GSOC PROJECT IN AUTOENCODERS

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HEP DATA

- Unfortunately I wasn't able to complete the analysis on the given dataset due to facing the same issue mentioned on the repository as well as my comment on Google Classroom and e-mail.
- Hence I would be unable to provide the results of my changes and how my changes improved these

MY IMPROVEMENTS

- Fixed Bugs in the code given in order to run models and configs other than the given default.
- Added criteria in early stopping to check if the validation loss is oscillating withing a particular band only for the last few epochs
- Added functionality of Variational Autoencoder using a new class and new loss function. Also implemented changes to run this as the standard architecture didn't support using this class.
- Have modified configuration parameter such as batch size and SAE layer parameters.

FURTHER IMPROVEMENTS

- For now, I have only implemented a basic VAE which uses linear layers only. This can be modified to include Convolutional layers as well which could improve the performance.
- Variations of VAE like Beta VAE (Disentangled VAE) may also be implemented by learning upon the hyperparameter as well
- Hyperparameter tuning can be improved to make it automated within a defined search space
- Inception Network based VAE may be implemented to counter overfitting in some cases
- Loss functions which are more dependent on class of data may be introduced. The standard MSE loss function may also be replaced by other loss functions used in reconstruction problems. For this research papers may be referred

EVALUATION VS ANALYSIS & FLAWS WITH BALER

- Analysis of the model is based on how well the model is able to evaluate a feature using other reconstructed features. However this may hide finer details of the reconstruction as some features may have some sort of under-approximation while some others may have over-approximation. If these errors cancel out each others' effect, the result of analysis may show good results even though individual reconstructions are not as good.
- Hence it would be better to judge on individual reconstruction of each feature instead as a collective property.
- I found the code provided to not have good coherence and it did not have a standard architecture that would allow for easy addition of new features.