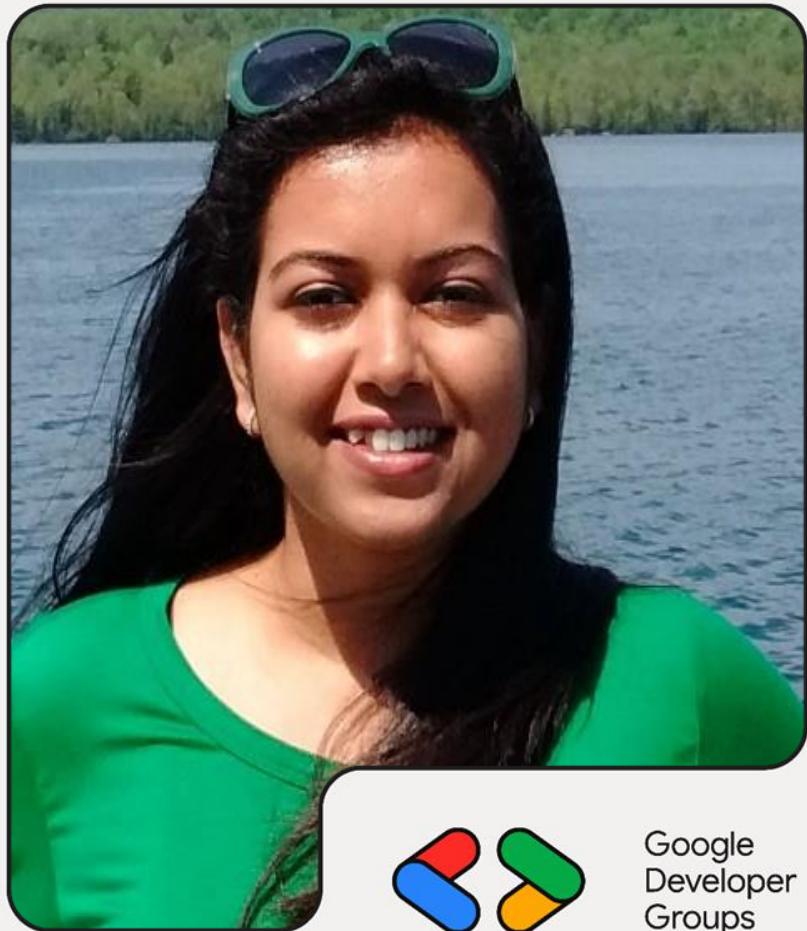


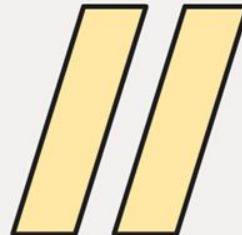
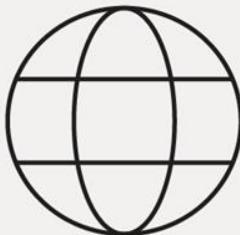
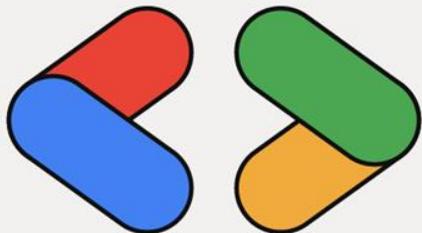
Visualizing Neural Network Training with PyTorch.

Ankita Guha

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



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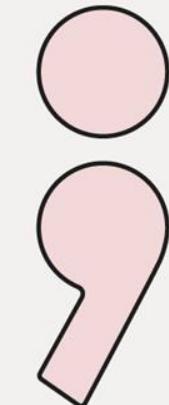


* **Data Source:**

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

* **GitHub Repo:**

<https://github.com/ankitaguhaoakland/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

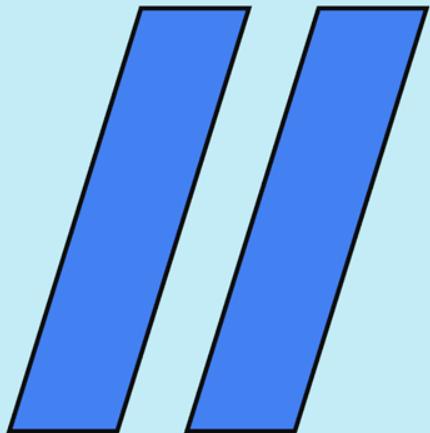
conda activate "VirtualEnvName"

(4)

Install all the packages

pip install -r requirements.txt

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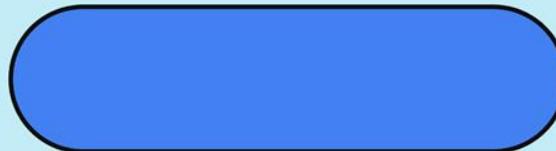
Setting Up the Data & Neural Network



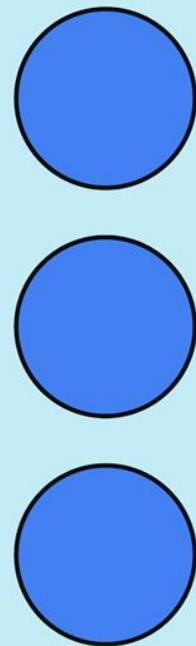
- Load, Process and Transform the Data (Image Sample).
- Split the data into Training & Testing dataset.
- Use “DataLoader” to build the Data Pipeline.
- Label the Data to identify various Images.
- Visualize few sample Data Images.
- Architecture of CNN.
- Define Learning Rate & Momentum.



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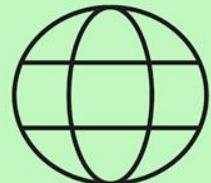


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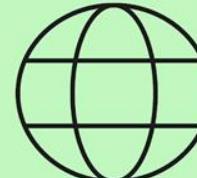
TensorBoard: Model Training Visualization



- ❑ 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

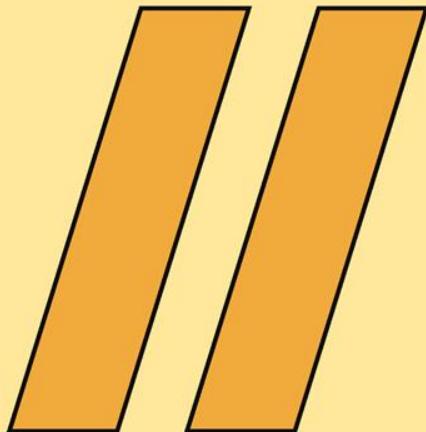


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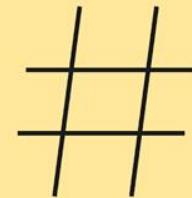
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Initial Image Grid: IMAGES



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

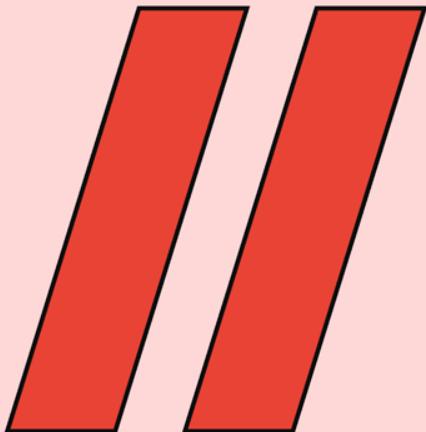
four_fashion_mnist_images

fashion_mnist_experiment_1

step 0 Wed Nov 05 2025 19:47:29 Eastern Standard Time

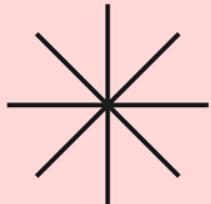


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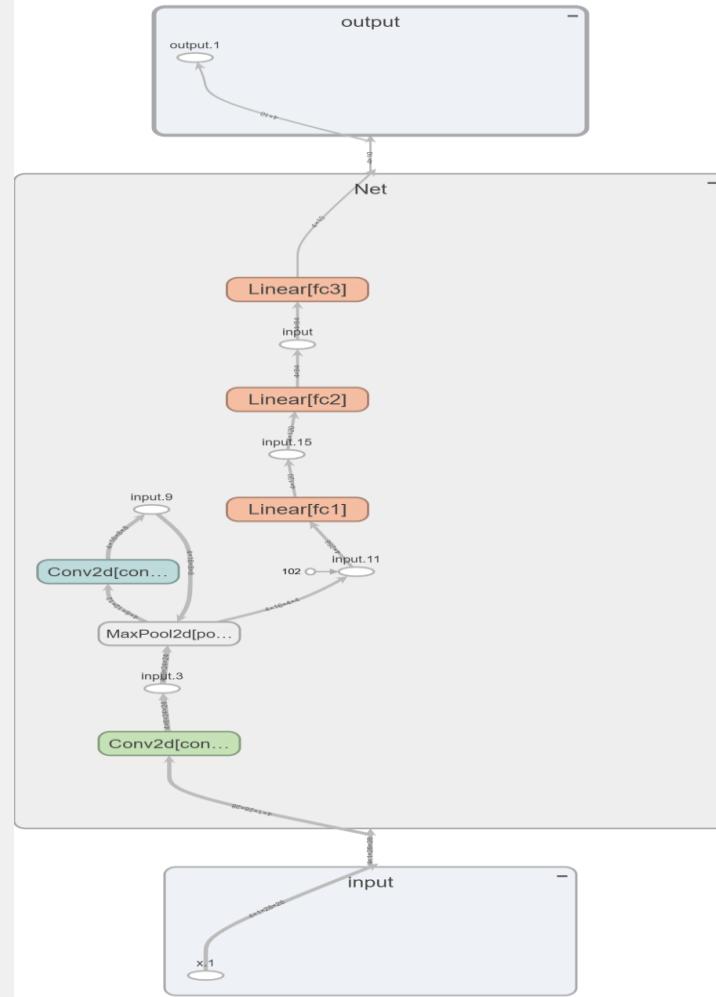
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Models Inspection: GRAPHS



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

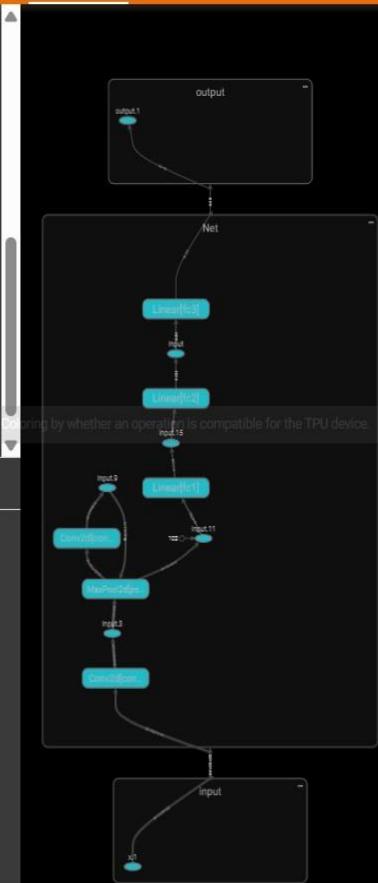
- Trace inputs
- Auto-extract high-degree nodes

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

0%

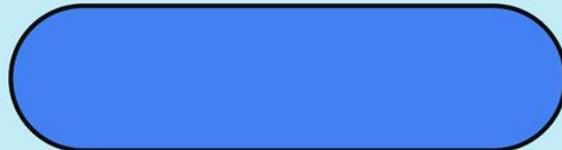
Incompatible Operations: (51)

- 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

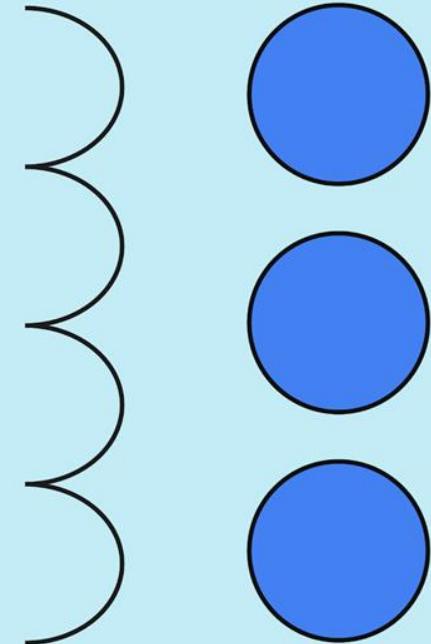
Statistical Data Analysis: PROJECTOR



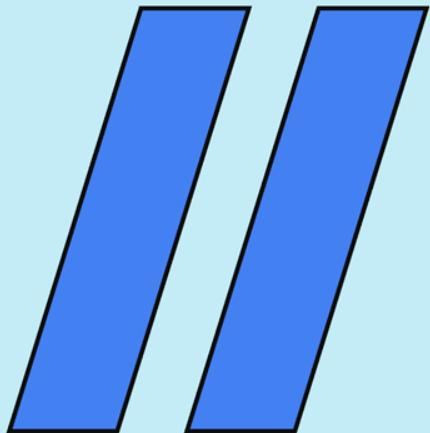
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Statistical Data Analysis: PROJECTOR



TensorBoard - PROJECTOR

TensorBoard

TIME SERIES

IMAGES

GRAPHS

PROJECTOR

INACTIVE



DATA

2 tensors found

default:00000

Label by
label

Color by
label

Coat

T-shirt/top

Ankle Boot

Trouser

Dress

Sneaker

Bag

UMAP T-SNE PCA CUSTOM

X Component #1 Y Component #2

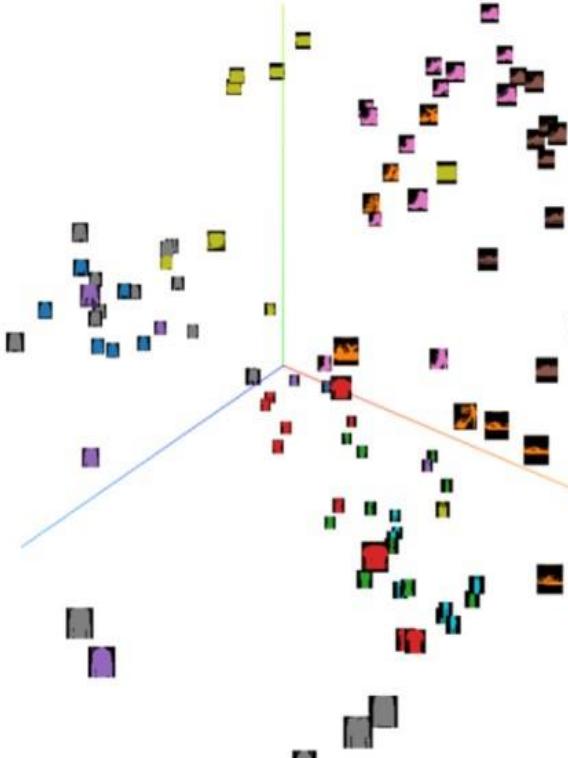
Z Component #3

PCA is approximate.

Total variance described: 54.7%



Points: 100 Dimension: 784



Show all data

Isolate selection

Clear selection

Search

By label

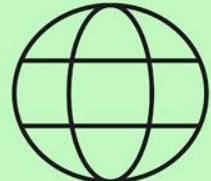
BOOKMARKS (0)

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Model Performance Tracking: SCALARS



TensorBoard

TIME SERIES

SCALARS

IMAGES

GRAPHS

PROJECTOR

 Show data download links Ignore outliers in chart scaling

Tooltip sorting method: default ▾

Smoothing



Horizontal Axis

STEP

RELATIVE

WALL

Runs

Write a regex to filter runs

 fashion_mnist_experiment_1

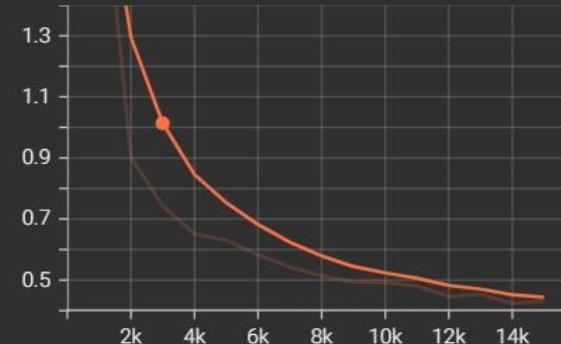
TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

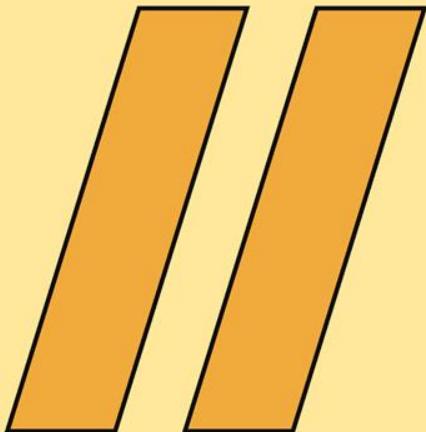
training loss

training loss



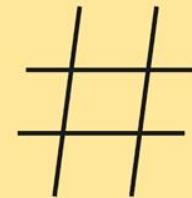
Name	Smoothed	Value	Step	Time	Relative
fashion_mnist_experiment_1	1.014	0.7435	2.999k	Sun Nov 16, 13:54:22	7s

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Model Prediction: IMAGES

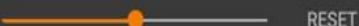


TensorBoard - IMAGES LABELLING

TensorBoard TIME SERIES SCALARS **IMAGES** GRAPHS PROJECTOR INACTIVE ▾ ⚙ C ⚙

Show actual image size

Brightness adjustment



RESET

Contrast adjustment



RESET

Runs

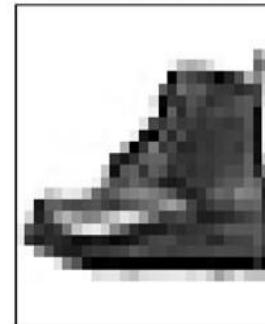
Write a regex to filter runs

fashion_mnist_experiment_1

TOGGLE ALL RUNS

runs

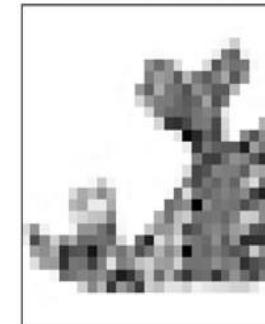
Ankle Boot, 98.1%
(label: Ankle Boot)



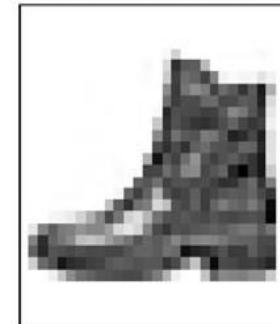
Sandal, 93.7%
(label: Sandal)



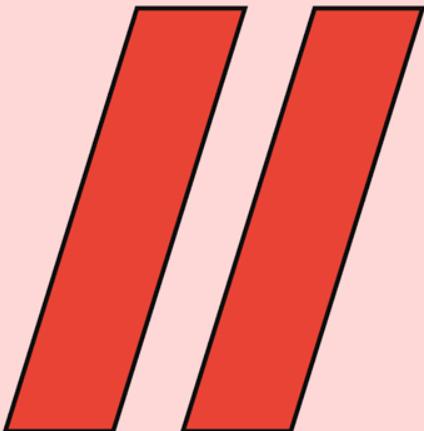
Sandal, 99.3%
(label: Sandal)



Ankle Boot, 97.2%
(label: Ankle Boot)

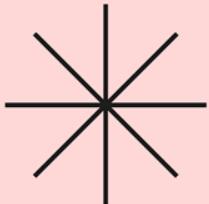


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Assessing Models Training: PR CURVES



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

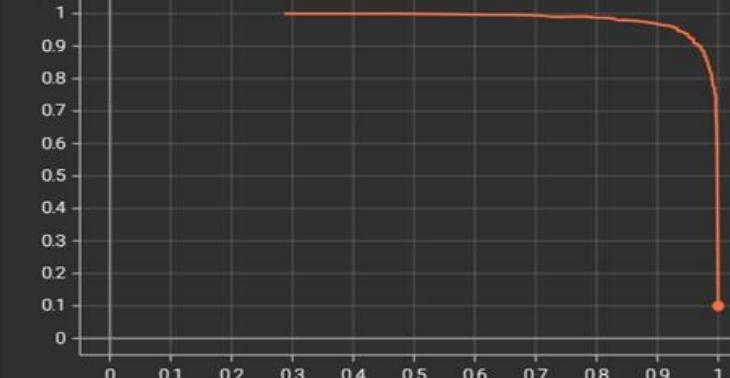
TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

Ankle Boot

Ankle Boot
tag: Ankle Boot



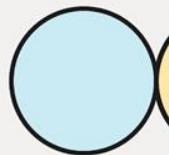
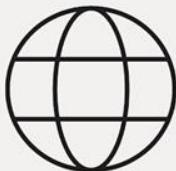
fashion_mnist_experiment_1 is at step 0

(Sun Nov 16 2025 14:25:25 GMT-0500 (Eastern Standard Time))

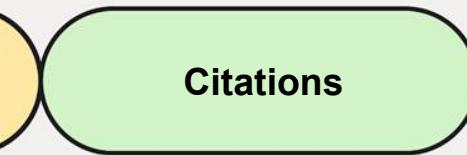
Bag

Coat

Dress



References



Citations



- **PyTorch:**

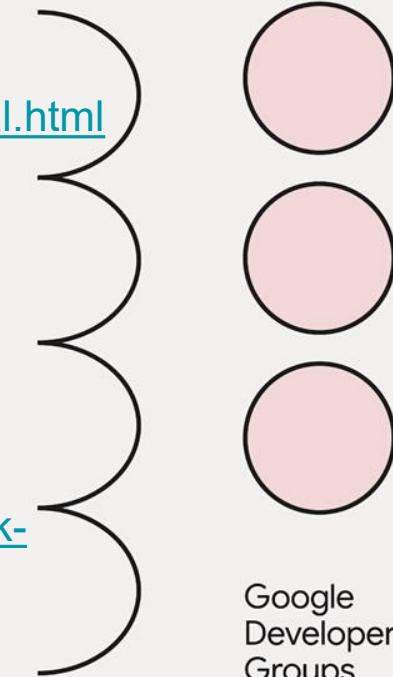
https://docs.pytorch.org/tutorials/intermediate/tensorboard_tutorial.html

- **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...

