CNN_업그레이드

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CNN_keras_MNIST

```
_________________________________________________________________
Epoch 1/10
600/600 [==============================] - 941s 2s/step - loss: 0.1897 - accuracy: 0.9416 - val_loss: 0.0452 - val_accuracy: 0.9852
Epoch 2/10
600/600 [==============================] - 935s 2s/step - loss: 0.0554 - accuracy: 0.9851 - val_loss: 0.0275 - val_accuracy: 0.9910
Epoch 3/10
600/600 [==============================] - 923s 2s/step - loss: 0.0422 - accuracy: 0.9882 - val_loss: 0.0262 - val_accuracy: 0.9924
Epoch 4/10
600/600 [==============================] - 929s 2s/step - loss: 0.0319 - accuracy: 0.9910 - val_loss: 0.0200 - val_accuracy: 0.9950
Epoch 5/10
600/600 [==============================] - 929s 2s/step - loss: 0.0257 - accuracy: 0.9928 - val_loss: 0.0215 - val_accuracy: 0.9934
Epoch 6/10
600/600 [==============================] - 932s 2s/step - loss: 0.0246 - accuracy: 0.9929 - val_loss: 0.0208 - val_accuracy: 0.9940
Epoch 7/10
600/600 [==============================] - 935s 2s/step - loss: 0.0194 - accuracy: 0.9944 - val_loss: 0.0234 - val_accuracy: 0.9941
Epoch 8/10
600/600 [==============================] - 930s 2s/step - loss: 0.0172 - accuracy: 0.9953 - val_loss: 0.0207 - val_accuracy: 0.9945
Epoch 9/10
600/600 [==============================] - 925s 2s/step - loss: 0.0153 - accuracy: 0.9952 - val_loss: 0.0221 - val_accuracy: 0.9938
Epoch 10/10
600/600 [==============================] - 931s 2s/step - loss: 0.0154 - accuracy: 0.9956 - val_loss: 0.0237 - val_accuracy: 0.9942
313/313 [==============================] - 41s 128ms/step - loss: 0.0237 - accuracy: 0.9942
최종 예측 성공률(%):  99.41999912261963
```

```
1/1 [==============================] - 0s 29ms/step
5 5
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 29ms/step
3 3
1/1 [==============================] - 0s 31ms/step
accuracy = 0.8666666666666667
false_number = [1, 3, 10, 23]
```

학습률 99%, 실제 테스트 86% 충분히 높은거 같아서 진행 X

CNN_keras_cifar 100

```
1563/1563 [==============================] - 10s 7ms/step - loss: 1.0421 - accuracy: 0.6877 - val_loss: 2.0072 - val_accuracy: 0.5254
Epoch 93/100
1563/1563 [==============================] - 10s 6ms/step - loss: 1.0455 - accuracy: 0.6867 - val_loss: 1.9944 - val_accuracy: 0.5300
Epoch 94/100
1563/1563 [==============================] - 11s 7ms/step - loss: 1.0466 - accuracy: 0.6873 - val_loss: 1.9606 - val_accuracy: 0.5207
Epoch 95/100
1563/1563 [==============================] - 10s 7ms/step - loss: 1.0338 - accuracy: 0.6887 - val_loss: 1.9726 - val_accuracy: 0.5194
Epoch 96/100
1563/1563 [==============================] - 10s 7ms/step - loss: 1.0221 - accuracy: 0.6935 - val_loss: 2.0911 - val_accuracy: 0.5219
Epoch 97/100
1563/1563 [==============================] - 11s 7ms/step - loss: 1.0329 - accuracy: 0.6920 - val_loss: 1.9348 - val_accuracy: 0.5181
Epoch 98/100
1563/1563 [==============================] - 10s 7ms/step - loss: 1.0191 - accuracy: 0.6937 - val_loss: 1.9827 - val_accuracy: 0.5164
Epoch 99/100
1563/1563 [==============================] - 10s 6ms/step - loss: 1.0120 - accuracy: 0.6966 - val_loss: 1.9593 - val_accuracy: 0.5210
Epoch 100/100
1563/1563 [==============================] - 10s 6ms/step - loss: 1.0121 - accuracy: 0.6972 - val_loss: 2.0115 - val_accuracy: 0.5175
313/313 [==============================] - 1s 3ms/step - loss: 2.0115 - accuracy: 0.5175
최종 예측 성공률(%):  51.749998331069946
```

```
1/1 [==============================] - 0s 22ms/step
apples hamster
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 24ms/step
leopard tree
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 32ms/step
snake tree
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 31ms/step
oranges oranges
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 41ms/step
oranges oranges
1/1 [==============================] - 0s 30ms/step
0.15
```

학습률 51%, 실제 테스트 15%

CNN_keras_cifar 100

```
1563/1563 [==============================] - 10s 6ms/step - loss: 2.4956 - accuracy: 0.3740 - val_loss: 2.3440 - val_accuracy: 0.3942
Epoch 12/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.4179 - accuracy: 0.3799 - val_loss: 2.2982 - val_accuracy: 0.4099
Epoch 13/100
1563/1563 [==============================] - 10s 7ms/step - loss: 2.3887 - accuracy: 0.3841 - val_loss: 2.2174 - val_accuracy: 0.4313
Epoch 14/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.3320 - accuracy: 0.3945 - val_loss: 2.1281 - val_accuracy: 0.4446
Epoch 15/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.3119 - accuracy: 0.3997 - val_loss: 2.2221 - val_accuracy: 0.4315
Epoch 16/100
1563/1563 [==============================] - 13s 8ms/step - loss: 2.2879 - accuracy: 0.4046 - val_loss: 2.2554 - val_accuracy: 0.4299
Epoch 17/100
1563/1563 [==============================] - 13s 8ms/step - loss: 2.2649 - accuracy: 0.4134 - val_loss: 2.1188 - val_accuracy: 0.4502
Epoch 18/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.2403 - accuracy: 0.4153 - val_loss: 2.1344 - val_accuracy: 0.4451
Epoch 19/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.2474 - accuracy: 0.4150 - val_loss: 2.1119 - val_accuracy: 0.4515
Epoch 20/100
1563/1563 [==============================] - 10s 7ms/step - loss: 2.1877 - accuracy: 0.4282 - val_loss: 2.0967 - val_accuracy: 0.4557
```

학습율 2배 진행 >> 오히려 감소

```
Epoch 11/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.6533 - accuracy: 0.3234 - val_loss: 2.4898 - val_accuracy: 0.3588
Epoch 12/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.5974 - accuracy: 0.3329 - val_loss: 2.3267 - val_accuracy: 0.3988
Epoch 13/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.5461 - accuracy: 0.3430 - val_loss: 2.2924 - val_accuracy: 0.4025
Epoch 14/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.5113 - accuracy: 0.3523 - val_loss: 2.2678 - val_accuracy: 0.3976
Epoch 15/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.4540 - accuracy: 0.3665 - val_loss: 2.3817 - val_accuracy: 0.3838
Epoch 16/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.4371 - accuracy: 0.3692 - val_loss: 2.1417 - val_accuracy: 0.4370
Epoch 17/100
1563/1563 [==============================] - 11s 7ms/step - loss: 2.4196 - accuracy: 0.3712 - val_loss: 2.1559 - val_accuracy: 0.4345
```

dense 레이어 추가 >> 별 반응 없음

```
Epoch 16/20
1563/1563 [==============================] - 13s 9ms/step - loss: 1.6074 - accuracy: 0.5486 - val_loss: 1.6749 - val_accuracy: 0.5377
Epoch 17/20
1563/1563 [==============================] - 13s 8ms/step - loss: 1.5624 - accuracy: 0.5566 - val_loss: 1.6584 - val_accuracy: 0.5486
Epoch 18/20
1563/1563 [==============================] - 13s 8ms/step - loss: 1.5273 - accuracy: 0.5635 - val_loss: 1.6896 - val_accuracy: 0.5423
Epoch 19/20
1563/1563 [==============================] - 13s 8ms/step - loss: 1.4929 - accuracy: 0.5722 - val_loss: 1.6752 - val_accuracy: 0.5457
Epoch 20/20
1563/1563 [==============================] - 13s 8ms/step - loss: 1.4492 - accuracy: 0.5884 - val_loss: 1.6630 - val_accuracy: 0.5554
313/313 [==============================] - 1s 4ms/step - loss: 1.6630 - accuracy: 0.5554
최종 예측 성공률(%):  55.540001392364502
```

```
elapsed_time

327.12132692337036
```

학습 CNN층을 한층 더 깊게 진행 > 눈에띄게 상승

CNN_keras_cifar 100

```
Epoch 92/100
1563/1563 [==============================] - 12s 7ms/step - loss: 1.0248 - accuracy: 0.6926 - val_loss: 2.0239 - val_accuracy: 0.5263
Epoch 93/100
1563/1563 [==============================] - 12s 7ms/step - loss: 1.0154 - accuracy: 0.6945 - val_loss: 1.9353 - val_accuracy: 0.5271
Epoch 94/100
1563/1563 [==============================] - 11s 7ms/step - loss: 1.0223 - accuracy: 0.6919 - val_loss: 1.9546 - val_accuracy: 0.5302
Epoch 95/100
1563/1563 [==============================] - 11s 7ms/step - loss: 1.0148 - accuracy: 0.6939 - val_loss: 1.9198 - val_accuracy: 0.5285
Epoch 96/100
1563/1563 [==============================] - 11s 7ms/step - loss: 1.0121 - accuracy: 0.6974 - val_loss: 1.9560 - val_accuracy: 0.5198
Epoch 97/100
1563/1563 [==============================] - 11s 7ms/step - loss: 1.0057 - accuracy: 0.6984 - val_loss: 1.9266 - val_accuracy: 0.5288
Epoch 98/100
1563/1563 [==============================] - 11s 7ms/step - loss: 0.9933 - accuracy: 0.7024 - val_loss: 1.9294 - val_accuracy: 0.5290
Epoch 99/100
1563/1563 [==============================] - 12s 7ms/step - loss: 0.9920 - accuracy: 0.7019 - val_loss: 2.0146 - val_accuracy: 0.5296
Epoch 100/100
1563/1563 [==============================] - 11s 7ms/step - loss: 0.9909 - accuracy: 0.7019 - val_loss: 1.9173 - val_accuracy: 0.5287
313/313 [==============================] - 1s 3ms/step - loss: 1.9173 - accuracy: 0.5287
최종 예측 성공률(%):  52.869999408721924
```

```
9] apples train
1/1 [==============================] - 0s 24ms/step
1/1 [==============================] - 0s 25ms/step
1/1 [==============================] - 0s 28ms/step
apples train
1/1 [==============================] - 0s 26ms/step
1/1 [==============================] - 0s 25ms/step
1/1 [==============================] - 0s 24ms/step
motorcycle butterfly
1/1 [==============================] - 0s 22ms/step
1/1 [==============================] - 0s 22ms/step
1/1 [==============================] - 0s 21ms/step
chair chair
1/1 [==============================] - 0s 24ms/step
1/1 [==============================] - 0s 21ms/step
0.5384615384615384
```

같은 학습률에서 유사한 사진들 50장으로 교체

>> 15%에서 53%로 상승!

CNN_keras_cifar 100

```
average='macro' :  0.4444444444444444
average='micro' :  0.5384615384615384
average='weighted' :  0.6623931623931624
```

	precision	recall	f1-score	support
apples	0.11	0.50	0.18	4
bear	1.00	0.25	0.40	4
bowls	0.00	0.00	0.00	0
butterfly	1.00	0.57	0.73	7
chair	1.00	1.00	1.00	5
clock	1.00	1.00	1.00	5
house	0.00	0.00	0.00	0
leopard	0.00	0.00	0.00	0
motorcycle	0.00	0.00	0.00	0
mushroom	0.00	0.00	0.00	4
oranges	1.00	1.00	1.00	3
rabbit	0.00	0.00	0.00	5
sea	1.00	0.60	0.75	5
sunflowers	1.00	1.00	1.00	5
sweet peppers	0.00	0.00	0.00	0
train	0.00	0.00	0.00	5
accuracy			0.54	52
macro avg	0.44	0.37	0.38	52
weighted avg	0.66	0.54	0.56	52

chair,clock, sunflowers, oranges 같은 경우는 100%확률로 잘 맞춤

>> 단순한 모양들을 잘 맞추는듯

CNN_keras_fashion 100

```
Epoch 1/5
1875/1875 [==============================] - 16s 7ms/step - loss: 0.5231 - accuracy: 0.8130 - val_loss: 0.3469 - val_accuracy: 0.8726
Epoch 2/5
1875/1875 [==============================] - 12s 6ms/step - loss: 0.3474 - accuracy: 0.8709 - val_loss: 0.2791 - val_accuracy: 0.8967
Epoch 3/5
1875/1875 [==============================] - 12s 6ms/step - loss: 0.3060 - accuracy: 0.8876 - val_loss: 0.2667 - val_accuracy: 0.9001
Epoch 4/5
1875/1875 [==============================] - 12s 6ms/step - loss: 0.2827 - accuracy: 0.8963 - val_loss: 0.2441 - val_accuracy: 0.9112
Epoch 5/5
1875/1875 [==============================] - 12s 6ms/step - loss: 0.2631 - accuracy: 0.9035 - val_loss: 0.2502 - val_accuracy: 0.9093
313/313 [==============================] - 1s 3ms/step - loss: 0.2502 - accuracy: 0.9093
0.25024130940437317 0.9093000292778015
```

```
1/1 [==============================] - 0s 29ms/step
1/1 [==============================] - 0s 19ms/step
9 9
1/1 [==============================] - 0s 19ms/step
1/1 [==============================] - 0s 19ms/step
8 9
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 22ms/step
9 9
1/1 [==============================] - 0s 19ms/step
accuracy = 0.6
false_number = [5, 9, 11, 12, 13, 14, 15, 17, 18, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 33, 36, 38]
```

학습에서 정확도 90%, 실제에서 정확도 60%

>> 올려보자!

CNN_keras_fashion 100

```
1875/1875 [==============================] - 12s 6ms/step - loss: 0.2108 - accuracy: 0.9211 - val_loss: 0.2241 - val_accuracy: 0.9195
Epoch 11/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.2051 - accuracy: 0.9236 - val_loss: 0.2199 - val_accuracy: 0.9216
Epoch 12/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.1993 - accuracy: 0.9250 - val_loss: 0.2253 - val_accuracy: 0.9170
Epoch 13/20
1875/1875 [==============================] - 11s 6ms/step - loss: 0.1914 - accuracy: 0.9283 - val_loss: 0.2186 - val_accuracy: 0.9224
Epoch 14/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.1860 - accuracy: 0.9307 - val_loss: 0.2191 - val_accuracy: 0.9213
Epoch 15/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.1836 - accuracy: 0.9316 - val_loss: 0.2421 - val_accuracy: 0.9147
Epoch 16/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.1785 - accuracy: 0.9327 - val_loss: 0.2131 - val_accuracy: 0.9258
Epoch 17/20
1875/1875 [==============================] - 11s 6ms/step - loss: 0.1740 - accuracy: 0.9342 - val_loss: 0.2105 - val_accuracy: 0.9240
Epoch 18/20
1875/1875 [==============================] - 11s 6ms/step - loss: 0.1698 - accuracy: 0.9358 - val_loss: 0.2176 - val_accuracy: 0.9253
Epoch 19/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.1676 - accuracy: 0.9373 - val_loss: 0.2089 - val_accuracy: 0.9263
Epoch 20/20
1875/1875 [==============================] - 12s 6ms/step - loss: 0.1620 - accuracy: 0.9391 - val_loss: 0.2193 - val_accuracy: 0.9237
313/313 [==============================] - 1s 3ms/step - loss: 0.2193 - accuracy: 0.9237
0.21926425397396088 0.9236999750137329
238.8182852268219
```

단순 epochs 증가 = 90>>92.3

```
Epoch 1/20
1875/1875 [==============================] - 23s 9ms/step - loss: 0.6836 - accuracy: 0.7593 - val_loss: 0.3684 - val_accuracy: 0.8590
Epoch 2/20
1875/1875 [==============================] - 15s 8ms/step - loss: 0.4194 - accuracy: 0.8462 - val_loss: 0.3322 - val_accuracy: 0.8749
Epoch 3/20
1875/1875 [==============================] - 15s 8ms/step - loss: 0.3657 - accuracy: 0.8686 - val_loss: 0.3363 - val_accuracy: 0.8756
Epoch 4/20
1875/1875 [==============================] - 17s 9ms/step - loss: 0.3349 - accuracy: 0.8799 - val_loss: 0.2963 - val_accuracy: 0.8899
Epoch 5/20
1875/1875 [==============================] - 15s 8ms/step - loss: 0.3120 - accuracy: 0.8877 - val_loss: 0.2560 - val_accuracy: 0.9070
Epoch 6/20
```

dropout, 학습 깊이 추가 = 93.1,

시간 = 238>325 약 30%증가

CNN_keras_fashion 100

```
average=None :  [0.25925926 1.         1.         0.875      0.33333333 0.75
 0.5        1.         0.46666667 1.        ]
average='macro' :  0.7184259259259259
average='micro' :  0.5979381443298969
average='weighted' :  0.7303360061092019
```

	precision	recall	f1-score	support
0	0.26	0.70	0.38	10
1	1.00	1.00	1.00	10
2	1.00	0.30	0.46	10
3	0.88	0.70	0.78	10
4	0.33	0.14	0.20	7
5	0.75	0.60	0.67	10
6	0.50	0.60	0.55	10
7	1.00	0.40	0.57	10
8	0.47	0.70	0.56	10
9	1.00	0.70	0.82	10
accuracy			0.60	97
macro avg	0.72	0.58	0.60	97
weighted avg	0.73	0.60	0.61	97

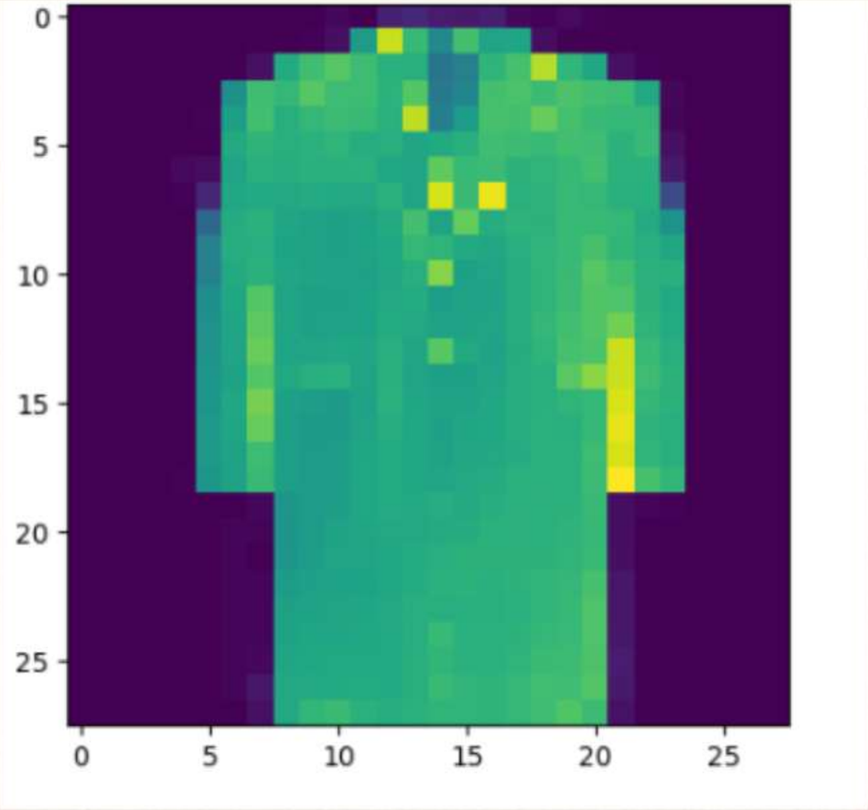
60% 정확도

```
average=None :  [0.52631579 1.         1.         1.         0.25       1.
 0.58333333 0.5625     0.6        1.        ]
average='macro' :  0.7522149122807017
average='micro' :  0.711340206185567
average='weighted' :  0.7677473322481462
```

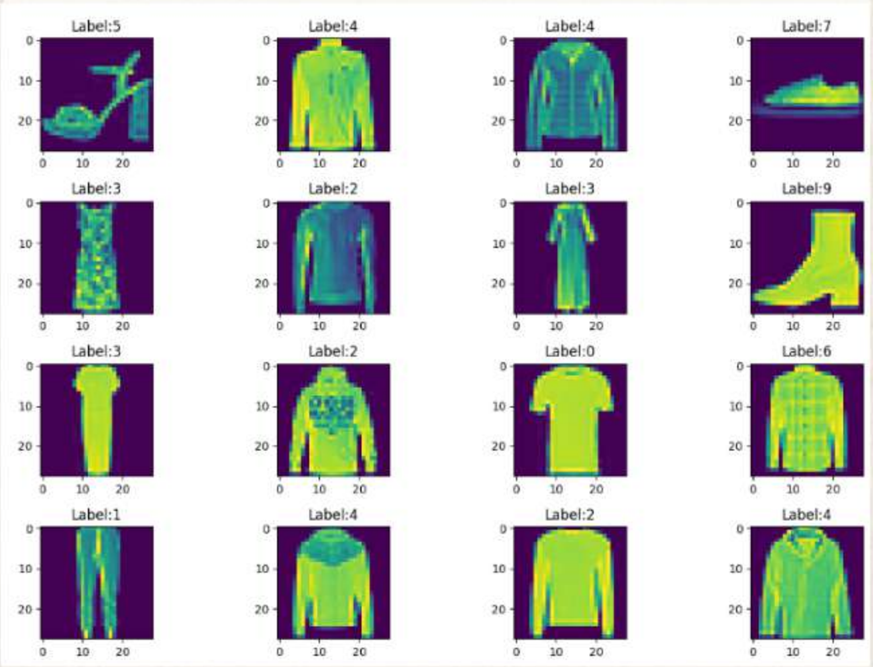
	precision	recall	f1-score	support
0	0.53	1.00	0.69	10
1	1.00	1.00	1.00	10
2	1.00	0.60	0.75	10
3	1.00	0.70	0.82	10
4	0.25	0.14	0.18	7
5	1.00	0.50	0.67	10
6	0.58	0.70	0.64	10
7	0.56	0.90	0.69	10
8	0.60	0.60	0.60	10
9	1.00	0.80	0.89	10

71% 정확도 but 4번은 오히려 더 떨어진 모습

CNN_keras_fashion 100



내가 뽑은 사진



4번 코트가 뭔가 이상함 내가 뽑은 사진이랑 눈에띄게 다름을 볼 수있음.

(4번 제외시 약 75~80%정도 정확성)

CNN_pytorch_MNIST

```
loss: 0.000517 accuracy: 0.983713 [50100/60000]
TEST:
 Accuracy: 98.9%, Avg loss: 0.035121

Epoch 9
-------------------------------
loss: 0.000490 accuracy: 0.980000 [  100/60000]
loss: 0.000542 accuracy: 0.983861 [10100/60000]
loss: 0.000497 accuracy: 0.985274 [20100/60000]
loss: 0.000483 accuracy: 0.985648 [30100/60000]
loss: 0.000484 accuracy: 0.985561 [40100/60000]
loss: 0.000486 accuracy: 0.985150 [50100/60000]
TEST:
 Accuracy: 98.9%, Avg loss: 0.038495

Epoch 10
-------------------------------
loss: 0.000241 accuracy: 0.990000 [  100/60000]
loss: 0.000475 accuracy: 0.986535 [10100/60000]
loss: 0.000448 accuracy: 0.986617 [20100/60000]
loss: 0.000447 accuracy: 0.986346 [30100/60000]
loss: 0.000451 accuracy: 0.985960 [40100/60000]
loss: 0.000458 accuracy: 0.985828 [50100/60000]
TEST:
 Accuracy: 98.9%, Avg loss: 0.035093
```

```
print(count/30*100)
```

```
66.66666666666666
```

정확도 99%, 실제 데이터 66% 만족

CNN_pytorch_cifar100

```
Epoch 9
----------------------
loss:0.021712 accuracy: 0.281250 [  128/50000]
loss:0.021682 accuracy: 0.298035 [12928/50000]
loss:0.021737 accuracy: 0.297613 [25728/50000]
loss:0.021741 accuracy: 0.298588 [38528/50000]
TEST:
 Accuracy: 37.2%, Avg loss: 2.432543

Epoch 10
----------------------
loss:0.019443 accuracy: 0.375000 [  128/50000]
loss:0.021296 accuracy: 0.311572 [12928/50000]
loss:0.021346 accuracy: 0.308030 [25728/50000]
loss:0.021330 accuracy: 0.308970 [38528/50000]
TEST:
 Accuracy: 37.0%, Avg loss: 2.477928
```

```
Predicted class: worm apples
Predicted class: worm apples
Predicted class: lamp telephone
Predicted class: worm telephone
Predicted class: telephone subway
Predicted class: worm subway
Predicted class: chair tea
Predicted class: worm tea
Predicted class: worm elephant
Predicted class: worm elephant
Predicted class: lamp sunflower
Predicted class: lamp sunflower
Predicted class: worm house
Predicted class: chair house
Predicted class: worm sea
Predicted class: worm sea
Predicted class: lamp cycle
Predicted class: worm cycle
Predicted class: worm flower
Predicted class: worm flower
Predicted class: lamp tv
Predicted class: worm tv
Predicted class: worm sneak
Predicted class: chair sneak
Predicted class: kangaroo mountain
Predicted class: worm mountain
Predicted class: worm people
Predicted class: chair people
Predicted class: worm skunk
Predicted class: worm skunk
Predicted class: worm butterfly
Predicted class: worm butterfly
Predicted class: lamp chair
Predicted class: oranges chair
Predicted class: worm hamster
Predicted class: chair hamster
Predicted class: worm tree
Predicted class: worm tree
Predicted class: oranges oranges
Predicted class: chair oranges
```

학습률 37%, 실제 데이터 약 5% 정도 정확도

>> 올려보자

CNN_pytorch_cifar100

```
Epoch 9
----------------------
loss:0.021712 accuracy: 0.281250 [  128/50000]
loss:0.021682 accuracy: 0.298035 [12928/50000]
loss:0.021737 accuracy: 0.297613 [25728/50000]
loss:0.021741 accuracy: 0.298588 [38528/50000]
TEST:
 Accuracy: 37.2%, Avg loss: 2.432543

Epoch 10
----------------------
loss:0.019443 accuracy: 0.375000 [  128/50000]
loss:0.021296 accuracy: 0.311572 [12928/50000]
loss:0.021346 accuracy: 0.308030 [25728/50000]
loss:0.021330 accuracy: 0.308970 [38528/50000]
TEST:
 Accuracy: 37.0%, Avg loss: 2.477928
```

```
Predicted class: worm apples
Predicted class: worm apples
Predicted class: lamp telephone
Predicted class: worm telephone
Predicted class: telephone subway
Predicted class: worm subway
Predicted class: chair tea
Predicted class: worm tea
Predicted class: worm elephant
Predicted class: worm elephant
Predicted class: lamp sunflower
Predicted class: lamp sunflower
Predicted class: worm house
Predicted class: chair house
Predicted class: worm sea
Predicted class: worm sea
Predicted class: lamp cycle
Predicted class: worm cycle
Predicted class: worm flower
Predicted class: worm flower
Predicted class: lamp tv
Predicted class: worm tv
Predicted class: worm sneak
Predicted class: chair sneak
Predicted class: kangaroo mountain
Predicted class: worm mountain
Predicted class: worm people
Predicted class: chair people
Predicted class: worm skunk
Predicted class: worm skunk
Predicted class: worm butterfly
Predicted class: worm butterfly
Predicted class: lamp chair
Predicted class: oranges chair
Predicted class: worm hamster
Predicted class: chair hamster
Predicted class: worm tree
Predicted class: worm tree
Predicted class: oranges oranges
Predicted class: chair oranges
```

학습률 37%, 실제 데이터 약 5% 정도 정확도

>> 올려보자

CNN_pytorch_cifar100

```
Epoch 7
-----------------------
loss:0.022190 accuracy: 0.234375 [  128/50000]
loss:0.022478 accuracy: 0.283493 [12928/50000]
loss:0.022507 accuracy: 0.280589 [25728/50000]
loss:0.022523 accuracy: 0.281873 [38528/50000]
TEST:
 Accuracy: 35.8%, Avg loss: 2.530378

Epoch 8
-----------------------
loss:0.024538 accuracy: 0.179688 [  128/50000]
loss:0.022054 accuracy: 0.284189 [12928/50000]
loss:0.022102 accuracy: 0.283815 [25728/50000]
loss:0.022111 accuracy: 0.285610 [38528/50000]
TEST:
 Accuracy: 31.5%, Avg loss: 2.734355

Epoch 9
-----------------------
loss:0.020293 accuracy: 0.390625 [  128/50000]
loss:0.021818 accuracy: 0.298422 [12928/50000]
loss:0.021759 accuracy: 0.296175 [25728/50000]
loss:0.021732 accuracy: 0.296564 [38528/50000]
TEST:
 Accuracy: 32.6%, Avg loss: 2.719389

Epoch 10
-----------------------
loss:0.021352 accuracy: 0.367188 [  128/50000]
loss:0.021020 accuracy: 0.315594 [12928/50000]
loss:0.021222 accuracy: 0.313355 [25728/50000]
loss:0.021257 accuracy: 0.310605 [38528/50000]
TEST:
 Accuracy: 39.0%, Avg loss: 2.387208

DONE!!
1517.5813353061676
```

```
19 Predicted class: plates clock
20 Predicted class: plates clock
21 Predicted class: plates clock
22 Predicted class: plates clock
23 Predicted class: lion mushroom
24 Predicted class: woman mushroom
25 Predicted class: woman mushroom
26 Predicted class: table mushroom
27 Predicted class: oranges oranges
28 Predicted class: oranges oranges
29 Predicted class: oranges oranges
30 Predicted class: rabbit rabbit
31 Predicted class: rabbit rabbit
32 Predicted class: rabbit rabbit
33 Predicted class: flatfish rabbit
34 Predicted class: skunk rabbit
35 Predicted class: mountain sea
36 Predicted class: plain sea
37 Predicted class: cloud sea
38 Predicted class: cloud sea
39 Predicted class: cloud sea
40 Predicted class: sunflowers sunflowers
41 Predicted class: sunflowers sunflowers
42 Predicted class: sunflowers sunflowers
43 Predicted class: sunflowers sunflowers
44 Predicted class: sunflowers sunflowers
45 Predicted class: tractor train
46 Predicted class: train train
47 Predicted class: train train
48 Predicted class: mountain train

5] count/48+100

50.0
```

```
average=None :  [1. 1. 0. 1. 0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 1. 0. 0. 0.
 1. 0.]
average='macro' :  0.3076923076923077
average='micro' :  0.4897959183673469
average='weighted' :  0.7142857142857143
```

	precision	recall	f1-score	support
apples	1.00	0.75	0.86	4
bear	1.00	0.50	0.67	4
bee	0.00	0.00	0.00	0
butterfly	1.00	0.33	0.50	6
camel	0.00	0.00	0.00	0
chair	1.00	1.00	1.00	4
clock	0.00	0.00	0.00	5
cloud	0.00	0.00	0.00	0
dolphin	0.00	0.00	0.00	0
flatfish	0.00	0.00	0.00	0
lawn-mower	0.00	0.00	0.00	0
lion	0.00	0.00	0.00	0
mountain	0.00	0.00	0.00	0
mushroom	0.00	0.00	0.00	4
oranges	1.00	1.00	1.00	3
plain	0.00	0.00	0.00	0
plates	0.00	0.00	0.00	0
rabbit	1.00	0.60	0.75	5
sea	0.00	0.00	0.00	5
skunk	0.00	0.00	0.00	0
sunflowers	1.00	1.00	1.00	5
sweet peppers	0.00	0.00	0.00	0
table	0.00	0.00	0.00	0
tractor	0.00	0.00	0.00	0
train	1.00	0.50	0.67	4
woman	0.00	0.00	0.00	0
accuracy			0.49	49
macro avg	0.31	0.22	0.25	49
weighted avg	0.71	0.49	0.56	49

깊은학습,dropout 변화등 다 별 차이 없음 40%

유사 데이터로 변환 50%,

CNN_pytorch_cifar100

```
19 Predicted class: plates clock
20 Predicted class: plates clock
21 Predicted class: plates clock
22 Predicted class: plates clock
23 Predicted class: lion mushroom
24 Predicted class: woman mushroom
25 Predicted class: woman mushroom
26 Predicted class: table mushroom
27 Predicted class: oranges oranges
28 Predicted class: oranges oranges
29 Predicted class: oranges oranges
30 Predicted class: rabbit rabbit
31 Predicted class: rabbit rabbit
32 Predicted class: rabbit rabbit
33 Predicted class: flatfish rabbit
34 Predicted class: skunk rabbit
35 Predicted class: mountain sea
36 Predicted class: plain sea
37 Predicted class: cloud sea
38 Predicted class: cloud sea
39 Predicted class: cloud sea
40 Predicted class: sunflowers sunflowers
41 Predicted class: sunflowers sunflowers
42 Predicted class: sunflowers sunflowers
43 Predicted class: sunflowers sunflowers
44 Predicted class: sunflowers sunflowers
45 Predicted class: tractor train
46 Predicted class: train train
47 Predicted class: train train
48 Predicted class: mountain train
```

```
5] count/48*100

50.0
```

```
average=None :  [1. 1. 0. 1. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 1. 0. 0. 0.
 1. 0.]
average='macro' :  0.3076923076923077
average='micro' :  0.4897959183673469
average='weighted' :  0.7142857142857143
```

	precision	recall	f1-score	support
apples	1.00	0.75	0.86	4
bear	1.00	0.50	0.67	4
bee	0.00	0.00	0.00	0
butterfly	1.00	0.33	0.50	6
camel	0.00	0.00	0.00	0
chair	1.00	1.00	1.00	4
clock	0.00	0.00	0.00	5
cloud	0.00	0.00	0.00	0
dolphin	0.00	0.00	0.00	0
flatfish	0.00	0.00	0.00	0
lawn-mower	0.00	0.00	0.00	0
lion	0.00	0.00	0.00	0
mountain	0.00	0.00	0.00	0
mushroom	0.00	0.00	0.00	4
oranges	1.00	1.00	1.00	3
plain	0.00	0.00	0.00	0
plates	0.00	0.00	0.00	0
rabbit	1.00	0.60	0.75	5
sea	0.00	0.00	0.00	5
skunk	0.00	0.00	0.00	0
sunflowers	1.00	1.00	1.00	5
sweet peppers	0.00	0.00	0.00	0
table	0.00	0.00	0.00	0
tractor	0.00	0.00	0.00	0
train	1.00	0.50	0.67	4
woman	0.00	0.00	0.00	0
accuracy			0.49	49
macro avg	0.31	0.22	0.25	49
weighted avg	0.71	0.49	0.56	49

유사 데이터로 변환 5% > 50%, 케라스랑 비슷한 수치

CNN_pytorch_fashion100

```
Epoch 5
-------------------------------
loss:0.021024 accuracy: 0.593750 [   64/60000]
loss:0.019453 accuracy: 0.637531 [ 6464/60000]
loss:0.019398 accuracy: 0.634562 [12864/60000]
loss:0.019293 accuracy: 0.634136 [19264/60000]
loss:0.019153 accuracy: 0.636651 [25664/60000]
loss:0.019008 accuracy: 0.635791 [32064/60000]
loss:0.018853 accuracy: 0.638571 [38464/60000]
loss:0.018691 accuracy: 0.640536 [44864/60000]
loss:0.018553 accuracy: 0.640605 [51264/60000]
loss:0.018410 accuracy: 0.642533 [57664/60000]
TEST:
 Accuracy: 64.0%, Avg loss: 1.104790
```

```
Predicted class: 8 6
Predicted class: 8 6
Predicted class: 7 7
Predicted class: 7 7
Predicted class: 7 7
Predicted class: 7 7
Predicted class: 4 8
Predicted class: 3 8
Predicted class: 3 8
Predicted class: 3 8
Predicted class: 9 9
Predicted class: 9 9
Predicted class: 8 9
Predicted class: 5 9
accuracy = 0.43333333333333335
```

원래 정확도 64%, 실제 데이터 43% 정도

CNN_pytorch_fashion100

```
loss:0.025159 accuracy: 0.851465 [ 6464/60000]
loss:0.025146 accuracy: 0.852534 [12864/60000]
loss:0.025196 accuracy: 0.849149 [19264/60000]
loss:0.025174 accuracy: 0.850530 [25664/60000]
loss:0.025168 accuracy: 0.850830 [32064/60000]
loss:0.025141 accuracy: 0.852641 [38464/60000]
loss:0.025104 accuracy: 0.855162 [44864/60000]
loss:0.025095 accuracy: 0.855727 [51264/60000]
loss:0.025098 accuracy: 0.855508 [57664/60000]
TEST:
 Accuracy: 85.6%, Avg loss: 1.605254

Epoch 5
-------------------------------
loss:0.024387 accuracy: 0.890625 [    64/60000]
loss:0.024980 accuracy: 0.862469 [ 6464/60000]
loss:0.024994 accuracy: 0.861707 [12864/60000]
loss:0.025033 accuracy: 0.859686 [19264/60000]
loss:0.025025 accuracy: 0.860037 [25664/60000]
loss:0.025022 accuracy: 0.860311 [32064/60000]
loss:0.025002 accuracy: 0.861507 [38464/60000]
loss:0.024995 accuracy: 0.861805 [44864/60000]
loss:0.024989 accuracy: 0.862086 [51264/60000]
loss:0.024983 accuracy: 0.862427 [57664/60000]
TEST:
 Accuracy: 86.3%, Avg loss: 1.597333

Done!
```

옵티마이저 Adam, 깊은학습등 86%

```
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
accuracy = 0.28865979381443296
```

오히려 감소? > 전처리 다시

CNN_pytorch_fashion100

```
Predicted class: 9 9
Predicted class: 9 9
Predicted class: 9 9
Predicted class: 9 9
Predicted class: 9 9
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
Predicted class: 8 8
accuracy = 0.5979381443298969
None
false_number = [0, 1, 2, 3, 4, 5, 9, 11, 15, 16, 17, 18, 19
```

실제데이터 60%

```
average=None :  [0.54545455 1.         1.         0.85714286 0.14285714 0.6
 0.5        0.77777778 0.38461538 0.8        ]
average='macro' :  0.6607847707847708
average='micro' :  0.5979381443298969
average='weighted' :  0.6768031510299551

              precision    recall  f1-score   support

           0       0.55      0.60      0.57        10
           1       1.00      1.00      1.00        10
           2       1.00      0.20      0.33        10
           3       0.86      0.60      0.71        10
           4       0.14      0.14      0.14         7
           5       0.60      0.30      0.40        10
           6       0.50      0.50      0.50        10
           7       0.78      0.70      0.74        10
           8       0.38      1.00      0.56        10
           9       0.80      0.80      0.80        10

    accuracy                           0.60        97
   macro avg       0.66      0.58      0.57        97
weighted avg       0.68      0.60      0.59        97
```

4번 제외시 65~70%정도

요약

CNN_keras_MNIST	99 86 >> 99 86
CNN_keras_cifar 100	51 15 >> 56, 53
CNN_keras_fashion 100	90,60 >> 93,71(77)
CNN_pytorch_MNIST	99,66 >>99,66
CNN_pytorch_cifar100	37,5 >> 40,50
CNN_pytorch_fashion 100	64,43 >> 86,60(67)