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## **Discovering galaxy formation channels with unsupervised learning**

Galaxies show a very complex and diverse evolutionary paths for which we do not have yet a comprehensive picture. One of the main reasons is that their evolution is so slow in time that we can only study galaxies at the moment of the observations. Simulations are of great help to overcome that issue.

In particular, the IllustrisTNG project is a suite of state-of-the-art cosmological galaxy formation simulations. Each simulation in IllustrisTNG evolves a large swath of a mock Universe from soon after the Big-Bang until the present day while taking into account a wide range of physical processes that drive galaxy formation. The simulations can be used to study a broad range of topics surrounding how the Universe — and the galaxies within it — evolved over time. Combining the TNG50 simulations with unsupervised learning algorithms, will allow us to find underlying patrons in the intricate pathways followed by galaxies up to the present day. Unsupervised learning is a rather unexplored tool in astronomy but with an incredible potential to help us find the unknown and unexpected.