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### Machine Learning and Nature Inspired Techniques in Industry 4.0

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In the last 20 years *ICT (Information Communication Technologies)* became more and more pervasive in our life. Similarly in industrial systems, new technologies, wireless communication protocols and data mining techniques play a key role both as enablers for new production and business processes and contributing as actual component of products' value chain.

Moreover, the *Industry 4.0* paradigm facilitates the vision of the factory of the future concept as a confluence of novel trends and technologies to change the way products and services are made. The ability of *Cyber Physical Systems (CPS)* to connect everything (human, things and smart factories) via the *internet of things (IoT)* and *internet of services (IoS)*, in a possible virtualized environment, with decentralized architectures and with real-time capability to analyse enormous quantity of data (*Big Data & Big analytics technologies*) in a modular way, are the main actual component of the Industry 4.0 concept.

In this context classical and novel *Machine Learning* and *Computational Intelligence (CI)* techniques, among which *Artificial Neural Networks (ANN)*, which have been developed exactly to extract (hidden) information from data for pattern recognition, classification and prediction issues, find a natural field of application. Such techniques have a huge potential to provide a clear improvement of many transformation processes, as well as to services such as logistic, personnel training and marketing.

Moreover non-conventional methods and technologies, as ontology and computing techniques inspired by nature have been adopted to address specific areas as NP-complete problems, reconfigurable-modular-adaptive-automated production systems, energy efficiency in sustainable manufacturing, optimization of key performance indicators and green manufacturing. New technological directions will be outlined in open (e.g. TOUCHPLANT Project of Regione Lombardia, White'R and Man-Made FP7-FOF-EU Projects) and new projects for designing smart, sustainable and robust manufacturing systems in the factory of the future.

**Maurizio Fiasché** is research coordinator at the Department of Economics, Management and Industrial Engineering of Politecnico di Milano (POLIMI), where his research interests are in Computational Intelligence and ICT for manufacturing, Biomedical applications, and real world complex problems solution. He received a Ph.D. in Computer and biomedical Engineering in 2010 and a M.Sc. in Electrical Engineering with magna cum laude in 2006 at University of Reggio Calabria, Italy. Member of INNS and Senior Member of IEEE in: Computational Intelligence, EMB, Signal Processing and Computer societies,

He was involved in three IEEE WGs as member for his expertise: IEEE P23026™ Standard for Systems and software engineering – Engineering and management of websites for systems, software, and services information, already become a ISO/IEC/IEEE Standard in 2014, IEEE P1760™ Standard for Information Technology Service Measures and Service Level Agreements, and IEEE P2145-1™ : Standard for Smart Transducer Interface for Sensors and Actuators - Common Network Services. He won a best presentation poster award during ICONIP 2008 conference in Auckland, NZ. At the moment He is Co-Chair of the Industrial relations for the IEEE Italy Section. He is author of 50 papers in international journals and conference proceedings, in Technical Program committee in more of 100 International Conferences, and referee for top international Journal also including Elsevier Neural Networks, Neural Computing and IEEE Transactions, He is also in the Editorial Board for several international Journals. He has been involved as Senior Researcher in Social&Smart EU FP7 (FIRE Project), and in FITMAN, white'R and Man – Made FP7 FOF Projects, in FITMAN FP7 Project, in Touchplant Project of Regione Lombardia with Politecnico di Milano. Moreover he has been lecture for several Universities and Institutes in Electrotechnics, Statistical Inference, Computer Science and Signal Processing courses. He is also senior consultant as ICT Project Manager and Software Engineer for several national and multinational Companies since 15 years.