

I5 Big Data and Machine Learning: Changing the Risk Assessment Landscape

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Learning Overview: The goal of this presentation is to provide attendees with an introduction to the process of machine learning and the available models as well as an overview of the potential ways in which it can be implemented into forensic psychiatry practice.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing understanding of machine learning and the benefits of incorporating machine learning into forensic psychiatry. In addition, attendees will gain insight into the application of machine learning in the risk assessment process and future directions for using this type of analysis.

The risk assessment field has seen little change since the introduction of actuarial and structured professional judgement tools in the 1990s. At the time of their introduction, these tools greatly improved risk assessment practice and outcome. However, for the past 10–15 years, other than tools being tweaked and new versions being released, there has been no notable advancement in the field. Information technology and data storage have greatly advanced research practice in a number of fields in recent years, and machine learning and the use of big data have the potential to change the risk assessment landscape.

Big data consists of a large amount of data, created at a high velocity and of a wide variety of types. Given how complex these datasets are, it is impractical to use traditional statistics to analyze them. Moreover, statistical analyses identify risk factors at a group-level instead of an individual level and often do not deal well with the comorbidities and heterogeneity of psychiatric disorders. Machine learning analysis can be used to extract value from big data and transform it into applicable information. Machine learning is a field of artificial intelligence that includes analyzing current and historical trends to make predictions on how unseen cases will behave as well as identifying patterns of human behavior to detect trends. The primary aim is to allow the algorithms to learn automatically and adjust the actions accordingly, with minimal human intervention.

The use of traditional statistical models has often focused on group effects, which makes it hard to extrapolate what is found to a specific individual, and are often used in conjunction with theoretical frameworks in order to confirm prior assumptions. However, because machine learning is data-driven and looks at patterns underlying the data itself, it provides the opportunity to identify predictors and automatically adapt and customize them on an individual level and potentially display patterns that are very useful that were previously unexpected.

While still in its infancy, research utilizing machine learning and big data in psychiatry are showing great promise. Predictive models may help to develop tailor-made interventions for patients and a better allocation of resources from the health care system. The process of machine learning and the data-driven models will be highlighted, as well as their application in forensic settings, as these models have the potential to identify individuals at a higher risk for an outcome of interest and can aid in the prediction of violent behavior, criminality, and social rehabilitation.

Machine Learning, Big-Data Analytics, Forensic Psychiatry