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Deep Transfer Learning for Star Cluster Classification[1] WEI WEI, University of Illinois at Urbana-Champaign, ELIU HUERTA, University of Illinois at Urbana-Champaign; NCSA, BRAD WHITMORE, Space Telescope Science Institute, JANICE LEE, IPAC; Caltech, STEPHEN HANNON, UC Riverside — We present the results of a proof-of-concept experiment which demonstrates that deep learning can successfully be used for production-scale classification of compact star clusters detected in HST UV-optical imaging of nearby spiral galaxies (D ¡ 20 Mpc) in the PHANGS-HST survey. Given the relatively small and unbalanced nature of existing, human-labelled star cluster samples, we transfer the knowledge of state-of-the-art neural network models for real-object recognition to classify star clusters candidates into four morphological classes. We perform a series of experiments to determine the dependence of classification performance on: neural network architecture; training data sets curated by either a single expert or three astronomers; and the size of the images used for training. We find that the overall classification accuracies are not significantly affected by these choices. The networks are used to classify star cluster candidates in the PHANGS-HST galaxy NGC 1559, which was not included in the training samples. The performance is competitive with that achieved in previously published human and automated quantitative classification of star cluster candidate samples. The methods introduced herein lay the foundations to automate classification for star clusters at scale.

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