection System	David Hemmi	**CSEM**
24 European Funding for Research and Innovation in Industry	Matthew Whellens	**Euresearch**

Note: The information contained is based on data provided by the speakers themselves. Version 1.0 | Zurich, 22th January 2026

SWISSMEM

Advanced Manufacturing & Materials

Room HPV G4, 1st floor

Presenter Marvin Schuster

25 Multi-axis 3D printing with granulates, fluids, endless fibers and more	Luca Paparo	**OST**
26 From manufacturing to materials and back	Konrad Papis	**inspire AG**
27 Accessible Metal 3D-Printing	Stephan Steiner	**a-metal AG**
28 Control of a Robot-Mounted Microactuator for High-Performance Milling	Rafael Sonderegger	**ETHZ**
29 Accelerating Aerospace Qualification in Metal Additive Manufacturing through Adaptive Toolpath Optimization	Huba Hörömpöly	**Gravity Pull Systems SA**
30 Universal, Bi-directional Real Time Communication For Digital Twins	Daniel Schmid	**ZHAW**
31 High resolution gravure printing	Jakob Heier	**Empa**
32 Cut Cost and Waste in DED with an AI-powered Digital Twin	Beatrice Paoli	**FFHS**
33 Accelerating innovation with new generative design tools	Manuel Biedermann	**nureo AG**
34 Automated design of connectors	David Gersinska, Raul San Miguel Peñas	**Stäubli Electrical Connectors AG**
35 Swiss Plasma Polishing - Plasma Electrolytic Polishing with a Jet	Yan Scholl	**BFH**
36 Lattice Structures in LPBF	Elischa Meier	**FHNW**
37 Process optimization and accelerated ramp-up in gear grinding	Francesco Crivelli	**CSEM**
38 High-precision micro-machining and precision-measurements of apertures made of carbides	Thomas Liebrich	**RhySearch**

Sustainability, IoT & Smart Systems

Room HPV G5, 1st floor

Presenter Adam Gontarz

39 Chemical Solvent Waste Reduction	Reinhard Berger	**ZHAW**
40 Life-like Robots: Musculoskeletal and Biohybrid Innovations for the Factory of the Future	Ronan Hinchet	**ETHZ**
41 Carbon Fibre Waste Reuse in Airborne Structures	Dejan Romančuk	**HSLU**
42 Plastic Waste as a Resource for Lightweight Structures	Markus Zogg	**inspire AG**
44 AI-Driven Optical Inspection and 3D Metrology for Reliable Battery Cell Manufacturing	Silas Dietler	**CSEM**
45 The future of wood fibers: nanocellulose and AI in industrial manufacturing	Teresa Alberts	**ITficient AG**
46Building an AI-Powered Ecosystem for Intelligent, Sustainable Solar Operations	Danuta Paraficz	**FFHS**
47 Chat with your Data	Markus Krack, Chris Ryan	**FHNW / iosys GmbH**
48 Sustainable Soft Aerial Robotics for Climate and Conservation	Pham Huy Nguyen	**Empa and EPFL**
49 Mobile Robot for Floor Grinding	Mario Russi	**CSEM**
50 The digital product passport: challenges and opportunities for industry	Peter Krummenacher	**BloqSens AG**
51 Optimum Clustering for Multi-Border Router Wireless Mesh Networks	Mahboob Karimian	**HEIG-VD**
52 Decentralized intelligence in industrial automation	Michael Schmid	**Compact Motion GmbH**

Keynote

Title:

Session: Challenges of Industry

Abstract:

Herr Markus Bambach

Prorektor Studium und Professor für Advanced Manufacturing

ETH Zürich

Topics:

Keynote

Title: BEYOND METAL – RETHINKING MACHINE TOOLS

Session: Challenges of Industry

Abstract: The machine tool industry is facing a fundamental turning point driven by accelerating digital transformation and shifting societal expectations. While traditional strengths in mechanical precision and hardware excellence remain important, they are no longer sufficient to secure long-term competitiveness. A growing gap exists between the speed of digital-native generations and the slower pace of industrial adaptation, creating challenges in talent attraction, workforce upskilling, and innovation. To remain competitive, the industry must urgently invest in digital upskilling, software development, and data-driven capabilities. Success will increasingly depend on intelligent, adaptive, and connected machine tools that operate within open digital ecosystems rather than as isolated systems. User experience, intuitive human–machine interaction, automation of both physical and digital processes, and cybersecurity are becoming critical differentiators. Global competition highlights the urgency of change. China's focused strategies and rapid execution contrast sharply with Europe's slower, regulation-driven approach, putting traditional industry leadership at risk. Lessons from the automotive sector show that digital integration, autonomy, and sustainability are redefining value creation. The machine tool of the future will be defined largely by software, data science, and AI, while leveraging proven hardware expertise. Only through open platforms, interoperability, and ecosystem collaboration can productivity gains, sustainability improvements, and new digital business models be realized. Without decisive investment in digital capabilities today, machine tool manufacturers risk being reduced to high-cost commodity hardware suppliers within the next decade.

Herr Christoph Plüss

CTO

United Machining Solutions AG

Topics:

Version 1.0 | Zurich, 22th January 2026

Note: The information contained is based on data provided by the speakers themselves.

1

Title: Swiss Tech Industry and the Academia: Thoughts from an Engineering Consultant Perspective

Session: Challenges of Industry

Abstract: The Helbling Group is a leading independent Swiss engineering and consulting firm that uniquely integrates interdisciplinary expertise in technological innovation, product development, business advisory, and infrastructure to drive the competitiveness and sustainable growth of its global clients.

Amid geopolitical upheaval, stagnant European growth, China's technological ascent, and the disruptive force of generative AI, Swiss industrial companies must navigate an increasingly complex strategic landscape. Success likely depends on a continued commitment to innovation and the core Swiss pillars of efficiency, quality, and reliability. In this ecosystem, the ETH Domain remains essential, providing the top-tier talent and cutting-edge research necessary to compete on a global scale.

"Physical AI" stands out as a critical opportunity for Switzerland; few regions can match its world-class competencies in mechatronics, algorithms, and software engineering—which are the key technologies in physical AI. This unique competitive advantage is sustained by the ongoing excellence of ETH and EPFL. Helbling is deeply committed to this strategic field, leveraging its interdisciplinary expertise to support companies worldwide in the development and implementation of tangible, AI-driven product solutions that bridge the gap between digital intelligence and physical machinery.

Herr Stefan von Bergen

Unternehmensbereichsleiter HTK II, Partner

Helbling Technik AG

Topics:

Note: The information contained is based on data provided by the speakers themselves.

2

Title: Trends at Siemens

Session: Challenges of Industry

Abstract: We are a leading technology company focused on industry, infrastructure, and mobility, creating technology to transform the everyday. By combining the real and digital worlds, we empower customers to accelerate digital and sustainability transformations—making factories efficient, cities livable, and transportation sustainable.

As a leader in industrial AI, we leverage deep domain know-how to apply AI to real-world applications across diverse industries.

At home in Switzerland since 1894, we have shaped daily life for millions. We drive solutions in energy, industry, mobility, building technology with our about 6000 employees in Switzerland.

We invest deeply in local R&D and manufacturing, as well as university partnerships. With our global Smart Infrastructure headquarters in Zug (79,400 employees worldwide), we are a central pillar of Switzerland as a knowledge and innovation hub.

Herr Michael Kiy

Director Innovation Management

Siemens Smart Infrastructure

Topics:

Note: The information contained is based on data provided by the speakers themselves.

3

Title: Technology Transfer - Building on proven concepts, in a new Framework

Session: Challenges of Industry

Abstract: Swiss mechanical industry is currently facing strong international competitive pressure. Both protectionist tendencies and extensive government support programs from major economies are worsen the situation and increasing the demands on our own economic policy. Decisive action is needed - now.

To ensure our innovative strength, the interfaces between research and industry must be strengthened. In particular, shorter project durations, simplified cooperation models, and more intensive financial support are required.

Goal: To translate research results into marketable industrial products more quickly and directly.

Kellenberger operates in this challenging environment and is seeking research partners and efficient transfer solutions. We aim to enhance short-term development projects with practical innovations and rapidly translate them into value-creating applications.

Currently, Kellenberger is particularly interested in research and collaborations in the following areas:

Machine tools

Machining processes

Precision engineering and metrology

AI-supported machine tools

Big data and data-driven process optimization

Efficiency improvements in industrial production/manufacturing/assembly/logistics

Herr Michael Egeter

Vice President Engineering

Kellenberger Switzerland AG

Topics:

4

Title: Gear Manufacturing in the Course of Time

Session: Challenges of Industry

Abstract: Reishauer AG is a company with over 230 years of history based in Wallisellen near Zurich. We invented generating gear grinding in 1945, a highly productive technology for gear manufacturing. With our machine tools and tooling, we are the world leader in high-quality gear finishing.

Our customer environment is mainly the worldwide automotive industry, especially eDrives – but basically anywhere with high quality and large quantity demands for gears. So, in almost any electric car on the streets you can find at least one gear that was ground on our machines.

Our industry nowadays faces several challenges: on the one hand, economic challenges, as market growth is lower than predicted, and on the other hand technical challenges with very high and still rising demands on gear quality.

Leading a competitive environment is only possible with innovation and technological leadership. Therefore, within our "Circle-of-Competence", we deliver everything from one hand and have full control over process, technology and machine. Our main future focus, besides perfect gear quality, are digital technologies and services.

What we are therefore looking for is expertise in AI applications for increasing R&D efficiency, cutting force modelling coupled with dynamic behavior of grinding machines into a full digital twin, and reliable tactile and optical measurement of superfinished surfaces.

Herr Maximilian Zimmer

CTO

Reishauer AG

Topics:

Note: The information contained is based on data provided by the speakers themselves.

5

Title: Low Volume, big Opportunity

Session: Challenges of Industry

Abstract: Synopsis

- Kostendruck, internationaler Konkurrenzdruck, hohe Löhne, sinkende Anzahl Facharbeiter, keine Bereitschaft für Schichtarbeit -› Automation

- Mass-Customization, Just-in-Time -› Low Volume, kleine Losgrössen

Die Herausforderungen einer kostengünstigen Produktion kleiner Losgrössen am Standort Schweiz beschäftigen viele Betriebe. Am Beispiel unseres Unternehmens werde ich die Herausforderungen unsere Precision-Parts-Fertigung illustrieren, dann technologische Aspekte beleuchten und schliesslich die Potentiale aufzeigen.

Herr Stephan Scholze

CTO

Agathon AG

Topics:

6

Title:

Session: Challenges of Industry

Abstract:

Frau Elena Cortona

CTO

Belimo AG

Topics:

Note: The information contained is based on data provided by the speakers themselves.

7

Title: Datacenters: The DC Challenge

Session: Challenges of Industry

Abstract: Actually, the electrical power consumption of data centers is growing exponentially. To provide the necessary power to the rages a change of the electrical system is needed. In the moment distribution of energy inside a data center is done by AC. To cover the higher energy demand of the different systems a switch from AC to DC in the range of the low voltage system is required. For this adaptation new components (e.g. dedicated high power converts) and protection systems will be needed to make sure that the reliability of the new system is ensured.

Data centers are just the front runner in the development of new low voltage grids. Industry or marine applications incorporate additional challenges like bidirectional energy flows due to local energy production and combination of AC and DC grids on different voltage levels.

ABB Corporate Research Switzerland is looking for research partners to support us related to this DC challenge.

Herr Till Rümenapp

CTO

ABB Research Center

Topics:

8

Title:

Session: Challenges of Industry

Abstract:

Herr Christoph Rüttimann

Global Vice President

Bystronic Group

Topics:

Note: The information contained is based on data provided by the speakers themselves.

9

Title:

Session: Challenges of Industry

Abstract:

Herr Stephan Keller

Senior Director

Turbo e-bike Systems

Topics:

Note: The information contained is based on data provided by the speakers themselves.

SWISSMEM

10

Title: Funding opportunities from Innosuisse

Session: Challenges of Industry

Abstract:

Herr Fabian Käser

Innovation Mentor

Innosuisse

Topics:

Note: The information contained is based on data provided by the speakers themselves.

11

Title: The EU Data Act: Opportunities and Future Perspectives for Data-Driven Organizations

Session: AI, Automation & Digital Twins

Abstract: Der Beitrag beleuchtet die Auswirkungen des EU Data Act auf datengetriebene Geschäftsmodelle im industriellen Umfeld. Als zentrales Element der europäischen Datenstrategie verpflichtet der Data Act Unternehmen zur umfassenden Anpassung ihrer Produktgestaltung, Vertragsstrukturen und Datenprozesse - insbesondere im Kontext vernetzter Produkte und IoT-Anwendungen. Gleichzeitig eröffnet die Regulierung neue Chancen für Innovation, datenbasierte Wertschöpfung und die Entwicklung digitaler Services, insbesondere für KMU.

Das Referat zeigt auf, wie Unternehmen die regulatorischen Anforderungen des Data Act nicht nur als Compliance-Herausforderung, sondern als strategische Chance begreifen können. Es werden konkrete Ansätze vorgestellt, wie industrielle Akteure - insbesondere aus dem Maschinen- und Anlagenbau - durch gezielte organisatorische und technische Anpassungen neue datenbasierte Geschäftsmodelle entwickeln und ihre Wettbewerbsfähigkeit stärken können.

Inhalte und Erkenntnisse:

- Überblick über die zentralen Bestimmungen des EU Data Act und deren Relevanz für industrielle Unternehmen

- Darstellung der Spannungsfelder zwischen Datenzugang, Geschäftsgeheimnissen und Datenschutz

- Chancen für KMU durch neue Rechte auf Datenzugang und -weitergabe

- Potenziale für Open Data Innovation, z. B. durch „Machine-as-a-Service“-Modelle oder Predictive Maintenance

- Rolle von ICT-Security als Werttreiber und nicht nur als Compliance-Faktor

Herr Marc Strittmatter, Susana Maria Soriano

Schwerpunktleiter Smart Services and Operations

HTWG Konstanz

Topics: Vom Regulierungsdruck zur Innovationschance: Der EU Data Act als Impulsgeber für industrielle Wertschöpfung

12

Title: Seamless Material Flow for Smarter Flexible Manufacturing

Session: AI, Automation & Digital Twins

Abstract: European manufacturers face increasing cost pressures while needing to remain agile in addressing shifting customer demands, customisation, and volatile market conditions. Traditional sequence-based production systems, though efficient, lack the flexibility required in this environment. To stay competitive, manufacturers must rethink rigid material flow structures and embrace seamless, adaptive solutions that link highly productive assets more intelligently.

Seamless material flow (SMF) is defined as the uninterrupted, optimised transport of resources across all production stages, enabled by automation, intralogistics systems, and digital integration. It goes beyond mechanisation by embedding data connectivity and responsiveness, turning intralogistics into a strategic enabler of flexibility. Critical enablers include change management for socio-technical transitions, advanced physical systems such as AGVs, AMRs, and conveyors, and digital foundations like real-time tracking, digital twins, and predictive analytics. Together, these elements support smaller lot sizes, responsiveness, and resilience.

This concept presents material flow not as a supporting function but as a strategic lever for future manufacturing.

The content has been elaborated for a summer school (Summer School Francesco Turco) and has been presented in greater detail there. Paper will be published on Scopus this year.

Herr Simone Miele

Junior Engineer

Ostschweizer Fachhochschule

Topics: flexible material flow, flexible manufacturing system, production management, intralogistics

13

Title: „Unlocking Hidden Factory Knowledge: How AI Transforms Metal Machining“

Session: AI, Automation & Digital Twins

Abstract: In der metallverarbeitenden Industrie geht ein erheblicher Teil des betrieblichen Know-hows in individuellen CNC-Programmen und isolierten Abläufen verloren. Programmierer:innen müssen bewährte Strategien bei ähnlichen Bauteilen häufig manuell rekonstruieren. Dies führt zu erhöhtem Aufwand, variabler Qualität und begrenzter Skalierbarkeit.

Manukai entwickelt einen On-Premise-Ansatz zur KI-gestützten Wiederverwendung von Bearbeitungswissen. Auf Basis geometrischer Merkmalsanalyse werden Bauteile mit bestehenden CAM-Strategien abgeglichen, sodass identifizierte Merkmale (z. B. Taschen oder Bohrungen) automatisiert passenden Bearbeitungsoperationen zugeordnet werden können.

Im Zentrum steht die systematische Strukturierung und Nutzbarmachung von Erfahrungswissen, ohne bestehende Fertigungsprozesse oder IP-Schutzmechanismen zu verändern. Der Ansatz ergänzt vorhandene CAM-Infrastrukturen und ermöglicht eine standardisierte, nachvollziehbare Wiederverwendung von Strategien.

Das Referat stellt die methodische Grundlage, die technische Architektur sowie erste Ergebnisse aus Pilotanwendungen vor. Es zeigt, wie durch KI-basierte Merkmals- und Strategiewiedererkennung Effizienzgewinne und Wissenssicherung in der spanenden Fertigung realisiert werden können.

Herr Pascal Weber

CEO & Founder

Manukai AG

Topics: Künstliche Intelligenz; CNC-Programmierung; Wissensmanagement; Fertigungsautomatisierung; Zerspanung

14

Title: Automating CNC tool inspection with AI

Session: AI, Automation & Digital Twins

Abstract: Using machine learning and computer vision, we developed the first system that is able to automatically determine CNC tool state, both fast and reliably. This way, tools users can opimise tool lifespan and manufacturers can automate production end quality control. Starting 2022 with a prototype, which was continuously improved based on market feedback, we have now a market-ready solution with first customers. We are looking for a partner to further integrate our solution in the machining ecosystems: One the one hand a partner to explore integration directly into cnc machines, on the other hand engineering expertise to integrate into tool production line.

Herr Alex Lichtenberger

Co-Founder

Technum GmbH

Topics: Tool Wear Detection, Machine Learning, Computer Vision, Machining, CNC

15

Title: Benchmarking Foundation Models for Industrial Time-Series Forecasting: Performance, Constraints, and the Path to Generalization

Session: AI, Automation & Digital Twins

Abstract: Goal:

Foundation models (FMs) excel in language (ChatGPT) and vision tasks but remain largely unproven in industrial settings dominated by time series data, such as sensor readings from a machine (temperature, vibration).

We systematically evaluated seven state-of-the-art FMs (TimesFM, Moirai, Chronos, TTM, Timer, UniTS, and Lag-Llama) for time series forecasting on multivariate data from the biomanufacturing sector.

Methodology:

This evaluation utilized ProbTS (open-source benchmarking toolkit) across three datasets: (A) a sterilization dataset with feature selection performed by domain experts, (B) a sterilization dataset with automated feature selection, and (C) a CL dataset curated by domain experts. We tested two configurations: context/prediction lengths of 512/96 and 128/24.

Metrics included those for single-point prediction (MSE) and those assessing the entire predicted probability distribution and uncertainty (CRPS).

Results:

TimesFM achieved the best overall performance, though Chronos outperformed it on several metrics for dataset (C). However, Chronos could not be evaluated under the longer configuration due to computational constraints. Moirai performed strongly on distribution-based metrics such as CRPS.

Perspectives:

These findings confirm the potential of FMs for industrial forecasting and suggest broad applicability to other time-series domains (e.g., manufacturing, supply chain). The primary hurdles remain computational cost and the lack of an off-the-shelf solution, necessitating high-level specialized expertise to effectively navigate the performance trade-offs across different models and metrics.

Frau Ayumi Katsuya

Scientific collaborator

HES-SO, University of Applied Sciences and Arts Western Switzerland (HEI-VS)

Topics: Smart Production & Industry 4.0; Artificial Intelligence; Sustainable Production & Resource Efficiency

16

Title: Combining Physics-based and Data-driven Modeling for Building Energy Systems

Session: AI, Automation & Digital Twins

Abstract: Building energy modeling plays a vital role in optimizing the operation of building energy systems by providing accurate predictions of the building's real-world conditions. In this context, various techniques have been explored, ranging from traditional physics-based models to data-driven models. An emerging trend is to combine physics-based and data-driven models into hybrid approaches with the aim of leveraging the advantage of each. This talk will provide an overview of such hybrid approaches, explore their mechanisms and showcase their application on a real-world building model. Specific aspects of evaluation include predictive performance, data dependency and interpretability.

Herr Leandro von Krannichfeldt

Doktorand

EPFL

Topics: Building Energy Modeling, Physics-inspired Machine Learning, Digital Twin

17

Title: Besso / unlock hidden savings in your supply chain

Session: AI, Automation & Digital Twins

Abstract: International companies are increasingly exposed to geopolitical tensions, where regulation and tariffs have become the weapon of choice in global trade disputes. Besso helps businesses navigate this new reality with clarity and speed. Leveraging advanced AI technology, Besso scales empirical legal research to deliver comprehensive, real-time insights into tariff and trade regulations across markets. Its platform continuously monitors regulatory changes, simulates supply chain scenarios, and identifies optimization opportunities that reduce exposure and cost. Unlike traditional consulting or static databases, Besso provides living intelligence that integrates directly into operational and strategic decision-making. This empowers companies with international supply chains in the tech sector to anticipate risk, adapt instantly, and convert complexity into competitive advantage. With a team boasting a track record of over $240 million in annually recurring tariff savings, Besso is redefining how companies protect profitability and resilience in an era of economic fragmentation. Besso works closely with three academic partners, who are among the global innovation leaders in their respective fields of trade law research and explainable AI.

Herr Philip Sieber-Gasser

CEO

Besso

Topics: Tariffs, Supply Chain Optimization, Cost Savings, Artificial Intelligence, Trade Regulation Intelligence

18

Title: Digital Twin for Robotic Manufacturing Applications

Session: AI, Automation & Digital Twins

Abstract: Der Vortrag stellt die Zielsetzung, den Inhalt und den aktuellen Stand eines Innosuisse-Projekts dar.

Das Projekt zielt darauf ab, das komplexe, von der Roboterpose abhängige statische und dynamische Verhalten eines MABI MAX100 Industrieroboters präzise abzubilden. Auf Basis eines validierten mechanischen MORe-Modells sollen optimale Steuerungs- und Bearbeitungsparameter automatisch generiert werden. Dazu werden Frequenzgangmessungen genutzt, um Steuerungs- und Prozessgrenzen zu quantifizieren, und die Technologie als Digitalen Zwilling in den Arbeitsablauf des robotischen Fräsens zu integrieren.

Da sechachsige Industrieroboter stark posenabhängige Eigenschaften wie Steifigkeit und Eigenfrequenzen aufweisen, müssen Steuerungs- und Prozessparameter laufend angepasst werden. Standardmäßig werden nur wenige Parameter-Sets verwendet, wodurch Schwingungsverhalten unberücksichtigt bleibt. Das Projekt ersetzt diese aufwändigen manuellen Tests durch ein simulationsgestütztes, automatisiertes Verfahren.

Bisher wurden der Roboter installiert, Messungen zur Validierung (Steifigkeit, Eigenfrequenzen, Modenformen) durchgeführt und ein physikalisches MORe-Modell aufgebaut und verfeinert. Die nächsten Schritte umfassen die Validierung des Modells, die Integration der API-Kommunikation zur automatischen Parameteranpassung sowie die Benchmark-Tests zur Bewertung der neuen Tools gegenüber den Standardfunktionen. Ziel ist eine optimierte Prozessstabilität und erweiterte Anwendungsmöglichkeiten für High-End-Industrieroboter.

Herr Sascha Weikert

Group Leader

inspire AG

Topics: Digital Twin, Robotic Milling, Control Parameter Tuning, Process Parameter Tuning, Productivity improvement

19

Title: Wireless Mesh Networks Routing Optimization using Machine Learning and Deep Learning

Session: AI, Automation & Digital Twins

Abstract: Wireless mesh networks (WMNs) are increasingly used in large-scale infrastructures, where efficient and reliable routing is key to maintaining performance. Traditional routing protocols like RPL depend on local decision-making and often produce suboptimal Directed Acyclic Graphs (DAGs), especially in dense or complex network topologies. This study explores whether machine learning (ML) and deep learning (DL) methods can be applied to globally optimise DAG-based routing in WMNs.

To investigate this, a high-performance simulator was developed to evaluate routing efficiency across different spanning trees, using realistic link quality metrics derived from physical parameters such as RSSI. The simulator generates a large labelled dataset of optimal and suboptimal trees from random network topologies, which is then used to train multiple ML and DL models. The optimisation task is formulated as a multi-label classification problem, where models predict the set of edges forming the best DAG.

Although various models—including classical classifiers, MLPs, and RNNs—were tested, none consistently outperformed RPL. This limitation arises from the difficulty of learning under strict DAG constraints like acyclicity and single-parent-per-node rules. However, the simulator itself identified DAGs up to 16% more efficient than RPL, highlighting the need for constraint-aware, structure-driven learning approaches in future work.

Herr Yann Charbon

Collaborateur Ra&D HES

HEIG-VD (IICT)

Topics: Machine Learning, Wireless Mesh Networks, Optimization, Fast Routing Simulator, Spanning Tree, Classification, MLP, RNN

20

Title: Free from Real Data: Synthetic-Driven Assembly Step Recognition

Session: AI, Automation & Digital Twins

Abstract: Quality control in industrial assembly is essential. Due to the specialized industrial components and processes, training vision-based assembly inspection models usually relies on task-specific real-world data, which is costly and labor-intensive to collect and annotate. In this paper, we propose a pipeline that automatically generates task-specific assembly data and further trains real-time inspection models using the synthetic data. It can be efficiently applied to a given task within an hour, requiring only CAD models and simple step descriptions. Focusing on practical challenges, our pipeline integrates a physics-based motion generation module to capture the variance of different human assembly, designs domain-randomized rendering to deal with the environmental complexity and variation, and employs an object-detection-based step recognition module for robust sim-to-real transfer, leading to 92.4% accuracy on a real-world assembly case with 46.7%, 15.8% and 61.2% performance improvement, respectively. Overall, our pipeline provides a practical solution for industrial assembly inspection without requiring expensive real-world data collection and annotation, with the effectiveness validated on real industrial assembly tasks in a factory.

Herr Hui Zhang

ETH Zurich

Topics: Manual assembly; Smart production; Action recognition; Artificial intelligence; Digital Factory

21

Title: Computer vision for high-mix, low-volume production

Session: AI, Automation & Digital Twins

Abstract: Computer Vision kann auf viele Weisen die Wettbewerbsfähigkeit von produzierenden Unternehmen stärken. Die automatisierte Erkennung, Bewertung, und Dokumentation von Produktionsschritten ermöglicht es Unternehmen, Qualitätskosten zu senken, neue Mitarbeitende schneller anzulernen, sowie Prozesse kontinuierlich zu optimieren. Hoch-variable Produktionsprozesse stellen dabei jedoch ein Anwendungshürde dar: Häufige Anpassungen der Vision-Modelle erfordern spezifische Expertise und hohen Aufwand, wodurch die Anzahl valider Businesscases limitiert wird.

Mit Sentinus AG zeigen wir auf, wie Computer Vision auch in der high-mix, low-volume Produktion zum Einsatz kommen kann. Durch den Einsatz synthetischer Trainingsdaten verlagert sich das Training von Vision-Modellen in den digitalen Raum und kann weitgehend automatisiert werden. Somit kann Computer Vision auch in der Einzestückproduktion wirtschaftlich eingesetzt werden. Anhand von echten Kundenbeispielen zeigen wir auf, wie sich der Einsatz von Computer Vision durch Fortschritte in Forschung & Entwicklung in den letzten Jahren gewandelt hat und nun auch eine breite Auswahl an Anwendungsfällen in der hoch-varianten menschen-zentrierten Produktion bietet.

Herr Jonas Conrad

Executive Lead

Sentinus AG

Topics: AI, Computer Vision, Human Centred Production, Synthetic Data

23

Title: Multiview – AI-Integrated Optical Inspection System

Session: AI, Automation & Digital Twins

Abstract: Lens-A-Lot is an AI-driven optical inspection system, co-developed with optimised synergy between artificial intelligence and advanced optics, specifically for Smart Production & Industry 4.0 applications. This cost-effective solution delivers rapid, reliable quality control for precision manufacturing parts. The system's specialised hardware—a single camera with telecentric optics—captures top and six angled side views in one shot, providing high-resolution imaging at 3.125 µm per pixel. Its compact, robust design eliminates moving parts and refocusing, reducing maintenance and operational costs. Lens-A-Lot's advanced illumination options enable precise detection of edges, surface defects, colour changes, and contamination, even on shiny or transparent surfaces. The integrated AI algorithms, tailored to the unique imaging capabilities of the hardware, automate inspection and support throughput rates of up to 4,000 parts per hour, including 3D model generation from multi-view images. By combining intelligent automation with purpose-built hardware, Lens-A-Lot offers scalable, high-accuracy inspection for industries where small part quality is critical. Its simplicity—requiring only one camera and optic—ensures affordability without compromising performance, making it an ideal solution for manufacturers embracing Industry 4.0 principles and seeking to optimise operational efficiency and product quality.

Herr David Hemmi

Head of Research and Business Development

CSEM

Topics: • AI-driven optical system for automated, high-precision quality inspection of manufacturing parts. • Smart production enabled by automating the most challenging inspection tasks in Industry 4.0 environments. • Co-developed AI and optics, optimised t

24

Title: European Funding for Research and Innovation in Industry

Session: AI, Automation & Digital Twins

Abstract: The presentation will offer a short introduction to the Horizon Europe funding programme, and then describe what opportunities are available for research and innovation in the area of Industry - specifically manufacturing, production and Industry 4.0/5.0. An update on the status of Switzerland with respect to association to the programme will also be provided.

Herr Matthew Whellens

Horizon Europe National Contact Point - Industry and Space

Euresearch

Topics: Funding, Research & Innovation, Horizon Europe, Industry 4.0, Manufacturing & Production

Note: The information contained is based on data provided by the speakers themselves.

25

Title: Multi-axis 3D printing with granulates, fluids, endless fibers and more

Session: Advanced Manufacturing & Materials

Abstract: A novel 5-axis 3D printer for non-planar extrusion printing with various materials has been developed at OST University of Applied Sciences. This innovative approach offers new possibilities for functional integration and lightweight construction, especially in combination with continuous fibers. This presentation will explore the potential of multi-axis 3D printing using use cases from mechanical engineering. The non-planar layer structure significantly reduces the visible stair steps, resulting in a smoother part surface. The use of multi-axis machines makes it possible to adjust the layer orientation to the direction of stress, thereby improving the mechanical properties of the printed object.

Herr Luca Paparo

Projektmitarbeiter Additive Manufacturing

OST Ostschweizer Fachhochschule

Topics: Additive manufacturing, 3D printing, material extrusion, functional integration, lightweighting

26

Title: From manufacturing to materials and back

Session: Advanced Manufacturing & Materials

Abstract: In manufacturing, materials play a vital role both on the piece's as well as on the tool's side. New manufacturing processes require adaptation of materials to work. However, to reach an optimized state, materials have to be developed for the specific manufacturing process. The solutions developed by the research group for Materials, Processes and Sustainability (maps) at inspire AG, in collaboration with the Advanced Manufacturing Lab (amlz) at ETH, and partners from the industry, provide performance and sustainability equally.

Advanced manufacturing technologies enable new materials to evolve. Field-Assisted Sintering Technology (FAST) is a fast sintering method, capable of improving even the most challenging materials. Such a material group are cemented carbides, e.g., tungsten carbide. Tools made from this material are widely applied in subtractive manufacturing, and therefore are essential for shaping our world.

We show, that tool materials made by FAST can surpass standard quality while drastically improving processing time. Our goals are to 3D-enable the technology for material and process efficiency, and to establish a "fast lane" for urgently required and high-performance tools, ultimately reducing lead time from two months to a single day.

Herr Konrad Papis

Group head

inspire AG

Topics: Advanced manufacturing • Material innovation • Alloys for additive manufacturing • Near net shaping by sintering • Lead time reduction

27

Title: Accessible Metal 3D-Printing

Session: Advanced Manufacturing & Materials

Abstract: At a-metal, our vision is to democratize metal 3D printing within the industry. We firmly believe that small and medium-sized enterprises, educational institutions, and small development groups should have easier access to this revolutionary technology on their premises.

By offering an affordable, compact, and safe metal 3D printing machine, we strive to provide our customers with the best price-performance package, while maintaining a very robust printing process and high-quality parts. Our closed-loop powder handling cartridge system ensures a clean and safe operation, eliminating the need for hiring academic experts or building a laboratory room around your metal 3D printer. With just a basic mechanical workshop, an innovative mindset, your technical team, and our machine, you can start printing complex metal parts in-house for an affordable price whenever you need them.

Herr Stephan Steiner

CEO & Co-Founder

a-metal AG

Topics: - Metal 3d printing process explained, - hurdles to enter metal 3d printing, - solution a-metal, - current development stage, - offer/collaboration potential

28

Title: Control of a Robot-Mounted Microactuator for High-Performance Milling

Session: Advanced Manufacturing & Materials

Abstract: Compared to conventional CNC machines, industrial robots offer greater workspace flexibility and full 6 degrees of freedom at much lower costs. Their industry application however, is limited by their low structural stiffness and dynamic actuation bandwidth.

The Inspire Robotics Lab proposes a micro-actuation device, which corrects end-effector position deviations in real time, counteracting process forces. Our device increases actuation bandwidth and enhances end-effector dynamic stiffness.

We have confirmed this approach by simulation and initial experiments, which showed a stabilization of the milling process and an increase in dynamic stiffness of the TCP.

We are currently developing control strategies that aim to enable high performance milling without damaging the robot arm, which should allow comparable throughput as conventional CNC milling.

Herr Rafael Sonderegger

PhD

Ethz

Topics: Robotic milling, Active control, Dynamic Stiffness, Industrial robot arms, Robust control

29

Title: Accelerating Aerospace Qualification in Metal Additive Manufacturing through Adaptive Toolpath Optimization

Session: Advanced Manufacturing & Materials

Abstract: Qualification remains one of the most time- and cost-intensive challenges in scaling metal additive manufacturing (AM) for aerospace. Current qualification frameworks assume that process parameter sets—laser power, scan speed, hatch spacing, and others—must be validated for each new part geometry, since geometric variations strongly influence local thermal gradients, residual stresses, and defect formation. Consequently, a parameter set qualified on a small coupon cannot automatically be extended to arbitrary geometries without further testing, slowing industrial adoption.

This research work, led by Gravity Pull Systems SA and Swiss Innovation Park Biel, explores how adaptive toolpath optimization can act as a process stabilizer and potential qualification accelerator. The PAAM system dynamically adjusts scan patterns to preserve consistent melt-pool conditions across diverse geometries, allowing a single parameter set to perform robustly across a wider design space. By separating the effects of process parameters from those of the toolpath, PAAM enables a more traceable and systematic evaluation of quality drivers.

The proposed qualification concept is that a manufacturer could validate a PAAM-enabled process on a reference geometry that encompasses representative feature types (walls, thin sections, overhangs, etc.), demonstrating consistent density, microstructure, and mechanical properties. If these results are reproducible across feature families, the data could support a family-based qualification approach, reducing the need to re-qualify every new geometry individually.

Herr Huba Hörömpöly

Partner

Gravity Pull Systems SA

Topics: Accelerating Aerospace Qualification in Metal Additive Manufacturing through Adaptive Toolpath Optimization

30

Title: Universal, Bi-directional Real Time Communication For Digital Twins

Session: Advanced Manufacturing & Materials

Abstract: The scientific work contains the solution for real-time, bi-directional communication between Digital and Real Twins in mechanical engineering. It features a three-axis XYZ axes system developed within a Model-based Systems Engineering (MBSE) environment using the RFLP V-model approach. The Real Twin is operated via a standard industrial PLC (B+R), while communication is enabled through Modelica, Named Pipes, and OPC UA (3DExperience platform). The study details the design and implementation of the communication interface, including connection types and modes. Performance is highlighted by a 10 ms turnaround time for one axis value. Potential applications span industrial (e.g. pick-and-place and 3D printing) and educational (alternatively as game-oriented demonstrator available) contexts. The project demonstrates that a complete Digital Twin Framework can be successfully integrated into a complex MBSE environment while maintaining high performance, effectively bridging the gap between physical and digital systems in mechanical engineering.

Herr Daniel Schmid

Dozent, Schwerpunktleiter am IPP, ZHAW

ZHAW Zürcher Hochschule für Angewandte Wissenschaften (SoE, IPP)

Topics: Digital Twin Framework, OPC UA, Modelica, XYZ Achses System

31

Title: High resolution gravure printing

Session: Advanced Manufacturing & Materials

Abstract: This project focuses on advancing gravure printing technology for printed electronics through the precise engineering of micro-scale cavities in gravure cylinders. By optimizing the geometry, depth, and distribution of these cavities, we can accurately control ink transfer and film thickness during the printing process—key factors for achieving high electrical performance and functional reliability in printed electronic devices. The innovative cavity design enables uniform deposition of conductive, dielectric, and semiconductive inks on a variety of flexible substrates. This approach bridges the gap between traditional high-speed printing and the stringent demands of electronic manufacturing, offering both scalability and cost efficiency. Through computational modeling, surface metrology, and experimental validation, the project demonstrates how tailored gravure cell structures can produce fine-resolution patterns with consistent line definition and conductivity. The resulting process supports the fabrication of components such as printed sensors, antennas, and flexible circuits. Ultimately, this research contributes to the development of next-generation manufacturing methods for flexible and wearable electronics, combining the precision of micro-fabrication with the productivity of roll-to-roll printing.

Herr Jakob Heier

Research Group Leader

Empa

Topics: printed electronics, gravure printing, , Roll-to-roll manufacturing, Microcavities, Ink transfer control

32

Title: Cut Cost and Waste in DED with an AI-powered Digital Twin

Session: Advanced Manufacturing & Materials

Abstract: In metal additive manufacturing, quality and efficiency remain major barriers to wider adoption. In processes like laser-powder Direct Energy Deposition (DED), it is common to repeat several production runs before obtaining a part that meets specifications. This trial-and-error approach drives up costs, wastes material, and slows down time-to-market.

Our idea is to develop a fast and accurate digital twin that enables first-time-right manufacturing. By combining physical modeling with data-driven methods, the solution would predict defects and deviations before they occur — saving time, reducing rework, and cutting production costs.

The potential applications are broad and high-value, for example:

- Customized prosthetics, produced to fit each patient's unique anatomy.

- Repair of critical automotive, railway, and aerospace components, extending product lifetimes and avoiding costly replacements.

- Production of high-performance parts with complex geometries, in one whole piece

This approach not only improves competitiveness, but also directly supports sustainable manufacturing by minimizing waste and enabling reuse. We are now looking for industrial partners to bring this idea to the next stage and explore its impact on the future of additive manufacturing.

Frau Beatrice Paoli

Professorin für angewandte Data Science und Digitalisierung

FFHS

Topics: Problem: trial-and-error in laser-powder DED → cost, waste, delays Approach: hybrid digital twin (physics-based + data-driven) for real-time prediction Value: first-time-right manufacturing → fewer defects, less rework, lower cost Applications: custom

33

Title: Accelerating innovation with new generative design tools

Session: Advanced Manufacturing & Materials

Abstract: Software-driven tools and agentic workflows are reshaping engineering. Nureo AG is a new startup coming out of ETH Zurich that supports companies in this technological shift and builds new automated design tools for engineering applications. The presentation will start with common industry bottlenecks (e.g., multi-week engineering cycles, slow iterations, and lengthy quotation and sales processes) and show how generative and automated design tools allow to speed-up time to market and sales processes, increase the productivity of engineering teams, and accelerate the development of innovative products. The pitch will highlight real-world industry examples such a joint collaboration with Siemens AG in the field of injection molding and additive manufacturing.

Herr Manuel Biedermann

Co-Founder & CEO

nureo AG

Topics: AI, Software, Generative Design, Startup

34

Title: Automated design of connectors

Session: Advanced Manufacturing & Materials

Abstract: The market for customized electrical connectors (ECs) is large and growing, with many customers needing special connectors that fit their specific applications. However, developing these solutions requires considerable time and money. The design process is complex, and the approval (homologation) process can take many months. In some cases, the total development time may last more than a year. These challenges make it hard to respond quickly to urgent customer needs.

Additionally, today's customized connectors are limited in shape, size, and functionality. They are not flexible enough for fast-changing requirements, slowing down innovation and decreasing competitiveness.

In this project, a new automated design tool is being developed to design ECs much faster and with more flexibility. It allows for new shapes and functions that were not possible before, and reduces development time and costs significantly.

This innovation will support a new product line at Stäubli called Monoblock. It will help enter new markets and respond quickly to customer requests. The goal is to simplify the development of customized ECs while making it faster, cheaper, and more adaptable.

Herr David Gersinska, Raul San Miguel Peñas

HW/SW Engineer, I&T Innovation Lab, Researcher

Stäubli Electrical Connectors AG (in Zusammenarbeit mit inspire AG)

Topics: Automatisierung, CAD-Design, Konfigurator, Prozessoptimierung, Steckverbinder

35

Title: Swiss Plasma Polishing - Plasma Electrolytic Polishing with a Jet

Session: Advanced Manufacturing & Materials

Abstract: Unser Spin-off «Swiss Plasma Polishing» der Berner Fachhochschule entwickelt eine innovative plasmaelektrolytische Poliertechnologie mit Jet (PEP-Jet), die die Grenzen herkömmlicher Polierverfahren überwindet.

Unsere Methode erzielt in kürzester Zeit glatte und korrosionsbeständige Oberflächen nach höchsten Standards, selbst bei komplexen und rauen 3D-gedruckten Bauteilen.

Dabei setzen wir nur auf wasserbasierte Elektrolyte, welche sicher für Menschen und nachhaltig für die Umwelt sind.

Unser PEP-Jet erlaubt gezieltes, lokales Polieren nach Oberflächenstandards ganz ohne Vorbehandlung oder Reinigung. Durch das gezielte Polieren mit einem Jet können wir einen Teil gezielt polieren, wo es wirklich erforderlich ist, dies spart Zeit und Ressourcen. Zudem erreichen wir mit dem Jet Orte an Teilen, bei denen heutige Poliermethoden scheitern.

Herr Yan Scholl

Berner Fachhochschule

Topics: Plasmapolieren, Oberflächenveredelung, Oberflächenbearbeitung, Metall polieren

36

Title: Lattice Structures in LPBF

Session: Advanced Manufacturing & Materials

Abstract: Lattice structures, whether stretching-based or bending-based in their load transfer behavior, have become an important design approach for lightweight and functional components. Defined by periodic or stochastic cellular geometries, they enable mass reduction, tailored stiffness, and controllable deformation characteristics. Their wider use was accelerated through polymer-based additive manufacturing, especially fused deposition modeling (FDM), where lattices were first broadly applied thanks to accessible design tools and manufacturing freedom.

While the fundamental advantages of lattices, such as weight reduction, material efficiency, and energy absorption are comparable across polymers and metals, their implementation in metal manufacturing opens new avenues for functional integration. Mechanical properties such as stiffness, strength, and fatigue behavior can be tuned through cell topology, gradient design, and strut dimensions.

In metal additive manufacturing, lattice structures are increasingly used in fields such as medical implants and heat exchangers, where internal architectures provide functional benefits like improved bone growth, stress and fluid flow and thermal management. Processes such as powder bed fusion and electron beam melting have enabled the production of fine, repeatable lattice features that were not manufacturable with conventional methods.

Modern software tools, which include generative design, topology optimization, and CAD-integrated lattice generators play a crucial role in enabling engineers to design and validate complex structures. This presentation highlights current capabilities, applications, and design considerations in metal lattice manufacturing.

Herr Elischa Meier

Wissenschaftlicher Assistent & Master's Student

FHNW Institut für Produkt- und Produktionsengineering (IPPE)

Topics: Lattice Structures overview - Growing interest of Lattices - Mechanical Properties - Usage in Metal Manufacturing - Design and Software

37

Title: Process optimization and accelerated ramp-up in gear grinding

Session: Advanced Manufacturing & Materials

Abstract: Continuous generating gear grinding is a high-performance manufacturing process that demands both elevated throughput and exceptional precision. Achieving these objectives requires careful optimization of process parameters—such as grinding speed, axial and radial infeed—to balance cycle time against surface and profile quality. This process must be done for each new part and geometry to be produced. Traditionally, this optimization relies on highly skilled engineers, whose expertise is costly and not universally available. Even for experienced specialists, determining optimal parameters is a challenging and time-consuming work based on trial and error.

In collaboration with Reishauer AG, we address this challenge by developing a comprehensive end-to-end pipeline for automated process parameter optimization, targeting the key quality metric: profile form deviation (f_fα). The proposed solution comprises four main components: 1) Preprocessing Module: Converts machine quality measurements into structured tabular data and incorporates a robust outlier detection mechanism based on clustering techniques. 2) Predictive Modeling: A generalized Gaussian Process-based model trained on industrial-scale data to predict quality outcomes under varying parameter configurations. 3) Smart Sampling Algorithm: Accelerates the search for optimal process parameters by guiding exploration toward promising regions of the parameter space, thereby reducing ramp-up time. 4) User Interface: An intuitive, web-based platform enabling seamless interaction with the optimization pipeline.

This integrated approach significantly reduces time and expertise required for parameter tuning, supporting consistent high-quality gear grinding performance in industrial environments.

Herr Francesco Crivelli

Head of Research & Business Development

CSEM SA

Topics: Process optimization, Accelerated ramp-up, End-to-end pipeline, Gaussian processes, Smart sampling

38

Title: High-precision micro-machining and precision-measurements of apertures made of carbides

Session: Advanced Manufacturing & Materials

Abstract: Optical apertures are used to measure the radiated power of the sun. They are made of carbide, a hard-to-machine and brittle material. The machining process, based on a combination of milling and grinding on a 5-axes machining centre, allows to machine complex geometries with form deviations ‹2 µm and feature sizes ‹50 µm without breakouts.

In addition, a multisensor coordinate measuring method is presented that enables to determine the opening area with a measurement uncertainty of only 11 ppm, which equals a measurement uncertainty of 0.00055 mm2.

The expertise gained can be used for other applications such as mould and tool making or medical technology.

Herr Thomas Liebrich

Head of Ultra-Precision Manufacturing Lab

RhySearch

Topics: Micro-machining / Cutting / Materials / Coordinate metrology / Measurement uncertainty

39

Title: Chemical Solvent Waste Reduction

Session: Sustainability, IoT & Smart Systems

Abstract: The chemical industry relies heavily on organic solvents, which account for a substantial share of energy consumption and CO_2 emissions in chemical production. Conventional solvents are widely used in downstream processing and extraction, yet they pose environmental and safety risks due to volatility and flammability. This project explores the potential of high-boiling, bio-based solvents as sustainable alternatives, focusing on the separation of acetic acid from aqueous solutions.

This project investigates high-boiling, bio-based solvent systems as sustainable alternatives. The selection of suitable candidates is supported by quantum chemical solvent screening, enabling the prediction of liquid–liquid equilibria and phase behavior prior to experimental validation. The subsequent development of energy-efficient separation and solvent recovery methods, such as extraction, pervaporation, or distillation, aims to minimize solvent losses and overall process energy demand.

The overarching goal is to advance solvent systems that enable efficient separation while reducing environmental impact and energy demand, thereby contributing to more sustainable downstream processes in the chemical and bioprocessing industries.

Herr Reinhard Berger

Laborleiter Verfahrenstechnik

Zurich University of Applied Sciences (ZHAW) Winterthur

Topics: Sustainable Processes, Chemical Industry, Bio-sourced intermediates, Waste Reduction

40

Title: Life-like Robots: Musculoskeletal and Biohybrid Innovations for the Factory of the Future

Session: Sustainability, IoT & Smart Systems

Abstract: Our research develops life-like robots that bridge the gap between biological systems and industrial applications. By combining musculoskeletal designs, soft materials, and biohybrid actuation, we create robotic systems that are inherently safer, more adaptive, and capable of dexterous interaction with complex environments. These innovations open opportunities in logistics, automation, and human-robot collaboration where flexibility and robustness are critical. I will highlight recent advances in musculoskeletal robots and soft robotic manipulators, and outline how these approaches contribute to the future of sustainable, human-centered manufacturing.

Herr Robert Katzschmann, Ronan Hinchet

Assistant Professor of Robotics, Senior Scientist

ETH Zurich

Topics: Robotics, Automation, Logistics, Resource Efficiency, AI-driven design

41

Title: Carbon Fibre Waste Reuse in Airborne Structures

Session: Sustainability, IoT & Smart Systems

Abstract: The Pilatus Aircraft Ltd. targets to reuse their ca. 6.6 t/year carbon fiber reinforced thermoset prepreg cutoffs, that are going to incineration today by an efficient novel prepreg cutoff reuse process. The main project-goal is to reuse these CF-prepreg cutoffs for manufacturing new aircraft components. The key novelty is that thermoset cutoffs are reused for the first time to manufacture structurally significant “flying” parts that are subject to rigorous qualification and certification requirements. At the same time the weight and costs shall be reduced compared to typical aluminum parts. Also structurally non-significant applications are envisaged. This will allow to reuse a large portion of the thermoset prepreg waste.

Herr Dejan Romančuk

Professor

Hochschule Luzern (HSLU)

Topics: Composites, Sustainability, Recycling, Structural Integrity, Aeronautics

42

Title: Plastic Waste as a Resource for Lightweight Structures

Session: Sustainability, IoT & Smart Systems

Abstract: During classical material recycling of endless fiber reinforced polymer (FRP) components or cutoffs with thermoplastic matrix systems, e.g. by a granulating and injection molding process, typically the fibers are cut to some mm length, what leads to a low mechanical performance of the recycled materials.

Together with industrial partners, Inspire is investigating the alternative Hot-Cold Flow-Press-Forming process to manufacture structural components, e.g. from thermoplastic FRP or low-value mixed plastic waste streams.

Several demonstrator components made by this innovative process route are presented highlighting the major benefits of the "soft" flow-press-forming in the hot tool, allowing:

(1) recycling of FRPs with "long" fibers & the conservation of the local textile structures leading to good mechanical performance

(2) the combination of high amounts of recycled (fiber reinforced) thermoplastics e.g. with CO2-efficient natural reinforcement elements

(3) the recycling of multi-material-waste streams with high thermoplastic content

The potential of this innovative process route to realize structural components with good mechanical performance and high recycled material content (up to 100 %) will be discussed based on the demonstrator components, e.g. targeting sustainable structures for logistics applications.

Herr Markus Zogg

Head Composite Structures

Inspire AG

Topics: recycling of plastic waste streams / recycling of fiber reinforced polymers / lightweight structures from recycled materials / Hot-Cold Flow-Press-Forming / sustainable structures for logistics applications

44

Title: AI-Driven Optical Inspection and 3D Metrology for Reliable Battery Cell Manufacturing

Session: Sustainability, IoT & Smart Systems

Abstract: In the production of miniature button battery cells for medical applications, dimensional accuracy and process stability are essential to ensure long-term reliability and highest quality. To meet these stringent requirements, an advanced inline inspection system was developed in collaboration with CSEM and integrated within a newly built fully automated 24/7 manufacturing line of an industrial partner. The developed system combines 3D light-field metrology for high-precision volumetric measurement with AI-driven optical end control for surface quality inspection, achieving continuous and fully automated quality assurance across approximately two million produced button battery cells per week.

Three 3D light-field cameras enable micron-level volumetric verification of button cells and dispensed electrolytes at a cycle rate of 4 Hz, ensuring 100% inline measurement coverage. Two additional 2D cameras equipped with machine-learning algorithms perform real-time anomaly detection, identifying defects and assembly inconsistencies with high robustness.

This architecture enables immediate statistical feedback on key process parameters, allowing early detection of tool wear or process drift and thereby stabilizing product quality. The combination of advanced 3D metrology and AI-based visual inspection establishes a new benchmark for industrial quality assurance - delivering consistent, traceable, and highly reliable production results in a demanding application fields of manufacturing.

Herr Silas Dietler

R&D Engineer

CSEM

Topics: - AI-driven inline inspection - Anomaly detection - 3D inline metrology - High volume Medtech manufacturing - Real-time process monitoring

45

Title: Die Zukunft der Holzfasern: Nanocellulose und KI in der industriellen Fertigung

Session: Sustainability, IoT & Smart Systems

Abstract: Viele Alltagsprodukte enthalten heute Bestandteile aus petrochemischen Rohstoffen, die weder nachhaltig noch umweltfreundlich sind. Nanocellulose bietet eine Alternative: Sie wird aus lokalem Holz gewonnen, ist für Mensch und Tier unbedenklich, nachwachsend und biologisch abbaubar. Bisher hat sich der Rohstoff jedoch nicht etabliert, da die Herstellung hohe Investitionen, viel Personal und Energie erfordert und es nur wenige Anlagenlieferanten gibt. Genau das möchte das Unternehmen Technikum Laubholz mit ihrem Projekt KIck-Bio nun ändern. „Ziel des Projekts ist es, eine betriebsfähige und vollautomatisch arbeitende Pilotanlage sowie ihren Digitalen Zwilling für die Herstellung von Nanocellulose aus Buchenholzfasern aufzubauen und mit einer anschließenden KI-Prozessoptimierung die Effizienz der Anlage zu steigern“.

Frau Teresa Alberts

CEO

ITficient AG

Topics: Nachhaltige Materialien, Künstliche Intelligenz, Prozessoptimierung, automatisierte Produktion, Smart Factory

46

Title: Building an AI-Powered Ecosystem for Intelligent, Sustainable Solar Operations

Session: Sustainability, IoT & Smart Systems

Abstract: Our current EAGLE project has demonstrated that AI-driven multispectral imaging can predict PV models performance and detect and classify photovoltaic (PV) module defects with exceptional accuracy. Building on this foundation, we envision its extension into a comprehensive ecosystem that strengthens operations, finance, and sustainability in the PV sector. In the field, coupling defect detection with performance models creates digital twins of PV assets, virtual replicas that mirror the real-time health of solar systems. These twins support lifetime yield prediction, insurance risk assessment, and optimized maintenance planning. Furthermore, objective, image-based diagnostics provide insurers with transparent tools to validate claims and support data-driven risk management.

Beyond operations and finance, EAGLE also unlocks major environmental benefits. By classifying which modules or cells remain viable, defect detection enables smart reuse and second-life applications, from repowering smaller systems to supporting rural electrification and off-grid storage. At end-of-life, the analysis of defect patterns linked to material degradation allows recyclers to optimize recovery processes for glass, silver, and silicon. Together, these applications transform defect detection from a diagnostic tool into a cornerstone of operational intelligence, financial trust, and circular economy practice, extending PV lifetimes, reducing waste, and securing a more sustainable solar future.

Frau Danuta Paraficz

data scientist

Fernfachhochschule

Topics: Solar energy, PV panels, sustainability, digital twin, AI

47

Title: Chat with your Data

Session: Sustainability, IoT & Smart Systems

Abstract: In der produzierenden Industrie werden zur Ermittlung von Produktionskennzahlen, wie Maschinenauslastung, Maschinen- oder Prozessstörungen, usw. in der Regel grosse monolithische MES-Systeme (Manufakturen Execution Systems) eingesetzt. Diese sind sehr teuer und nicht sehr flexibel in ihrer Anwendung. Durch die fortschreitenden Digitalisierung der Produktion mit sogenannten Smart Factory Konzepte können alternativ zu MES-Systeme sogenannte Edge oder SCADA Systeme (Supervisory, Control and Data Acquisition) eingesetzt werden. Diese sind kostengünstiger und erlauben mit entsprechenden Tools wie z.B. Graphana, oder sogenannten Power Bi Produktionskennzahlen oder Maschinenkennzahlen graphisch darzustellen und auszuwerten. Der "Nachteil" von Power BI sind, dass Mitarbeitenden die Auswertungen erstellen möchten, grundlegende oder gar erweiterte Informatikkenntnisse aufweisen müssen. Aus diesem Grund wird die Programmierung von Power BI oder SCADA Systemen meist von Seiten der Informatikabteilungen übernommen.

Diese führt meist zu Wartezeiten und Reibungspunkten in den Unternehmen, da vor allem bei kleineren und mittleren Unternehmen die Informatikkapazitäten limitiert sind. Auf Grund dieser Ausgangslage wurde die Idee entwickelt, dass man mittels eines KI-Assistenten ohne

Informatikkenntnisse durch die Eingabe eines "Prompt" automatisch Produktionsrapporte generieren kann. Der KI-Assistent "Chat with your Data" kann seine Daten aus beliebigen Datenbanken mit Echtzeitdaten beziehen. Ein erster Prototyp steht bereits erfolgreich im Einsatz.

Herr Markus Krack

Professor für Smart Factory

Fachhochschule Nordwestschweiz, Institut für Business Engineering

Topics: Nutzung von AI / LLM in der Produktion

48

Title: Sustainable Soft Aerial Robotics for Climate and Conservation

Session: Sustainability, IoT & Smart Systems

Abstract: To access and collect data in remote environments, aerial robots face challenges to maintain endurance while being highly adaptable and robust to the constantly changing environments, errant wind disruptions, and interacting wildlife. To approach this, sustainable aerial robots, inspired by nature, provide us with various adaptable strategies to encode physical intelligence within the design of the next generation of aerial robots. For example, a series of perching aerial robots utilize metamorphic structures to both fly in a highly stiff state and wrap around a tree branch in a continuum soft state. Thus, saving extra payload that would have been occupied by adding an additional manipulator onboard. Our team has also actively been developing biodegradable structures and actuators for sustainable aerial robots. Studying Javan cucumber seeds, moulding biodegradable gliders made of potato wafers, utilized as sensorized flying sensors for gathering large-scale information from the forest floor before biodegrading into the environment. Further, our international collaborations have led to the exciting field of soft aerial-aquatic adhesion. We have seen our systems employ bio-inspired graspers designed based on the remora and net-wing midge suction cups for capabilities of attaching and perching both underwater and in terrestrial environments. Finally, our team is expanding the capabilities of our soft aerial robots to not just fly, but also dive, swim, escape water, and sail. These projects open the door to the endless capabilities for these multi-modal and multi-capability soft aerial robots.

Herr Pham Huy Nguyen

Research Scientist at Laboratory of Sustainability Robotics

Empa and EPFL

Topics: Aerial robots must balance endurance, adaptability, and robustness in changing environments. Nature-inspired designs embed physical intelligence for sustainable aerial robotics. Metamorphic perching robots switch between flight and grasping modes to sav

49

Title: Mobile Robot for Floor Grinding

Session: Sustainability, IoT & Smart Systems

Abstract: Wood floor grinding is a labor-intensive and repetitive task, traditionally performed with heavy machinery that still requires continuous human operation. This exposes workers to dust, noise, and physical injury risks, while demanding skill to achieve a uniform finish. Automating this process offers a step-change in both safety and efficiency for the construction industry.

We developed and tested an automated approach that enables a robot to grind floors evenly and reliably without human intervention. By simulating and optimizing coverage path planning strategies, we identified a rotated zig-zag trajectory as the most effective, reducing errors and ensuring a consistent surface finish. The software was successfully deployed onto a custom-built robotic platform and validated in a real apartment setting, proving the feasibility of autonomous sanding in practice.

The impact of this work extends far beyond wood floors. The approach establishes a transferable framework for automating other heavy, repetitive, and safety-critical surface treatments such as concrete grinding, polishing, or even painting and spraying. By combining simulation-driven development with real-world validation, this project demonstrates how robotics can rapidly improve workplace safety, boost efficiency, and accelerate the adoption of autonomous systems in construction and related industries.

Herr Mario Russi

Head of Physical Robotics

CSEM

Topics: Improved worker safety – automation removes direct human exposure to dust, noise, and injury risks in floor grinding. Higher efficiency and quality – optimized robotic paths deliver faster, more uniform results than manual sanding. Proven real-world fea

50

Title: Der Digitale Produktpass: Herausforderungen und Chancen für die Industrie

Session: Sustainability, IoT & Smart Systems

Abstract: Der Digitale Produktpass: Ein Katalysator für die technologische Neuausrichtung

Die Einführung des Digitalen Produktpasses (DPP) durch die EU stellt die Schweizer Tech-Industrie vor eine fundamentale Neuerung. Weit über eine reine Compliance-Pflicht hinaus, definiert der DPP als zentraler digitaler Datensatz die künftigen Spielregeln für Produkttransparenz und Nachhaltigkeit.

Für F&E- und Produktionsverantwortliche wird die Notwendigkeit, Produktdaten über komplexe, fragmentierte Lieferketten hinweg interoperabel zusammenzuführen, zur größten technischen Herausforderung. Doch genau hier liegt die Chance für Innovation: Der DPP zwingt Unternehmen zur digitalen Harmonisierung ihrer Prozesse, was unmittelbar zu Effizienzsteigerungen und tieferen Einblicken in den Produktlebenszyklus führt.

Wer den DPP strategisch implementiert, sichert sich einen Wettbewerbsvorteil. Die gewonnenen, validierten Daten ermöglichen nicht nur die glaubwürdige Kommunikation von Nachhaltigkeitsbemühungen, sondern schaffen die Grundlage für neue, profitable Services rund um Wartung, Reparatur und das hochwertige Recycling von Komponenten.

Für die Schweizer Industrie gilt es, den DPP als Investition in die Zukunftsfähigkeit zu begreifen. Jetzt ist der Zeitpunkt, durch Pilotprojekte aktiv in die Gestaltung der Dateninfrastruktur einzusteigen und diesen regulatorischen Impuls als Katalysator für die technologische und prozessuale Führungsposition zu nutzen.

Herr Peter Krummenacher

CEO

BloqSens AG

Topics: - Rahmenbedingungen - Was ist ein DPP - Herausforderungen - Chancen - Wegleitung zum Start

51

Title: Optimum Clustering for Multi-Border Router Wireless Mesh Networks

Session: Sustainability, IoT & Smart Systems

Abstract: Low-power wireless mesh networks with thousands of interconnected nodes are becoming increasingly common. Standards such as Wi-SUN provide a framework for these networks, but as their size grows, congestion at certain nodes creates bottlenecks and reduces reliability. Routing protocols like RPL, which most mesh standards use, make decisions locally at each node without awareness of traffic conditions elsewhere in the network. Sharing such information could improve performance but would also add communication overhead and complexity.

A practical way to improve Quality of Service (QoS) is to add multiple border routers. This divides a large network into smaller, more manageable sub-networks. Instead of generating many control packets, traffic is redirected through additional border routers that provide high bandwidth and stable connections to the cloud or final destination. However, adding border routers requires careful planning to ensure that only the minimum number necessary for the desired QoS is used. This involves determining their optimal placement through two key steps: first, clustering the large network into smaller sub-networks, and second, selecting the most suitable nodes within each cluster to act as new border routers.

Herr Mahboob Karimian

Chargé de Ra&D

HEIG-VD (IICT)

Topics: IoT, Mesh, Routing Optimization, Clustering, Network fast Simulation

52

Title: Decentralized intelligence in industrial automation

Session: Sustainability, IoT & Smart Systems

Abstract: Dezentrale intelligente Antriebe, wie der Rhino Linearmotor von Compact Motion, verlagern die Rechenleistung vom Schaltschrank direkt in die Maschinen – die Zukunft smarter Produktionsmaschinen.

Herr Michael Schmid

Co-Founder

Compact Motion GmbH

Topics: Dezentrale Intelligenz - smarte Antriebe

X

Title: Moving to Series Production with Plastic Powder Bed Fusion (PBF)

Session:

Abstract: Powder Bed Fusion (PBF) is a key technology in additive manufacturing. However, the step from prototyping and small batches to true industrial series production is a challenge – driven by high costs, limited material availability, and the lack of adaptation to specific industrial needs. We aim to explore how PBF can be made cost-efficient and sustainable for series applications in Switzerland. We will evaluate the new generation of PBF machines with regard to productivity, energy efficiency, and adaptability to Swiss production requirements. At the same time, we will address the materials side: Which powder qualities and volumes are needed? How can supply chains be stabilized? And how can recycling be better integrated into the process?

The project's goal is to clearly map the current state of what is already possible, while identifying the critical gaps that still need to be filled in order for PBF to become a true series production technology. This opens up new opportunities for Swiss industries such as medical technology, mobility, and consumer goods, which all benefit from tailored, efficient, and reliable manufacturing.

Herr Daniel Werner

Group Leader

Inspire AG

Topics: Production, Plastics, Materials, Value, AI

X

Title: Konzeption nachhaltiger IoT-Lösungen

Session:

Abstract: Konzeption nachhaltiger IoT-Lösungen

Der digitale Wandel hat unsere Welt tiefgreifend verändert – doch mit dem rasanten Wachstum der Informationstechnologie steigt auch ihr ökologischer Fussabdruck. Allein die weltweite Nutzung digitaler Dienste verursacht jährlich Treibhausgasemissionen in Milliardenhöhe. Vor diesem Hintergrund gewinnt Nachhaltigkeit zunehmend an Bedeutung: Hard- und Software müssen so entwickelt, betrieben und genutzt werden, dass sie Ressourcen schonen – für eine digitale Zukunft, die auch ökologisch tragfähig ist.

Im Rahmen des Interreg-Projekts «IoT Sustainability» wurde untersucht, wie nachhaltige IoT-Lösungen konzipiert werden können. Ergebnisse unserer Forschungsarbeit geben Antworten auf zentrale Fragestellungen:

a) Welche Datenformate und Protokolle eignen sich für einen effizienten Datenaustausch in IoT-Systemen?

Im Internet of Things müssen Geräte Daten unter oft schwierigen Bedingungen austauschen – etwa bei geringer Rechenleistung, begrenztem Speicher oder instabilen Netzwerken. Sowohl die Wahl des Datenformats als auch des Kommunikationsprotokolls spielt dabei eine entscheidende Rolle. Erst das richtige Zusammenspiel ermöglicht es, Effizienz, Zuverlässigkeit und Nachhaltigkeit gleichermassen zu erreichen.

b) Wie lässt sich nachhaltige Software – sogenannte Green Software – entwickeln?

Nachhaltige Softwareentwicklung bedeutet mehr als nur die Reduzierung des Energieverbrauchs. Sie umfasst bewusste Architekturentscheidungen, den Einsatz effizienter Algorithmen, die optimierte Nutzung von Cloud-Ressourcen sowie ein Umdenken im gesamten Software-Lebenszyklus. Ziel ist es, klimafreundliche Anwendungen zu schaffen, die Nachhaltigkeit als strategische Kompetenz verankern – ohne die Produktivität der Entwicklerinnen und Entwickler einzuschränken.

Herr Rene Pawlitzek

Professor für Informatik

Fachhochschule OST - Institut für Elektronik, Sensorik und Aktorik (ESA)

Topics: Untersuchung nachhaltiger IoT-Konzepte, effiziente Datenformate und Protokolle, Entwicklung von Green Software, nachhaltiger Betrieb von Software, Nachhaltigkeit im gesamten Software-Lebenszyklus

X

Title: Datalogger for building automation systems

Session:

Abstract: Building energy management today faces significant challenges due to the fragmented nature of automation systems. Organizations are often locked into proprietary vendor solutions, creating dependency that limits flexibility. Many buildings operate with a mix of protocols and systems from different manufacturers

Our innovation is to provide a cost-effective, multi-protocol, vendor-independent module that, once installed in a building, collects data from various automation sources (e.g., HVAC systems) and stores it in a unified database. The aggregated data can then be used to perform an energy audit of the building and provide actionable insights for the owner. The current prototype only supports BACnet protocol but is designed to be extendable for Modbus, KNX, ...

Herr Sylvan Arnold

Assistant Embeded Systems Engineer

HES-SO Valais

Topics: Design of a datalogger for building automation systems, Passive or active traffic acquisition, Analysis of HVAC systems efficiency with collected data, Energy audit, Performance optimization

X

Title: Influences of Recycling Loops on Plastic Processing and Parts Properties

Session:

Abstract: This project investigates closed-loop recycling of polyolefins with a focus on different polypropylenes. We subject materials to multiple reprocessing cycles and injection-mold them into standardized specimens to quantify how processability and end-use properties evolve. The experiments track rheology and flow (MFI, capillary rheometry), tensile performance (strength, modulus, strain at break), impact resistance and viscoelastic response (DMA). Thermal/oxidative stability is assessed via DSC (OIT) and FTIR carbonyl indices. Microstructural changes are inferred from crystallinity metrics and related morphology indicators. To minimize positional bias, sampling is standardized to the mid-gauge of ISO 527 tensile bars, and processing histories are logged to interpret structure–process–property linkages.

The aim is to show how properties change with the number of reprocessing cycles and to identify the range in which parts still meet typical requirements. We fit trend lines versus cycle number, define practical limits (specification bands). Where relevant, we note straightforward options (e.g., re-stabilization) to keep properties within target limits.

Herr Josip Dubravac

Wissenschaftlicher Mitarbeiter

OST / IWK Institut für Werkstofftechnik und Kunststoffverarbeitung

Topics: Plastics, Recycling, Processing Parameters, Injection Moulding, Sustainability

X

Title: High dielectric permittivity elastomers for energy transducers

Session:

Abstract: The synthesis of novel functional dielectric materials that are printed into devices capable of converting one form of energy into another is of high societal relevance. Our research spans the entire spectrum, from material creation and optimization to device engineering and the exploration of manifold applications. We have developed high-permittivity dielectric elastomers with an unprecedented range of properties and utilize them as active components in devices for emerging technologies. The devices reversibly change their shape in response to an electric field, generate an electric signal when mechanically stressed, and store electricity in the form of batteries. Our materials have the potential to revolutionize various fields of application, including actuators, sensors, energy harvesting, artificial muscles, soft robotics, energy storage, stretchable electronics, and solid-state refrigeration.

Frau Dorina Opris

Group leader

Empa

Topics: Soft robotics and Additive Manufacturing & New Materials

X

Title: Sensor matrix

Session:

Abstract: As part of an Innosuisse project, OST Buchs, Empa St. Gallen, and the companies Medela and StepZero have developed a sensor matrix. This matrix consists of flexible pixels measuring 10 × 10 × 1 mm, capable of simultaneously measuring pressure, shear forces, temperature, and humidity. The sensor matrix can be realized as a flexible mat and can be read out either via wired or wireless connection. It can be adapted to different pressure ranges as required. Possible application areas include medical technology, sport and fitness, robotics, measurement technologies and other fields. In this project, expertise from microtechnology, electronics, digital communication, data science, and physiology were combined within an interdisciplinary team.

Herr Guido Piai

Prof. Ing. (Univ.), Leiter des Instituts ESA für Elektronik, Sensorik und Aktorik

OST Ostschweizer Fachhochschule

Topics: Medical technology, robotics, measurement technology, microtechnology, electronics

X

Title: Life Cycle Assessment in Additive Manufacturing

Session:

Abstract: This presentation introduces a Life Cycle Assessment (LCA) of polymer production using Selective Laser Sintering (SLS). The study compares Additive Manufacturing (AM) routes employing two materials: DuraForm PA and EMS D2660A. Both materials are evaluated for a single use case, living hinges developed for exoskeleton components in logistics applications. During the AM process, the energy consumption of the entire manufacturing cycle is recorded. The produced parts are tested to assess durability and lifespan, and the results are compared with real usage data from logistics operations to estimate emissions associated with the use phase. The study follows ISO 14040/44 standards and aims to identify key environmental impact drivers throughout the life cycle. The results highlight the potential of polymer AM to improve sustainability and product performance, demonstrating the relevance of data-driven LCA approaches for industrial applications.

Herr Dario Puccio

Project Engineer

inspire AG

Topics: Additive Manufacturing; Life Cycle Assessment; Polymers Production; Process Chains;

X

Title: Effects of Exoskeletons on Manual Assembly Workers

Session:

Abstract: In collaboration with Everllence (formerly MAN Energy Solutions) and Auxivo, we conducted a field experiment where we equipped shop floor workers with back-and-shoulder exoskeletons. These devices attach to the body to support during manual tasks such as lifting and handling heavy objects. Our objective was to assess how the exoskeleton affects physical strain, work performance, and stress levels. We monitored physiological indicators like heart rate, blood pressure, and muscle activity throughout the experiment. Participants completed their daily tasks with and without the exoskeleton, each condition lasting about an hour. The results demonstrate that the exoskeleton significantly decreases physical strain. Additionally, participants reported feeling less stressed, which was also reflected in the physiological data. While the impact on productivity varies by task, especially for shoulder and overhead work, the exoskeleton tends to increase productivity. Overall, our findings indicate that exoskeletons are a valuable technology to enhance worker well-being and potentially improve both short-term and long-term productivity.

Herr Jannick Fiedler

Doktorand

inspire AG / ETH Zurich

Topics: Smart Technologies, Industry 4.0, Industry 5.0, Assembly Processes, Worker Assistance

X

Title: Additive manufacturing of metal parts in OST

Session:

Abstract: Additive manufacturing (AM) of metals offers innovative pathways for producing complex and high-performance components. Three representative methods—Laser Metal Deposition (LMD), Wire Arc Additive Manufacturing (WAAM), and Fused Filament Fabrication (FFF)illustrate the diversity of current research and industrial applications.

LMD utilizes a focused laser beam to create a melt pool on the substrate, into which metal powder is fed. This process enables the production and repair of high-value components with excellent material properties and controlled microstructures. In our project of Pelton Turbine Repair, our focus has been on process parameter optimization, multi-material deposition, and Erosion tests after LMD.

WAAM, based on an electric arc as the heat source and metal wire as the feedstock, is particularly suited for large-scale metallic parts. Our research project Cladding with Inconel, our target has been improving geometrical accuracy and developing new material for WAAM.

FFF of metals, although derived from polymer printing, employs metal-filled filaments followed by debinding and sintering. It provides a cost-effective route to small and intricate metal components. In our injection mold manufacturing project we addressed the challenges such as achieving full density, optimizing sintering profiles, and exploring cooling channels for particular applications.

Herr Mohammad Rabiey

Prof.

IWK, OST

Topics: Additive Manufacturing (AM), Laser Metal Deposition (LMD), Wire Arc Additive manufacturing (WAAM), Fused Filament Fabrication (FFF)

X

Title: AI-enhanced risk analysis for complex industrial systems

Session:

Abstract: As complex systems become integral to modern life, industries like aerospace, automotive and energy distribution stand at the forefront of both technological advancement and safety challenges. The increasing complexity of technical systems demands ever more rigorous risk analysis to prevent mission aborts, service interruptions, and costly failures. Despite strict safety regulations, the accelerating pace of development and the pressure to contain costs increase the likelihood of overlooked hazards.

Reshape Systems SA addresses these challenges with an AI-driven risk analysis platform. Acting as a digital “co-pilot” for engineers, our software automates the identification of critical risks throughout the system lifecycle and dynamically updates assessments as new design or supplier data emerge. Through Explainable AI, our solution provides full transparency and traceability, enabling engineers to verify and trust AI-assisted decisions.

Herr Andrea Apollonio

CEO

Reshape Systems

Topics: Risk analysis requirements in modern industry, High impact accidents in industry, Generative AI, Explainable AI, AI-enabled business models

X

Title: Physics-informed AI for Smarter Flow Measurement in Industrial Processes

Session:

Abstract: Accurate flow measurement is critical for efficient and reliable production, from chemical and pharmaceutical plants to food, beverage, and energy systems. Yet in real production environments, flow meters often face systematic measurement errors caused by complex pipe geometries, turbulence effects, or installation constraints. These deviations reduce efficiency and can lead to costly quality issues.

Our collaboration with Endress+Hauser Flowtec AG introduces a new AI-based framework that combines physical simulation data with deep learning to automatically correct such measurement errors. By integrating knowledge from computational fluid dynamics (CFD) into a neural network, the system learns how real-world flow conditions influence sensor readings, even under previously unseen setups.

The result is a “physics-informed” AI that can predict and compensate measurement deviations, enabling more precise and robust flow monitoring across different industrial applications. This approach demonstrates how artificial intelligence can enhance existing sensor technologies, reduce the need for manual calibration, and pave the way for self-correcting, smart measurement systems in modern production environments.

Frau Lilach Goren Huber

Dozentin

Zürich Hochschule für angewandte Wissenschaften (ZHAW)

Topics: Physics-Informed AI, sensor calibration, industrial processes, process automation, error correction

X

Title: Multi-Protocol Datalogger for Building Automation Systems

Session:

Abstract: Modern building energy management systems face growing challenges due to fragmented automation architectures and a lack of interoperability between vendors. Buildings often host a mix of HVAC, lighting, and monitoring devices using different communication standards—such as BACnet, Modbus, or KNX—making centralized supervision and optimization extremely difficult.

To address this challenge, we propose a multi-protocol, vendor-independent datalogger that integrates seamlessly into existing building automation networks. The system can passively capture traffic, actively map the network topology, and poll selected devices to acquire complete operational data. Once aggregated, the collected information can be analyzed to identify devices, energy consumption patterns, and inefficiencies in real time.

The datalogger forms a core component of the broader Digitalisation et Efficience Énergétique (DEE) initiative, which aims to enable data-driven energy audits and pave the way for an Intelligent Building Energy Management System (IBEMS).

A first prototype currently supports BACnet, with planned extensions to Modbus, KNX, and other protocols. This innovation contributes to more transparent, flexible, and efficient energy management, empowering facility managers to make informed decisions and accelerate the digital transformation of building infrastructures.

Herr Silvan Zahno

Full Professor UAS

HES-SO Systems Engineering

Topics: Data-driven energy audits for building automation systems, Passive and Active data acquisition techniques, Multi-protocol integration and network mapping, Performance monitoring and optimization strategies, Building energy management challenges

X

Title: Innovation Factory for Next-Generation Manufacturing: A Digital Transformation Hub at OST University of Applied Sciences

Session:

Abstract: The Innovation Factory represents a groundbreaking initiative to establish a nationwide lighthouse project for advanced manufacturing at the Swiss Innovation Park OST (SIPO) in St. Gallen. This interdisciplinary project bridges the gap between academia and industry by creating a comprehensive platform for digital transformation in manufacturing.

The factory integrates multiple departments - Technology, Business, and Computer Science - to demonstrate the future of Swiss production. At its core, the project utilizes unihockey ball manufacturing as a practical example to showcase end-to-end digital processes. The production line features sensor-equipped machines that generate real-time data, AI-powered quality control using optical methods and pattern recognition, and complete traceability through serial numbering systems.

Key technological components include seamless ERP integration with SAP systems, horizontal and vertical IT system integration, cloud-based data storage with machine learning capabilities, and automated sustainability reporting. The project emphasizes practical application through its "Learn-to-Learn" platform, serving various study programs while fostering partnerships with industry leaders.

This initiative positions Eastern Switzerland as a center of excellence for high-wage manufacturing locations, demonstrating how traditional production can be transformed through data-driven approaches, artificial intelligence, and sustainable practices to remain globally competitive.

Herr Valmir Bekiri

Wissenschaftlicher Mitarbeiter

IPM - OST

Topics: Industry 4.0, Digital Twin, Smart Manufacturing, Sustainability, Innovation Ecosystem

X

Title: AI-Powered Predictive Maintenance for Large Hydro Machines

Session:

Abstract: Our presentation describes the application of machine learning and digital twin modeling for predictive maintenance of large hydro pump-turbine machines. GradeSens developed an AI-based analytics platform capable of detecting early anomalies in critical components such as bearings, seals, and hydraulic systems, extending well beyond the capabilities of traditional condition monitoring systems. The method combines engineering expertise with data-driven modeling: historical SCADA data are analyzed and resampled, then used to train regression-based digital twins (linear, ensemble boost, or neural networks) that replicate the machine's physical behavior. Once validated, these models continuously monitor deviations between predicted and measured parameters, generating health indicators (KPIs) such as efficiency, bearing temperature, and shaft displacement.

In a real pump-storage case, a bolt-loosening failure undetected by standard vibration sensors caused major damage (>500 k CHF). The digital twin approach revealed clear anomalies on two KPIs up to three weeks before the breakdown, demonstrating its preventive potential. After only two months of operation, results confirmed reliable health indicators and significant opportunities to optimize maintenance, improve equipment availability, and increase energy production. The same AI-based methodology can be extended to auxiliary systems, or small hydro units, delivering a scalable predictive maintenance framework for the hydropower industry and beyond.

Herr Yvan Jacquat

CEO

GradeSens AG

Topics: Machine learning, hydro energy, predictive maintenance, digital twin modelling, anomaly detection

X

Title: Datenbasierte zirkuläre Services: Wie die Maschinenindustrie Umweltnutzen und Wirtschaftlichkeit gleichzeitig steigern kann

Session:

Abstract: Dieser Vortrag zeigt, wie datenbasierte zirkulären Services nicht nur wirtschaftlich attraktiv sind, sondern auch ökologische Vorteile bringen. Im Zentrum steht ein generisches Analysewerkzeug, das Unternehmen hilft, den Nutzen solcher Services systematisch zu quantifizieren.

Die Methodik wurden im Rahmen eines internationalen EUREKA-Projekts anhand von Serviceprodukten von acht Industriefirmen aus der Schweiz und Deutschland entwickelt und getestet. Die Wertschöpfung durch diese Services wurde aus der Anbieter-, Kunden- und Umweltperspektive detailliert modelliert und quantifiziert.

Diese aus diesen acht Fallstudien entwickelten Modelle wurden anschliessend verallgemeinert, um auch auf Anwendungsfälle ausserhalb des Projektrahmens übertragbar zu sein. Die verallgemeinerten Modelle basieren auf generischen Service-Mustern und abstrahierten Kosten- und Nutzentreibern, welche aus den detaillierten Modellen abgeleitet wurden. Mit den verallgemeinerten Modellen können alle Wertschöpfungsdimensionen über die Zeit – und damit beispielsweise Break-even Zeiten – berechnet werden. Im Vortrag wird das verallgemeinerte Modell an einem konkreten Beispiel illustriert.

Herr Jürg Hosang, Frau Corinna Baumgartner, Herr Nicolas Nyfeler, Prof. Jürg Meierhofer

Professor

ZHAW

Topics: Industrielle Services, Maschinenindustrie, Nachhaltigkeit, Wirtschaftlichkeit, Modell

X

Title: Results may look normal

Session:

Abstract: In a controlled Promptathon experiment, twenty teams of sales professionals were tasked with generating AI-assisted quotations for the same construction project using OpenAI's ChatGPT Playground.

All teams worked under identical conditions: the same project data, the same Retrieval-Augmented Generation (RAG) pipeline with a shared price database, and identical multi-stage prompting and fine-tuning procedures. Despite these standardized parameters, the resulting offers differed notably, particularly in how pricing and persuasive framing were expressed. This divergence underscored the inherent variability introduced by human prompt design and the stochastic interpretive mechanisms of large language models.

The accompanying presentation introduces a Gray-Box analytical framework designed to explain these variations. This approach combines transparent analysis of prompt-engineering strategies with partial interpretability of model-internal reasoning. It identifies multiple causal layers—including entropy in query phrasing, variable contextual embeddings, and diffusion in attention weighting—that contribute to output variance. The analysis frames these mechanisms within a semi-deterministic model of AI-human co-creation, emphasizing both the controllable and emergent aspects of AI-assisted offer generation. Ultimately, the findings reveal that even under rigorously uniform technical inputs, prompt-based workflows reflect complex cognitive and procedural dynamics, requiring both systematic design and adaptive understanding for consistent business automation outcomes.

Herr Andreas Lorenz

Professor

FHNW - Institut für Business Engineering

Topics: Gen-AI, Promptings, Business Offering, Standard Deviation, Analysis

X

Title: Side-Channel Attacks on Cryptographic Algorithms

Session:

Abstract: In my talk, I will present a power analysis-based side-channel attack, which is an effective method of attacking cryptographic algorithms. Specifically, I will describe an attack that aims to extract the randomly chosen private key for an RSA cryptosystem.

This forms part of a larger project with Securosys SA, a company that aims to secure data transmission over public telecommunications networks using its products. To this end, they develop hardware security modules (HSMs), which encrypt and authenticate digital data using standardized procedures. HSMs have competing goals: the highest security and the highest data throughput. To process data quickly, computationally intensive processes are accelerated using dedicated hardware. IMES significantly co-developed this FPGA-based acceleration.

However, if data throughput is the only consideration during development, the result could be a system without protection against side-channel attacks. In this case, the device's power consumption is measured. This data trace can then be used to identify the sequence of individual computing operations, allowing conclusions to be drawn about the secret keys. To prevent such attacks, IMES tested its own implementation and improved it until no relevant information could be obtained. Our hardware-accelerated algorithms are integrated into the HSMs of Securosys, a company that successfully sells these devices.

Herr Dorian Amiet

Senior Research Engineer

IMES Institut für Mikroelektronik, Embedded Systems und Sensorik

Topics: Cryptography, Power Analysis, Side-Channel Attack, FPGA, Microcontroller

X

Title: Smart debonding for a sustainable Future: Emerging trends in reversible assemblies

Session:

Abstract: Bonding and welding drive product innovation by combining the best properties of different materials into a single, optimized assembly.

However, at the end of a product's life cycle, recycling such multi-material assemblies poses significant challenges: each material and component must be separated and recovered individually, which requires a controlled debonding process prior to recycling.

This issue is particularly critical for polymer-based assemblies, where permanent adhesive or welded joints hinder material separation and reuse.

The present project investigates existing and emerging technologies that enable bonding and debonding on demand, allowing adhesive or welded joints to be selectively released through external triggers such as heat, or electromagnetic fields.

These reversible bonding technologies open new perspectives for sustainable product design and circular manufacturing, facilitating both recycling and the reconfiguration of technical components, including composite organo-sheets and other advanced polymer structures.

Herr Pierre Jousset

Professor, Fachbereichsleiter Verbindungstechnik

OST Ostschweizer Fachhochschule

Topics: Assembly, joining, debonding, polymer, sustainable,

X

Title: Architektur und Validierung eines lokal gehosteten, dialogbasierten Assistenzsystems zur geführten Wartung im Textilmaschinenbau

Session:

Abstract: Angesichts der zunehmenden Komplexität moderner Produktionssysteme und des anhaltenden Fachkräftemangels hat die ZHAW eine LLM-basierte Lösung für die digitale Betriebs- und Wartungsunterstützung entwickelt. In enger Zusammenarbeit mit dem Schweizer Textilmaschinenhersteller SSM Schärer Schweiter Mettler AG wurde ein Prototyp konzipiert, der auf einer on-premise Retrieval-Augmented Generation (RAG) Technologie basiert. Dieses System ermöglicht es Maschinenbedienern, über eine Chatbot-Schnittstelle in natürlicher Sprache Fragen zu stellen und sofort präzise, handlungsleitende Anweisungen direkt aus der offiziellen technischen Dokumentation zu erhalten.

Das Hauptziel des Projekts war die Entwicklung einer skalierbaren Lösung, die es Betreibern erlaubt, häufig auftretende Probleme selbstständig zu lösen, wodurch SSMs hochqualifiziertes Support-Personal entlastet und die Betriebseffizienz gesteigert wird.

Das System wurde anhand eines umfassenden, realitätsnahen Datensatzes von 400 Kundenanfragen evaluiert. Die Bewertung erfolgte nach drei zentralen Kriterien: Konformität der Antwort mit den Maschinendokumentationen, Vollständigkeit bei der Beantwortung der Nutzeranfrage und die Antwortgeschwindigkeit. Die Ergebnisse des Prototyps sind überzeugend: Er erreichte eine Konformität von über 90 % und eine Vollständigkeit von mehr als 80 %. Eine zusätzliche manuelle Überprüfung durch Fachexperten bestätigte, dass 81 % der generierten Antworten vollständig korrekt und für den praktischen Einsatz durch Maschinenbediener geeignet waren. Die Studie belegt eindrucksvoll die technische Machbarkeit und den hohen praktischen Nutzen von RAG-basierten Systemen im industriellen Umfeld und bietet eine robuste Vorlage für deren Implementierung in anderen Branchen.

Herr Jochen Wulf, Markus Baumann

Dozent, Head of After Sales Services

ZHAW, SSM Group, SSM Schärer Schweiter Mettler AG

Topics: geführte Wartung, Textilmaschinenbau, Large Language Models, Retrieval-Augmented Generation

X

Title: Agentic Physical AI - New Approaches to Embodied Intelligence in Robotics and Automation

Session:

Abstract: We present the opportunities in integrating Agentic Physical AI for robotics and automation. This emerging field connects AI, robotics, and cognitive science to create physical agents that can reason, adapt, and interact with humans in unstructured environments. Instead of training one large model to fully control a robot end-to-end, we will show how applications can be built, reconfigured and re-programmed via natural language through an agentic approach.

We will show case studies with humanoid robots and quadruped robots in smart factories and Industry 4.0 environments. We will put special attention into general intelligence relations for mobile robotics, with mobile manipulators and specially humanoids at the focus.

We will also cover the practical steps to deploy such technologies today, whether in cells with industrial robots or cobots, or with mobile robots able to operate around the entire factory floor or warehouse, alongside humans.

Herr Jorge Peña Queralta

Senior Lecturer, Head of Research Group

ZHAW - Zurich University of Applied Sciences

Topics: Physical AI; Agentic AI; Embodied AI; Robotics; Automation

X

Title: In-air collision of macro droplets as a novel production method demonstrated using aroma filled food pearls.

Session:

Abstract: This feasibility study investigates a novel production technology based on the targeted in-air-collision of droplets of different sizes and compositions. Two liquids are brought together in flight in such a way that they combine and form multiphase structures – from homogeneous mixtures to gradients to clearly defined core-shell systems. This principle opens up a wide range of potential applications for innovative products. The food industry is being investigated as an exemplary field of application. With the help of droplet collision, it is possible to produce aroma-filled food pearls that have novel taste and texture properties. A test platform with image processing enables the systematic analysis of droplet interactions and the resulting structures under varying process parameters. The presented project is based on four main objectives: i) the development of an experimental platform, ii) the investigation of a basic physical understanding of droplet collisions, iii) the production of an innovative food product as a demonstrator, iv) the development of a scale-up concept with risk and cost estimates for an industrial implementation.

Potential partners include food manufacturers and plant engineers from the food processing industry to enable the transfer from the laboratory to industrial applications.

Herr Manfred Schär

Wissenschaftlicher Mitarbeiter

Berner Fachhochschule

Topics: Drop collision / fluid dynamics; Production technology / dosing technology; Food innovation; Material structures (core, gradient, shell); Scale-up & industrial implementation

X

Title: Minimierung von Ausschuss in Prozessketten bestehend aus Umformung und Wärmebehandlung

Session:

Abstract: Durch umformtechnische Fertigungsverfahren werden teils beträchtliche Eigenspannungen in Bauteile eingebracht. Im Falle einer nachgelagerten Wärmebehandlung werden diese Eigenspannungen abgebaut, was meist zu einem unerwünschten Verzug der Bauteile führt. Aktuell arbeiten wir an numerischen Methoden, mit welchen der Bauteilverzug in Prozessketten bestehend aus Umformung und Wärmebehandlung vorhergesagt werden kann. Basierend darauf sollen Ansätze abgeleitet werden, wie der Bauteilverzug minimiert, der Produktionsausschuss reduziert und damit die Produktivität verbessert werden kann.

Herr Christian Egger

Senior Research Engineer

OST - Ostschweizer Fachhochschule

Topics: Umformtechnik, Wärmebehandlung, Effizienzsteigerung und Produktivitätsverbesserung in Fertigungsprozessen

X

Title: Smart Sensing under Data Constraints: A Case Study on Battery Safety and Performance

Session:

Abstract: Batteries have become a key enabling technology across industries, from mobile devices and electric vehicles to large-scale energy storage systems. As their use expands, ensuring performance and safety becomes increasingly critical. Failures such as thermal runaway can lead to severe safety incidents, and undetected degradation reduces efficiency and lifetime.

Continuous monitoring and early detection of emerging failures and degradation are therefore essential. In recent years, advanced monitoring algorithms based on machine learning have gained popularity in applied research, taking advantage of the large quantities of high-fidelity monitoring data. However, in real applications of large-scale battery packs consisting of hundreds or thousands of cells, storing and processing voltage and temperature data from each cell over long periods is rarely feasible and often only aggregated, pack-level data are available. This raises a fundamental question: what type and amount of data are sufficient for reliable detection of emerging faults and degradation mechanisms?

Our work addresses this question by studying how AI-based algorithms can achieve strong detectability with minimal and resource-efficient data. The findings highlight not only how to design and optimize battery monitoring systems for improved safety and reliability but also illustrate a broader principle relevant to many industrial domains: the balance between data reduction and diagnostic performance is central to making accurate monitoring and anomaly detection both scalable and viable.

Herr Antoni Plonczak

Wissenschaftlicher Assistent

ZHAW

Topics: *AI-based anomaly detection in Li-ion batteries; *Detectability of faults in realistic operating conditions; *Detectability of faults under data constraints; *Algorithm transferability to real world battery systems; *Data availability requirements for a

X

Title: Intelligent Motors for Anomaly Detection in Pipetting Robots

Session:

Abstract: Small and medium-sized motors, along with other components of the drive system, can be leveraged as sensors for running integrated anomaly detection on a machine learning-enabled microcontroller. Integrating anomaly detection and self-monitoring capabilities into drive systems – such as the arms of a pipetting robot in liquid handling applications – offers an all-in-one approach: anomalies and degradations like clogging, wear or age-related faults are continuously identified close to their origin, early, in real-time, and with essentially no hardware overhead.

Motors are often located directly at or near the moving components, making them ideal for capturing relevant condition data. A lightweight autoencoder implementation enables local anomaly detection on a low-cost microcontroller as an integral part of the drive system, without the need for additional sensors nor requiring cloud connectivity or complex processing pipelines. This makes predictive maintenance feasible as a cost-efficient, embedded feature of the drive system, even in compact and resource-constrained environments.

The approach is broadly applicable beyond laboratory automation and could keep the complexity and costs of future drive systems low, while improving reliability, economic efficiency, sustainability and operational safety.

Herr Andreas Breitenmoser

Professor für Embedded Systems

OST – Ostschweizer Fachhochschule

Topics: Predictive maintenance; Cost-efficient solution (no added sensors); Edge AI on microcontrollers; Tiny autoencoder implementation; Industrial use case demonstration

X

Title: How Effective are multimodal LLM Agents at Exploratory Data Analysis?

Session:

Abstract: Large language models (LLMs) can autonomously run end-to-end data-science workflows, building pipelines that rival human experts in Kaggle contests. Yet it remains unclear how much of this ability comes from genuine exploratory data analysis, i.e. inspecting and visualizing data to uncover patterns, versus simply tuning off-the-shelf algorithms that can score well but lack explainability and may lean on spurious correlations. To probe this, we have created a diagnostic benchmark of tabular and time-series binary-classification tasks where the two classes are perfectly separated by a single handcrafted feature. The benchmark is designed so that an agent's success hinges entirely on its capacity to discover patterns within this numerical datasets, with no additional contextual information provided. The challenge for the LLM is to identify the feature using only Pandas, NumPy, and Matplotlib, emphasizing the ability to perform true EDA rather than defaulting to black-box modeling. In this talk we will present our findings on the abilities of LLMs to explore datasets effectively and respect task constraints.

Herr Iason Kastanis

Group Leader Predictive Analytics

CSEM

Topics: -LLM Autonomy in Data Science -Questioning True EDA Capability -Diagnostic Benchmark Creation -Focus on Interpretability

X

Title: Machine Learning for Adaptive Automation in the Digital Factory

Session:

Abstract: The automated wiring of control cabinets, connectors, and cable harnesses offers great potential to replace manual, time-consuming, and error-prone processes. Robo Wire is developing a robotic platform that automates cable handling and routing, addressing the growing shortage of skilled labor in the electrical and mechanical engineering industries.

CSEM supports Robo Wire in a decisive development step toward the Digital Factory through the targeted use of machine learning. Learning-based models simplify programming, optimize wire-routing paths, and enable flexible adaptation to various control-cabinet designs, connectors, and cable harnesses. With visual recognition and adaptive path planning, the system can respond to design changes without manual intervention.

By combining modern robotics with machine-learning technology, Robo Wire makes a significant contribution to the Digital Factory and to smart production systems. The project exemplifies how data-driven intelligence makes automation systems not only more precise but also adaptive and self-optimizing – a key advancement toward agile, efficient, and future-ready manufacturing processes.

Herr David Hemmi

Head of Research and Business Development

Robowire / CSEM

Topics: Robo Wire develops an automation platform that replaces manual wiring of control cabinets, connectors, and cable harnesses. CSEM supports Robo Wire in integrating machine learning for intelligent route planning, visual recognition, and adaptive process c

X

Title: Plug-and-Perform: Robotics for the High-Mix, Low-Volume Era

Session:

Abstract: Auto-Mate Robotics enables industrial companies to automate high-mix, low-volume manufacturing quickly and cost-effectively. At its core are intuitive software building blocks that let teams create, adapt, and reuse applications with little-to-no programming knowledge. Standardized yet flexible robotic cells integrate into existing lines, support frequent product changeovers, and scale modularly as demand grows. Integrated machine vision handles detection, pose estimation, and inspection, improving process reliability while generating data for traceability and continuous improvement.

Planning and commissioning are accelerated through simulation and digital twins. Teams can test scenarios upfront, validate cycle times and gripper concepts, and minimize collision risks. The result is shorter ramp-up, reduced downtime, and a clearer business case. Auto-Mate Robotics supports the full lifecycle with consulting, feasibility studies, training, and service, from initial pilot to fleet-wide rollout and ongoing operations.

Outcomes include more stable processes, higher overall equipment effectiveness (OEE), consistent quality, and meaningful relief for skilled workers. Operations with high variant diversity and small batch sizes benefit most, including assembly, kitting, palletizing, and visual inspection, where flexibility and short changeover times are decisive.

Herr Lucas Renfer

CEO / Co-Founder

Auto-Mate Robotics AG

Topics: High-Mix Low Volume Production, Robotics, Machine-Vision, Digital Twin & Simulation, No-Code-programming