jupyter mnist_shlee2017036122 (autosaved)

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File Edit View Insert Cell Kernel Help Not Trusted Python 3 (ipykernel)

Run Code

In [5]:
```
# This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python docker image: https://github.com/kaggle/docker-py
# For example, here's several helpful packages to load in

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)

# Input data files are available in the "../input/" directory.
# For example, running this (by clicking run or pressing Shift+Enter) will list all f

import os
for dirname, _, filenames in os.walk('C:/Users/user/Desktop/shlee/homework/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))

# Any results you write to the current directory are saved as output.
```

```
C:/Users/user/Desktop/shlee/homework/input₩sample_submission.csv
C:/Users/user/Desktop/shlee/homework/input₩test.csv
C:/Users/user/Desktop/shlee/homework/input₩train.csv
```

In [6]:
```
%matplotlib inline

import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split

from keras.utils import np_utils
from keras.preprocessing.image import ImageDataGenerator
from keras.models import Sequential
from keras.layers import Dense, Dropout, Activation, Flatten, Convolution2D, MaxPool
from keras.callbacks import ModelCheckpoint

print("Pandas", pd.__version__)
print("NumPy", np.__version__)
```

```
Pandas 1.5.3
NumPy 1.23.5
```

In [7]:
```
img_size = 28
batch_size = 64
validation_split = 0.1
epochs = 8
```

In [8]:
```
train_raw_dataset = pd.read_csv("C:/Users/user/Desktop/shlee/homework/input/train.csv"
test_raw_dataset = pd.read_csv("C:/Users/user/Desktop/shlee/homework/input/test.csv")
```

In [9]:
```
def preprocess(train_raw_dataset, test_raw_dataset):
    # Work with train data
    X_train = train_raw_dataset.drop(["label"], axis=1)
    X_train = X_train.values.astype("float32")
    X_train = X_train.reshape(X_train.shape[0], img_size, img_size, 1)
    X_train /= 255
    X_train = X_train.clip(0, 1)

    y_train = train_raw_dataset["label"]
    y_train = y_train.values
    y_train = np_utils.to_categorical(y_train, 10)

    # Split to train/validation set
    X_train, X_valid, y_train, y_valid = train_test_split(
```

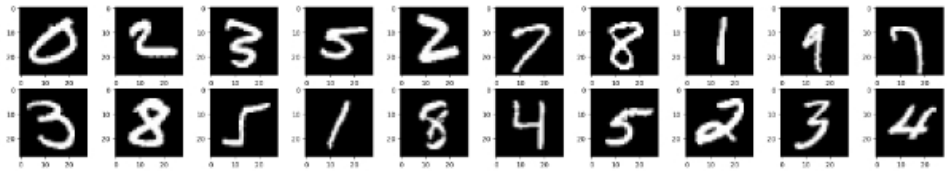
```
        X_train,
        y_train,
        test_size=validation_split,
        shuffle=True
    )

    # Work with test data
    X_test = test_raw_dataset.values.astype("float32")
    X_test = X_test.reshape(X_test.shape[0], img_size, img_size, 1)
    X_test /= 255
    X_test = X_test.clip(0, 1)

    return X_train, X_valid, y_train, y_valid, X_test

X_train, X_valid, y_train, y_valid, X_test = preprocess(train_raw_dataset, test_raw_da
```

In [10]:
```
fig = plt.figure(figsize=(25, 4))
for i in range(20):
    ax = fig.add_subplot(2, 10, i+1)
    plt.imshow(X_train[i].reshape(28, 28), cmap='gray')
```

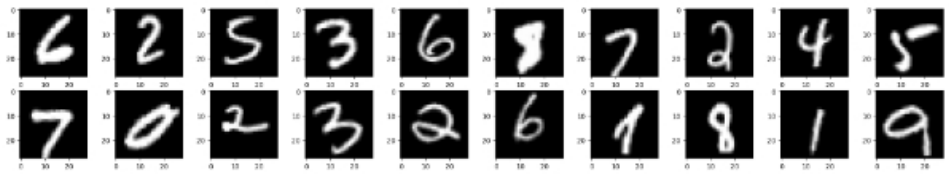


In [11]:
```
datagen = ImageDataGenerator(
    rotation_range=10,
    width_shift_range=0.05,
    height_shift_range=0.05,
    zoom_range=0.05,
    data_format="channels_last",
    validation_split=validation_split
)

# compute quantities required for featurewise normalization
# (std, mean, and principal components if ZCA whitening is applied)
datagen.fit(X_train)

datagen_flow = datagen.flow(X_train, y_train, batch_size=batch_size)
```

In [12]:
```
fig = plt.figure(figsize=(25, 4))
for X_batch, y_batch in datagen_flow:
    for i in range(20):
        ax = fig.add_subplot(2, 10, i+1)
        plt.imshow(X_batch[i].reshape(28, 28), cmap=plt.get_cmap('gray'))
    plt.show()
    break
```



In [13]:
```
input_shape = (img_size, img_size, 1)

model = Sequential()
model.add(Convolution2D(32, (5, 5), padding="same", input_shape=input_shape))
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size=(2, 2), strides=(2, 2), padding="same"))
model.add(Convolution2D(64, (5, 5), padding="same", input_shape=input_shape))
model.add(Activation("relu"))
model.add(MaxPooling2D(pool_size=(2, 2), strides=(2, 2), padding="same"))
model.add(Flatten())
model.add(Dense(1024))
model.add(Activation("relu"))
model.add(Dropout(0.5))
```

```
model.add(Dense(10))
model.add(Activation("softmax"))

model.compile(loss="categorical_crossentropy", optimizer="adam", metrics=["accuracy"]

print(model.summary())
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 28, 28, 32)        832

 activation (Activation)     (None, 28, 28, 32)        0

 max_pooling2d (MaxPooling2D  (None, 14, 14, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 14, 14, 64)        51264

 activation_1 (Activation)   (None, 14, 14, 64)        0

 max_pooling2d_1 (MaxPooling  (None, 7, 7, 64)         0
 2D)

 flatten (Flatten)           (None, 3136)              0

 dense (Dense)               (None, 1024)              3212288

 activation_2 (Activation)   (None, 1024)              0

 dropout (Dropout)           (None, 1024)              0

 dense_1 (Dense)             (None, 10)                10250

 activation_3 (Activation)   (None, 10)                0

=================================================================
Total params: 3,274,634
Trainable params: 3,274,634
Non-trainable params: 0
_________________________________________________________________
None
```

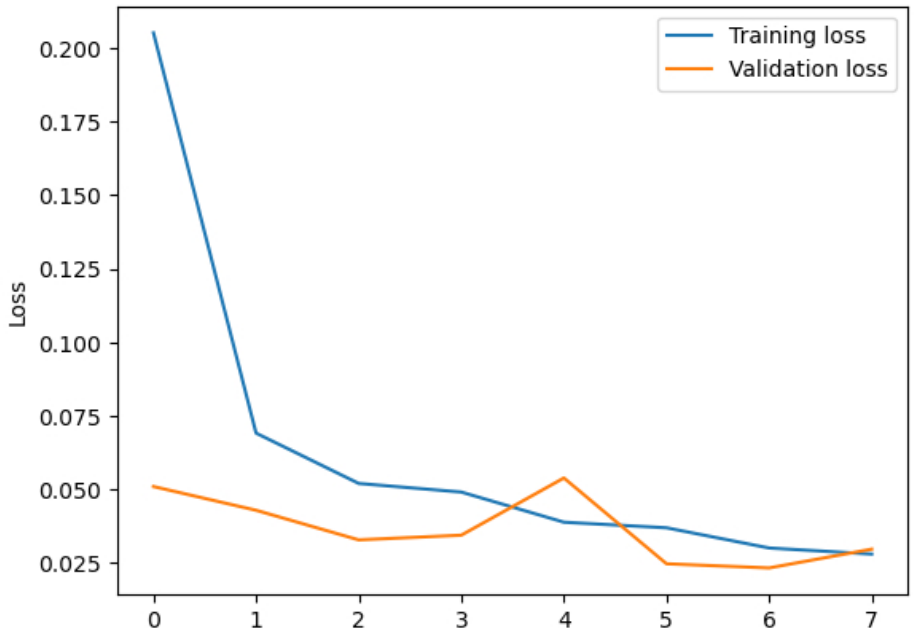
In [14]:
```
train_history = model.fit_generator(
    datagen_flow,
    epochs=epochs,
    steps_per_epoch=(len(X_train) / batch_size),
    validation_data=(X_valid, y_valid)
)
```

```
Epoch 1/8
C:₩Users₩user₩AppData₩Local₩Temp₩ipykernel_6052₩516153850.py:1: UserWarning: `Model.
fit_generator` is deprecated and will be removed in a future version. Please use `Mo
del.fit`, which supports generators.
  train_history = model.fit_generator(
590/590 [==============================] - 22s 36ms/step - loss: 0.2052 - accuracy:
0.9360 - val_loss: 0.0509 - val_accuracy: 0.9831
Epoch 2/8
590/590 [==============================] - 23s 39ms/step - loss: 0.0691 - accuracy:
0.9791 - val_loss: 0.0429 - val_accuracy: 0.9864
Epoch 3/8
590/590 [==============================] - 24s 40ms/step - loss: 0.0520 - accuracy:
0.9839 - val_loss: 0.0328 - val_accuracy: 0.9886
Epoch 4/8
590/590 [==============================] - 22s 38ms/step - loss: 0.0491 - accuracy:
0.9851 - val_loss: 0.0344 - val_accuracy: 0.9900
Epoch 5/8
590/590 [==============================] - 23s 38ms/step - loss: 0.0388 - accuracy:
0.9882 - val_loss: 0.0539 - val_accuracy: 0.9836
Epoch 6/8
590/590 [==============================] - 23s 39ms/step - loss: 0.0369 - accuracy:
```

```
0.9888 - val_loss: 0.0247 - val_accuracy: 0.9919
Epoch 7/8
590/590 [==============================] - 23s 38ms/step - loss: 0.0300 - accuracy:
0.9907 - val_loss: 0.0233 - val_accuracy: 0.9924
Epoch 8/8
590/590 [==============================] - 23s 38ms/step - loss: 0.0280 - accuracy:
0.9919 - val_loss: 0.0296 - val_accuracy: 0.9921
```

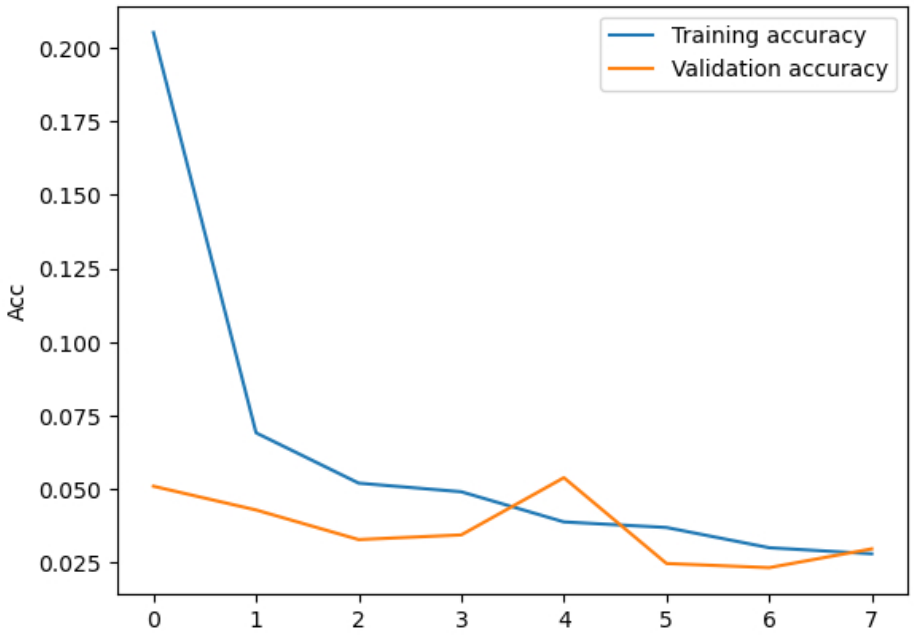
In [15]:
```
plt.plot(train_history.history["loss"], label="Training loss")
plt.plot(train_history.history["val_loss"], label="Validation loss")
plt.legend()
plt.ylabel('Loss')
```

Out[15]:
```
Text(0, 0.5, 'Loss')
```



In [16]:
```
plt.plot(train_history.history["loss"], label="Training accuracy")
plt.plot(train_history.history["val_loss"], label="Validation accuracy")
plt.legend()
plt.ylabel('Acc')
```

Out[16]:
```
Text(0, 0.5, 'Acc')
```

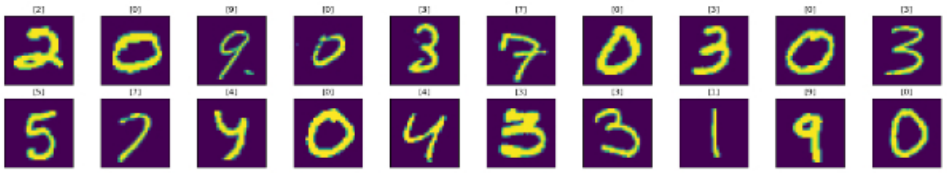


In [17]:
```
test = model.predict(X_test)
```

```
test_labels = np.argmax(test, axis=1)
```

```
875/875 [==============================] - 5s 5ms/step
```

In [18]:
```
fig = plt.figure(figsize=(25, 4))
for idx in np.arange(20):
    ax = fig.add_subplot(2, 10, idx+1, xticks=[], yticks=[])
    plt.imshow(X_test[idx].reshape(28, 28))
    ax.set_label([test_labels[idx]])
    ax.set_title([test_labels[idx]])
```



In [19]:
```
results = pd.Series(test_labels, name="Label")
submission = pd.concat([pd.Series(range(1,28001),name = "ImageId"), results],axis = 1
submission.to_csv("mnist_prediction.csv", index=False)
```