

Lab Assignment: 8

- Download wandb in colab and login using API key
- Import required libraries and write device agnostic code
- Import fashion MNIST and make data loader with only odd classes
- Write train and test loop, plot function for loss and accuracy plot
- Take cross entropy as loss function
- For hyper parameter take activation function and optimizer
- In activation function take ReLU and Tanh
- And in optimizer take Adam and SGD
- Now train the model for with and without wandb

Result:

CO Lab:

Current iter: 1/4

Activation function: Tanh and Optimizer: Adam

Epoch: 1

Train Loss: 0.2047 | Test Loss: 0.1082 | Train Accuray: 0.9314 | Test Accuracy: 0.9608

Epoch: 2

Train Loss: 0.1239 | Test Loss: 0.0968 | Train Accuray: 0.9575 | Test Accuracy: 0.9655

Epoch: 3

Train Loss: 0.0920 | Test Loss: 0.0981 | Train Accuray: 0.9679 | Test Accuracy: 0.9629

Epoch: 4

Train Loss: 0.1050 | Test Loss: 0.0986 | Train Accuray: 0.9658 | Test Accuracy: 0.9650

Epoch: 5

Train Loss: 0.0787 | Test Loss: 0.1256 | Train Accuray: 0.9724 | Test Accuracy: 0.9591

Epoch: 6

Train Loss: 0.0695 | Test Loss: 0.0949 | Train Accuray: 0.9765 | Test Accuracy: 0.9677

Epoch: 7

Train Loss: 0.0637 | Test Loss: 0.0686 | Train Accuray: 0.9770 | Test Accuracy: 0.9769

Epoch: 8

Train Loss: 0.0564 | Test Loss: 0.0749 | Train Accuray: 0.9794 | Test Accuracy: 0.9739

Epoch: 9

Train Loss: 0.0503 | Test Loss: 0.0647 | Train Accuray: 0.9828 | Test Accuracy: 0.9780

Epoch: 10

Train Loss: 0.0502 | Test Loss: 0.0535 | Train Accuray: 0.9819 | Test Accuracy: 0.9781

Epoch: 11

Train Loss: 0.0598 | Test Loss: 0.0615 | Train Accuray: 0.9779 | Test Accuracy: 0.9756

Epoch: 12

Train Loss: 0.0447 | Test Loss: 0.0623 | Train Accuray: 0.9837 | Test Accuracy: 0.9761

Epoch: 13

Train Loss: 0.0398 | Test Loss: 0.0548 | Train Accuray: 0.9855 | Test Accuracy: 0.9798

Epoch: 14

Train Loss: 0.0472 | Test Loss: 0.0558 | Train Accuray: 0.9836 | Test Accuracy: 0.9782

Epoch: 15

Train Loss: 0.0479 | Test Loss: 0.0611 | Train Accuray: 0.9835 | Test Accuracy: 0.9764

Epoch: 16

Train Loss: 0.0370 | Test Loss: 0.0599 | Train Accuray: 0.9863 | Test Accuracy: 0.9792

Epoch: 17

Train Loss: 0.0320 | Test Loss: 0.0526 | Train Accuray: 0.9870 | Test Accuracy: 0.9793

Epoch: 18

Train Loss: 0.0258 | Test Loss: 0.0552 | Train Accuray: 0.9907 | Test Accuracy: 0.9777

Epoch: 19

Train Loss: 0.0281 | Test Loss: 0.0619 | Train Accuray: 0.9888 | Test Accuracy: 0.9792

Epoch: 20

Train Loss: 0.0269 | Test Loss: 0.0607 | Train Accuray: 0.9891 | Test Accuracy: 0.9767

Epoch: 21

Train Loss: 0.0263 | Test Loss: 0.0529 | Train Accuray: 0.9898 | Test Accuracy: 0.9781

Epoch: 22

Train Loss: 0.0301 | Test Loss: 0.0548 | Train Accuray: 0.9900 | Test Accuracy: 0.9809

Epoch: 23

Train Loss: 0.0218 | Test Loss: 0.0602 | Train Accuray: 0.9930 | Test Accuracy: 0.9785

Epoch: 24

Train Loss: 0.0179 | Test Loss: 0.0569 | Train Accuray: 0.9926 | Test Accuracy: 0.9799

Epoch: 25

Train Loss: 0.0221 | Test Loss: 0.0612 | Train Accuray: 0.9915 | Test Accuracy: 0.9786

Epoch: 26

Train Loss: 0.0181 | Test Loss: 0.0715 | Train Accuray: 0.9915 | Test Accuracy: 0.9790

Epoch: 27

Train Loss: 0.0154 | Test Loss: 0.0609 | Train Accuray: 0.9943 | Test Accuracy: 0.9791

Epoch: 28

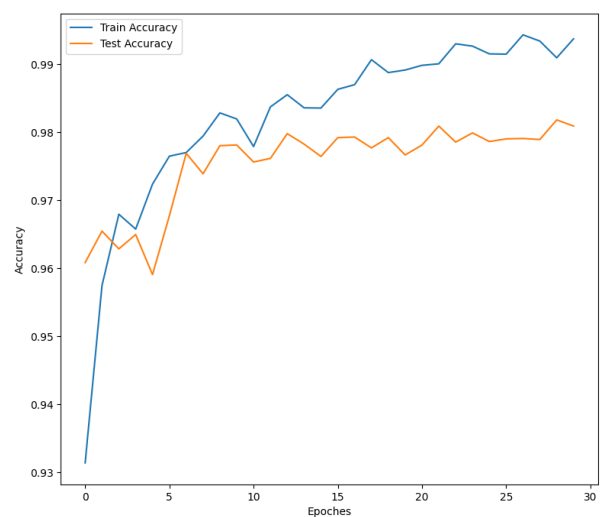
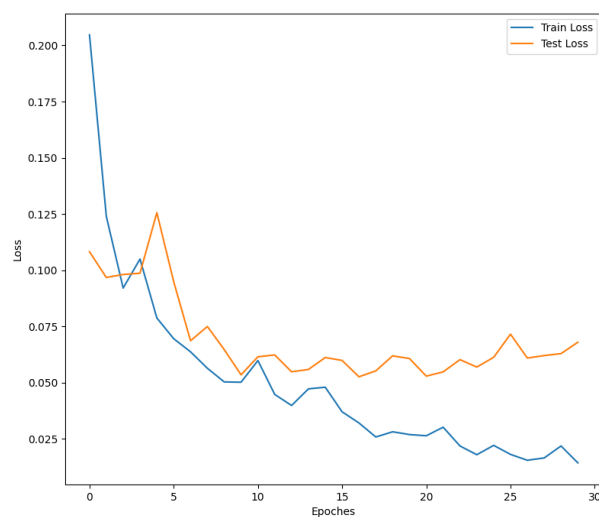
Train Loss: 0.0165 | Test Loss: 0.0620 | Train Accuray: 0.9934 | Test Accuracy: 0.9789

Epoch: 29

Train Loss: 0.0218 | Test Loss: 0.0629 | Train Accuray: 0.9909 | Test Accuracy: 0.9818

Epoch: 30

Train Loss: 0.0143 | Test Loss: 0.0679 | Train Accuray: 0.9937 | Test Accuracy: 0.9809



Execution time of 1 iter: 491.2617652910001 Seconds.

=====
Current iter: 2/4

Activation function: Tanh and Optimizer: SGD

Epoch: 1

Train Loss: 0.2006 | Test Loss: 0.1032 | Train Accuray: 0.9280 | Test Accuracy: 0.9613

Epoch: 2

Train Loss: 0.0999 | Test Loss: 0.0925 | Train Accuray: 0.9614 | Test Accuracy: 0.9671

Epoch: 3

Train Loss: 0.0743 | Test Loss: 0.0830 | Train Accuray: 0.9715 | Test Accuracy: 0.9678

Epoch: 4

Train Loss: 0.0633 | Test Loss: 0.0821 | Train Accuray: 0.9754 | Test Accuracy: 0.9716

Epoch: 5

Train Loss: 0.0517 | Test Loss: 0.0752 | Train Accuray: 0.9789 | Test Accuracy: 0.9716

Epoch: 6

Train Loss: 0.0472 | Test Loss: 0.1069 | Train Accuray: 0.9819 | Test Accuracy: 0.9643

Epoch: 7

Train Loss: 0.0424 | Test Loss: 0.0687 | Train Accuray: 0.9820 | Test Accuracy: 0.9764

Epoch: 8

Train Loss: 0.0374 | Test Loss: 0.0696 | Train Accuray: 0.9849 | Test Accuracy: 0.9770

Epoch: 9

Train Loss: 0.0311 | Test Loss: 0.0662 | Train Accuray: 0.9871 | Test Accuracy: 0.9768

Epoch: 10

Train Loss: 0.0326 | Test Loss: 0.0734 | Train Accuray: 0.9872 | Test Accuracy: 0.9729

Epoch: 11

Train Loss: 0.0301 | Test Loss: 0.0627 | Train Accuray: 0.9877 | Test Accuracy: 0.9783

Epoch: 12

Train Loss: 0.0272 | Test Loss: 0.0597 | Train Accuray: 0.9885 | Test Accuracy: 0.9793

Epoch: 13

Train Loss: 0.0259 | Test Loss: 0.0692 | Train Accuray: 0.9896 | Test Accuracy: 0.9746

Epoch: 14

Train Loss: 0.0214 | Test Loss: 0.0710 | Train Accuray: 0.9913 | Test Accuracy: 0.9752

Epoch: 15

Train Loss: 0.0199 | Test Loss: 0.0770 | Train Accuray: 0.9912 | Test Accuracy: 0.9739

Epoch: 16

Train Loss: 0.0197 | Test Loss: 0.1191 | Train Accuray: 0.9907 | Test Accuracy: 0.9641

Epoch: 17

Train Loss: 0.0202 | Test Loss: 0.0807 | Train Accuray: 0.9917 | Test Accuracy: 0.9793

Epoch: 18

Train Loss: 0.0162 | Test Loss: 0.0844 | Train Accuray: 0.9931 | Test Accuracy: 0.9774

Epoch: 19

Train Loss: 0.0179 | Test Loss: 0.0868 | Train Accuray: 0.9918 | Test Accuracy: 0.9753

Epoch: 20

Train Loss: 0.0148 | Test Loss: 0.0770 | Train Accuray: 0.9930 | Test Accuracy: 0.9780

Epoch: 21

Train Loss: 0.0166 | Test Loss: 0.0760 | Train Accuray: 0.9931 | Test Accuracy: 0.9782

Epoch: 22

Train Loss: 0.0146 | Test Loss: 0.0845 | Train Accuray: 0.9937 | Test Accuracy: 0.9783

Epoch: 23

Train Loss: 0.0110 | Test Loss: 0.0890 | Train Accuray: 0.9948 | Test Accuracy: 0.9768

Epoch: 24

Train Loss: 0.0157 | Test Loss: 0.0926 | Train Accuray: 0.9934 | Test Accuracy: 0.9708

Epoch: 25

Train Loss: 0.0130 | Test Loss: 0.0905 | Train Accuray: 0.9943 | Test Accuracy: 0.9784

Epoch: 26

Train Loss: 0.0106 | Test Loss: 0.0809 | Train Accuray: 0.9942 | Test Accuracy: 0.9773

Epoch: 27

Train Loss: 0.0088 | Test Loss: 0.0952 | Train Accuray: 0.9965 | Test Accuracy: 0.9786

Epoch: 28

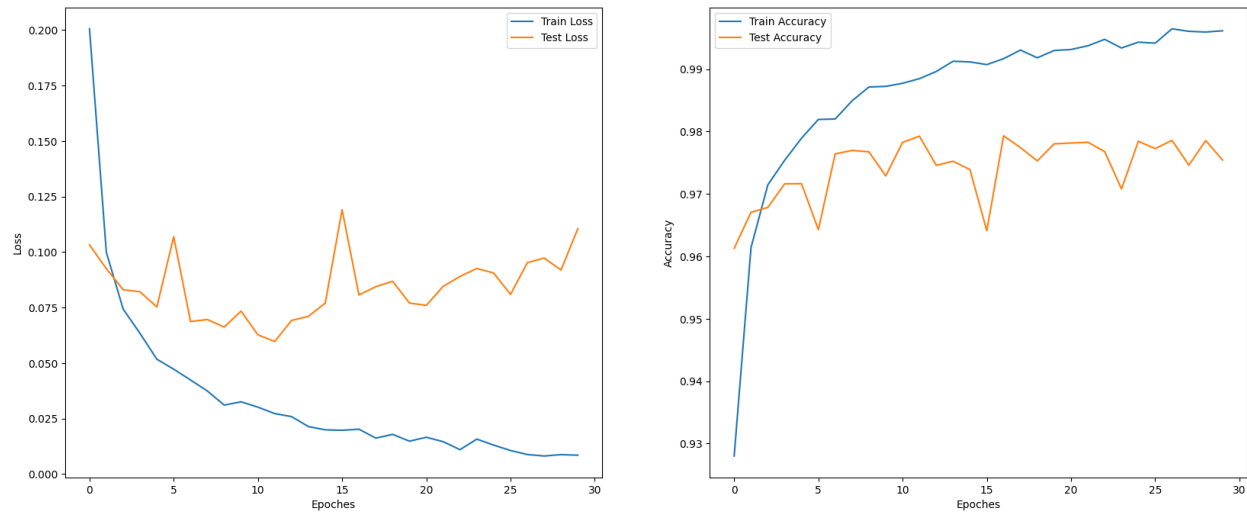
Train Loss: 0.0081 | Test Loss: 0.0973 | Train Accuray: 0.9961 | Test Accuracy: 0.9746

Epoch: 29

Train Loss: 0.0088 | Test Loss: 0.0919 | Train Accuray: 0.9959 | Test Accuracy: 0.9786

Epoch: 30

Train Loss: 0.0085 | Test Loss: 0.1106 | Train Accuray: 0.9961 | Test Accuracy: 0.9754



Execution time of 2 iter: 398.0965149140002 Seconds.

=====

Current iter: 3/4

Activation function: RELU and Optimizer: Adam

Epoch: 1

Train Loss: 0.1972 | Test Loss: 0.1778 | Train Accuray: 0.9344 | Test Accuracy: 0.9432

Epoch: 2

Train Loss: 0.1092 | Test Loss: 0.0820 | Train Accuray: 0.9622 | Test Accuracy: 0.9717

Epoch: 3

Train Loss: 0.0902 | Test Loss: 0.0949 | Train Accuray: 0.9681 | Test Accuracy: 0.9671

Epoch: 4

Train Loss: 0.0999 | Test Loss: 0.3309 | Train Accuray: 0.9649 | Test Accuracy: 0.9161

Epoch: 5

Train Loss: 0.0745 | Test Loss: 0.1182 | Train Accuray: 0.9745 | Test Accuracy: 0.9573

Epoch: 6

Train Loss: 0.0631 | Test Loss: 0.0909 | Train Accuray: 0.9777 | Test Accuracy: 0.9736

Epoch: 7

Train Loss: 0.0732 | Test Loss: 0.0858 | Train Accuray: 0.9735 | Test Accuracy: 0.9707

Epoch: 8

Train Loss: 0.0577 | Test Loss: 0.0705 | Train Accuray: 0.9785 | Test Accuracy: 0.9746

Epoch: 9

Train Loss: 0.0465 | Test Loss: 0.0615 | Train Accuray: 0.9835 | Test Accuracy: 0.9793

Epoch: 10

Train Loss: 0.0532 | Test Loss: 0.0583 | Train Accuray: 0.9816 | Test Accuracy: 0.9791

Epoch: 11

Train Loss: 0.0504 | Test Loss: 0.0639 | Train Accuray: 0.9823 | Test Accuracy: 0.9768

Epoch: 12

Train Loss: 0.0466 | Test Loss: 0.0621 | Train Accuray: 0.9827 | Test Accuracy: 0.9778

Epoch: 13

Train Loss: 0.0440 | Test Loss: 0.0656 | Train Accuray: 0.9842 | Test Accuracy: 0.9780

Epoch: 14

Train Loss: 0.0401 | Test Loss: 0.0647 | Train Accuray: 0.9846 | Test Accuracy: 0.9771

Epoch: 15

Train Loss: 0.0396 | Test Loss: 0.0560 | Train Accuray: 0.9850 | Test Accuracy: 0.9780

Epoch: 16

Train Loss: 0.0304 | Test Loss: 0.0712 | Train Accuray: 0.9883 | Test Accuracy: 0.9755

Epoch: 17

Train Loss: 0.0373 | Test Loss: 0.0950 | Train Accuray: 0.9854 | Test Accuracy: 0.9723

Epoch: 18

Train Loss: 0.0295 | Test Loss: 0.0658 | Train Accuray: 0.9887 | Test Accuracy: 0.9775

Epoch: 19

Train Loss: 0.0254 | Test Loss: 0.0717 | Train Accuray: 0.9891 | Test Accuracy: 0.9777

Epoch: 20

Train Loss: 0.0269 | Test Loss: 0.0867 | Train Accuray: 0.9900 | Test Accuracy: 0.9704

Epoch: 21

Train Loss: 0.0252 | Test Loss: 0.0608 | Train Accuray: 0.9899 | Test Accuracy: 0.9787

Epoch: 22

Train Loss: 0.0255 | Test Loss: 0.0662 | Train Accuray: 0.9907 | Test Accuracy: 0.9774

Epoch: 23

Train Loss: 0.0193 | Test Loss: 0.0720 | Train Accuray: 0.9920 | Test Accuracy: 0.9782

Epoch: 24

Train Loss: 0.0194 | Test Loss: 0.0690 | Train Accuray: 0.9923 | Test Accuracy: 0.9773

Epoch: 25

Train Loss: 0.0182 | Test Loss: 0.0776 | Train Accuray: 0.9928 | Test Accuracy: 0.9795

Epoch: 26

Train Loss: 0.0207 | Test Loss: 0.0717 | Train Accuray: 0.9908 | Test Accuracy: 0.9790

Epoch: 27

Train Loss: 0.0173 | Test Loss: 0.0615 | Train Accuray: 0.9935 | Test Accuracy: 0.9799

Epoch: 28

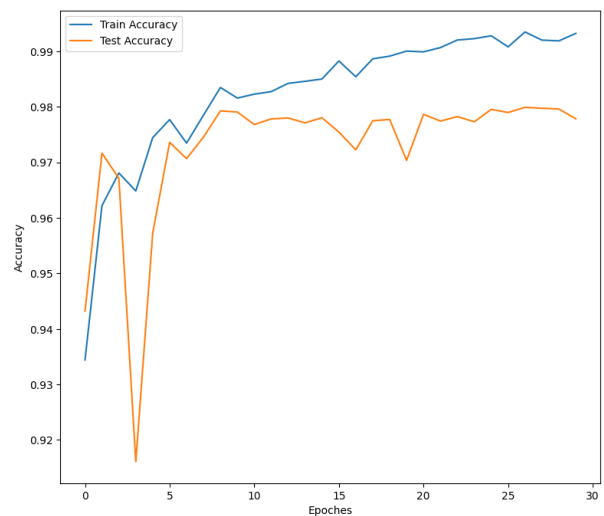
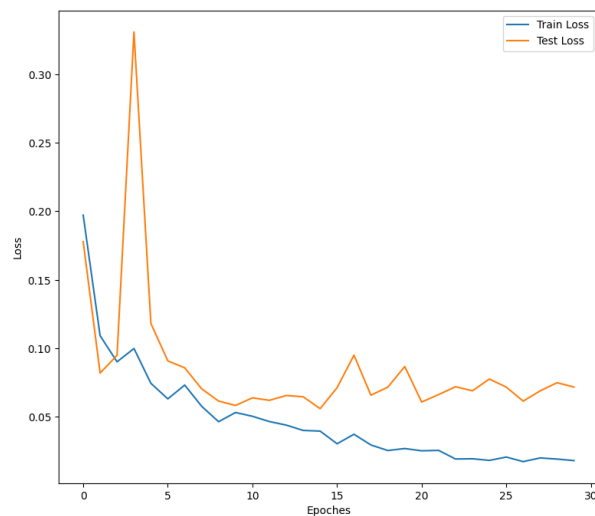
Train Loss: 0.0200 | Test Loss: 0.0690 | Train Accuray: 0.9920 | Test Accuracy: 0.9797

Epoch: 29

Train Loss: 0.0192 | Test Loss: 0.0749 | Train Accuray: 0.9919 | Test Accuracy: 0.9796

Epoch: 30

Train Loss: 0.0181 | Test Loss: 0.0718 | Train Accuray: 0.9932 | Test Accuracy: 0.9778



Execution time of 3 iter: 491.9555042820002 Seconds.

=====

Current iter: 4/4

Activation function: RELU and Optimizer: SGD

Epoch: 1

Train Loss: 0.1992 | Test Loss: 0.1022 | Train Accuray: 0.9277 | Test Accuracy: 0.9650

Epoch: 2

Train Loss: 0.1011 | Test Loss: 0.0947 | Train Accuray: 0.9618 | Test Accuracy: 0.9671

Epoch: 3

Train Loss: 0.0759 | Test Loss: 0.0810 | Train Accuray: 0.9702 | Test Accuracy: 0.9675

Epoch: 4

Train Loss: 0.0664 | Test Loss: 0.1038 | Train Accuray: 0.9742 | Test Accuracy: 0.9685

Epoch: 5

Train Loss: 0.0524 | Test Loss: 0.0706 | Train Accuray: 0.9788 | Test Accuracy: 0.9720

Epoch: 6

Train Loss: 0.0454 | Test Loss: 0.0845 | Train Accuray: 0.9833 | Test Accuracy: 0.9717

Epoch: 7

Train Loss: 0.0418 | Test Loss: 0.0737 | Train Accuray: 0.9823 | Test Accuracy: 0.9736

Epoch: 8

Train Loss: 0.0361 | Test Loss: 0.0770 | Train Accuray: 0.9852 | Test Accuracy: 0.9743

Epoch: 9

Train Loss: 0.0330 | Test Loss: 0.0753 | Train Accuray: 0.9869 | Test Accuracy: 0.9735

Epoch: 10

Train Loss: 0.0317 | Test Loss: 0.0722 | Train Accuray: 0.9866 | Test Accuracy: 0.9775

Epoch: 11

Train Loss: 0.0292 | Test Loss: 0.0720 | Train Accuray: 0.9881 | Test Accuracy: 0.9758

Epoch: 12

Train Loss: 0.0308 | Test Loss: 0.0801 | Train Accuray: 0.9870 | Test Accuracy: 0.9740

Epoch: 13

Train Loss: 0.0269 | Test Loss: 0.1030 | Train Accuray: 0.9893 | Test Accuracy: 0.9717

Epoch: 14

Train Loss: 0.0220 | Test Loss: 0.0818 | Train Accuray: 0.9904 | Test Accuracy: 0.9760

Epoch: 15

Train Loss: 0.0215 | Test Loss: 0.0833 | Train Accuray: 0.9904 | Test Accuracy: 0.9750

Epoch: 16

Train Loss: 0.0179 | Test Loss: 0.1041 | Train Accuray: 0.9923 | Test Accuracy: 0.9740

Epoch: 17

Train Loss: 0.0216 | Test Loss: 0.0881 | Train Accuray: 0.9902 | Test Accuracy: 0.9778

Epoch: 18

Train Loss: 0.0169 | Test Loss: 0.0918 | Train Accuray: 0.9934 | Test Accuracy: 0.9748

Epoch: 19

Train Loss: 0.0179 | Test Loss: 0.0851 | Train Accuray: 0.9920 | Test Accuracy: 0.9771

Epoch: 20

Train Loss: 0.0142 | Test Loss: 0.0889 | Train Accuray: 0.9936 | Test Accuracy: 0.9746

Epoch: 21

Train Loss: 0.0147 | Test Loss: 0.0875 | Train Accuray: 0.9938 | Test Accuracy: 0.9778

Epoch: 22

Train Loss: 0.0139 | Test Loss: 0.0891 | Train Accuray: 0.9946 | Test Accuracy: 0.9784

Epoch: 23

Train Loss: 0.0128 | Test Loss: 0.0842 | Train Accuray: 0.9951 | Test Accuracy: 0.9768

Epoch: 24

Train Loss: 0.0129 | Test Loss: 0.0968 | Train Accuray: 0.9942 | Test Accuracy: 0.9736

Epoch: 25

Train Loss: 0.0111 | Test Loss: 0.1056 | Train Accuray: 0.9951 | Test Accuracy: 0.9754

Epoch: 26

Train Loss: 0.0124 | Test Loss: 0.0990 | Train Accuray: 0.9938 | Test Accuracy: 0.9741

Epoch: 27

Train Loss: 0.0107 | Test Loss: 0.0957 | Train Accuray: 0.9953 | Test Accuracy: 0.9768

Epoch: 28

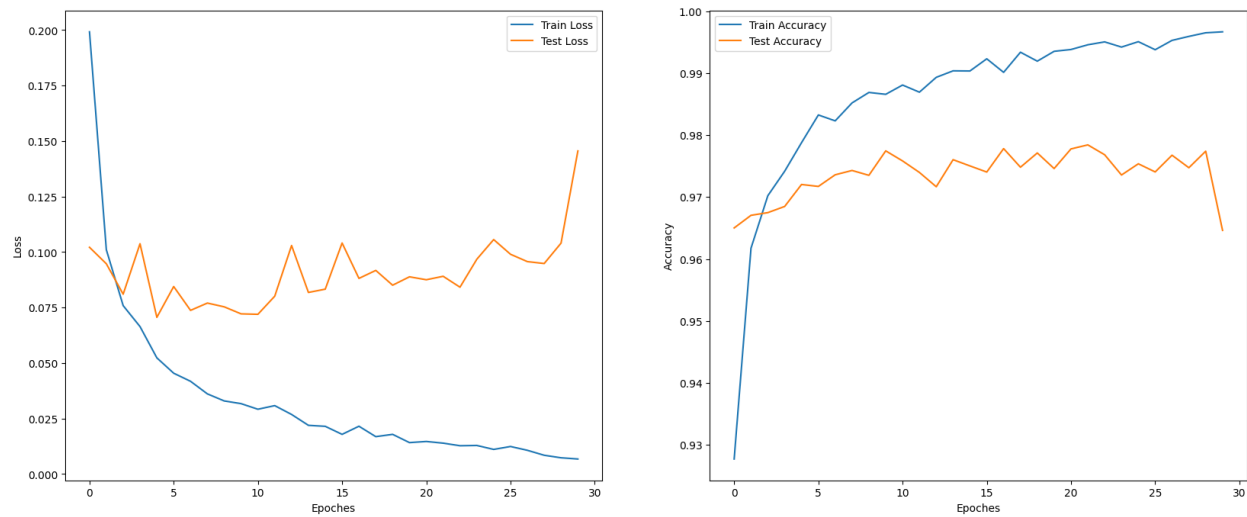
Train Loss: 0.0085 | Test Loss: 0.0948 | Train Accuray: 0.9960 | Test Accuracy: 0.9747

Epoch: 29

Train Loss: 0.0073 | Test Loss: 0.1040 | Train Accuray: 0.9965 | Test Accuracy: 0.9774

Epoch: 30

Train Loss: 0.0068 | Test Loss: 0.1456 | Train Accuray: 0.9967 | Test Accuracy: 0.9646



Execution time of 4 iter: 399.0964121699999 Seconds.

Observation:

- We use a pretrained resnet18 model from pytorch so after 3 epochs it performs overfitting in every iteration.
- We achieve accuracy up to 99%.
- GPU Observation

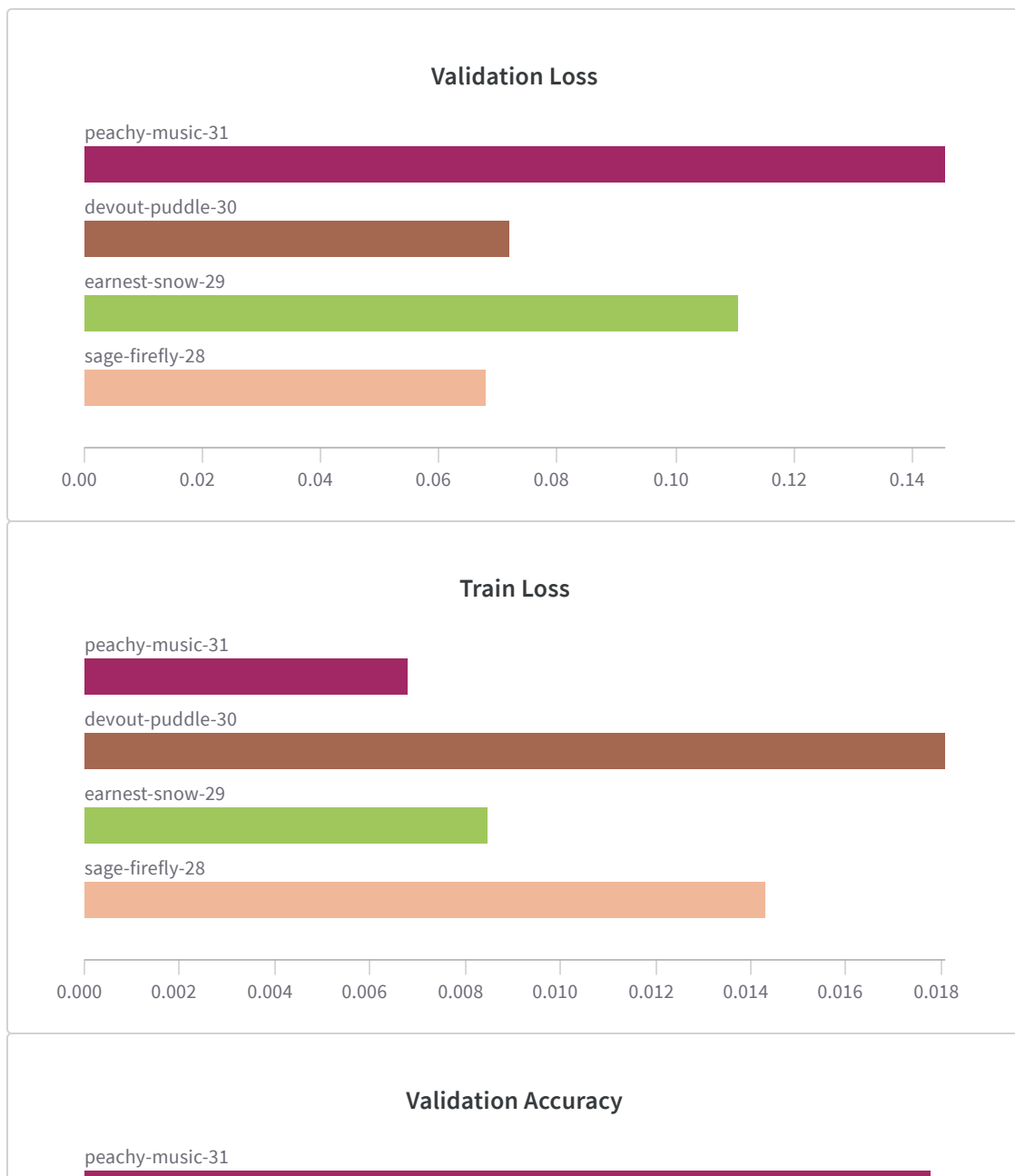
Model	GPU Utilization (%)	GPU Temp (C)	GPU Memory Allocation (%)	Run Time
Tanh Adam	74.93	76.93	11.43	8:00 min
Tanh SGD	67.67	77.00	11.43	6:30 min
RELU Adam	71.60	77.13	11.7	8:00 min
RELU SGD	67.13	77.00	11.7	6:30 min

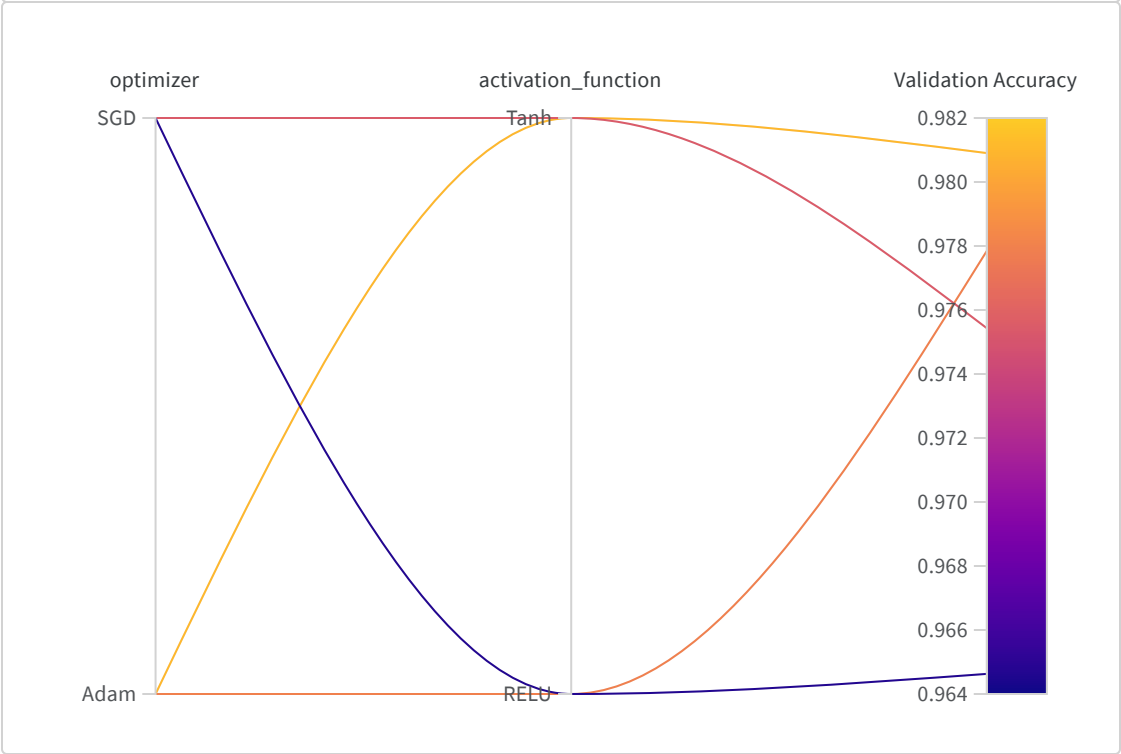
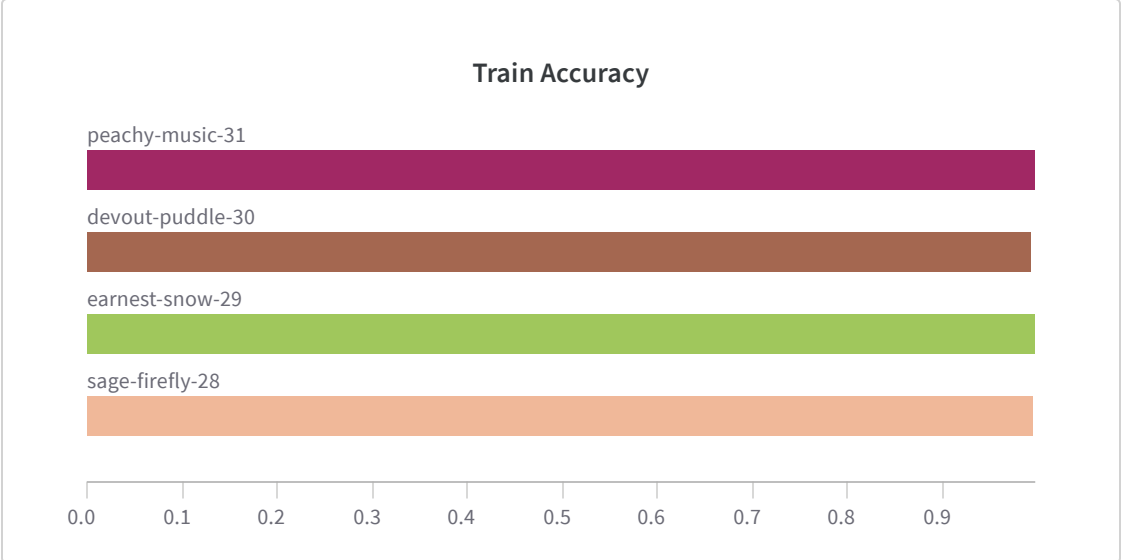
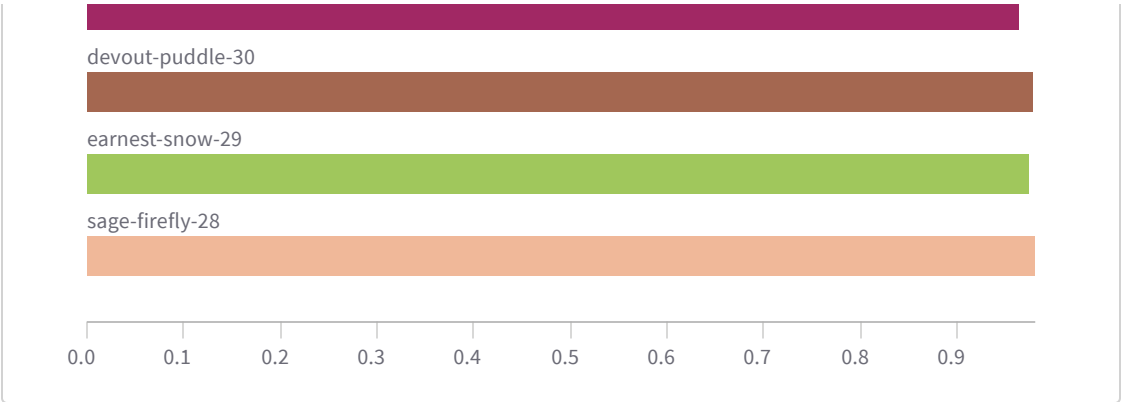
Note: I make observations after running the whole assignment but write it in between two results.

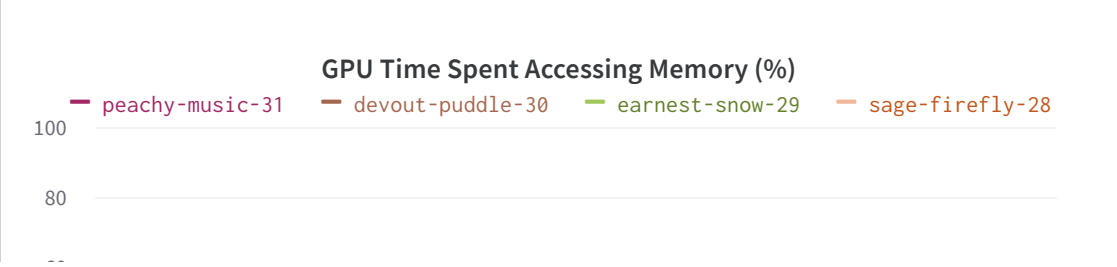
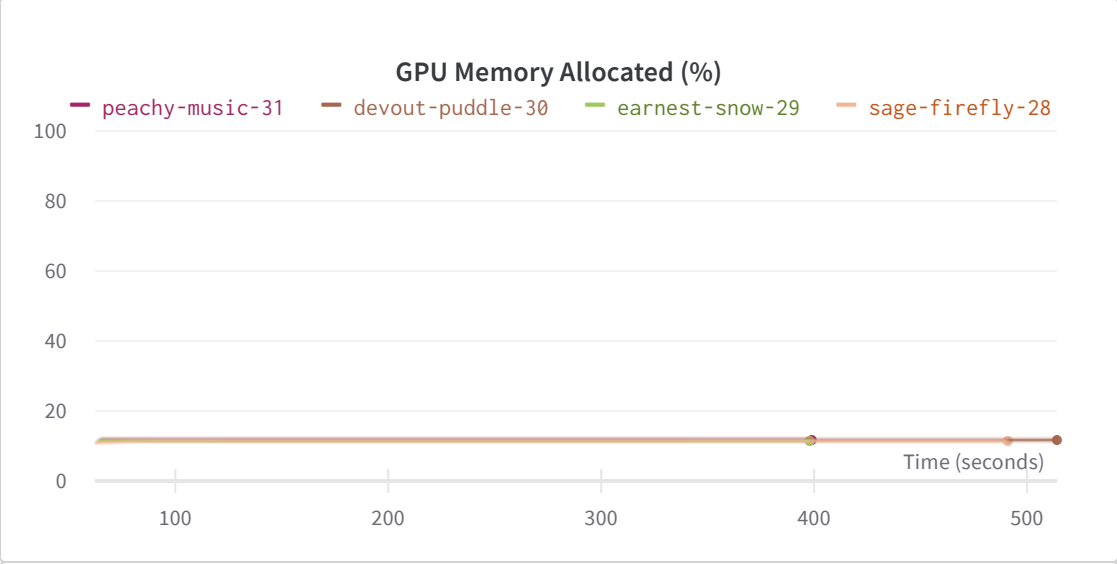
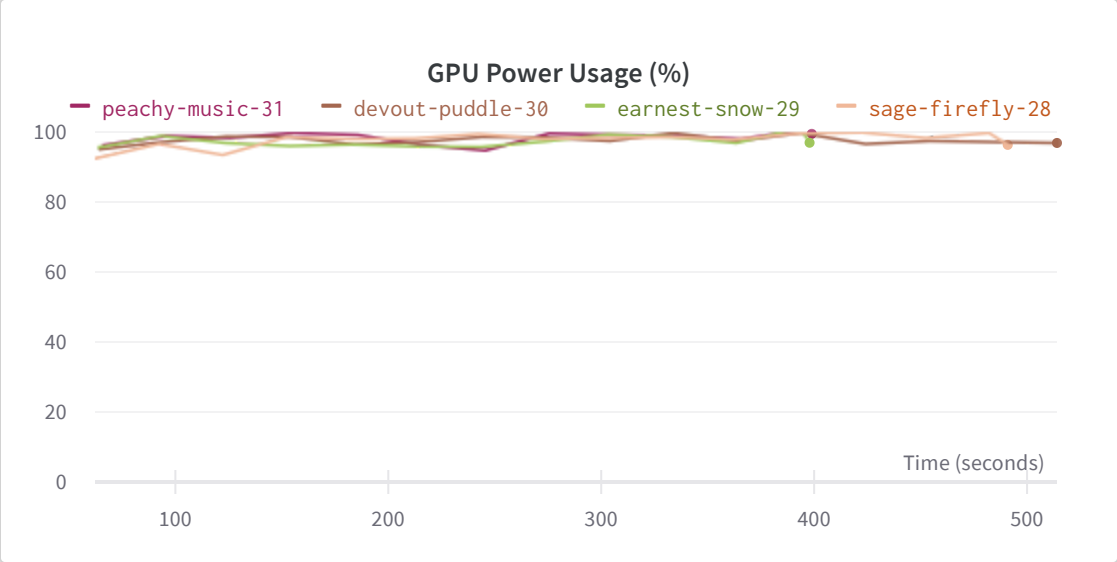
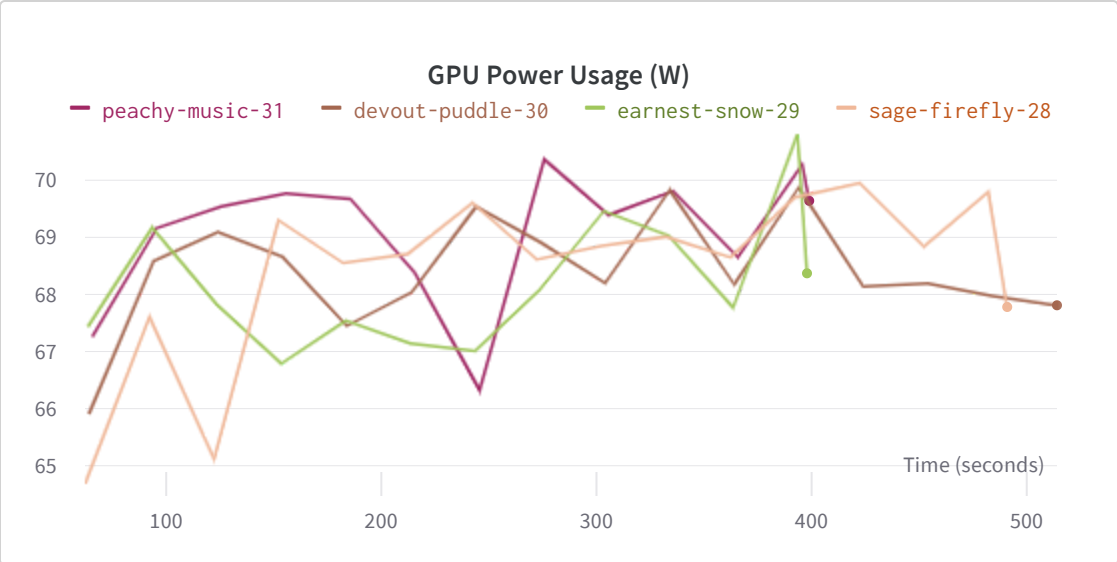
M22CS061-DLOps-Assignment-8-Report

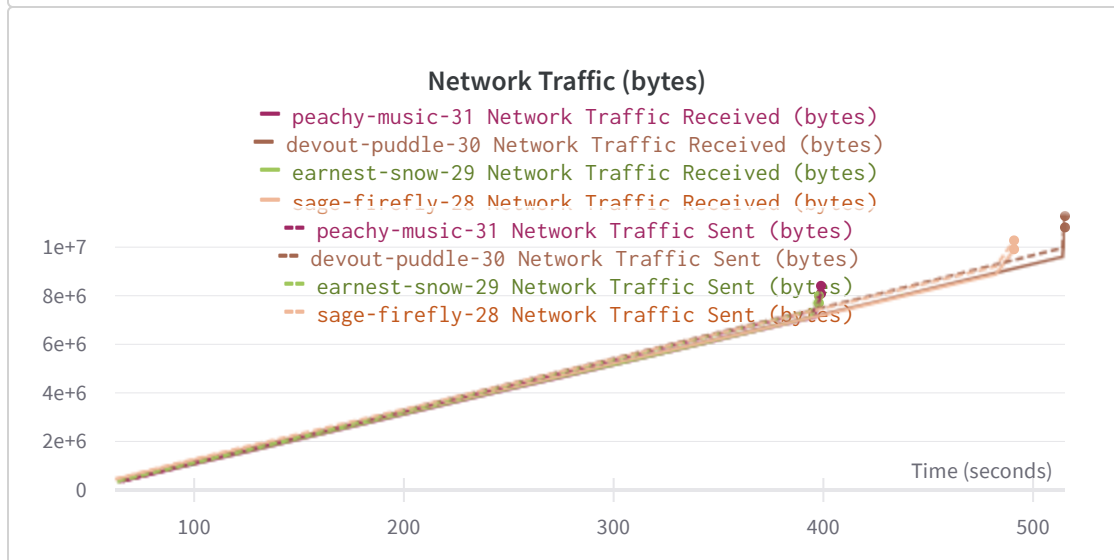
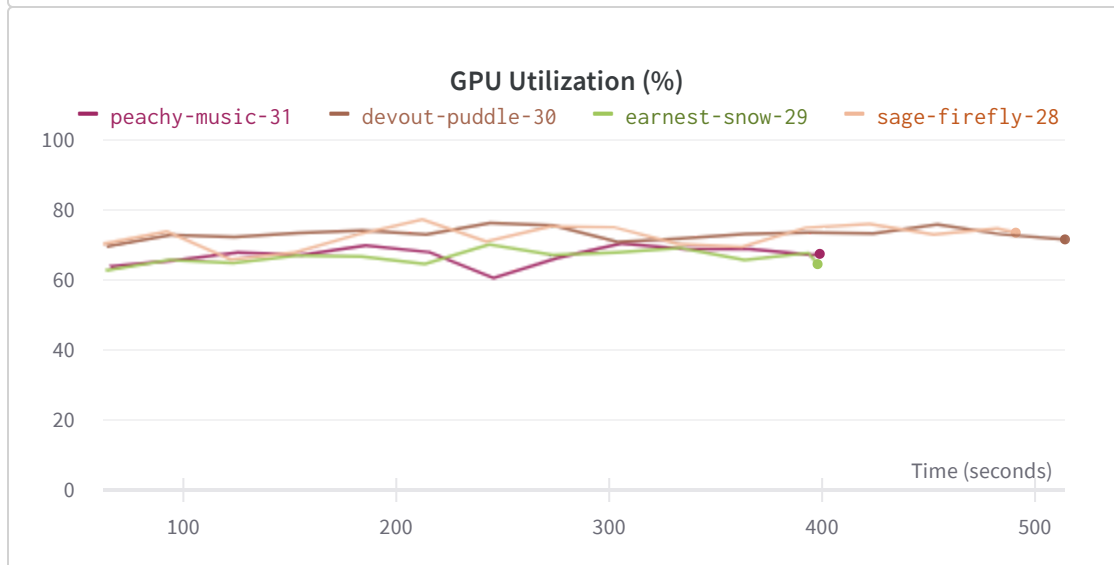
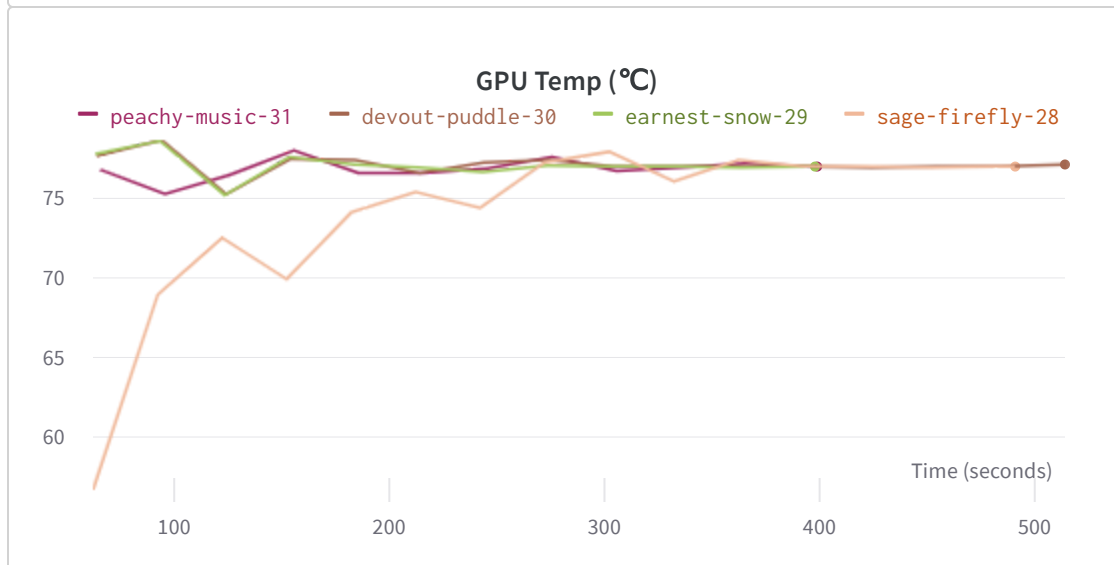
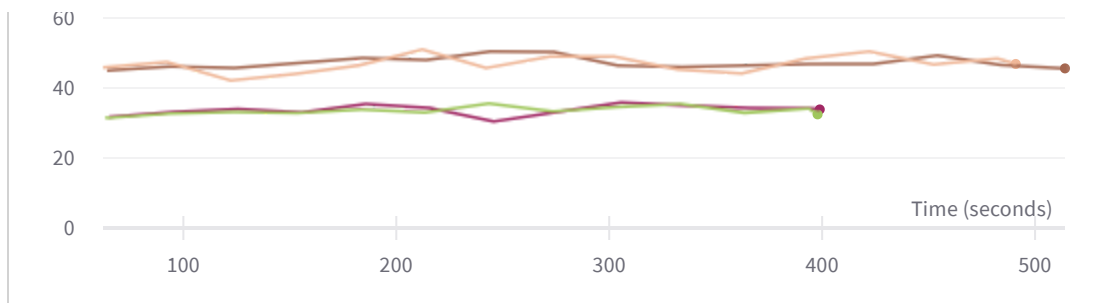
Jash Patel

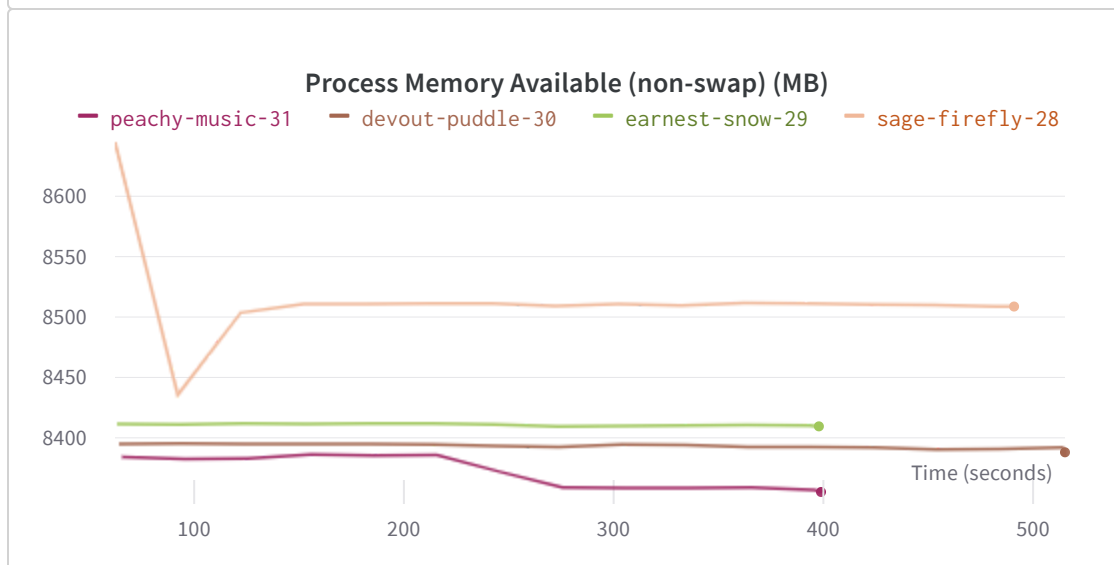
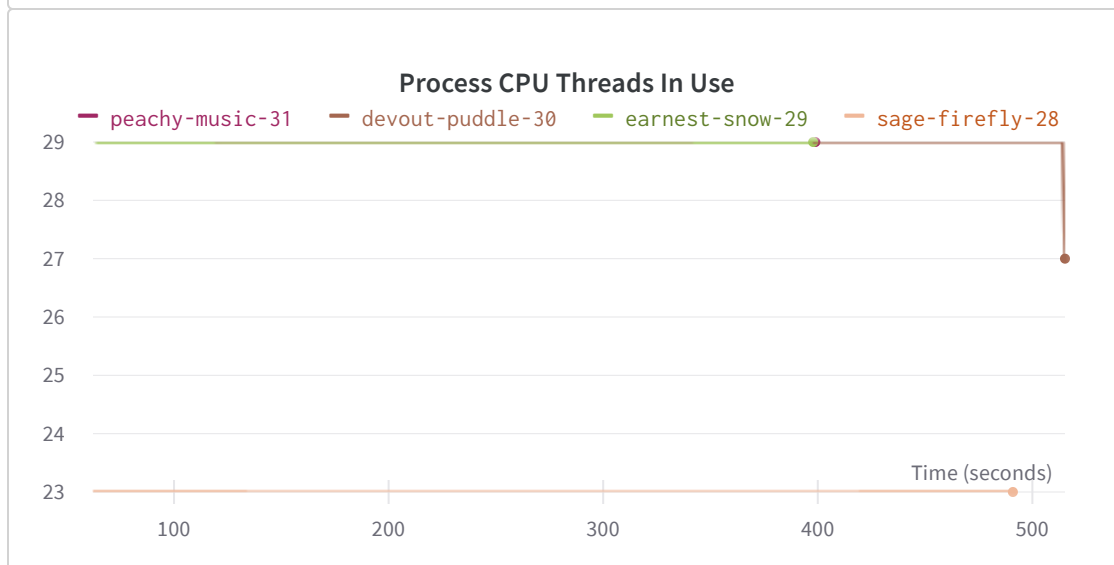
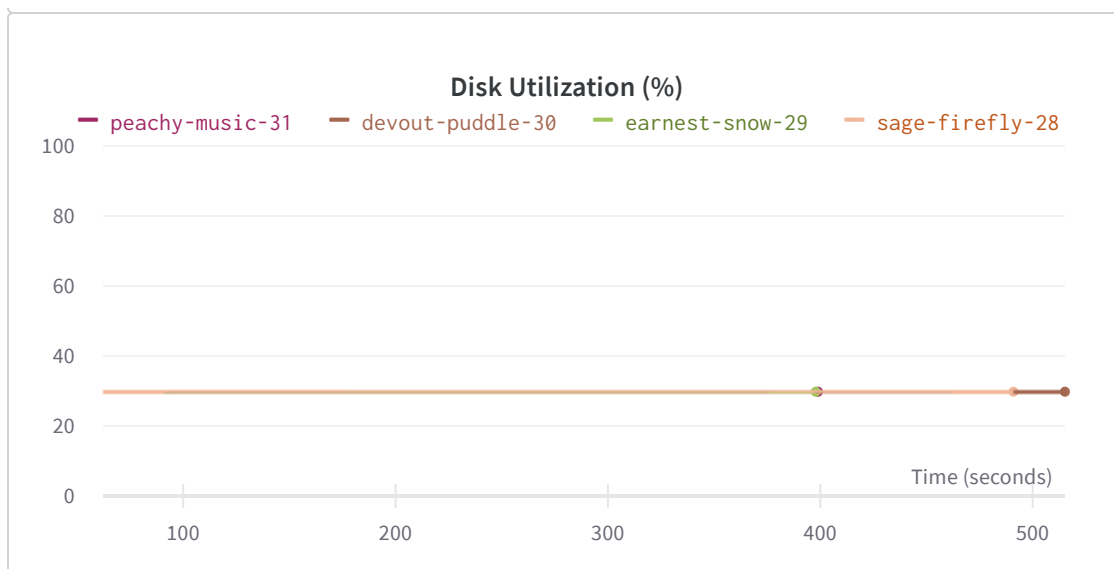
▼ Section 1

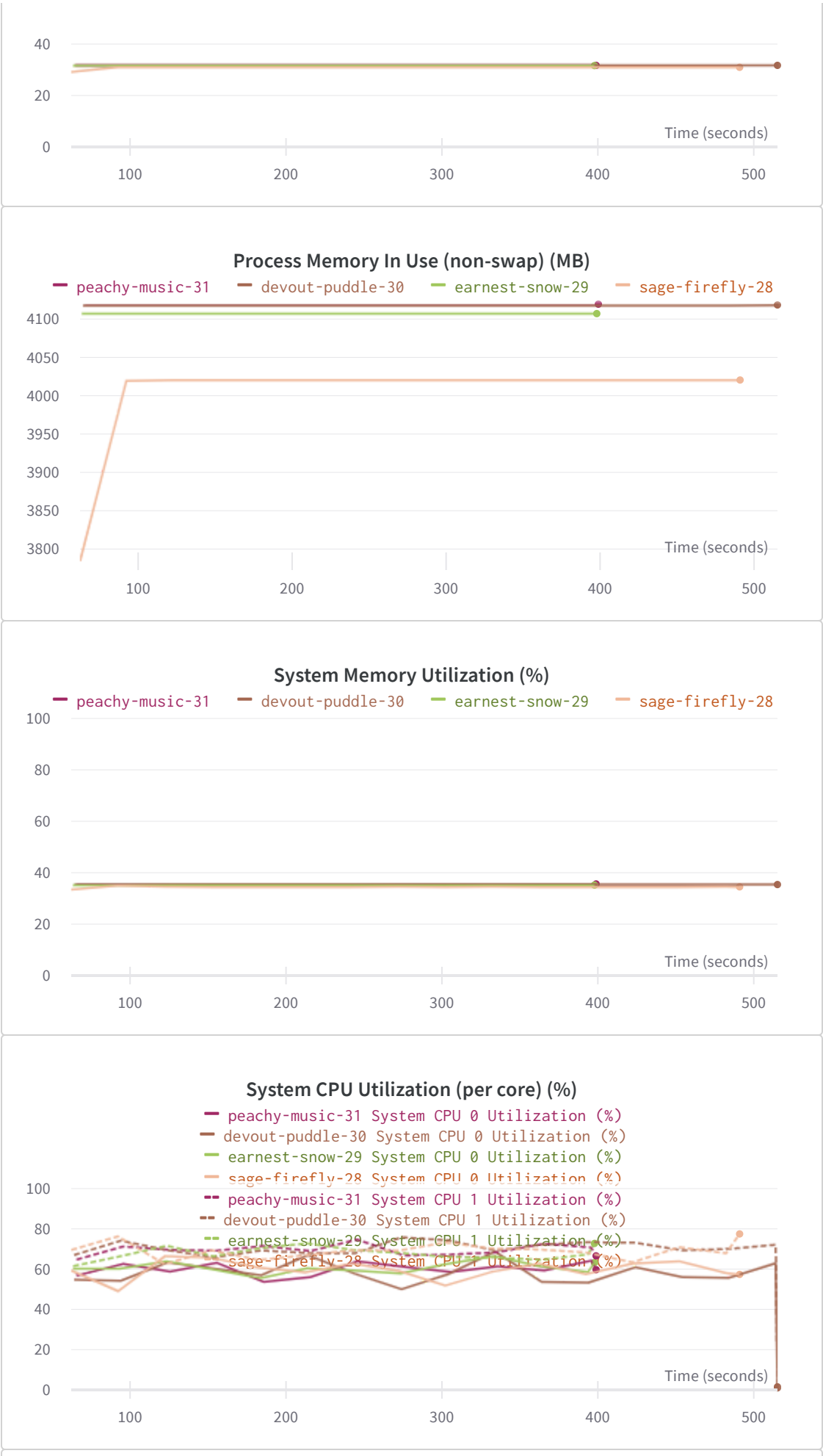


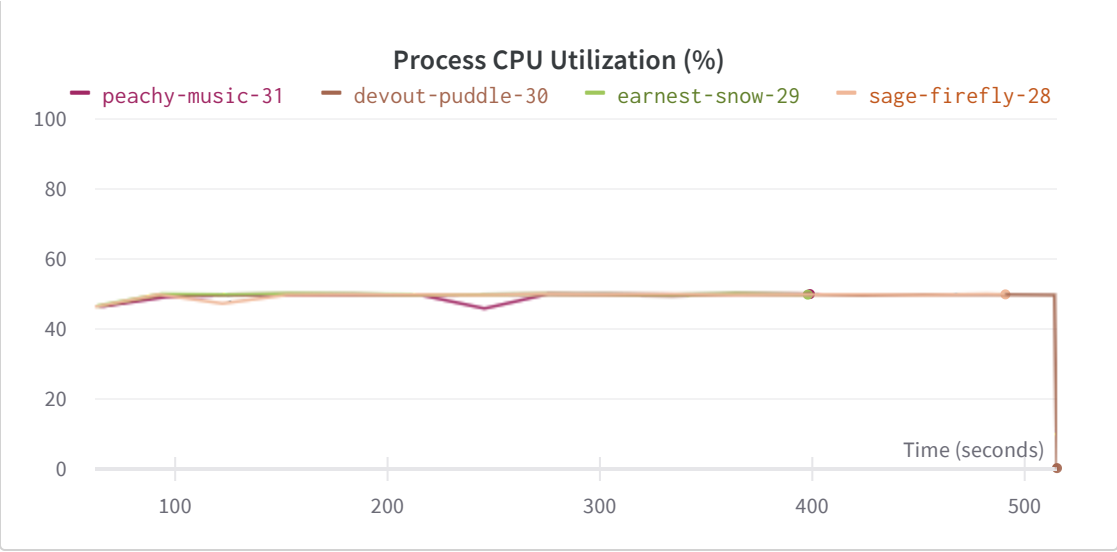










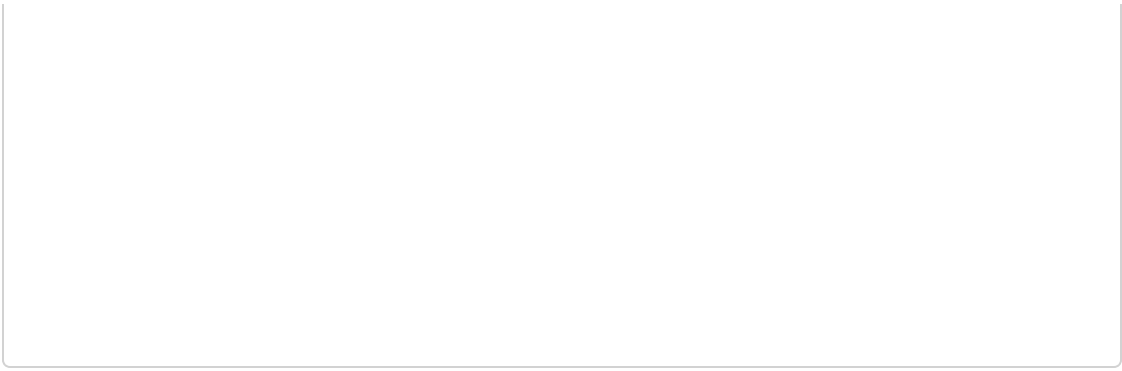


Parameter importance with respect to Validation Acc... ▾

Search Parameters 1-5 of 5 < >

Config parameter	Importance ⓘ ↓	Correlation
Runtime	<div><div></div></div>	<div><div></div></div>
optimizer.value_Adam	<div><div></div></div>	<div><div></div></div>
optimizer.value_SGD	<div><div></div></div>	<div><div></div></div>
activation_function.v...	<div><div></div></div>	<div><div></div></div>
activation_function.v...	<div><div></div></div>	<div><div></div></div>

☒ Run set 4 ⋮



Created with  on Weights & Biases.

https://wandb.ai/maa_64/dlops-lab-assi-8/reports/M22CS061-DLOps-Assignment-8-Report--Vmlldzo0MTA3MDU0