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## Exploring the Link Between the Star Formation History and the Morphology of Galaxies Using CNNs

We study the connection between the factors regulating star formation in galaxies on different spatial and temporal scales and connect morphological features (such as bars, bulges and spiral arms) with their integrated star formation on different timescales. This is being done using machine learning methods, specifically using convolutional neural networks (CNNs). The network is trained on a subset of galaxies in the SDSS-IV MaNGA DR17 ( $0 < z < 0.1$ ) ( $N \sim 10,010$ ). The CNN network is trained to predict SFR, stellar mass and the  $t_{50}$  of galaxies. Furthermore, we use the network prediction to construct the galaxies' star formation histories using the dense\_basis SED fitting algorithm. The target values are taken from the schema data of the SDSS surveys which use more traditional methods (i.e spectral fitting) to acquire the values of the parameters for each galaxy. Additionally, we explore the use of transfer learning on the ResNet50 architecture with pretrained weights from ImageNet. We focus on interpretability of the trained network using various XAI methods such as SHAP (SHapley Additive exPlanations), to see what parts of galaxy images the network is focusing on to make its predictions. With this, we can explore which morphological features of galaxies have the greatest impact on predicted star formation history parameters, and use it to gain insights on the links between the underlying physical processes regulating star formation in galaxies.

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