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Introduction to Machine Learning in Genetic Toxicology

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Any modern application of technology in use today likely has some component of machine learning (ML) or artificial intelligence (AI) associated with its development or execution. ML/AI has become such a ubiquitous part of our lives that we often take it for granted and rarely acknowledge what it is doing for us or conversely, we overly exaggerate its influence and consider it a potential threat to our workforce and society. Regardless of these perceptions, there is no denying the impact of AI/ML on our lives, and more specifically on science. Perhaps one of the most well-recognized roles of machine learning in science is in analyzing datasets that were previously inaccessible. “Big data” has frankly become an understatement compared to the reality in which we find ourselves with our ability to generate large volumes of data in a very short period of time. Examples of general applications of AI/ML in science will be reviewed.

When we move to genetic toxicology specifically, we continue to see the utility of AI/ML. As New Approach Methodologies development more efficient ways of generating high content output, the need for analytical schemes that can easily deal with large or complex data structures is critical. From in silico work studying structure activity relationships to in vitro studies using pattern recognition for multiplexed biomarker assessments and large meta analyses of in vivo data, there are applications and opportunities for ML to contribute greatly for improvements in our workflow. This presentation will highlight several applications of ML in the analysis and interpretation of data from current genetic toxicology methods.