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Deep-learning nuclear cross sections

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Beyond their many impacts in our societies, artificial intelligence and machine learning are also often seen as representing a paradigm shift in scientific research. Their unsurpassed ability to learn complex patterns in large datasets have found multiple applications ranging from designing powerful emulators of complex theories, to processing massive amounts of data to opening new ways to solve inverse problems. Nuclear theory offers a unique playground for the application and development of AI/ML techniques. In contrast to other natural science domains or human sciences, nuclear theory has very robust foundations yet rely on a small set of free parameters that must be calibrated on experimental data. Most if not all nuclear theories are also computationally expensive. Finally, the amount of experimental data available for training AI/ML models is quite limited. In this presentation, I will discuss recent attempts to employ deep-learning techniques to directly learn how nuclear cross sections transform across the chart of isotopes. I will also attempt to identify possible future research directions at the intersection of nuclear theory and modeling and AI/ML.

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Classification de Session: Machine Learning for Nuclear Data

Classification de thématique: Challenges of Nuclear Data: Machine Learning