● CNN 모델 구조 summary

- Model: "sequential_1"

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- Layer (type)   Output Shape   Param #

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- conv2d_2 (Conv2D)   (None, 28, 28, 32)   320

- conv2d_3 (Conv2D)   (None, 28, 28, 64)   18496

- batch_normalization_1 (Bat   (None, 28, 28, 64)   256
- chNormalization)

- max_pooling2d_1 (MaxPoolin   (None, 14, 14, 64)   0
- g2D)

- flatten_1 (Flatten)   (None, 12544)   0

- dropout_2 (Dropout)   (None, 12544)   0

- dense_2 (Dense)   (None, 64)   802880

- dropout_3 (Dropout)   (None, 64)   0

- dense_3 (Dense)   (None, 10)   650

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- Total params: 822602 (3.14 MB)
- Trainable params: 822474 (3.14 MB)
- Non-trainable params: 128 (512.00 Byte)

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● Epochs 12~22 로그

Epoch 12/100
1719/1719 [==============================] - 8s 5ms/step - loss: 0.1684 - accuracy: 0.9381 - val_loss: 0.2164 - val_accuracy: 0.9270 - lr: 5.0000e-04
Epoch 13/100
1719/1719 [==============================] - 9s 5ms/step - loss: 0.1595 - accuracy: 0.9396 - val_loss: 0.2480 - val_accuracy: 0.9248 - lr: 5.0000e-04
Epoch 14/100
1719/1719 [==============================] - 8s 5ms/step - loss: 0.1521 - accuracy: 0.9425 - val_loss: 0.2240 - val_accuracy: 0.9278 - lr: 5.0000e-04
Epoch 15/100
1719/1719 [==============================] - 9s 5ms/step - loss: 0.1500 - accuracy: 0.9421 - val_loss: 0.2415 - val_accuracy: 0.9270 - lr: 5.0000e-04
Epoch 16/100
1712/1719 [===========================>.] - ETA: 0s - loss: 0.1482 - accuracy: 0.9442
Epoch 16: ReduceLROnPlateau reducing learning rate to 0.0002500000118743628.
1719/1719 [==============================] - 9s 5ms/step - loss: 0.1482 - accuracy: 0.9442 - val_loss: 0.2365 - val_accuracy: 0.9252 - lr: 5.0000e-04
Epoch 17/100
1719/1719 [==============================] - 8s 5ms/step - loss: 0.1270 - accuracy: 0.9497 - val_loss: 0.2347 - val_accuracy: 0.9308 - lr: 2.5000e-04
Epoch 18/100
1719/1719 [==============================] - 9s 5ms/step - loss: 0.1209 - accuracy: 0.9533 - val_loss: 0.2363 - val_accuracy: 0.9276 - lr: 2.5000e-04
Epoch 19/100
1719/1719 [==============================] - 9s 5ms/step - loss: 0.1164 - accuracy: 0.9547 - val_loss: 0.2381 - val_accuracy: 0.9314 - lr: 2.5000e-04
Epoch 20/100
1719/1719 [==============================] - 8s 5ms/step - loss: 0.1146 - accuracy: 0.9545 - val_loss: 0.2511 - val_accuracy: 0.9302 - lr: 2.5000e-04
Epoch 21/100
1718/1719 [==============================>.] - ETA: 0s - loss: 0.1141 - accuracy: 0.9569
Epoch 21: ReduceLROnPlateau reducing learning rate to 0.0001250000059371814.
1719/1719 [==============================] - 9s 5ms/step - loss: 0.1140 - accuracy: 0.9569 - val_loss: 0.2435 - val_accuracy: 0.9284 - lr: 2.5000e-04
Epoch 22/100
1719/1719 [==============================] - 8s 5ms/step - loss: 0.1039 - accuracy: 0.9596 - val_loss: 0.2370 - val_accuracy: 0.9300 - lr: 1.2500e-04
313/313 [==============================] - 1s 4ms/step - loss: 0.2765 - accuracy: 0.9297
[0.27649107575416565, 0.9297000169754028]

● CNN 모델 훈련 그래프 (Epochs : 22)
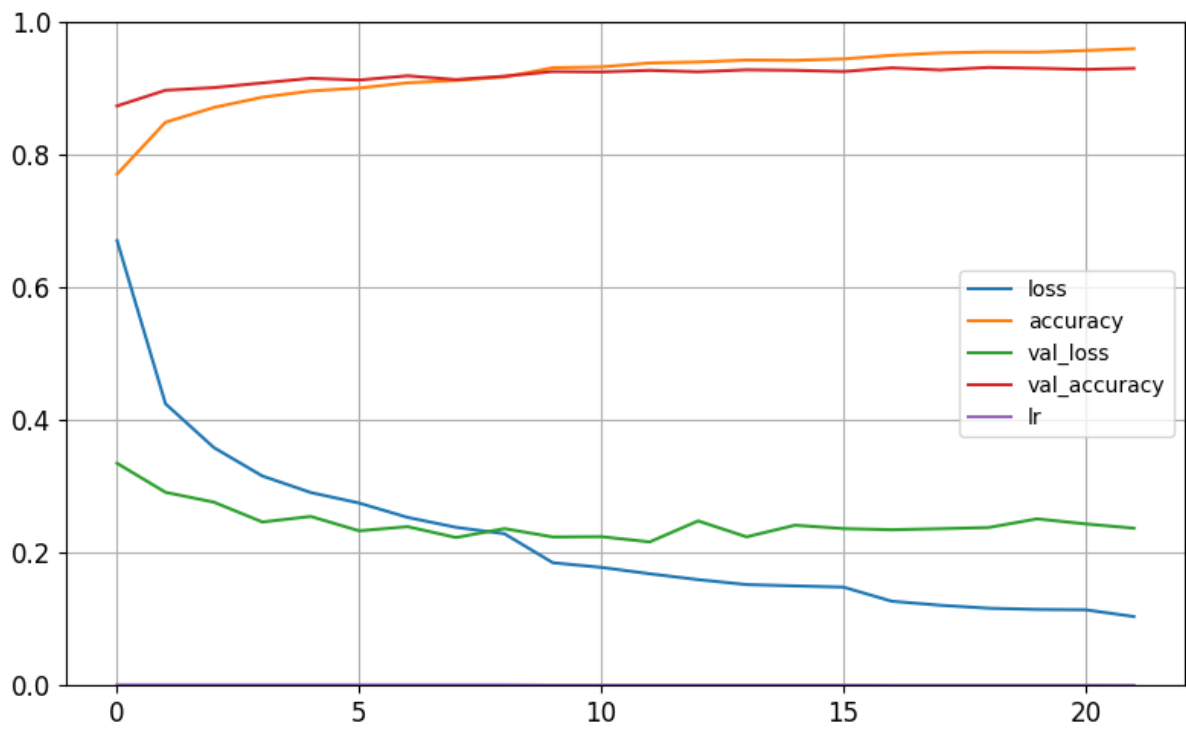
● 테스트 데이터 평가

313/313 [==============================] - 1s 3ms/step - loss: 0.2765 - accuracy: 0.9297
[0.27649107575416565, 0.9297000169754028]