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AI for Laser Technology Conference: Artificial intelligence making inroads into industry

How can we use data and algorithms to improve the quality, efficiency and flexibility of laser technology and production engineering processes? To answer this question, 70 experts assembled at the first “AI for Laser Technology Conference” in Aachen on November 6 and 7, 2019 to discuss the latest trends in the key technology of artificial intelligence, or AI. The two-day conference at the Fraunhofer Institute for Laser Technology ILT hosted 13 speakers who gave users a practical grounding in the relevant processes as well as plenty of guidance on putting them into practice. Participants also enjoyed a guided tour through the Fraunhofer ILT laboratories offering exclusive insights into latest research.

Transforming production settings in Industrie 4.0 in the future will create a simpler, more reliable and more synergetic environment for analyzing production processes. “The research and industry experts who spoke at the AI for Laser Technology Conference highlighted how AI methods can use collected data to come to clear conclusions that can subsequently be used to optimize production processes,” says Peter Abels, group leader Process Control and System Technology at Fraunhofer ILT.

The conference ran at full capacity, with a total of 70 participants from Germany and Austria. The presentations covered a wide range of topics including machine learning, augmented reality and data analysis using neural networks.

Artificial intelligence for data-driven manufacturing

The event included presentations by the companies Microsoft Intelligent Cloud, Intel Germany, Daimler, plasmio Industrietechnik, Beckhoff Automation, 4D, Scansonic MI, oculavis and HotSprings. As well as proposing various ways of putting artificial intelligence to good use, the speakers also offered insights into AI processes that are already up and running.

Applications highlighted by the experts included techniques for analyzing the condition of production tools, real-time-capable machine control systems as well as error detection and causal analysis in manufacturing processes. In some production environments – for example laser welding for car manufacturing and micro joining for battery technology – it is already possible to analyze weld seams in real-time using image-based monitoring systems and to classify the seams reliably using custom algorithms. Moreover, new methods of virtual reality (VR) and augmented reality (AR)

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are steadily opening up new options in various areas, including remote support and the simulation of manufacturing processes.

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Researchers from Fraunhofer ILT and the Nonlinear Dynamics of Laser Manufacturing Processes Instruction and Research Department NLD at RWTH Aachen University provided an overview of the foundations required to implement the corresponding technology. For their part, the Fraunhofer institutes IPT, IME and ILT offered an introduction to the International Center for Networked, Adaptive Production (ICNAP). The researchers involved in this initiative are working with manufacturing companies and technology enablers to link AI methods to Smart Manufacturing, Big Data and the Internet of Things.

High-quality data and communication are essential

The quality of data is a key issue that often gets neglected in practice, argued Stephan Schwarz from Daimler. When bringing together data from a variety of sources – such as laser systems, production machines and camera monitoring systems – it is essential to ensure that the data has been carefully prepared and cleaned prior to embarking on an in-depth analysis. Meanwhile, Stephan Gillich of Intel Germany used his talk to present new concepts for accelerated hardware and software architectures that are required for increasingly complex information systems.

The argument that successful real-life AI deployment relies on an effective dialog between data and process experts was emphasized by a number of speakers. Dr. Benjamin Kreck from Microsoft Intelligent Cloud used his keynote speech to argue that the key to success lies not only in a company's technical capabilities, but also in its ability to adapt and transform its culture.

Laboratory tour: using data to optimize laser material processing

During a guided tour through their laboratories, Fraunhofer ILT researchers explained how comprehensive data acquisition and synchronization can create the right conditions for big data analysis in the context of material processing with ultrashort laser pulses (USP). Participants got the chance to see a live demonstration of this data gathering in action during combined ns and fs pulse laser processing, including a real-time dashboard display taken directly from the cloud.

The Aachen-based researchers also showcased another application that can be optimized using machine learning, in this case the laser welding of fiber-reinforced plastic (FRP) tapes. Structures embossed in the tape are identified and measured by a thermal imaging process control system during laser processing. A dedicated algorithm then analyses and classifies the welds during live processing to enable the process to be adjusted and improved immediately.

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A second edition of the AI for Laser Technology Conference has already been scheduled for next year. It will take place in Aachen on November 4 and 5, 2020.

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Image 1:
Seventy experts from industry and research participated in the first AI for Laser Technology Conference in Aachen in November 2019.
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Image 2:
On a guided tour through the Fraunhofer ILT labs, participants got the chance to see how a system collects data in real time during USP laser processing.
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Image 3:
Special algorithms can be used to optimize laser processes by improving error detection and causal analysis.
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Die **Fraunhofer-Gesellschaft** ist die führende Organisation für angewandte Forschung in Europa. Unter ihrem Dach arbeiten 72 Institute und Forschungseinrichtungen an Standorten in ganz Deutschland. Mehr als 26 600 Mitarbeiterinnen und Mitarbeiter erzielen das jährliche Forschungsvolumen von 2,6 Milliarden Euro. Davon fallen knapp 2,2 Milliarden Euro auf den Leistungsbereich Vertragsforschung. Rund 70 Prozent dieses Leistungsbereichs erwirtschaftet die Fraunhofer-Gesellschaft mit Aufträgen aus der Industrie und mit öffentlich finanzierten Forschungsprojekten. Internationale Kooperationen mit exzellenten Forschungspartnern und innovativen Unternehmen weltweit sorgen für einen direkten Zugang zu den wichtigsten gegenwärtigen und zukünftigen Wissenschafts- und Wirtschaftsräumen.

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