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# Machine learning dark matter halo formation

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Dark matter halos are the fundamental building blocks of cosmic large-scale structure. Improving our theoretical understanding of their structure, evolution and formation is an essential step towards understanding how galaxies form, which in turn will allow us to fully exploit the large amount of data from future galaxy surveys. I will present a machine learning approach which aims to provide new physical insights into the physics driving halo formation. We train a machine learning algorithm to learn cosmological structure formation directly from N-body simulation. The algorithm infers the relationship between the initial conditions and the final dark matter halos, based on inputs describing different properties of the local environment surrounding the dark matter particles in the initial conditions. I will demonstrate that one can infer which aspects of the early-Universe density field impact the formation of the final dark matter halos by evaluating the predictive performance of the algorithm when provided with different types of information.

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