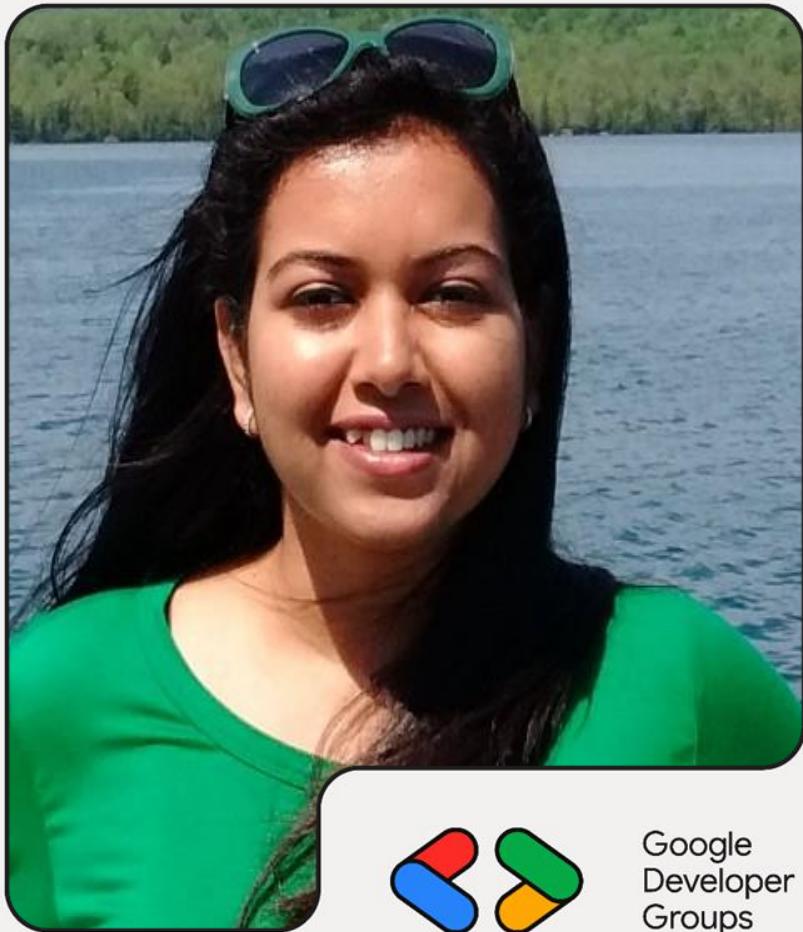


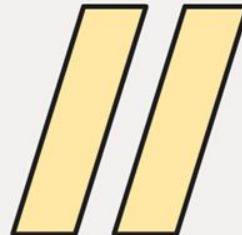
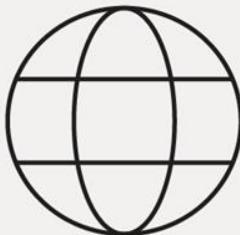
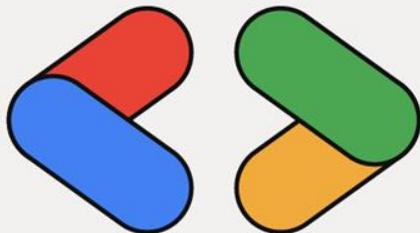
# Visualizing Neural Network Training with TensorBoard.

Ankita Guha

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



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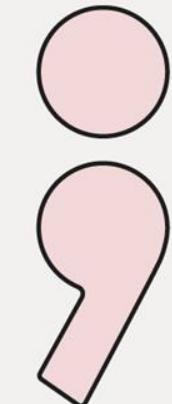


\* **Data Source:**

<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

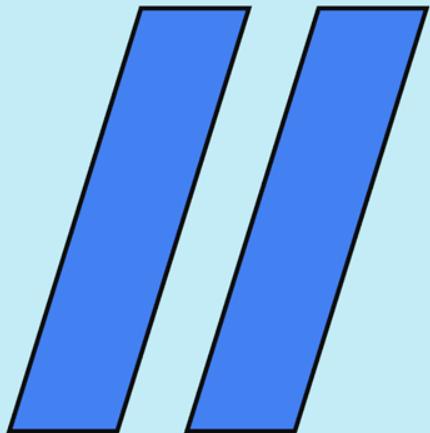
*conda activate "VirtualEnvName"*

( 4 )

## Install all the packages

*pip install -r requirements.txt*

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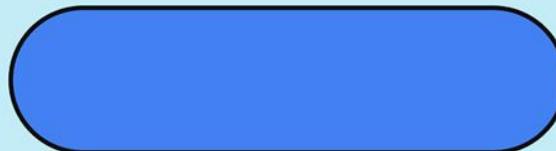
# Setting Up the Data & Neural Network



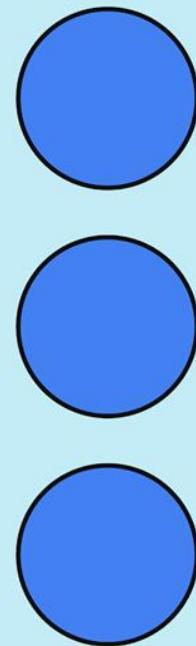
- Load, Process and Transform the Data (Image Sample).
- Split the data into Training & Testing dataset.
- Use “DataLoader” to build the Data Pipeline.
- Label the Data to identify various Images.
- Visualize few sample Data Images.
- Architecture of CNN.
- Define Learning Rate & Momentum.



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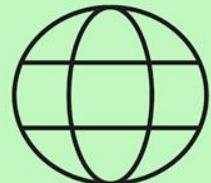


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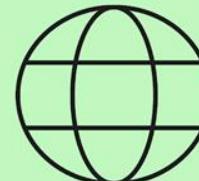
# TensorBoard: Model Training Visualization



- 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

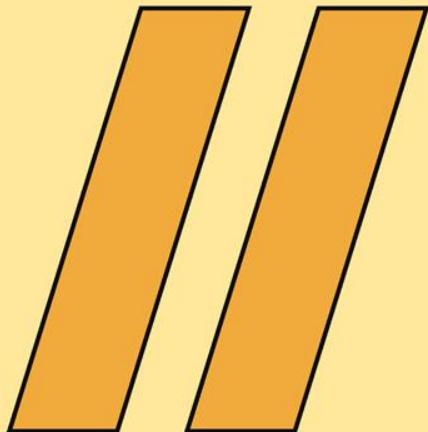


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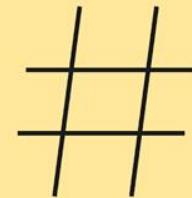
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# Initial Image Grid: IMAGES



## 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

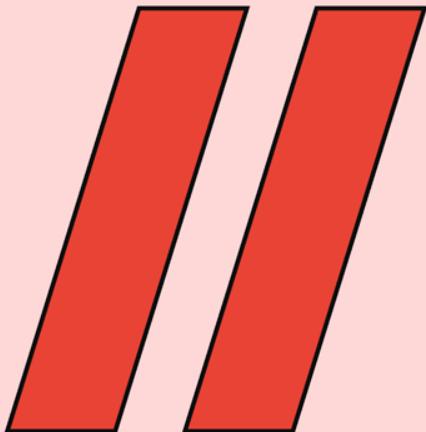
four\_fashion\_mnist\_images

fashion\_mnist\_experiment\_1

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

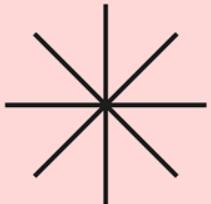


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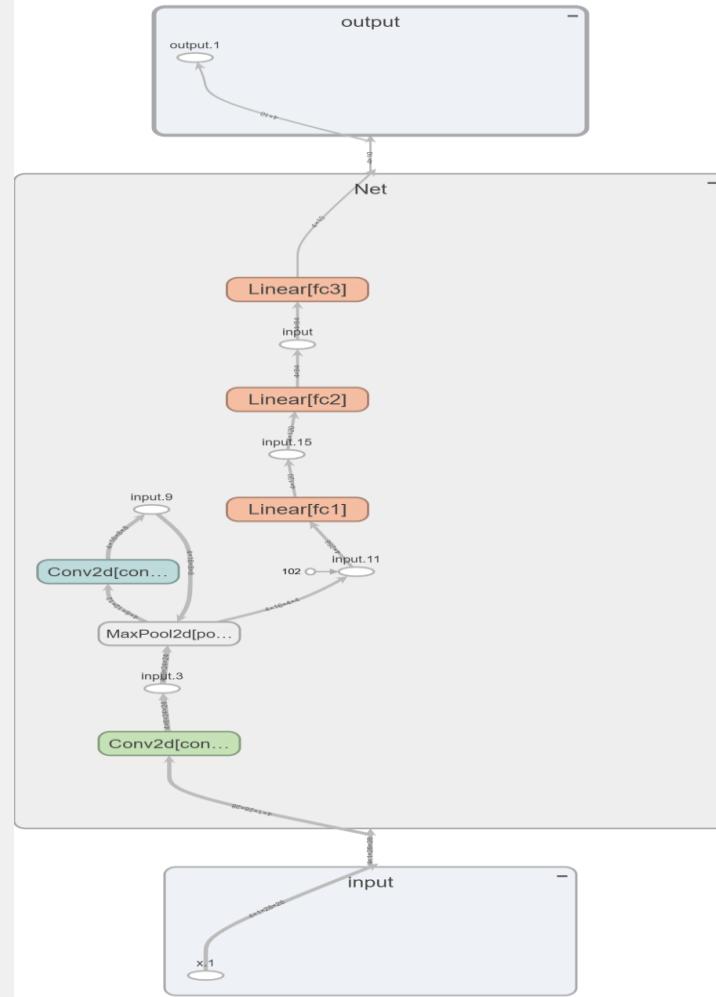
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# Models Inspection: GRAPHS



# 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 ?

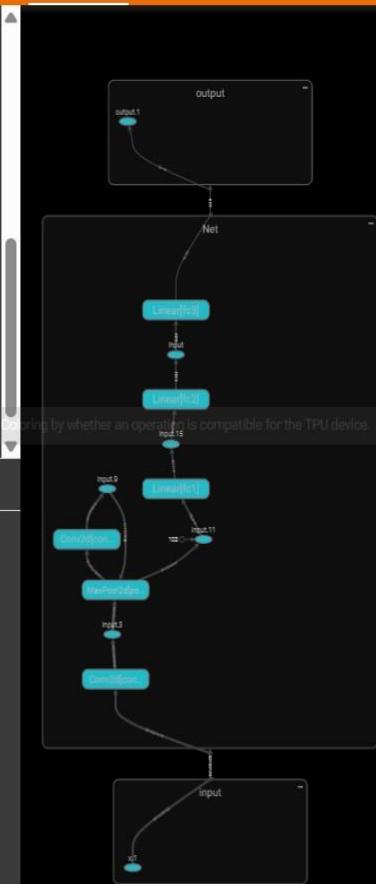
● Constant ?

■ 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

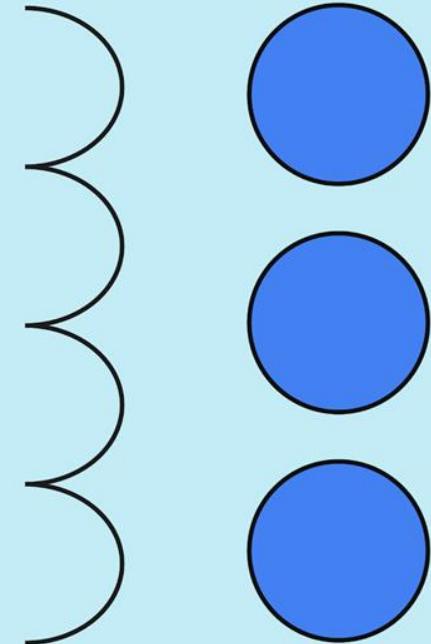
# Statistical Data Analysis: PROJECTOR



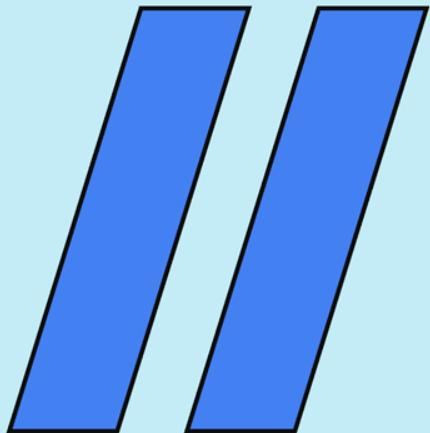
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# Statistical Data Analysis: PROJECTOR



# 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

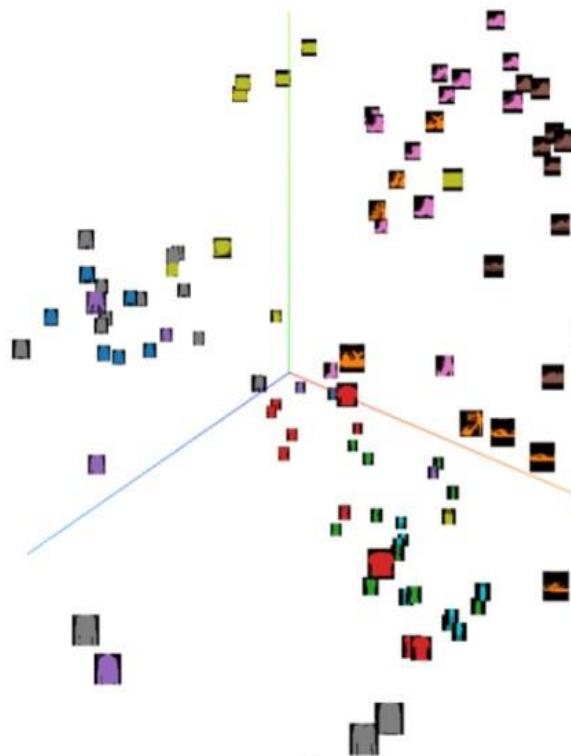
Z Component #3

PCA is approximate. [?](#)

Total variance described: 54.7%



Points: 100 | Dimension: 784



Search

By label

Show all data

Isolate selection

Clear selection

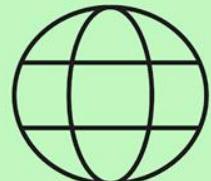
BOOKMARKS (0) [?](#)

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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

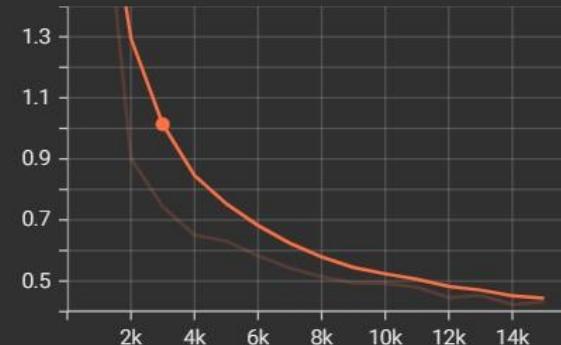
TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

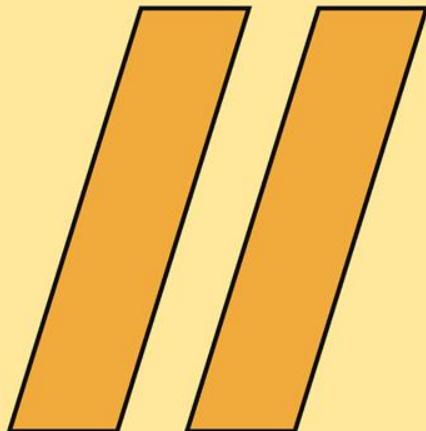
training loss

training loss



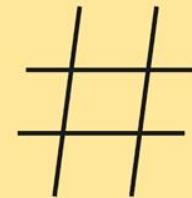
Name	Smoothed	Value	Step	Time	Relative
fashion_mnist_experiment_1	1.014	0.7435	2.999k	Sun Nov 16, 13:54:22	7s

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# Model Prediction: IMAGES

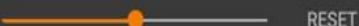


# TensorBoard - IMAGES LABELLING

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

Show actual image size

Brightness adjustment



RESET

Contrast adjustment



RESET

Runs

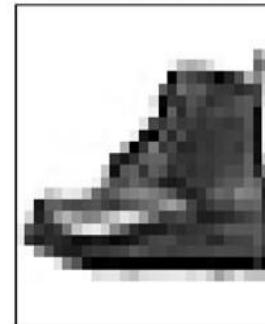
Write a regex to filter runs

fashion\_mnist\_experiment\_1

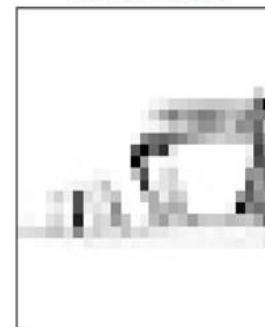
TOGGLE ALL RUNS

runs

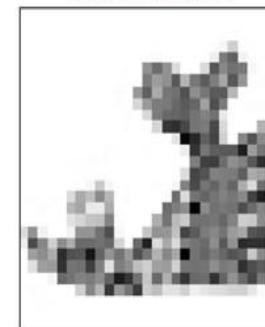
Ankle Boot, 98.1%  
(label: Ankle Boot)



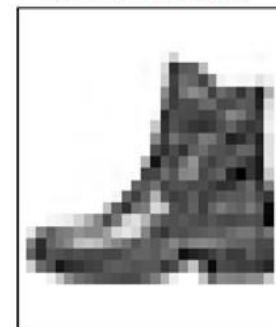
Sandal, 93.7%  
(label: Sandal)



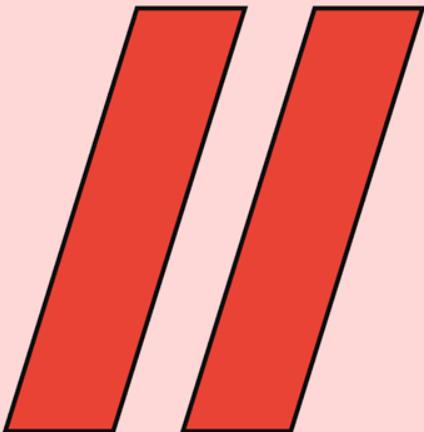
Sandal, 99.3%  
(label: Sandal)



Ankle Boot, 97.2%  
(label: Ankle Boot)

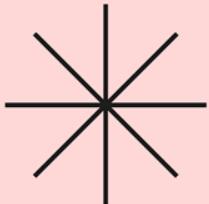


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# Assessing Models Training: PR CURVES



# 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

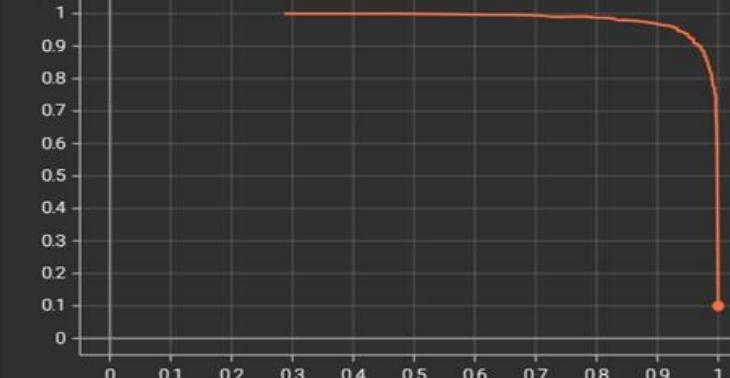
TOGGLE ALL RUNS

runs

Filter tags (regular expressions supported)

Ankle Boot

Ankle Boot  
tag: Ankle Boot



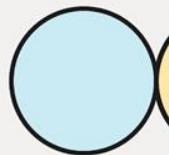
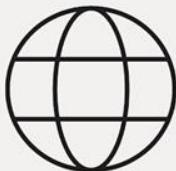
fashion\_mnist\_experiment\_1 is at step 0

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

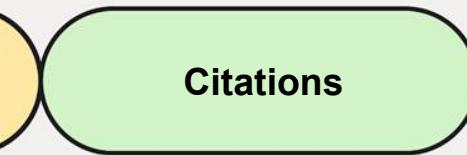
Bag

Coat

Dress



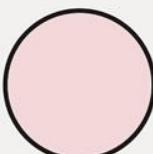
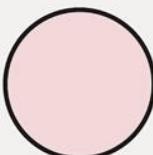
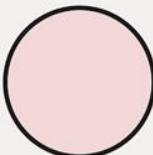
References



Citations



- **PyTorch:**  
[https://docs.pytorch.org/tutorials/intermediate/tensorboard\\_tutorial.html](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/>



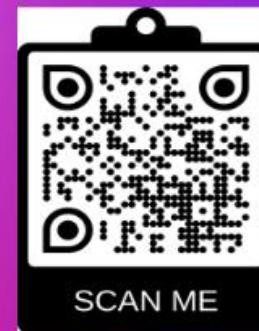
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 PyTorch AMBASSADOR



Ankita Guha

*Data Analyst Programmer II, Freudenberg*



Invitation to join PyTorch Community Michigan

# HAPPY TO CONNECT!



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Ambassador '25 | Women Tech Makers Am...

