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## # GAN Galaxy Images

This repository contains the implementation of a Generative Adversarial Network (GAN) to generate fake galaxy images based on the Galaxy10 DECals dataset. The GAN is trained to create realistic galaxy images using three color bands (g, r, z) at a resolution of 32x32 pixels.

### ## Project Overview

The goal of this project is to use a GAN to generate new galaxy images that resemble those in the Galaxy10 DECals dataset. The dataset consists of images of galaxies in different morphological classes. The project involves the following steps:

#### 1. **Dataset Preparation:**

- Download the Galaxy10 DECals dataset from Moodle.
- Downsample the images from 64x64 pixels to 32x32 pixels.

#### 2. **Data Preprocessing:**

- Normalize the images to have pixel values in the range [-1, 1].

#### 3. **Model Architecture:**

- Build the generator and discriminator networks using Keras.
- Generator: Converts latent vectors into 32x32x3 images.
- Discriminator: Classifies images as real or fake.

#### 4. **Training the GAN:**

- Train the GAN for 100-200 epochs.
- Plot generated images at intervals to monitor progress.

#### 5. **Results:**

- Generate and evaluate fake galaxy images.
- Interpolate between random latent vectors to observe changes in generated images.

### ## Repository Contents

- `gan\_galaxy\_images.ipynb`: Jupyter notebook containing the code for data preprocessing, model building, training, and evaluation.
- `README.md`: This readme file.

### ## Getting Started

To run the code, follow these steps:

1. Clone the repository:

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```bash
git clone https://github.com/your-username/gan-galaxy-images.git
cd gan-galaxy-images
```
```

2. Open the Jupyter notebook:

```
```bash
jupyter notebook gan_galaxy_images.ipynb
```
```

3. Follow the instructions in the notebook to download the dataset, preprocess the data, build and train the GAN, and generate fake galaxy images.

## ## Dependencies

- Python 3.x
- TensorFlow
- Keras
- NumPy
- h5py
- Matplotlib

## ## Acknowledgments

- The Galaxy10 DECals dataset is provided by AstroNN.
- This project is part of a lab exercise on GANs for generating galaxy images.

## ## License

This project is licensed under the MIT License. See the [LICENSE](LICENSE) file for details.

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