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Enhancing X-ray Binary Analysis through Deep Learning

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X-ray binaries, systems composed of a star and a compact object, are pivotal to our understanding of astrophysical phenomena. However, the analysis of their X-ray spectra, critical for unlocking the secrets of these celestial bodies, is notoriously computationally intensive. Traditional approaches often struggle to keep pace with the voluminous data generated by observatories, a challenge set to intensify with the advent of next-generation X-ray observatories like XRISM and Athena.
This talk introduces a pioneering project that leverages deep learning to revolutionize the evaluation of complex physical models used in X-ray binary analysis. By integrating Bayesian inference within a deep learning framework, our approach significantly reduces computational time without sacrificing accuracy. This breakthrough is particularly timely, ensuring that the astrophysical community can efficiently process and analyze the large datasets expected from upcoming observatories. Our preliminary results demonstrate not only a substantial reduction in evaluation times but also an improvement in the fidelity of model predictions. This advancement is a testament to the potential of deep learning in astrophysical research, offering a scalable solution to the challenges posed by big data in astronomy.

Presenter: TUTONE, Antonio

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