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LEMON: Modelling strong gravitational lenses in a finger snap

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New wide-field astronomical surveys are opening a new window on the Universe, by collecting data for extraordinarily vaste samples of galaxies. Strong gravitational lenses are rare astronomical events, whose actual number will increase of more than 100 times thanks to the unique data from the Euclid wide survey or the Rubin LSST observations. After finding such 100,000 strong lenses, they need to be modelled. It is therefore absolutely necessary to develop techniques which can allow to estimate precise galaxy lens and source model parameters and their uncertainties in a finger snap.

For this reason we have developped a machine learning code based on Bayesian Neural Networks, named LEMON (LEns MOdelling with Neural networks), and started to implement it within the Euclid Strong lensing pipeline, to complement the more standard and more time consuming lens modelling approaches. I will present our latest developments. We have trained the network on a sample of Euclid-like mock lenses. We model the lens using both a SIE and a power-law, characterized by the Einstein radius, the axis ratio and the position angle, and the power-law slope for the latter model. With respect to the previous version of the code we will also determine the light parameters of the lens galaxy, i.e. effective radius, Sérsic index and total magnitude. I will discuss the performance of the code, the application to real data and introduce future developments and applications.

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Session Classification: Cosmic Insights from Big Data: How Machine Learning is Decoding the Universe

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