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APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE DEVELOPMENT AND CHARACTERIZATION OF NATURAL PRODUCTS

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Artificial intelligence (AI) is changing the landscape of natural product research, providing innovative tools for development and characterization that increase both efficiency and precision. This talk will highlight the central role of AI techniques, including machine learning (ML) algorithms such as artificial neural networks (ANN), decision trees (DT), clustering techniques, dimensionality reduction methods, etc. Several case studies will be explored to highlight the superiority of AI models in predicting outcomes and analyzing data complexity, which can outperform traditional approaches. Focus will be put on using AI in the optimization of compounds extraction from medicinal herbs, analysis of bioactive compounds and their effects in natural products, as well as on analysis of multivariate nature of data obtained from characterization of such products. AI methods can discern intricate patterns and predict product characteristics with remarkable accuracy, and can thus be used for quality control and optimization. This discussion will extend to nanoencapsulation technologies, emphasizing how AI algorithms can model and predict release behaviors of bioactive compounds, thereby guiding the design of advanced delivery systems for nutritional and pharmaceutical applications. This predictive capability is crucial for designing controlled-release formulations that optimize the therapeutic efficacy and/or bioavailability of bioactive compounds. Additionally, the lecture will explore the use of text mining and natural language processing, in conjunction with AI, to aggregate and interpret vast amounts of literature on biomedicine and natural products, showcasing AI's capacity to streamline research and discovery in nutritional and pharmaceutical applications of natural products.

Keywords: artificial intelligence, machine learning, data science, natural products, development, optimization, characterization

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