Finetuning Deep Learning Models on Astrophysical Datasets

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Literature Review:

1. **Pretrained models for Image classification**
   Image detection models can be used to identify the object or structures in the images like stars, exoplanets, nebula, neutron star, dwarf planets, galaxies, comets, etc.
   - I think YOLOS model is quite popular in vision field, my GPU is RTX 3050 4GB VRAM, with these gpu specification it is quite difficult to run the model on it, as YOLOS will through error if large dataset, batch size, image dimensions are used on this gpu, but it can run on my gpu if image dimensions are less and batch sizes too(deep learning - How to train Yolo model with GPU of 'NVIDIA GeForce RTX 3050 Laptop GPU - Stack Overflow).
     Reference: YOLOS
   - More preferably, will be using ViT or DETR model for image detection.
   - Vision Transformer (ViT), DETR
   - **ViT** model, applies the Transformer architecture directly to image data. Unlike conventional convolutional neural networks (CNNs), ViT uses the self-attention mechanism, a core component of Transformers, to capture relationships across an image without relying on convolutions.
   - **DETR** model, consists of convolutional backbone along an encoder-decoder Transformer which can be trained end-to-end for object detection.

2. **Given Dataset:** The given dataset contains the images of the galaxies belonging to the categories like - elliptical, clockwise spiral, anticlockwise spiral, edge-on, star/don't know, or merger, the brightest and largest galaxies.

The methods of finetuning which I think are suitable for the dataset includes:(these all methods come under supervised fine-tuning)

- Task-Specific Fine-Tuning: A method that focuses on specific task or domain for specific dataset.
- Transfer-learning: This method is useful when data is limited and some knowledge is already embedded in pretrained model.
  Acorn | Fine-Tuning LLMs: Top 6 Methods, Challenges and Best Practices
- Basic hyperparameter tuning: Manually adjusting parameters like learning rate, epochs, batch size until desired performance is achieved.
  Fine-Tuning LLMs: Overview, Methods & Best Practices

3.Other Methods:

I tried gaining basic information about the others methods like **Bootstrap Aggregating, Boosting, Stacking(Stack Generalisation), Voting Ensembles and others in the list.**