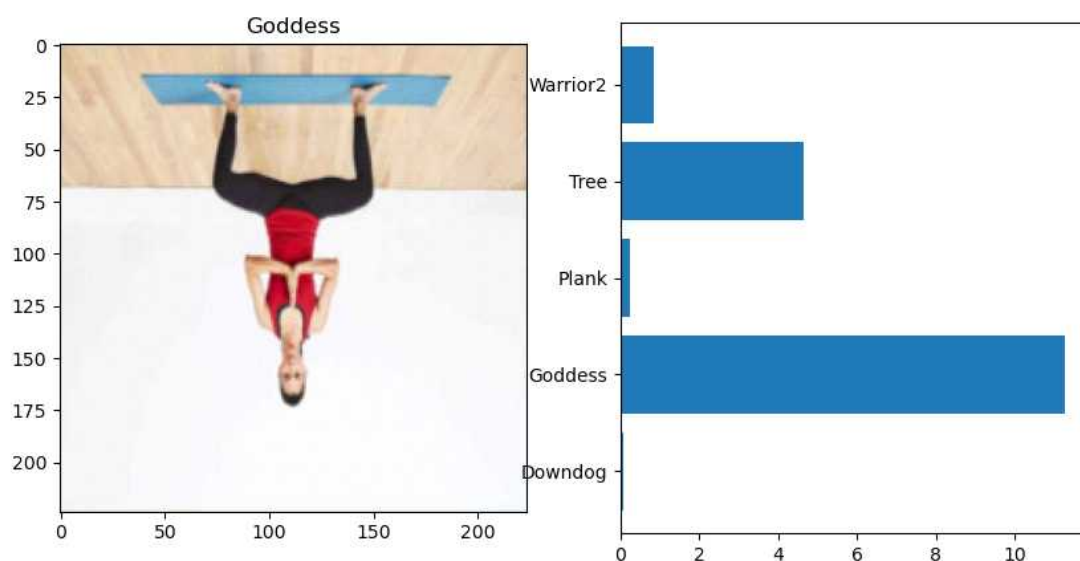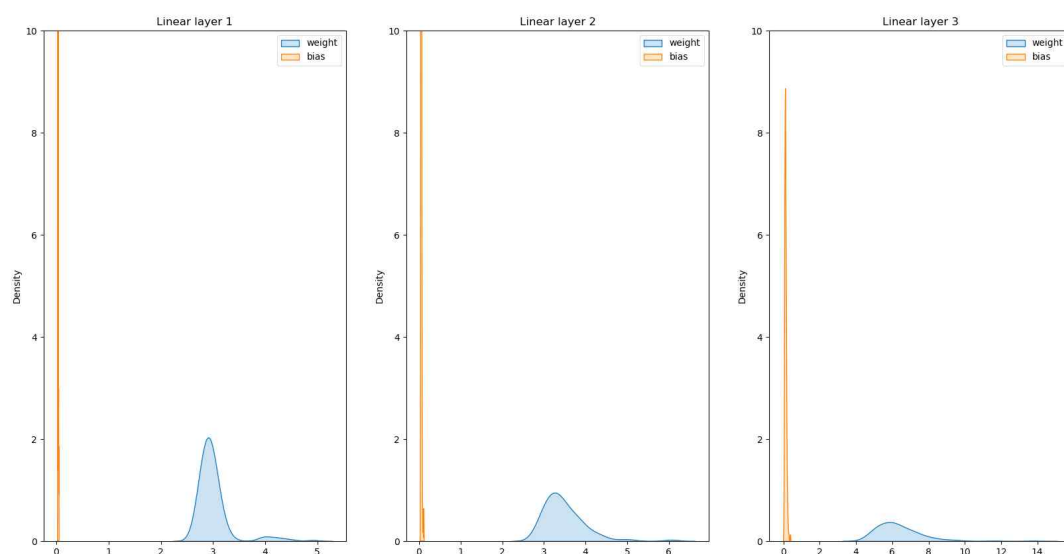# MixUp Training과 Label smoothing 사용해보기

이나겸

기본 코드로 돌렸을 때 보다 MixUp Training이나 Label smoothing으로 돌렸을 때 결과가 더 나을 것 이라고 생각하고 돌렸는데, 여러번 돌려봐도 기본 코드보다 더 나은 결과라기 보다는 비슷하거나 좀 더 못한 결과가 나왔다. 코드를 잘못 적용한 것인지, 내용을 제대로 이해하지 못 하고 있는 것 같다.
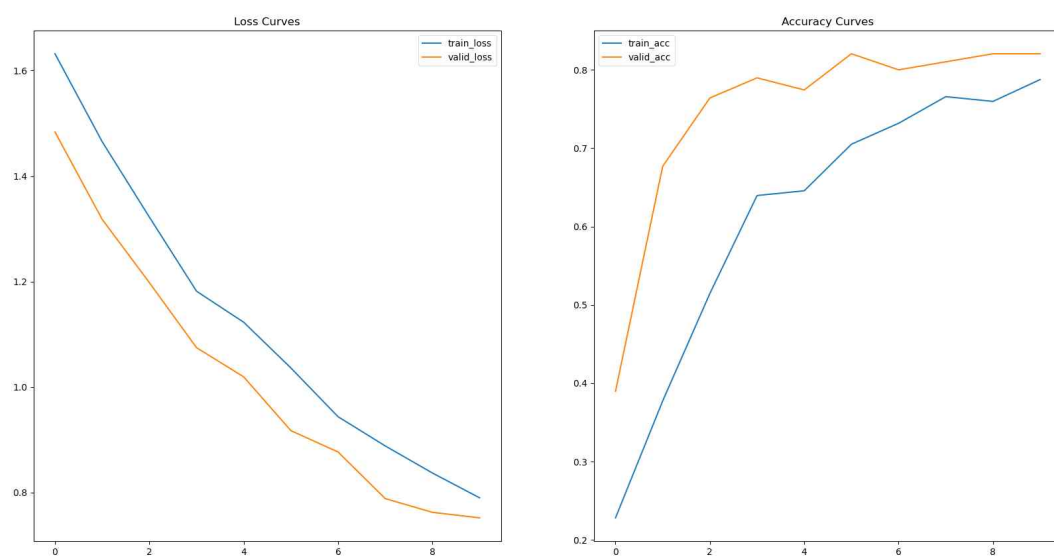
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main

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training data sizes : [161, 166, 164, 166, 167]
validation data sizes : [39, 39, 39, 39, 39]
Total Number of training images : 824
Total Number of validation images : 195
training on gpu...
Starting Training from Scratch.

Epoch: 0   Training Loss: 1.6319   Validation Loss: 1.4837
                  Training Accuracy: 22.82%   Validation Accuracy: 38.97%

Epoch: 1   Training Loss: 1.4653   Validation Loss: 1.3181
                  Training Accuracy: 37.74%   Validation Accuracy: 67.69%

Epoch: 2   Training Loss: 1.3224   Validation Loss: 1.1982
                  Training Accuracy: 51.46%   Validation Accuracy: 76.41%

Epoch: 3   Training Loss: 1.1819   Validation Loss: 1.0748
                  Training Accuracy: 63.96%   Validation Accuracy: 78.97%

Epoch: 4   Training Loss: 1.1230   Validation Loss: 1.0195
                  Training Accuracy: 64.56%   Validation Accuracy: 77.44%

Epoch: 5   Training Loss: 1.0364   Validation Loss: 0.9176
                  Training Accuracy: 70.51%   Validation Accuracy: 82.05%

Epoch: 6   Training Loss: 0.9439   Validation Loss: 0.8771
                  Training Accuracy: 73.18%   Validation Accuracy: 80.00%

Epoch: 7   Training Loss: 0.8886   Validation Loss: 0.7888
                  Training Accuracy: 76.58%   Validation Accuracy: 81.03%

Epoch: 8   Training Loss: 0.8372   Validation Loss: 0.7627
                  Training Accuracy: 75.97%   Validation Accuracy: 82.05%

Epoch: 9   Training Loss: 0.7902   Validation Loss: 0.7522
                  Training Accuracy: 78.76%   Validation Accuracy: 82.05%

Best epoch: 9 with loss: 0.75 and acc: 82.05%
131.45 total seconds elapsed. 13.14 seconds per epoch.
training on gpu...
tensor([[0.0771, 11.2877, 0.2608, 4.6530, 0.8495]], device='cuda:0')
Accuracy for class Downdog : 1.0
Accuracy for class Goddess : 0.7435897435897436
Accuracy for class Plank : 0.9230769230769231
Accuracy for class Tree : 0.9487179487179487
Accuracy for class Warrior2 : 0.7435897435897436

Goddess

SGD ; lr=0.001

Linear layer 1   Linear layer 2   Linear layer 3

SGD ; lr=0.001

Loss Curves   Accuracy Curves

MixUp Training

training data sizes : [162, 164, 162, 163, 161]
validation data sizes : [39, 39, 39, 39, 39]
Total Number of training images : 812
Total Number of validation images : 195
training on gpu...
Starting Training from Scratch.

Epoch: 0   Training Loss: 1.6425   Validation Loss: 1.5097
                  Training Accuracy: 22.41%   Validation Accuracy: 36.92%

Epoch: 1   Training Loss: 1.5685   Validation Loss: 1.3947
                  Training Accuracy: 27.83%   Validation Accuracy: 52.31%

Epoch: 2   Training Loss: 1.4821   Validation Loss: 1.2752
                  Training Accuracy: 33.62%   Validation Accuracy: 70.77%

Epoch: 3   Training Loss: 1.4588   Validation Loss: 1.2151
                  Training Accuracy: 31.03%   Validation Accuracy: 76.41%

Epoch: 4   Training Loss: 1.3966   Validation Loss: 1.1464
                  Training Accuracy: 36.70%   Validation Accuracy: 79.49%

Epoch: 5   Training Loss: 1.3705   Validation Loss: 1.0792
                  Training Accuracy: 36.82%   Validation Accuracy: 75.90%

Epoch: 6   Training Loss: 1.3051   Validation Loss: 1.0193
                  Training Accuracy: 35.47%   Validation Accuracy: 84.10%

Epoch: 7   Training Loss: 1.2412   Validation Loss: 0.9796
                  Training Accuracy: 49.26%   Validation Accuracy: 79.49%

Epoch: 8   Training Loss: 1.2257   Validation Loss: 0.9086
                  Training Accuracy: 49.01%   Validation Accuracy: 89.23%

Epoch: 9   Training Loss: 1.2376   Validation Loss: 0.8865
                  Training Accuracy: 47.66%   Validation Accuracy: 85.64%

Best epoch: 9 with loss: 0.89 and acc: 85.64%
125.77 total seconds elapsed. 12.58 seconds per epoch.
training on gpu...
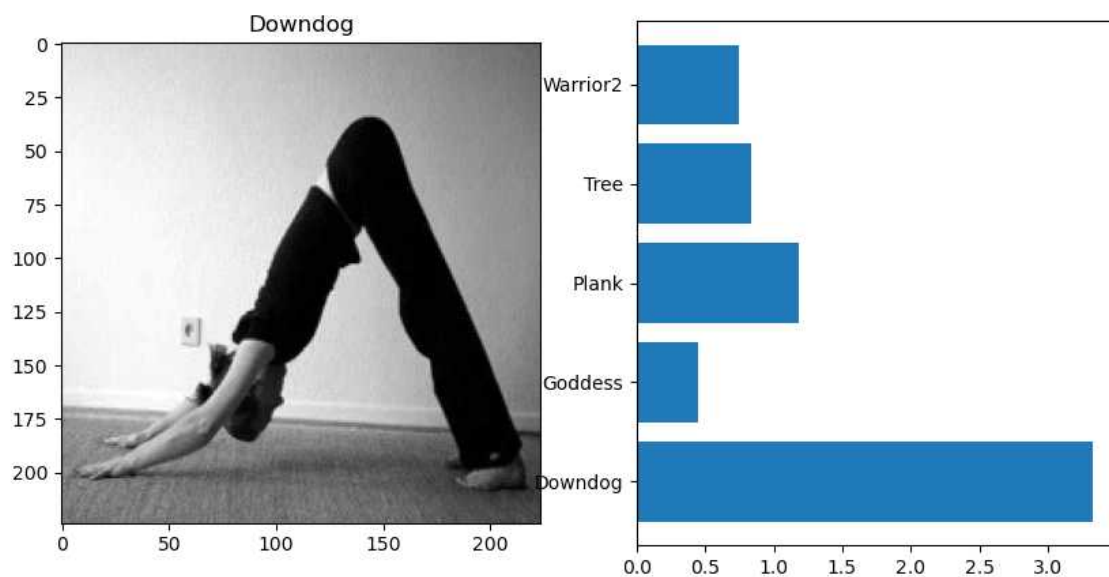tensor([[3.3271, 0.4476, 1.1783, 0.8402, 0.7513]], device='cuda:0')
Accuracy for class Downdog : 0.9487179487179487
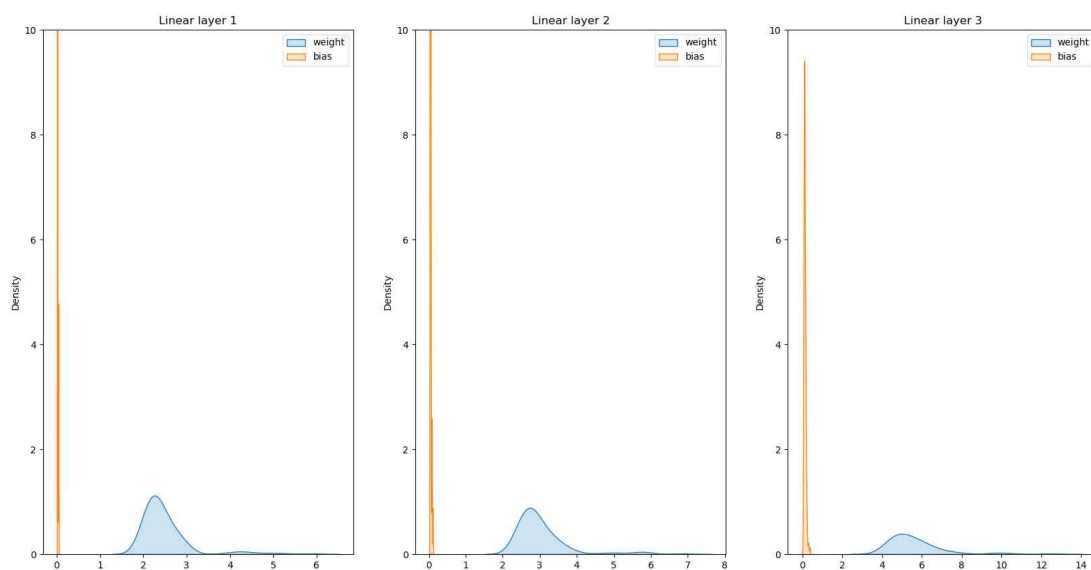Accuracy for class Goddess : 0.717948717948718
Accuracy for class Plank : 0.9487179487179487
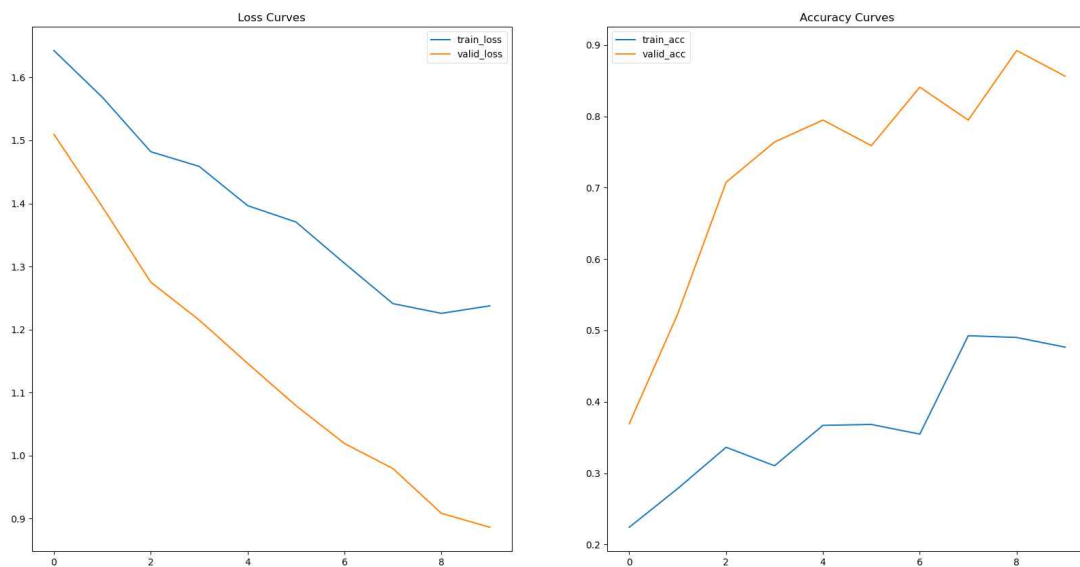Accuracy for class Tree : 0.9487179487179487
Accuracy for class Warrior2 : 0.6666666666666666

Downdog

SGD ; lr=0.001

Linear layer 1   Linear layer 2   Linear layer 3

SGD ; lr=0.001

Loss Curves   Accuracy Curves

Label Smoothing

training data sizes : [158, 163, 163, 162, 166]
validation data sizes : [39, 39, 39, 39, 39]
Total Number of training images : 812
Total Number of validation images : 195
training on gpu...
Starting Training from Scratch.

Epoch: 0   Training Loss: 1.6316   Validation Loss: 1.4913
                  Training Accuracy: 23.89%   Validation Accuracy: 42.56%

Epoch: 1   Training Loss: 1.5051   Validation Loss: 1.3986
                  Training Accuracy: 36.58%   Validation Accuracy: 59.49%

Epoch: 2   Training Loss: 1.4151   Validation Loss: 1.3065
                  Training Accuracy: 46.43%   Validation Accuracy: 66.67%

Epoch: 3   Training Loss: 1.3106   Validation Loss: 1.2320
                  Training Accuracy: 57.51%   Validation Accuracy: 75.90%

Epoch: 4   Training Loss: 1.2436   Validation Loss: 1.1607
                  Training Accuracy: 64.04%   Validation Accuracy: 79.49%

Epoch: 5   Training Loss: 1.1911   Validation Loss: 1.0937
                  Training Accuracy: 65.39%   Validation Accuracy: 84.10%

Epoch: 6   Training Loss: 1.1478   Validation Loss: 1.0828
                  Training Accuracy: 66.87%   Validation Accuracy: 78.97%

Epoch: 7   Training Loss: 1.1017   Validation Loss: 1.0089
                  Training Accuracy: 72.54%   Validation Accuracy: 81.03%

Epoch: 8   Training Loss: 1.0394   Validation Loss: 0.9686
                  Training Accuracy: 74.75%   Validation Accuracy: 84.62%

Epoch: 9   Training Loss: 1.0341   Validation Loss: 0.9564
                  Training Accuracy: 74.38%   Validation Accuracy: 81.54%

Best epoch: 9 with loss: 0.96 and acc: 81.54%
131.69 total seconds elapsed. 13.17 seconds per epoch.
training on gpu...
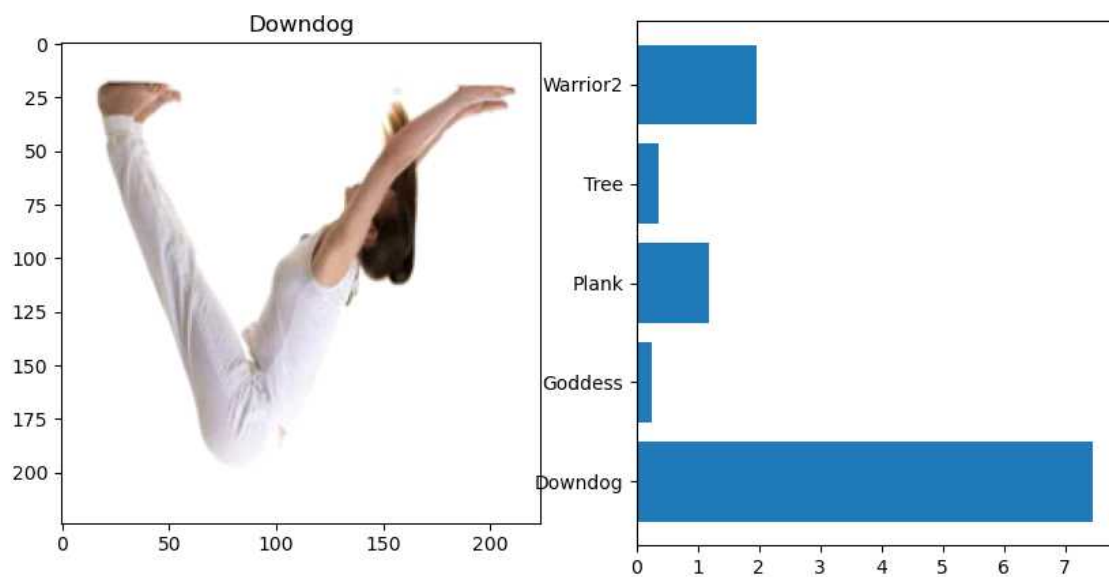tensor([[7.4555, 0.2442, 1.1882, 0.3627, 1.9570]], device='cuda:0')
Accuracy for class Downdog : 0.9743589743589743
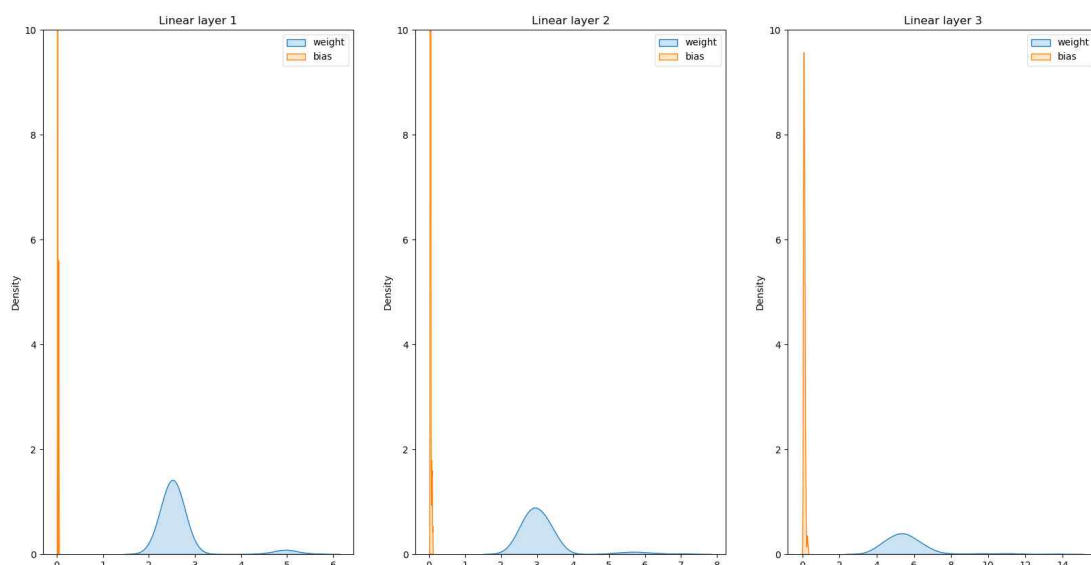Accuracy for class Goddess : 0.7692307692307693
Accuracy for class Plank : 0.8974358974358975
Accuracy for class Tree : 0.8717948717948718
Accuracy for class Warrior2 : 0.7948717948717948

Downdog

SGD ; lr=0.001

Linear layer 1

Linear layer 2

Linear layer 3

SGD ; lr=0.001

Loss Curves

Accuracy Curves