

STAR-GALAXY CLASSIFICATION USING DEEP LEARNING

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Overview

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Introduction

- The challenge of accurately classifying astronomical objects as stars or galaxies has been a fundamental task in astrophysics for centuries.
- Traditional methods relied heavily on visual inspection and morphological analysis, which were labour-intensive and limited by human subjectivity and the capacity to process large data volumes.
- With the advent of modern sky surveys like the Sloan Digital Sky Survey (SDSS), the volume of astronomical data has grown exponentially, rendering manual classification impractical.

Introduction

- The proposed system uses Convolution Neural Network (CNN). The models will classify photometric data under two classes Star. An automated system with the help of deep learning methodology we can make these much easier.
- The models will classify photometric data under two classes Star. An automated system can be very helpful to offers significant benefits for star-galaxy classification, including reduced human error, increased scalability, and efficient handling of vast data quantities

LITERATURE REVIEW 1

Ganesh Ranganath Chandrasekar Iyer Krishna Chaithanya Vastare (2017). Deep Learning for Star-Galaxy Classification

TITLE	YEAR	DATASET	ARCHITECTURE ARCHITECTURE	ACCURACY
Deep Learning for Star-Galaxy Classification	2017	Dataset was taken from the Sloan Digital Sky Survey (SDSS). The dataset contains 30 million images.	Convolutional Neural Networks(CNN)	99.19

LITERATURE REVIEW 2

Kim EJ, Brunner RJ. Star-galaxy classification using deep convolutional neural networks. Monthly Notices of the Royal Astronomical Society. 2016 Oct 17:stw2672.

TITLE	YEAR	DATASET	ARCHITECTURE ARCHITECTURE	ACCURACY
Star-galaxy classification using deep convolutional neural networks	2016	photometric and spectroscopic data sets with different characteristics and compositions. data sets and the image pre-processing steps for retrieving cutout images	Convolutional Neural Networks (ConvNets)	99.48

LITERATURE REVIEW 3

Sun H, Guo J, Kim EJ, Brunner RJ. Unsupervised stargalaxy classification with cascade variational auto-encoder. arXiv preprint arXiv:1910.14056. 2019 OCT 30.

TITLE	YEAR	DATASET	ARCHITECTURE ARCHITECTURE	ACCURACY
Unsupervised star galaxy classification with cascade variational auto-encoder	2019	Uses the SDSS dataset with a labelled subset (140,000 images) and an unlabelled subset (100,000 images).	Cascade Variational Auto-Encoder (CasVAE), Variational Autoencoder (VAE), Autoencoder (AE)	VAE + ML - 75 DKL-VAE + ML - 84 CasVAE - 90

LITERATURE REVIEW SUMMMERY

REVIEW PAPER	ARCHITECTURE	ACCURACY
Deep Learning for Star-Galaxy Classification	Convolutional Neural Networks(CNN)	99.19
Star-galaxy classification using deep convolutional neural networks	Convolutional Neural Networks (ConvNets)	99.48
Unsupervised star galaxy classification with cascade variational auto[[encoder	Cascade Variational Auto-Encoder (CasVAE)	90

DATA SET

- The dataset is taken from the Kaggle repository, containing a collection of astronomical images captured using a 1.3-meter telescope located in Nainital, India.
- The dataset contains 3986 sample observations, with 942 Galaxies and 3044 Stars photometric data.
- Link : <https://www.kaggle.com/datasets/divyansh22/dummy-astronomy-data/>

PROJECT PROPOSAL

Objective

Develop a deep learning-based system for the accurate classification of astronomical objects as stars or galaxies, leveraging the benefits of reduced human error, increased scalability, and efficient handling of vast data quantities.

Methodology

Utilize Convolutional Neural Networks (CNNs) to build a binary classifier that can distinguish between stars and galaxies in photometric data. Implement data preprocessing, model training, and evaluation steps to optimize the classification performance.



**Thank
You**