import torch

import torch.nn as nn

import torchvision.models as models

import torchvision.utils as vutils

import matplotlib.pyplot as plt

# Load the pre-trained AlexNet model

alexnet = models.alexnet(pretrained=True)

# Extract the first convolutional layer's kernel weights

first\_conv\_layer = alexnet.features[0]

kernels = first\_conv\_layer.weight.data.cpu()

# Reshape kernels to (64, 3, 11, 11) to prepare for visualization

kernels\_grid = vutils.make\_grid(kernels, nrow=8, normalize=True, scale\_each=True)

# Convert the grid tensor to a NumPy array and rearrange channels

kernels\_grid = kernels\_grid.permute(1, 2, 0).numpy()

# Display the kernels

plt.figure(figsize=(12, 12))

plt.imshow(kernels\_grid)

plt.axis('off')

# Save the figure as a PDF file

plt.savefig('alexnet\_kernels.pdf', format='pdf', bbox\_inches='tight')