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Artificial Intelligence, Safety and Reliability : an old story or a new age?

Biography

Patrice Aknin is a data science researcher who hold the position of Scientific Director at IRT SystemX since 2013. SystemX is an RTO (Research Technological Organisation) located in Saclay, near Paris, which is positioned as an accelerator of the digital transformation of industry, services and territories. Previously, he was Scientific Director at SNCF, the French national railway company. Between 1988 and 2013, he held various positions as a Researcher and then Research Director at Ifsttar (French Institute of science and technology for Transport, Developement and Networks), which recently became the University Gustave Eiffel. He is professor at Ecole des Ponts Paristech and also at Télécom Paris. He is a member of several scientific councils of prestigious institutions such as ENS Paris-Saclay, Télécom SudParis and ENSTA Paris. He has directed the PhD work of about twenty students. He is the author or co-author of nearly 150 publications in the fields of diagnosis, data science, maintenance, mainly on applications in the field of transport.

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Abstract

The new proposals of artificial intelligence, and especially data science, are now flooding the scientific field, the industrial field, and, more generally, society. These proposals are not limited to the progress in machine learning itself, especially in deep learning. Indeed, many scientific areas are impacted and are facing significant evolutions: image recognition, scientific computation aggregating physical models and data-based models, data augmentation, natural language processing, optimization and reinforcement learning, new digital twins, cyber-detection by machine learning, supervision of large industrial systems, bidirectional digital assistants (learning from and to the expert), hybridization between symbolic AI and connectionist AI... The fields of safety, maintenance, and reliability are not exempt from this surge and these promises. But is this safety-IA hybridization new? One could say that until now, data science has come to the rescue of safety to help describe aging processes, stochasticity of states and their transitions, ... In its unsupervised versions, it can also be of great help in detecting cases of failure not yet observed in real life. Today, with the explosion in the number of AI algorithms integrated into industrial and service systems, the question arises about their validation and confidence placed in them. Safety sees before it a new field of application of exponential size where the usual tools are helpless in the face of the combinatorial nature of states and operational domains with an increasingly wide spectrum. The talk proposes response elements to these dual-entry questions. It will illustrate them through current applications such as autonomous vehicle validation, fault diagnosis of large critical systems, and rail maintenance.