MACHINES LEARN FROM EACH OTHER

Launch of the "Federated Learning - Enabling Swarm Intelligence" research collaboration between Bosch and AIT

Bosch Research and the AIT Austrian Institute of Technology are strengthening their research cooperation in the field of federated learning over the next three years. The cooperation with the AIT Centre for Vision, Automation & Control (VAC) builds on a long-standing and very successful collaboration between Bosch Research and the VAC in the field of control technology. The focus is on adaptive and locally learning algorithms. With Federated Learning, the two partners are now taking the next step towards networked and jointly learning machines and components.

Federated Learning

Algorithms for the automation of mobile machinery are already being trained using machine learning. The models required for this can be trained in a decentralised manner on the control units of the individual machines (local learning). However, individual systems cannot benefit from the experience of other systems in the fleet. The use of federated learning makes it possible to combine models and thus knowledge about the behaviour of several machines in the cloud to create an improved overall model. Specifically, individual machines that have collected data under extreme environmental conditions such as sub-zero temperatures can pass on the knowledge they have "learnt" to other machines. Another example is when machines detect malfunctions in operating behaviour or defective components because they deviate from "normal behaviour". As only the learnt models and not the recorded data are exchanged, this is a particularly privacy-friendly method of machine learning in an increasingly networked world.

The aim of this research co-operation is to transfer the concept of federated learning to complex non-linear dynamic systems, to implement it in selected applications and to develop the added value of federated learning. The VAC contribution focuses on identifying existing scientific gaps and closing them with new methods and algorithms. Following successful research and application of AI methods in various industrial applications, a new chapter is being opened with federated learning. The decentralised optimisation of models on data-generating devices enables the creation of self-learning systems that can continuously adapt without compromising data security. Bosch Research contributes the industrial requirements and example applications on which the concept is implemented. In addition, Bosch also utilises the developed methods in an industrial context in its various business units.

Machines learn from each other over the course of their life cycle and become better and better

The use of federated learning enables the transfer of knowledge across machines. This allows the system properties to be continuously improved across an entire fleet during operation, and not just on the individual system. Great importance is attached to scalability so that the methods developed can be applied to a large number of Bosch products.

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About Bosch Research

Bosch Research serves the innovation pipeline of the Bosch divisions through a global network. The research areas cover a broad portfolio ranging from electromobility and hydrogen technologies to information and communication technologies, resource and energy efficiency as well as solutions for the healthcare sector, automated driving and robotics. Research and innovation have been part of Bosch's DNA for over 130 years. It is based on the conviction that research is not an end in itself, but contributes to improving people's quality of life. This conviction is reflected in our guiding principle "We innovate for life".

The Bosch Group is a leading global technology and service company with Robert Bosch GmbH and 440 subsidiaries and regional companies in over 60 countries. They combine mobility solutions, industrial technology, consumer goods and energy and building technology in four business sectors.

www.bosch.com/research/

Blog post on the topic of federated learning

About the AIT Centre for Vision, Automation & Control

The AIT Austrian Institute of Technology (AIT) is Austria's largest non-university research organisation. It plays a key role at European level as the research and technology organisation that deals with the key infrastructure issues of the future.

The Centre for Vision, Automation & Control (VAC) is one of the AIT's seven research units. It is dedicated to industrial automation and digitalisation and uses the opportunities this offers to initiate and drive forward innovations for industry. The centre conducts research in the fields of image processing, automation and control, as well as the use of artificial intelligence methods. The centre covers the entire automation chain, from the acquisition of information by intelligent sensor systems to AI-based decision-making by autonomous systems. The research work at the centre results in innovations to increase the flexibility, adaptability and resilience of companies while simultaneously improving energy and resource efficiency and minimising production costs.

ait.ac.at/vac

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