CS 203: Software Tools & Techniques for AI

IIT Gandhinagar

Sem-II - 2024-25

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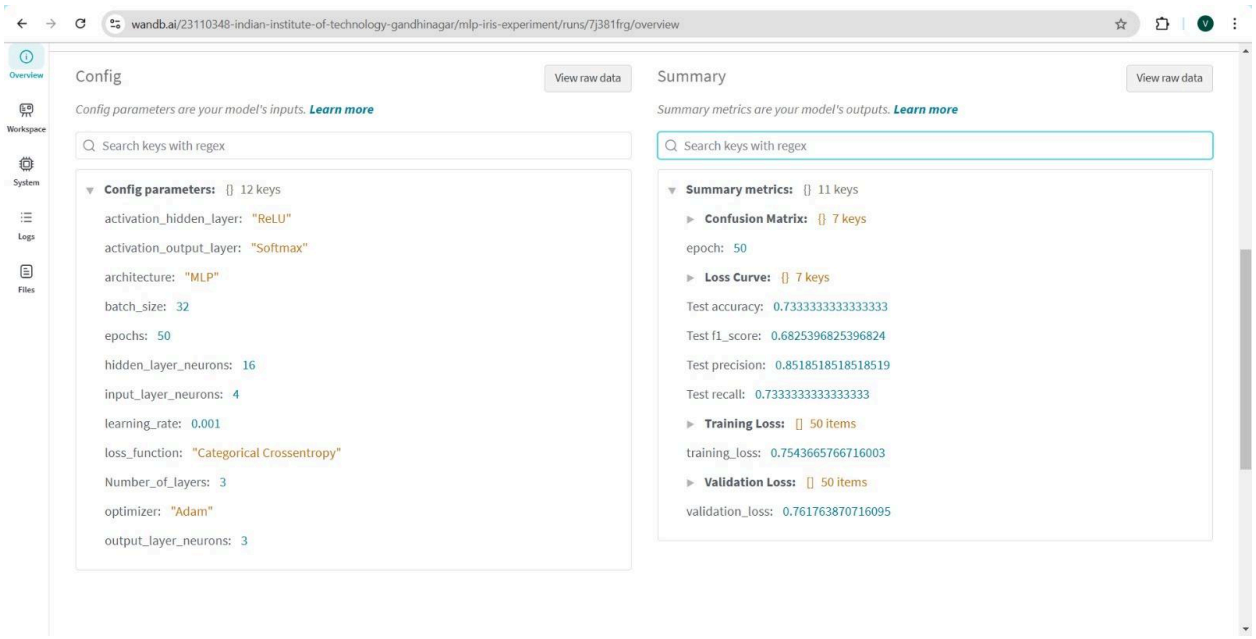
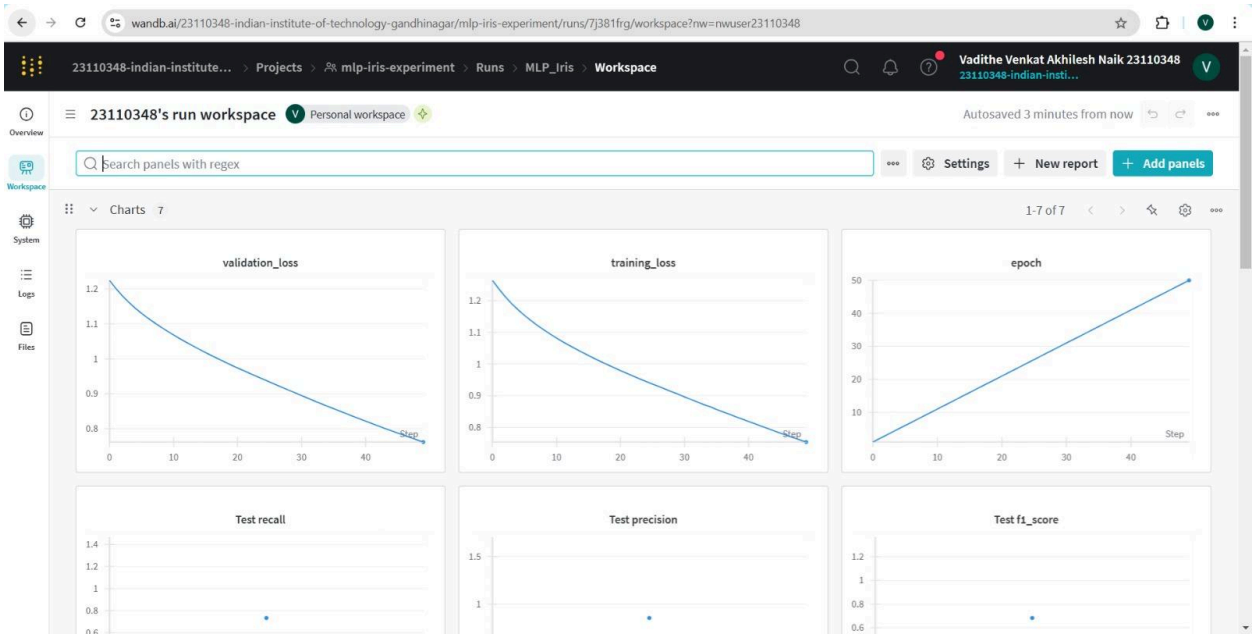
GitHub Repository Link:
https://github.com/Praveennayak22/CS203_Lab6

Colab Link:
https://colab.research.google.com/drive/1PdUlab50im8x9alTNtmtW9Y1VbeUTj0T?usp=sharing

Section 1: MLP Model Implementation & Experiment Tracking

W & B dashboard:

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23110348-indian-institute... > Projects > mlp-iris-experiment > Runs > MLP_Iris > Workspace
Vadithe Venkat Akhilesh Naik 23110348
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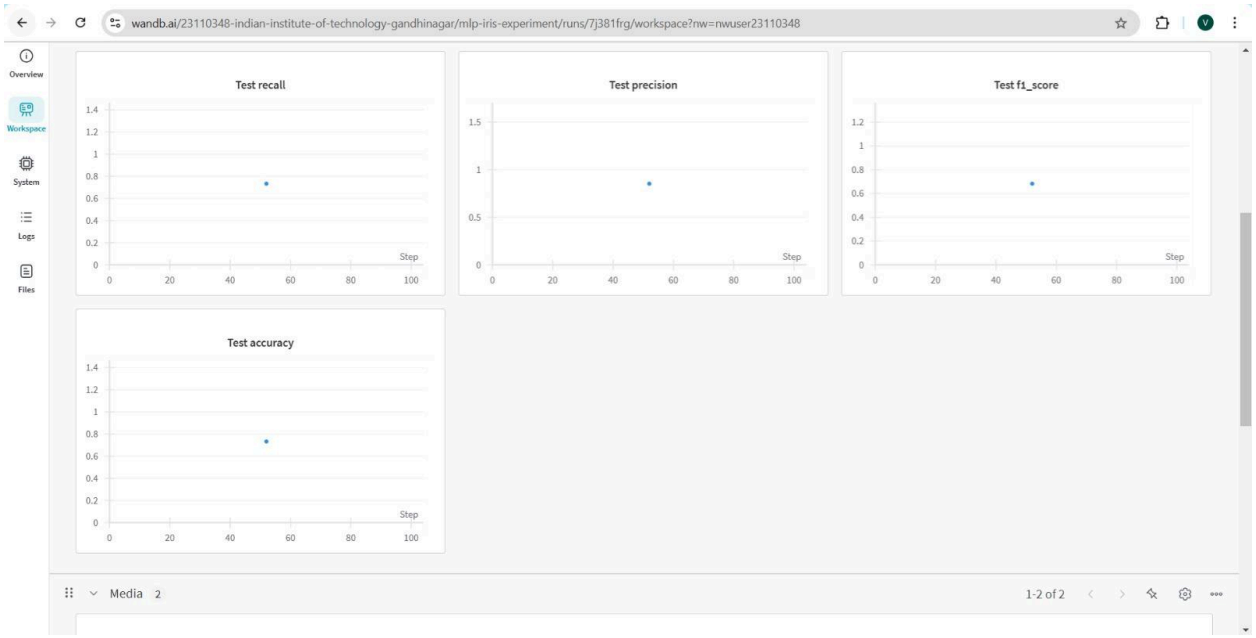
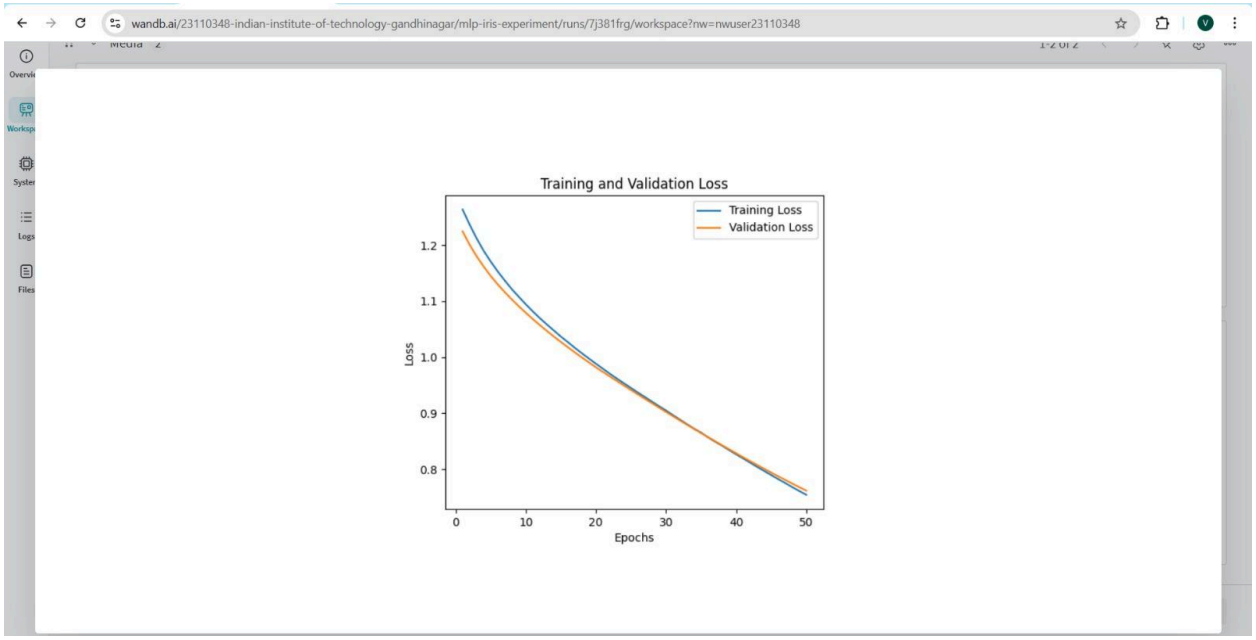
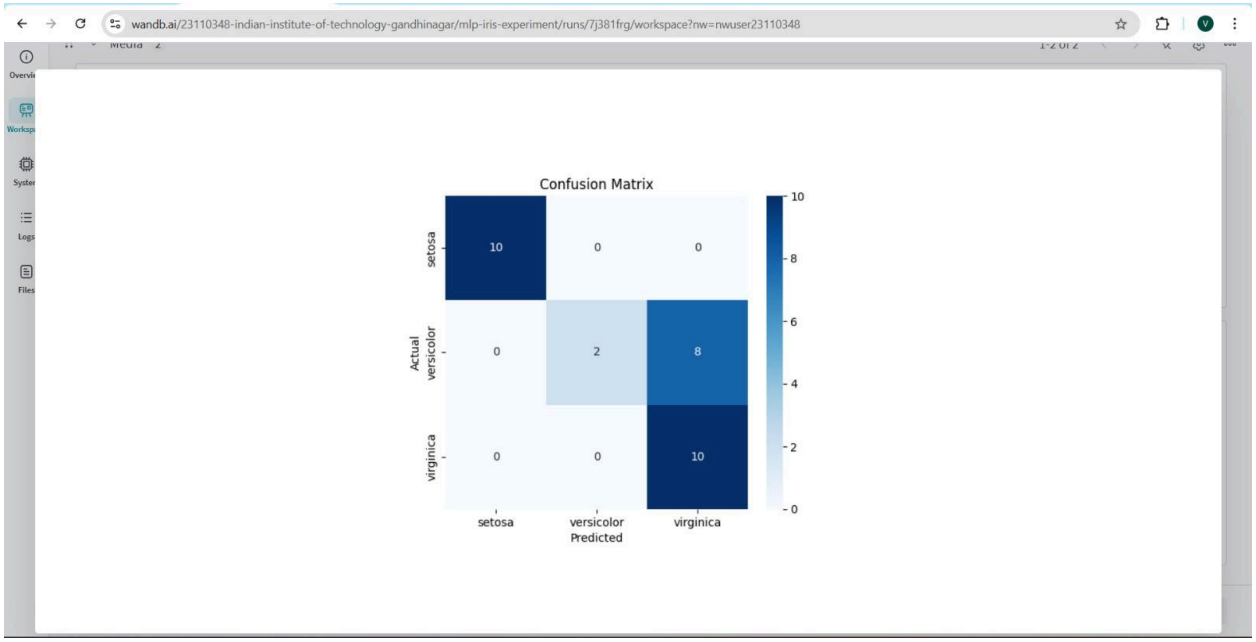
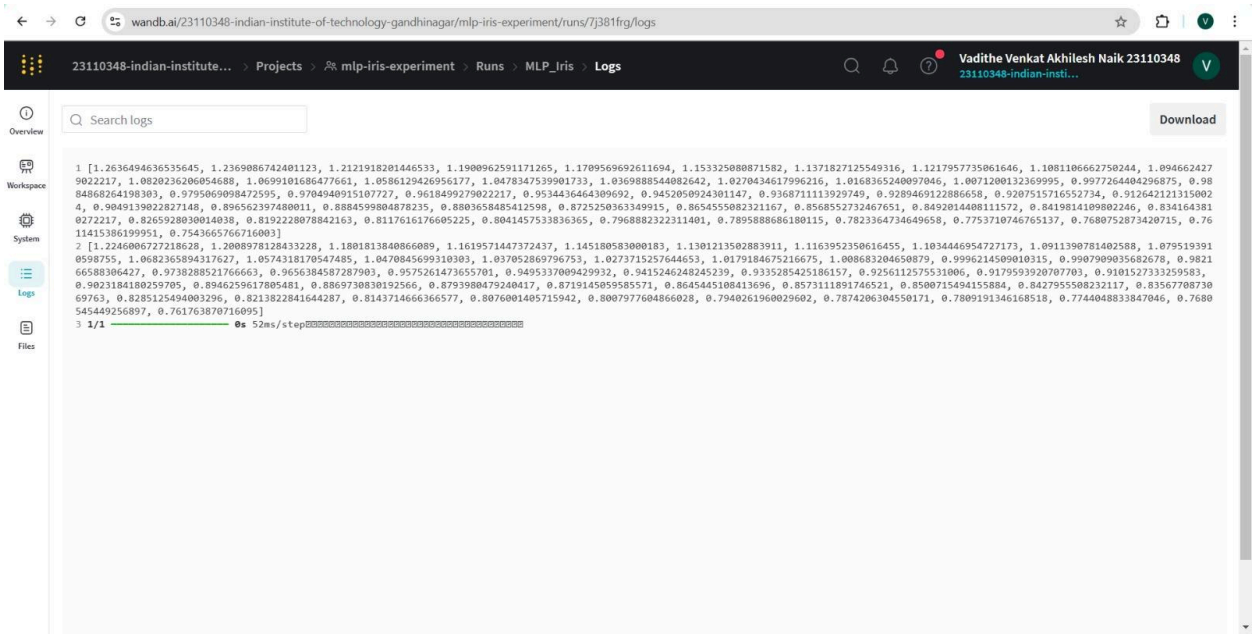
Overview
Workspace
System
Logs
Files
23110348's run workspace
Personal workspace
Autosaved 3 minutes from now
Search panels with regex
Settings
New report
Add panels
Charts 7
1-7 of 7
validation_loss
training_loss
epoch
Test recall
Test precision
Test f1_score
Step


wandb.ai/23110348-indian-institute-of-technology-gandhinagar/mlp-iris-experiment/runs/7j381frg/workspace?nw=nwuser23110348
Overview
Workspace
System
Logs
Files
Test recall
Test precision
Test f1_score
Test accuracy
Step
Media 2
1-2 of 2

- Training loss and Validation loss over 50 epochs







Section 2: Hyperparameters

A relation (direct or inverse) between the hyperparameters and their impact on the performance (Hypothetically, epoch is directly proportional to performance, but batch size is inversely proportional).

Describe the performance for each hyperparameter combination over accuracy and F1.

- Epochs is directly proportional to accuracy & F1-score.
- Batch size is inversely proportional to accuracy.
- if learning rate is too low then it is slow learning and if not that is too high then it is unstable.
- **Manual Search:** Requires trial-and-error tuning, Time-consuming, Difficult to explore many configurations
- **AutoGluon Search:** Grid Search is exhaustive but slow, Random Search is faster, but less precise, Hyperband is efficient & adaptive, Bayesian Optimization is of best performance
- Hyperband + Bayesian Optimization is generally the better approach because it efficiently allocates resources to promising models while also refining the search using past results.
- This results in better performance compared to Random Search, which selects hyperparameters randomly and may miss optimal configurations.
- However, Random Search is simpler(small datasize) and sometimes faster, making it a good choice when computational resources are limited.
- **Best Approach:** Bayesian Optimization balances speed & accuracy.

Compare manual tuning vs. automated search

Which approach is better and why? (At most five lines of explanation)

- Automated search (Grid Search, Random Search, Bayesian Optimization) explores more configurations in less time, while manual tuning is slower and requires more experience in it.
- Automated search often finds better hyperparameters, leading to higher accuracy and F1 scores compared to manually chosen values.
- Automated methods ensure systematic exploration, reducing human bias in selecting hyperparameters.
- Manual tuning allows domain knowledge incorporation, but automated methods adapt to complex patterns without human intervention.
- Automated search is generally better for larger search spaces, but manual tuning is useful when computational resources are limited.

Plots for the training vs validation loss for each hyperparameter configuration.

- The plots for the manual are in the colab