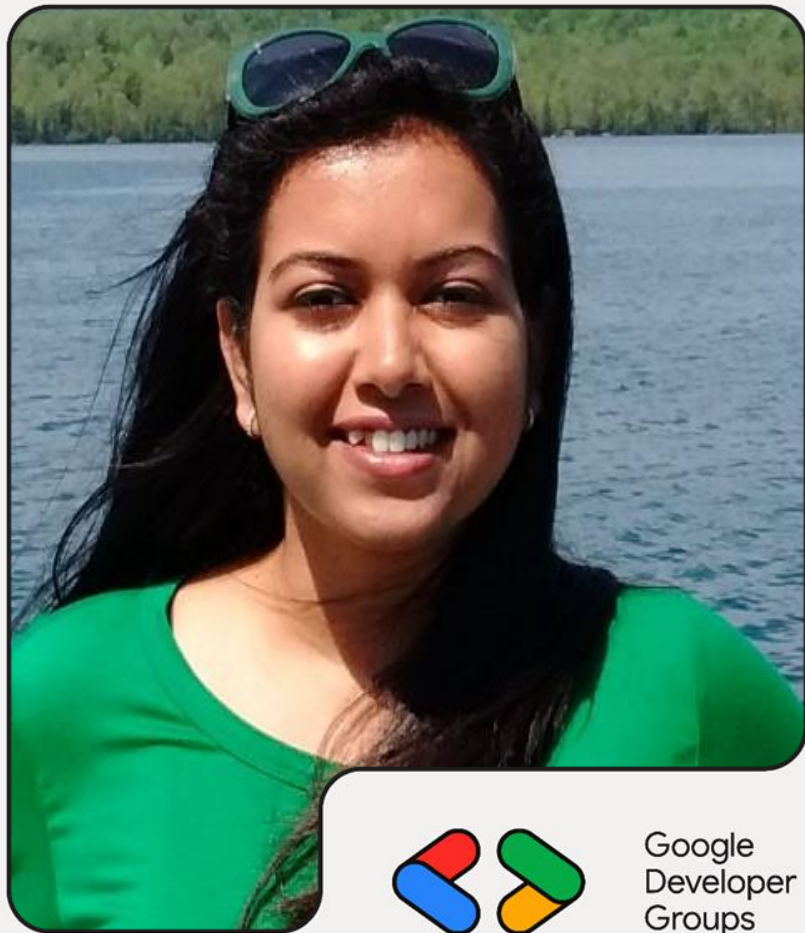


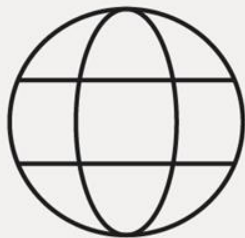


Visualizing Neural Network Training with TensorBoard.

Ankita Guha

Data Analyst Programmer II, Freudenberg e-Power System
PyTorch Ambassador





*** Data Source:**

<https://github.com/zalandoresearch/fashion-mnist>

*** GitHub Repo:**

<https://github.com/ankitaguhaokland/Google-Michigan-Dev-Fest-2025>



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Next Steps

(1)

Download the Fashion-MNIST data source

(2)

Clone the Repo/Download the Jupyter Notebook

(3)

Make sure to create your own Virtual Environment

(4)

Activate your Environment

(5)

Install all Packages from “requirements.txt” file

Virtual Env Creation & Activation

(1)

Create a new conda environment

```
conda create -n "VirtualEnvName"
```

If no Python:

```
conda create -n "VirtualEnvName" Python 3.11.14
```

(2)

Open Anaconda: Show List of Environments

```
conda info --envs
```

(3)

Activate Environment

```
conda activate "VirtualEnvName"
```

(4)

Install all the packages

```
pip install -r requirements.txt
```


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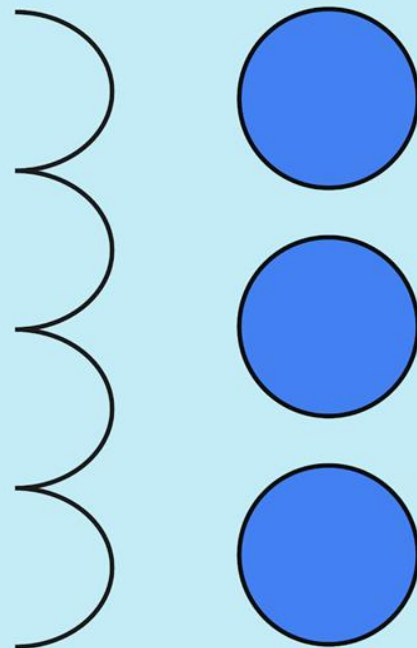


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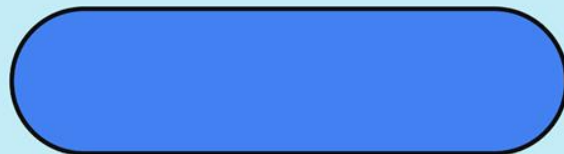
Setting Up the Data & Neural Network



- 
- Load, Process and Transform the Data (Image Sample).
 - Split the data into Training & Testing dataset.
 - Use “DataLoader” to build the Data Pipeline.
 - Label the Data to identify various Images.
 - Visualize few sample Data Images.
 - Architecture of CNN.
 - Define Learning Rate & Momentum.



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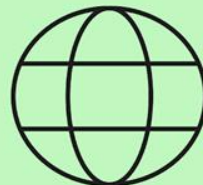
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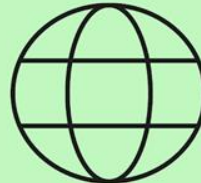
TensorBoard: Model Training Visualization



- ☐ Set up the TensorBoard
- ✓ Make sure to install "tensorboard" & "TensorFlow" before running the "*tensorboard --logdir=runs*"
- ✓ To make localhost visible to everyone:
"*tensorboard --logdir=runs --bind_all*"
- ☐ Writing initial "Images" should be visible on TensorBoard
- ☐ Models Inspection: "Graphs" on TensorBoard
- ☐ Statistical Data Analysis: "Projector" on TensorBoard
- ☐ Model Performance Tracking: "Scalars" on TensorBoard
- ☐ Model Prediction: "Images" on TensorBoard
- ☐ Assessing Model Training: "PR Curves" on TensorBoard



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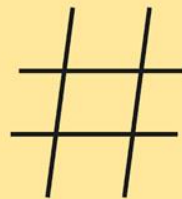
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Initial Image Grid: IMAGES



TensorBoard

TIME SERIES

IMAGES

☐ Show actual image size

Brightness adjustment



RESET

Contrast adjustment



RESET

Runs

Write a regex to filter runs



fashion_mnist_experiment_1

TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

four_fashion_mnist_images

four_fashion_mnist_images

step 0

Wed Nov 05 2025 19:47:29 Eastern Standard Time

fashion_mnist_experiment_1

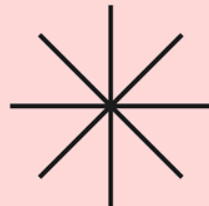


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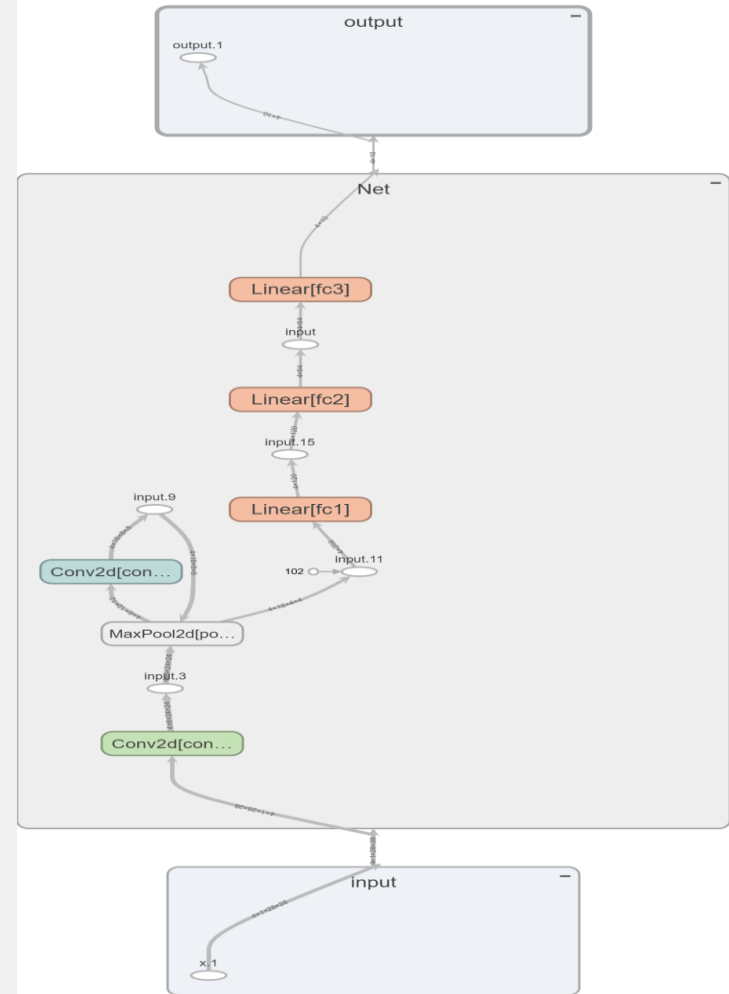
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Models Inspection: GRAPHS



NN Architecture – LeNet

1. Classical LeNet-like or LeNet-derived.
2. Simplification and modernization of the original LeNet-5 architecture developed by Yann LeCun.
3. Two Convolutional Blocks (Conv-Pool Sequence): Sequential Nature of alternating Convolution & Pooling Layer > Spatial Features.
4. Full Connectivity for Classification: Model flattens resulting feature maps into a single vector and uses three standard fully-connected (dense) layers for classification.



TensorBoard - GRAPHS: TPU Compatibility

TensorBoard

TIME SERIES

IMAGES

GRAPHS

PROJECTOR

INACTIVE



Node options

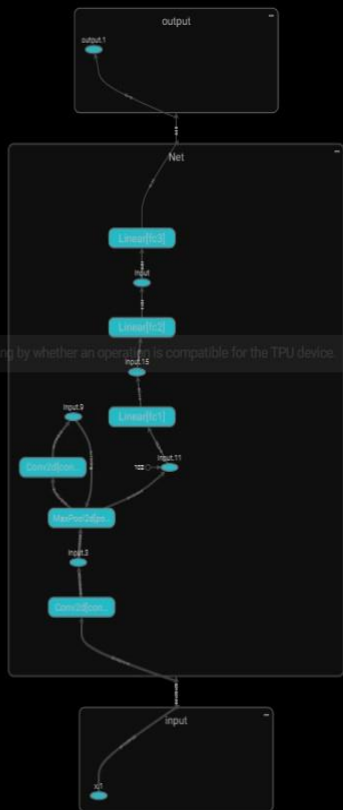
- ☐ Trace inputs
- ☒ Auto-extract high-degree nodes

Color by

- ☐ None
- ☐ Structure
- ☐ Device
- ☐ XLA cluster
- ☐ Compute time
- ☐ Memory
- ☒ TPU compatibility

Legend

- Valid Op
- Invalid Op
(* = expandable)
- Namespace ?
- OpNode ?
- Unconnected series ?
- Connected series ?
- Constant ?
- Summary ?
- Dataflow edge ?
- Control dependency edge ?
- Reference edge ?



TPU Compatibility

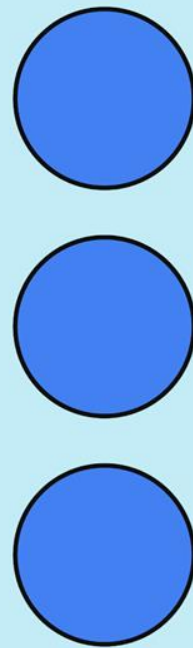


Incompatible Operations: (51)

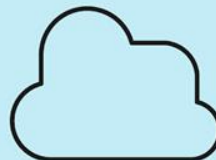
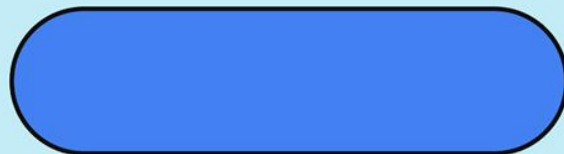
- input/x.1
- output/output.1
- Net/input.3
- Net/input.9
- Net/input.11
- Net/102
- Net/input.15
- Net/input
- Net/Conv2d[conv1]/input.1
- Net/Conv2d[conv1]/152
- Net/Conv2d[conv1]/153
- Net/Conv2d[conv1]/154
- Net/Conv2d[conv1]/147
- Net/Conv2d[conv1]/155
- Net/Conv2d[conv1]/149
- Net/Conv2d[conv1]/147
- Net/Conv2d[conv1]/146
- Net/MaxPool2d[pool]/input.5
- Net/MaxPool2d[pool]/146



Statistical Data Analysis: PROJECTOR



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Statistical Data Analysis: PROJECTOR



TensorBoard - PROJECTOR

TensorBoard

TIME SERIES

IMAGES

GRAPHS

PROJECTOR

INACTIVE



DATA

2 tensors found
default:00000

Label by
label

- Color by
label
- Coat 7
 - T-shirt/top 10
 - Ankle Boot 13
 - Trouser 9
 - Dress 10
 - Sneaker 11
 - Bag 9

UMAP T-SNE PCA CUSTOM

X Component #1 Y Component #2

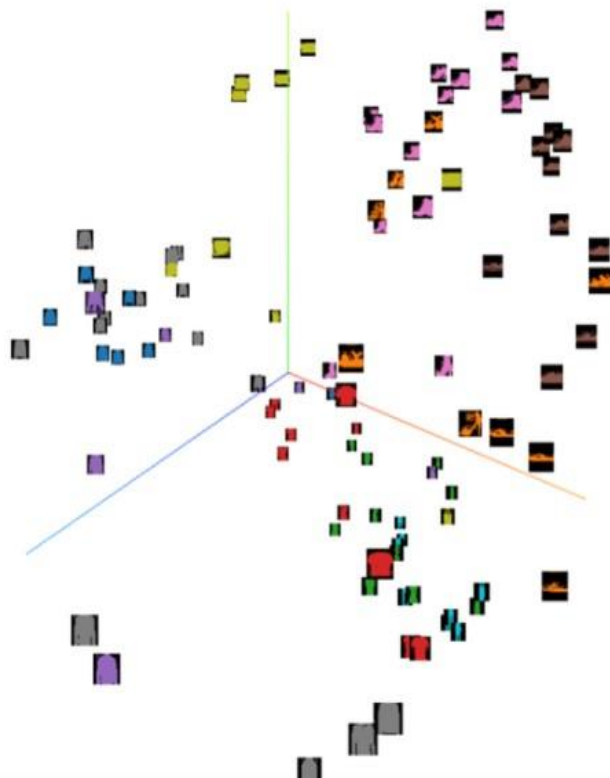
Z Component #3 ☒

PCA is approximate.

Total variance described: 54.7%.



Points: 100 | Dimension: 784



Show all data

Isolate selection

Clear selection

Search

By
label

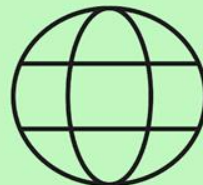
BOOKMARKS (0)

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Model Performance Tracking: SCALARS



- ☐ Show data download links
- ☒ Ignore outliers in chart scaling

Tooltip sorting method: default

Smoothing

0.6

Horizontal Axis

STEP

RELATIVE

WALL

Runs

Write a regex to filter runs

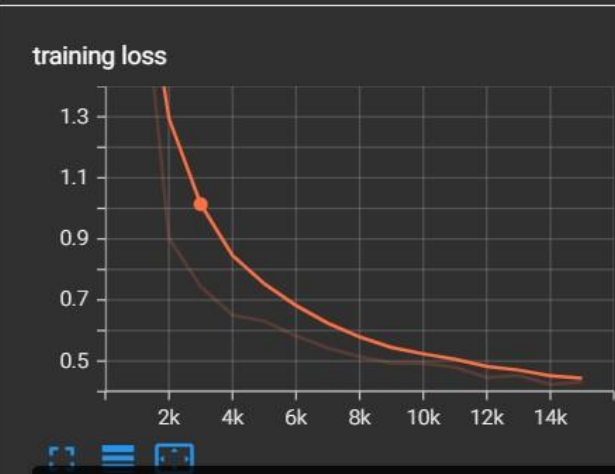
☒ ☐ fashion_mnist_experiment_1

TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

training loss



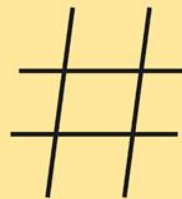
| Name | Smoothed | Value | Step | Time | Relative |
|----------------------------|----------|--------|--------|----------------------|----------|
| fashion_mnist_experiment_1 | 1.014 | 0.7435 | 2.999k | Sun Nov 16, 13:54:22 | 7s |

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Model Prediction: IMAGES



☒ Show actual image size

Brightness adjustment

RESET

Contrast adjustment

RESET

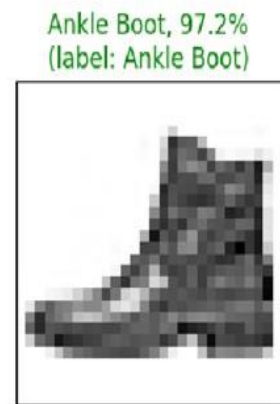
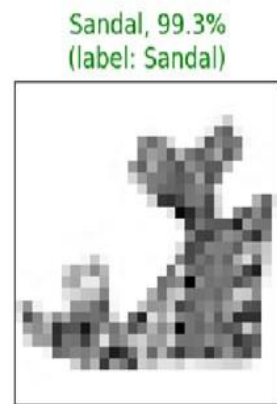
Runs

Write a regex to filter runs

☒ ☐ fashion_mnist_experiment_1

TOGGLE ALL RUNS

runs

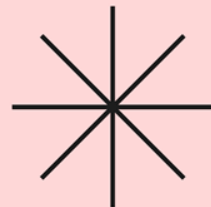


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Assessing Models Training: PR CURVES



TensorBoard - PR CURVES

TensorBoard

TIME SERIES

SCALARS

IMAGES

GRAPHS

PR CURVES

PROJECTOR

Time Display Type

STEP

RELATIVE

WALL

☒ fashion_mnist_experiment_1
step 0

Runs

Write a regex to filter runs

☒ ☐ fashion_mnist_experiment_1

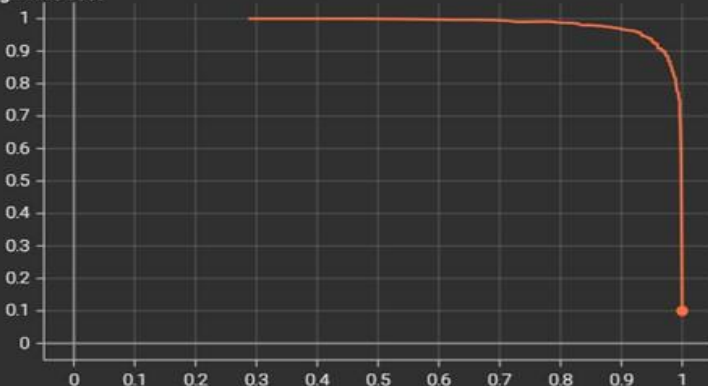
TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

Ankle Boot

Ankle Boot
tag: Ankle Boot



☒ fashion_mnist_experiment_1 is at step 0
(Sun Nov 16 2025 14:25:25 GMT-0500 (Eastern Standard Time))

Bag

Coat

Dress



References

Citations



- **PyTorch:**

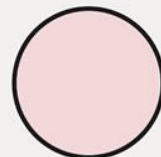
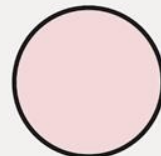
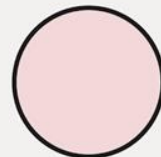
https://docs.pytorch.org/tutorials/intermediate/tensorboard_tutorial.html

- **CNN Image Processing:**

<https://svitla.com/blog/cnn-for-image-processing/>

- **CNN Architecture Diagram:**

<https://www.linkedin.com/pulse/what-convolutional-neural-network-cnn-deep-learning-nafiz-shahriar/>

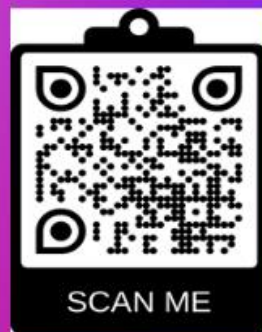


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 PyTorch **AMBASSADOR**



Ankita Guha
Data Analyst Programmer II, Freudenberg



Invitation to join PyTorch Community Michigan

HAPPY TO CONNECT!



Ankita Guha

Data Analyst Programmer | PyTorch
Ambassador '25 | Women Tech Makers Am...

