Application of Machine Learning in Smart Factory Electromagnetic Radiation Exposure Levels Monitoring

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Abstract

Public and occupational exposure, both at home and at work, to electromagnetic (EM) fields of complex mix of electric and magnetic fields is not a new phenomenon. However, the environmental exposure to artificial EM radiations has been steadily increasing as growing electricity demand, domestic appliances, industrial equipment, telecommunications, broadcasting, ever-advancing wireless technologies and changes in social behaviour have created massive expanding known and unknown artificial sources.

It is not disputed that EM fields above certain levels can trigger biological effects. The current debate is also centred on whether long-term low-level exposure can evoke biological responses and influence people's wellbeing. Experiments with healthy volunteers indicate that short-term exposure at the levels present in the environment or in the home do not cause any apparent detrimental effects. Exposures to higher levels that might be harmful are restricted by national and international guidelines.

This paper seeks to address the uncertainties and resolve the debates on the impacts of short-term medium-term and long-term electromagnetic (EM) radiation on the public and occupational wellbeing, a robust guideline and system driven by artificial intelligence (AI). This AI/deep learning capabilities and high computational capacity would extend and combine diverse studies, methods, and statistical (data) association on cellular, animal, and epidemiology studies to attain the missing consistency and certainty about the true health and environmental effect of non-ionising EM radiations. Our scope is smart manufacturing environment with active always-on massive internet of things sensors with an extension to supply chain and smart cities use cases.

Our proposed application of machine learning for monitoring EMF radiation in smart factory solution and operational system would tremendously improve safety, regulatory compliance and workforce confidence in the working environment. The visible, predictive and prescriptive functionalities of the AI-driven EMF monitoring system would proactively alert and position all stakeholders (workers, business leaders, the public, academia and regulatory bodies)　in vintage situations necessary to forestall harms and damages to life, property and the environment.