THE ASTRONOMY RESEARCH CENTRE

ARCNet SEMINAR

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"Deep learning predictions of galaxy merger stage and the importance of observational realism"

Abstract

Observations and theoretical predictions alike show that mergers transform galaxies — from changes in AGN activity, star-formation rates, and gas metallicity distributions to angular momenta and morphologies. However, putting these findings in an evolutionary context requires large galaxy interaction samples and the ability to connect these changes to specific stages in a merger. In this talk, I will discuss ways that more complete samples and more accurate merger stage classifications can be obtained by combining the hydrodynamical simulations, synthetic observations, and deep learning. Specifically, I train convolutional neural networks using synthetic observations from a suite of hydrodynamical merger simulations run with the FIRE-2 model. The simulations offer an important advantage over real observations -- ground truth target classes for interaction stage. Synthetic observations of the simulations are produced with various levels of realism (e.g. projected stellar mass and dust-inclusive radiative transfer) to answer the following questions: (1) What is gained/lost by making the images more realistic? (2) How realistic do the images need to be in order to achieve high performance in classifying mergers in realistic images? (3) How sensitive is the network performance to image quality? (4) Is a network that is trained on synthetic observations for one survey easily transferable to another survey of higher or lower image quality?

Wednesday, September 4, 2019
3:00 p.m.
Elliott Building
Room 160