



Mar Athanasius College of Engineering, Kothamangalam

Department of Computer Applications

Mini Project 2023-25 Batch

Abstract

Title: Star-Galaxy Classification Using Deep Learning

References:

1. Ganesh Ranganath Chandrasekar Iyer Krishna Chaithanya Vastare (2017). Deep Learning for Star-Galaxy Classification
2. Kim EJ, Brunner RJ. Star-galaxy classification using deep convolutional neural networks. Monthly Notices of the Royal Astronomical Society. 2016 Oct 17:stw2672
3. Jasim AM, Kenamer N, Kirkby D, Ihler A, Sanchez-Lopez FJ. ContextNet: Deep learning for star galaxy classification. In International conference on machine learning 2018 Jul 3 (pp. 2582-2590). PMLR.

Accurately classifying astronomical objects as stars or galaxies has been a fundamental challenge in astrophysics for centuries. Traditional methods relied on visual inspection and morphological analysis, which were labor-intensive and limited by human subjectivity and data processing capacity. With the exponential data growth from modern sky surveys like the Sloan Digital Sky Survey (SDSS), manual classification has become impractical. A literature review of recent studies highlights the use of algorithms such as Convolutional Neural Networks (CNN), deep convolutional neural networks (ConvNets), and ContextNet for star-galaxy classification. Of these, CNNs have shown the best performance in terms of model building and computational efficiency. In this approach, deep learning methods are used to classify stars and galaxies by rejecting erroneous data, correcting for extinction, aligning images, and centering objects using tools like nMontage and SExtractor. The dataset, taken from Kaggle, contains 3986 entries (942 galaxies and 3044 stars). Star-galaxy classification using CNNs reduces human error, enhances scalability, and efficiently processes large volumes of data, making it a valuable approach for astronomical classification tasks.

Submitted By:

Ajay Das M

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Faculty Guide:

Prof. Nisha Markose

Project Coordinator:

Prof. Sonia Abraham