DEEP LEARNING

BY M.J.PASSLAR

COMPUTERONIC – TEHRAN – IRAN

2022

CHAPTER 9 : LET'S SOLVE A REAL PROBLEM

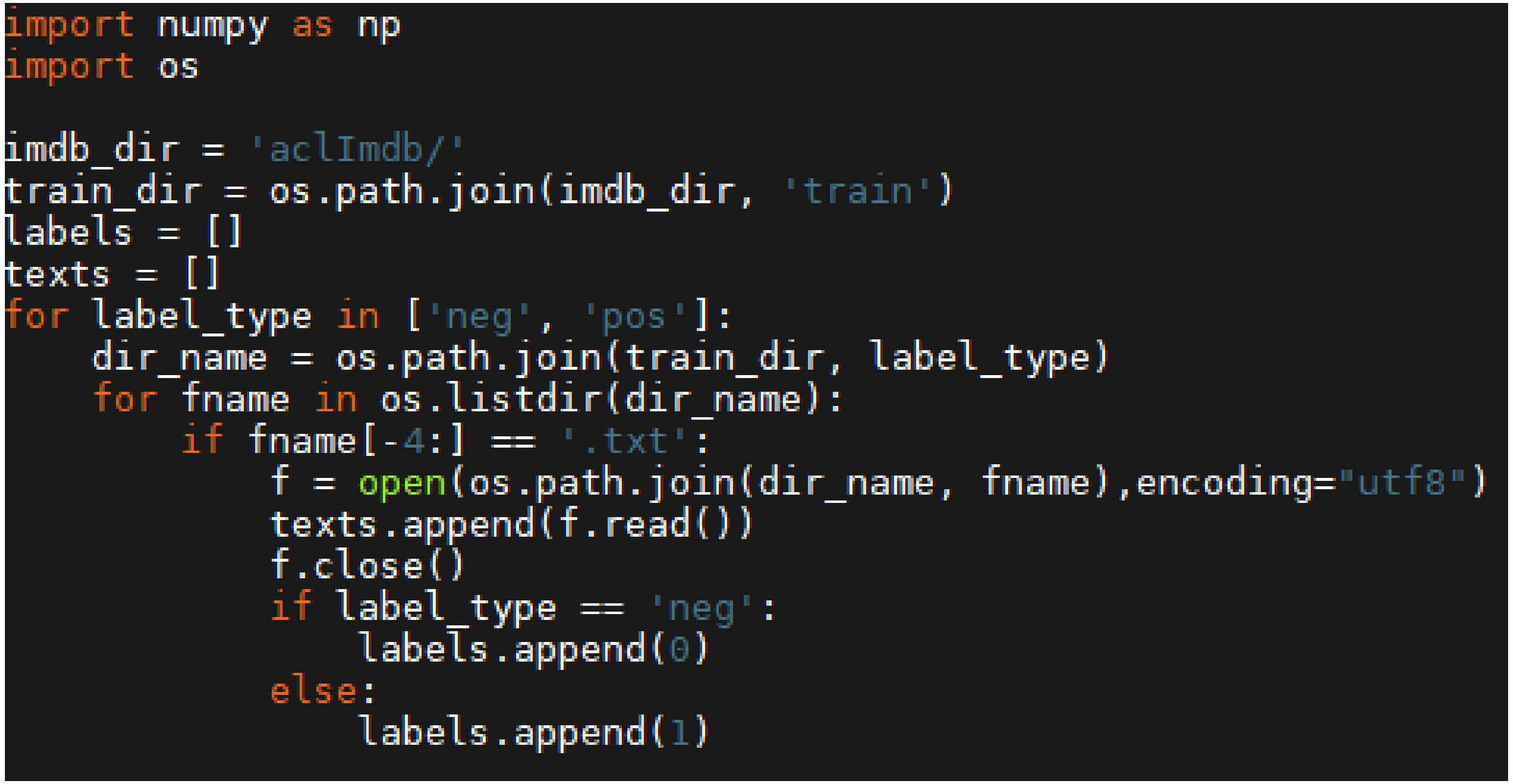
Downloading pre-trained word embeddings

- Word2Vec algorithm
  - In the early 200
  - Developed by Tomos Mikolov @ google in 2013
  - Download: https://code.google.com/archive/p/word2vec

- GloVe algorithm
  - Developed by Stanford research in 2014
  - Download: https://nlp.stanford.edu/projects/glove

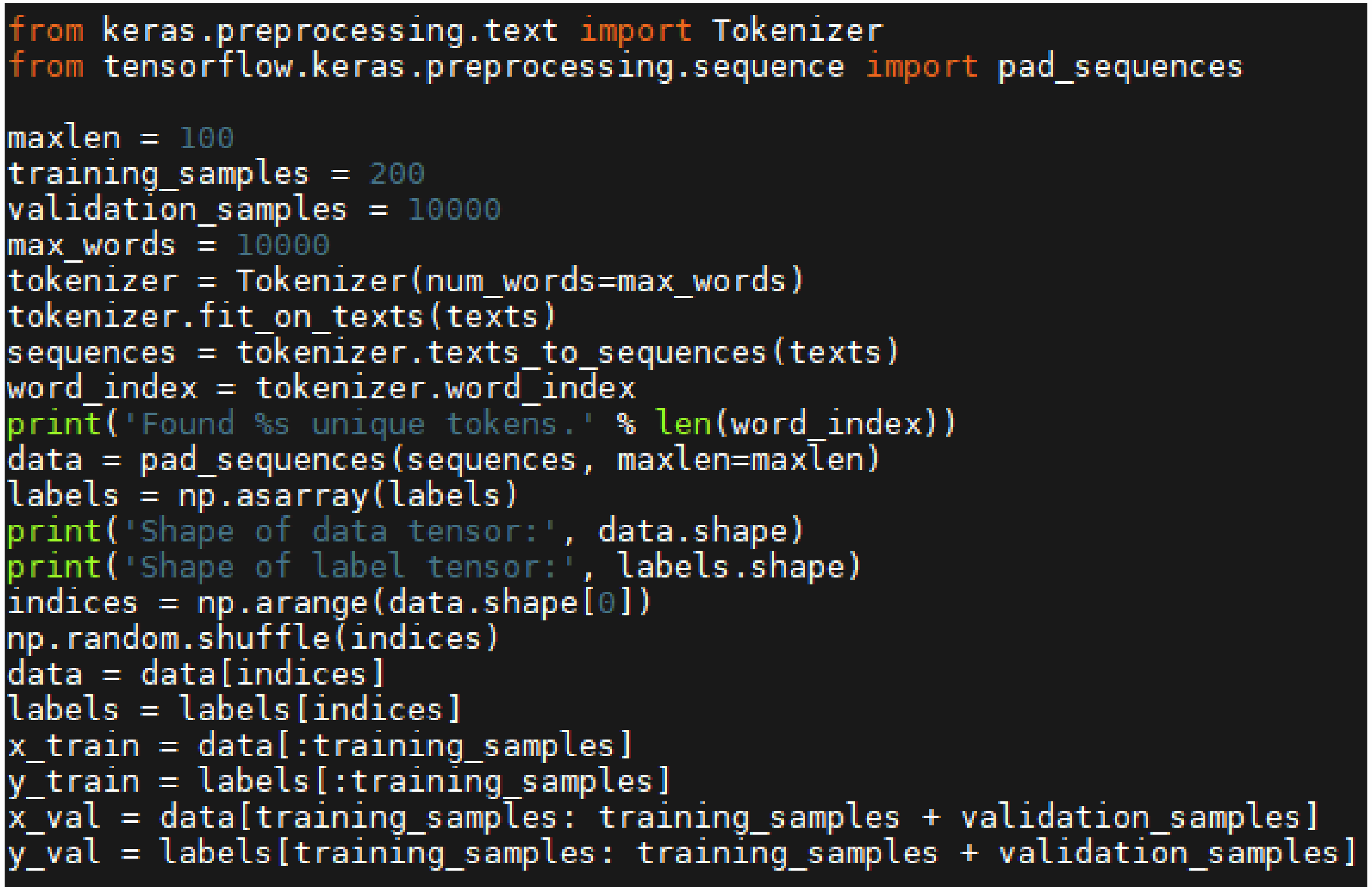
- Download the IMDB data set
  - Download: http://mng.bz/0tIo

Processing the labels of the raw IMDB data



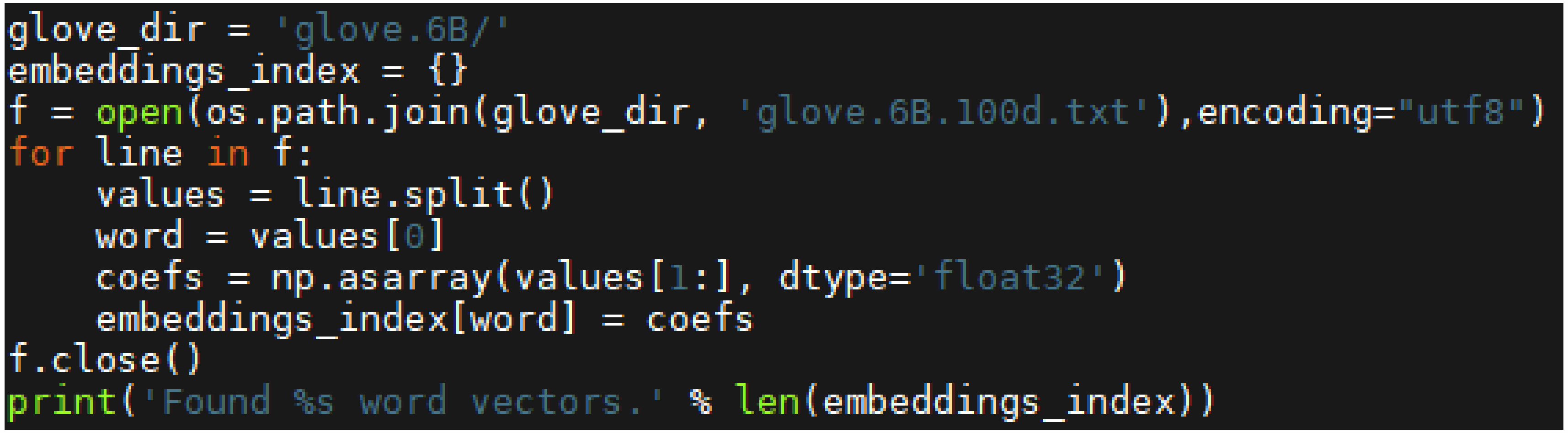
```python
import numpy as np
import os

imdb_dir = 'aclImdb/'
train_dir = os.path.join(imdb_dir, 'train')
labels = []
texts = []
for label_type in ['neg', 'pos']:
    dir_name = os.path.join(train_dir, label_type)
    for fname in os.listdir(dir_name):
        if fname[-4:] == '.txt':
            f = open(os.path.join(dir_name, fname),encoding="utf8")
            texts.append(f.read())
            f.close()
            if label_type == 'neg':
                labels.append(0)
            else:
                labels.append(1)
```

Tokenizing the text of the raw IMDB data



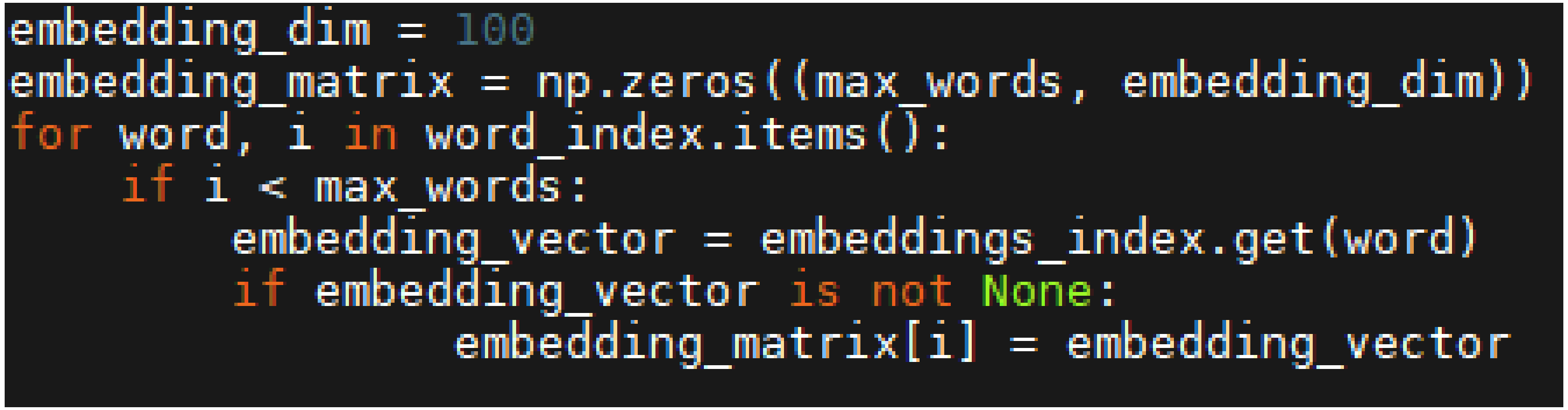
```
from keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences

maxlen = 100
training_samples = 200
validation_samples = 10000
max_words = 10000
tokenizer = Tokenizer(num_words=max_words)
tokenizer.fit_on_texts(texts)
sequences = tokenizer.texts_to_sequences(texts)
word_index = tokenizer.word_index
print('Found %s unique tokens.' % len(word_index))
data = pad_sequences(sequences, maxlen=maxlen)
labels = np.asarray(labels)
print('Shape of data tensor:', data.shape)
print('Shape of label tensor:', labels.shape)
indices = np.arange(data.shape[0])
np.random.shuffle(indices)
data = data[indices]
labels = labels[indices]
x_train = data[:training_samples]
y_train = labels[:training_samples]
x_val = data[training_samples: training_samples + validation_samples]
y_val = labels[training_samples: training_samples + validation_samples]
```

Processing the embeddings



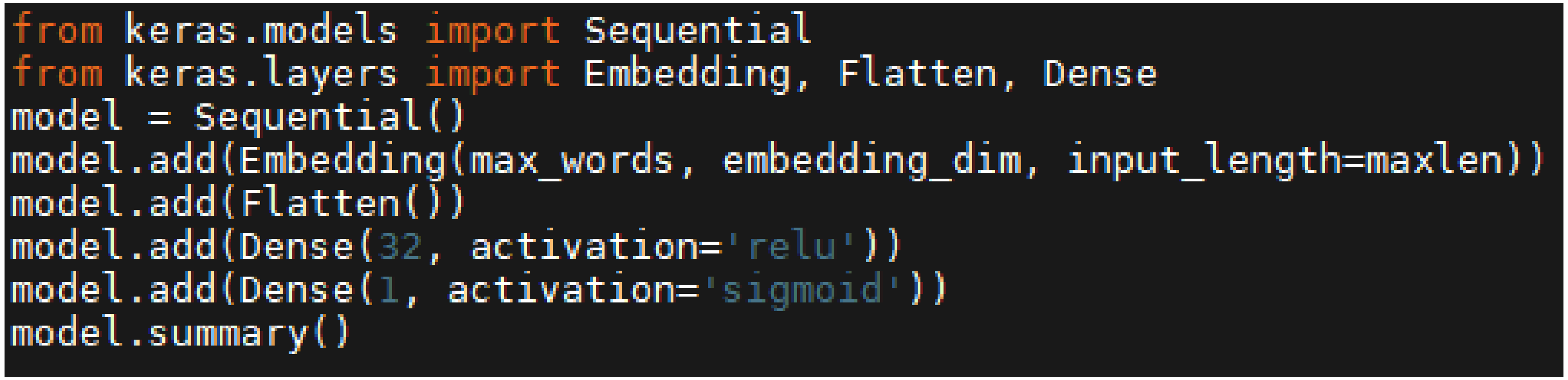
```
glove_dir = 'glove.6B/'
embeddings_index = {}
f = open(os.path.join(glove_dir, 'glove.6B.100d.txt'),encoding="utf8")
for line in f:
    values = line.split()
    word = values[0]
    coefs = np.asarray(values[1:], dtype='float32')
    embeddings_index[word] = coefs
f.close()
print('Found %s word vectors.' % len(embeddings_index))
```

Preparing the GloVe word-embeddings matrix



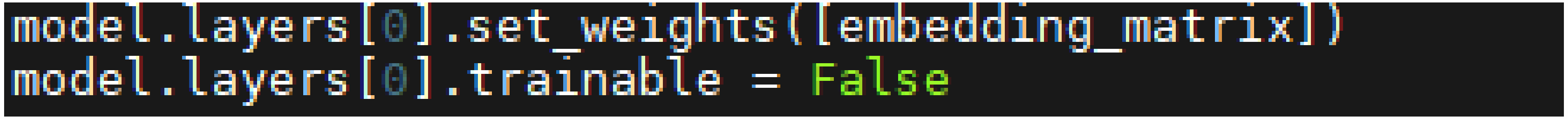
```python
embedding_dim = 100
embedding_matrix = np.zeros((max_words, embedding_dim))
for word, i in word_index.items():
    if i < max_words:
        embedding_vector = embeddings_index.get(word)
        if embedding_vector is not None:
            embedding_matrix[i] = embedding_vector
```

Model definition



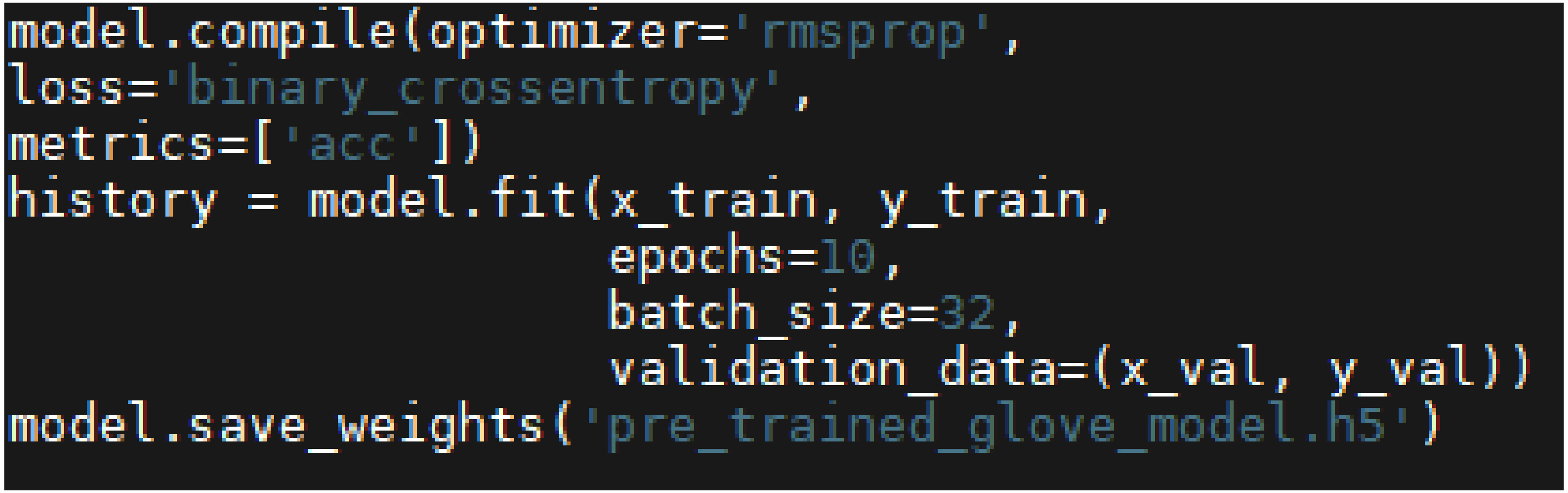
```
from keras.models import Sequential
from keras.layers import Embedding, Flatten, Dense
model = Sequential()
model.add(Embedding(max_words, embedding_dim, input_length=maxlen))
model.add(Flatten())
model.add(Dense(32, activation='relu'))
model.add(Dense(1, activation='sigmoid'))
model.summary()
```

Loading pretrained word embeddings into the Embedding layer



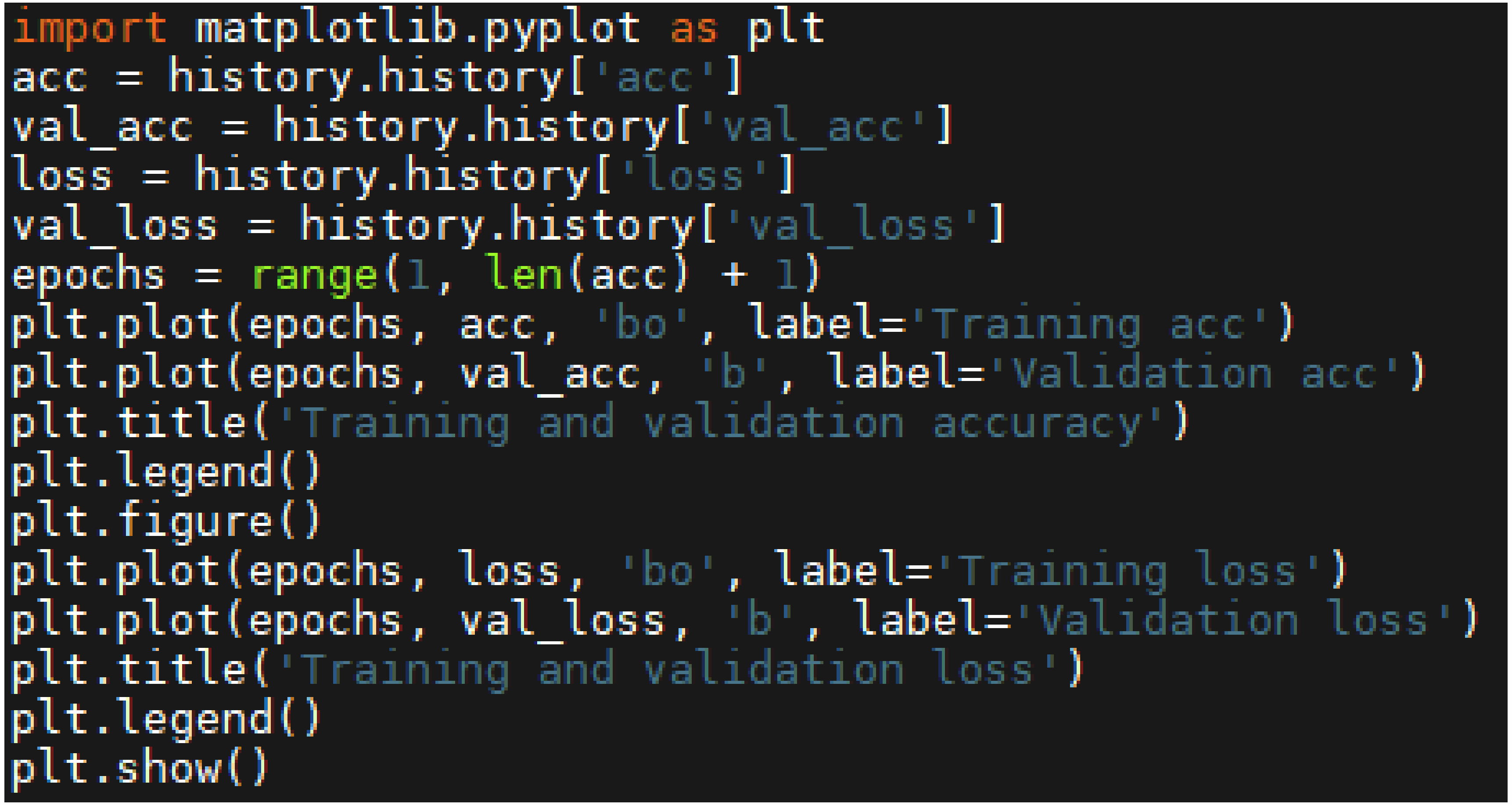
```
model.layers[0].set_weights([embedding_matrix])
model.layers[0].trainable = False
```

Training and evaluation



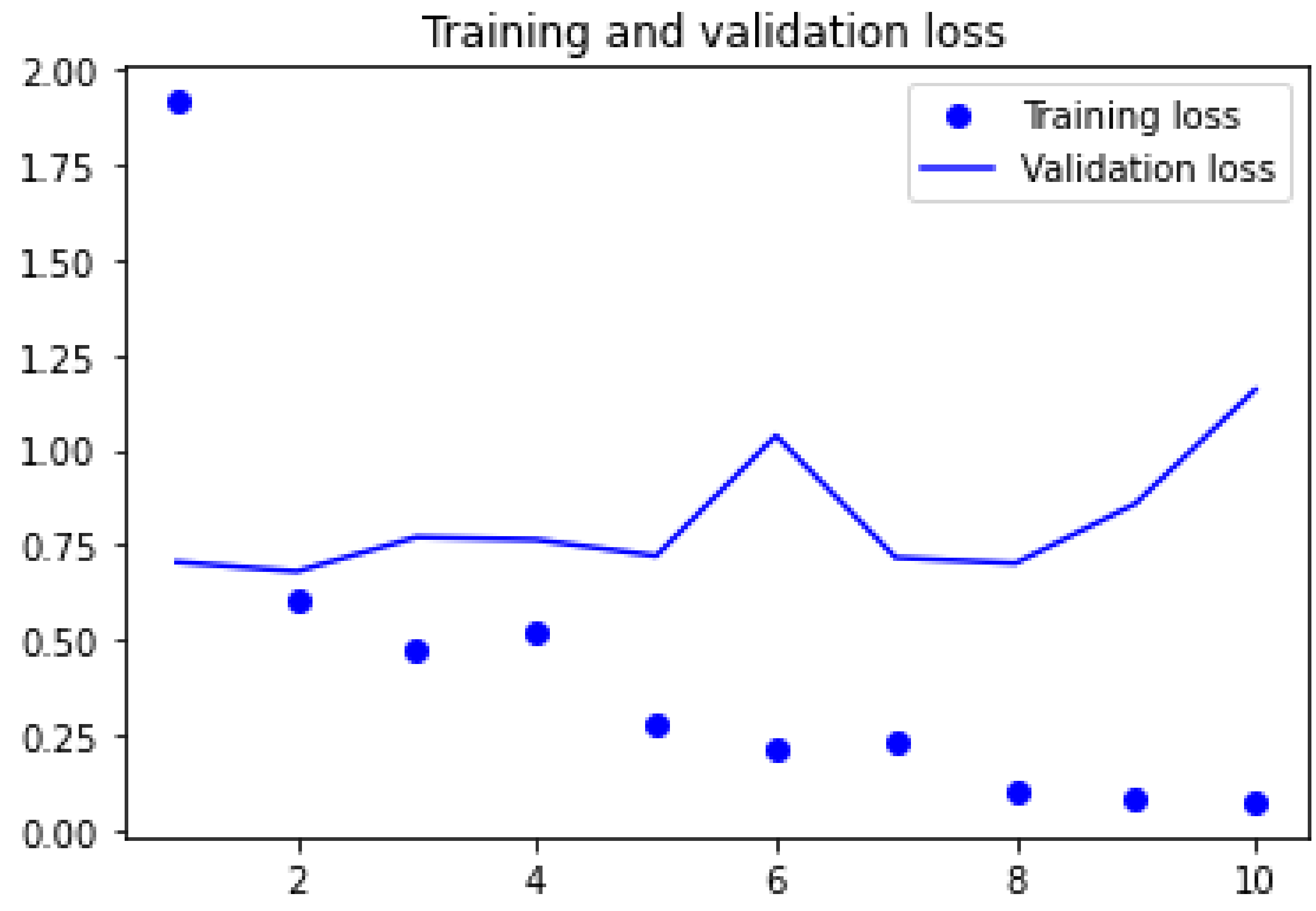
```
model.compile(optimizer='rmsprop',
loss='binary_crossentropy',
metrics=['acc'])
history = model.fit(x_train, y_train,
                    epochs=10,
                    batch_size=32,
                    validation_data=(x_val, y_val))
model.save_weights('pre_trained_glove_model.h5')
```

Plotting the results

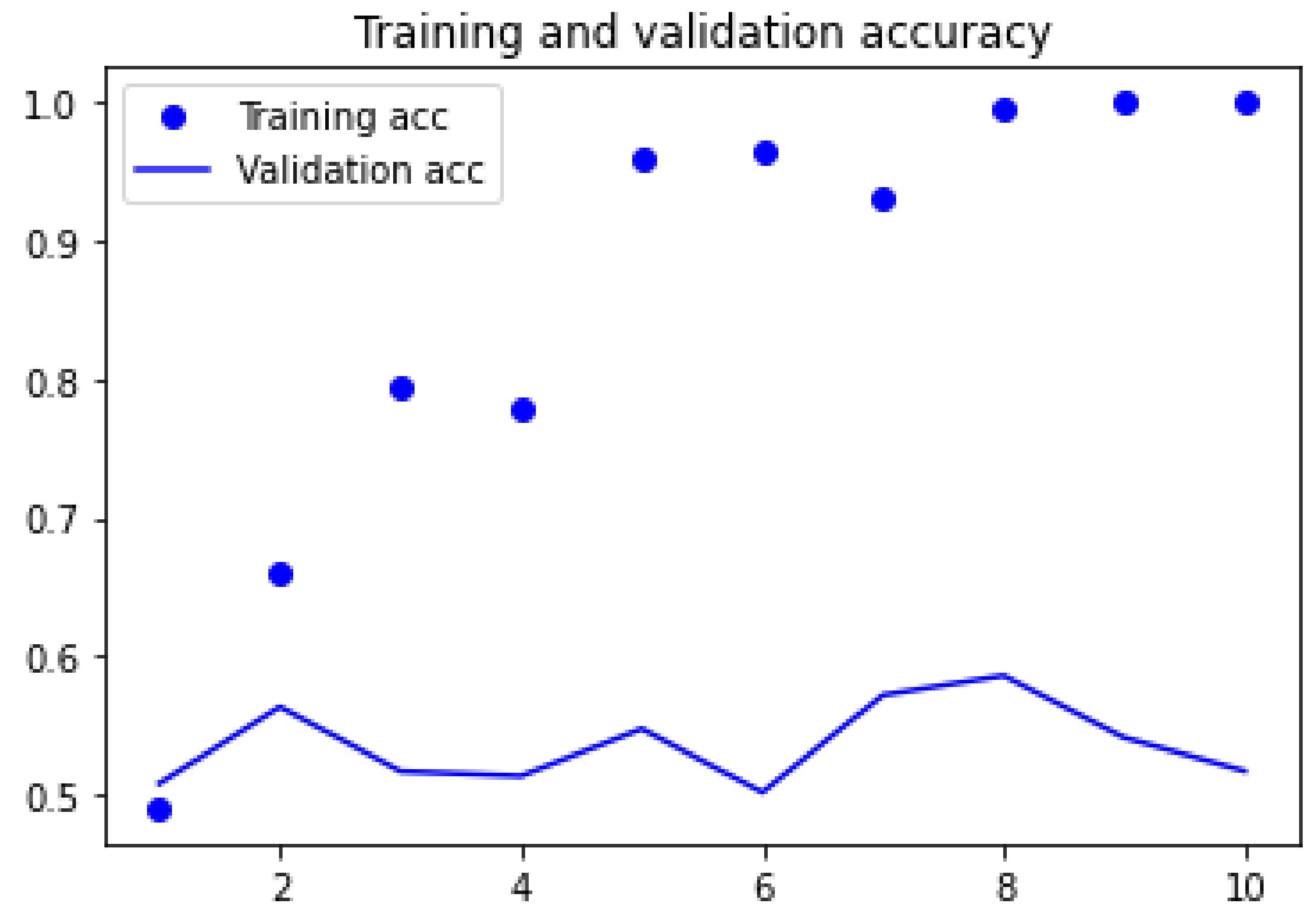


```
import matplotlib.pyplot as plt
acc = history.history['acc']
val_acc = history.history['val_acc']
loss = history.history['loss']
val_loss = history.history['val_loss']
epochs = range(1, len(acc) + 1)
plt.plot(epochs, acc, 'bo', label='Training acc')
plt.plot(epochs, val_acc, 'b', label='Validation acc')
plt.title('Training and validation accuracy')
plt.legend()
plt.figure()
plt.plot(epochs, loss, 'bo', label='Training loss')
plt.plot(epochs, val_loss, 'b', label='Validation loss')
plt.title('Training and validation loss')
plt.legend()
plt.show()
```

Loss – model with pretrained word-embedding

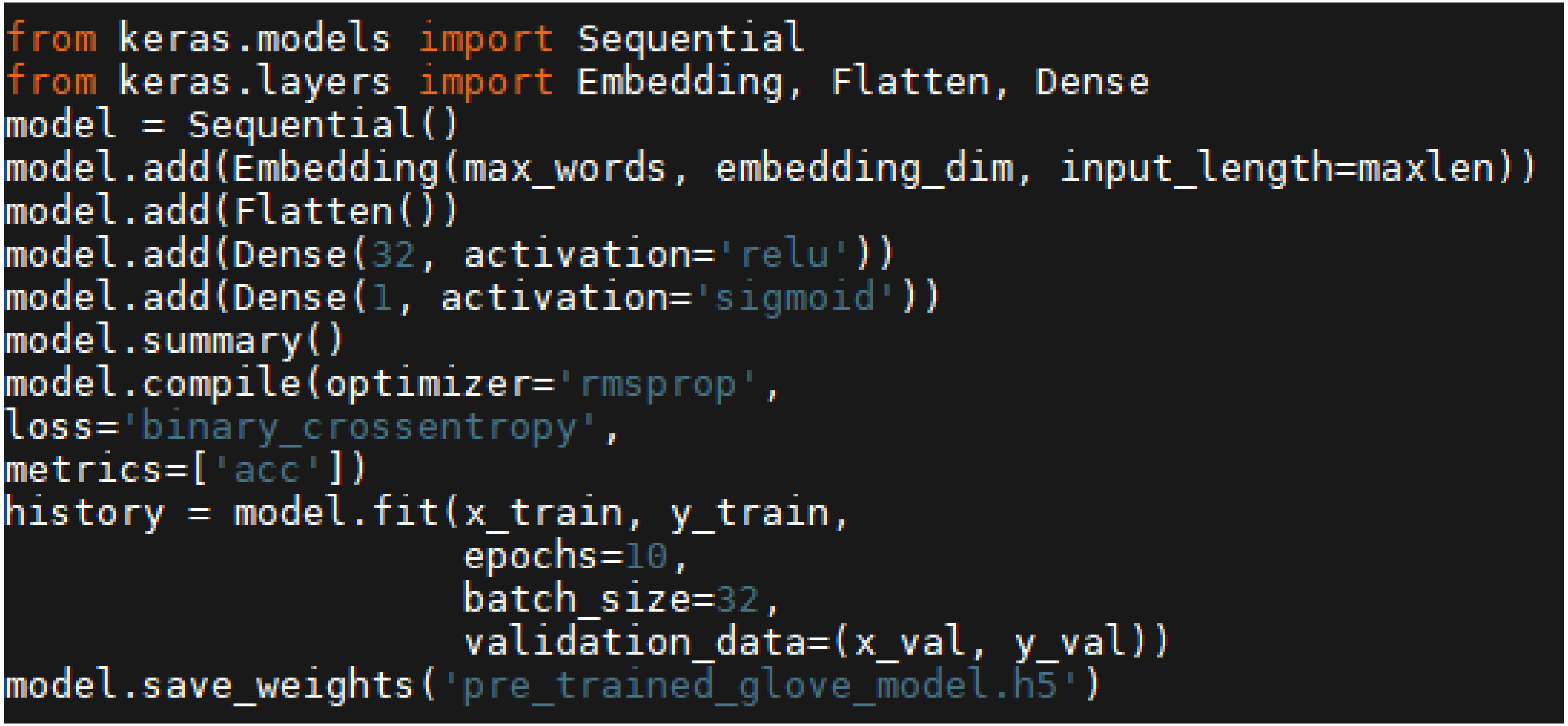


Accuracy – model with pretrained word-embedding



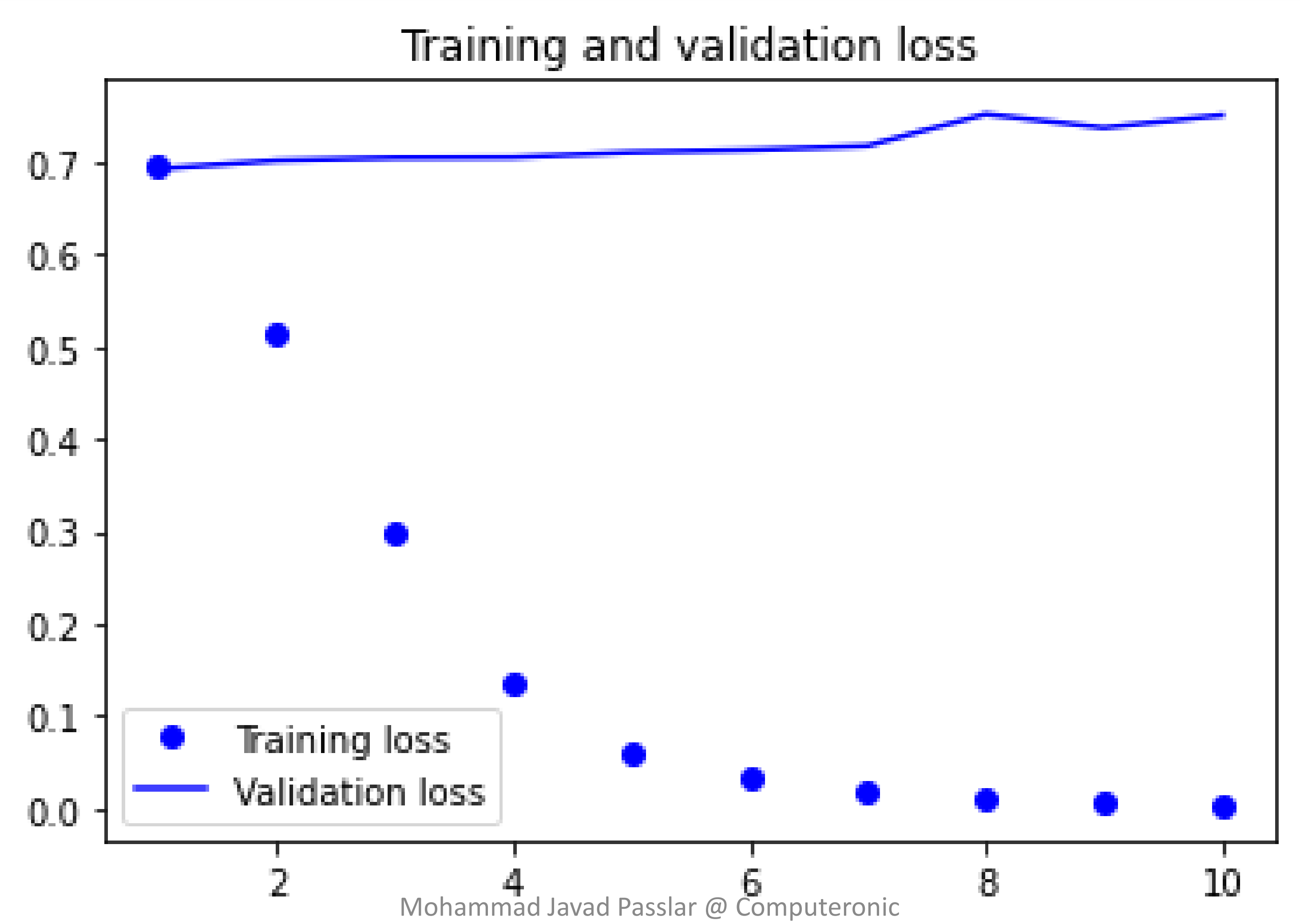
Mohammad Javad Passlar @ Computeronic

Let's remove pretrained embedding layer...



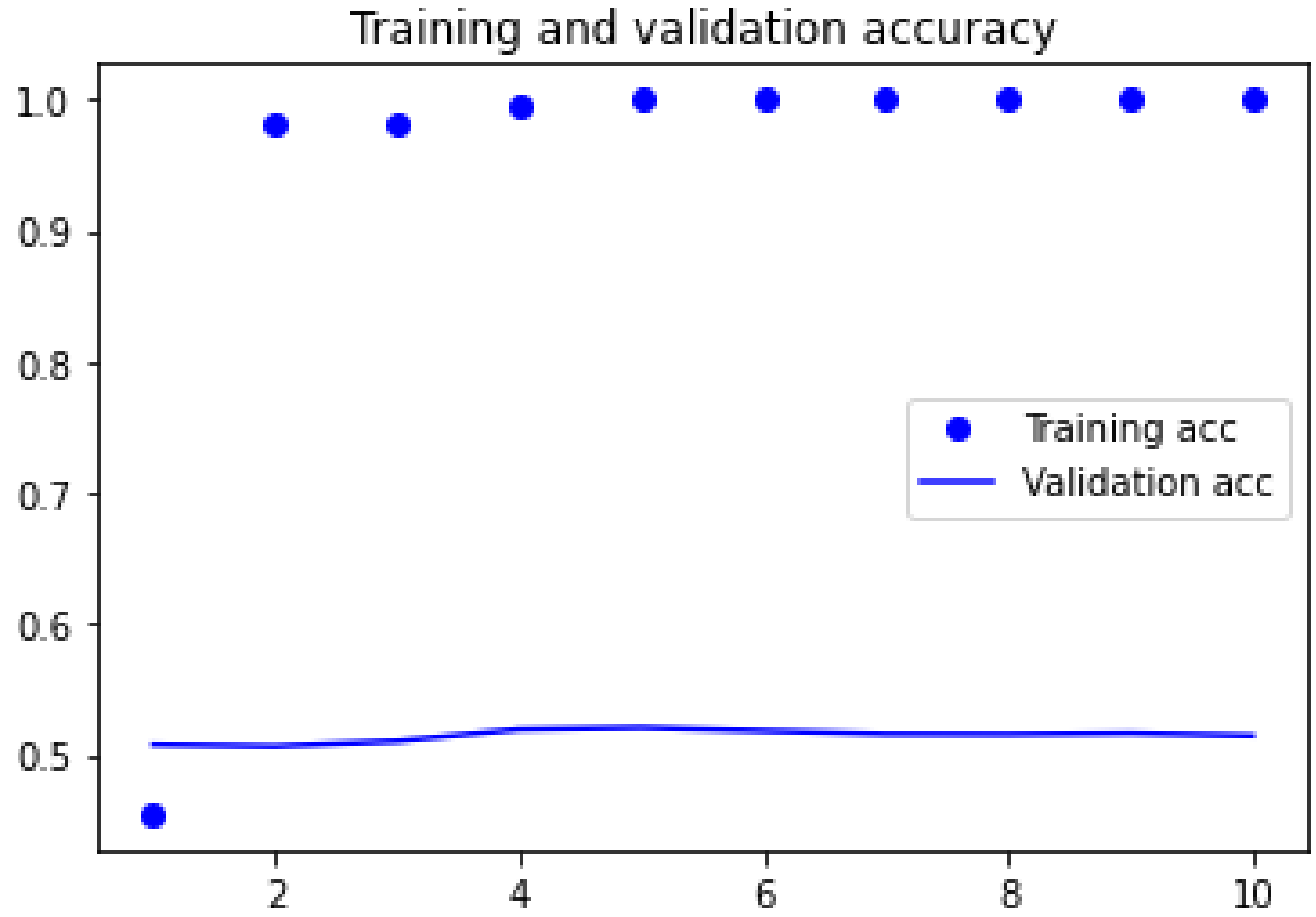
```
from keras.models import Sequential
from keras.layers import Embedding, Flatten, Dense
model = Sequential()
model.add(Embedding(max_words, embedding_dim, input_length=maxlen))
model.add(Flatten())
model.add(Dense(32, activation='relu'))
model.add(Dense(1, activation='sigmoid'))
model.summary()
model.compile(optimizer='rmsprop',
loss='binary_crossentropy',
metrics=['acc'])
history = model.fit(x_train, y_train,
                    epochs=10,
                    batch_size=32,
                    validation_data=(x_val, y_val))
model.save_weights('pre_trained_glove_model.h5')
```

Loss - model with-out pretrained word-embedding



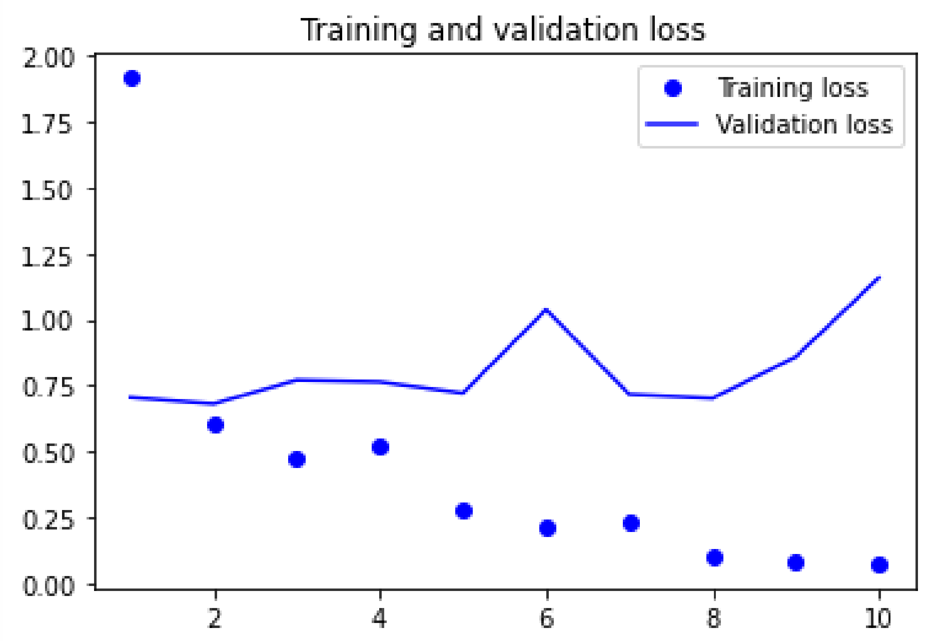
Mohammad Javad Passlar @ Computeronic

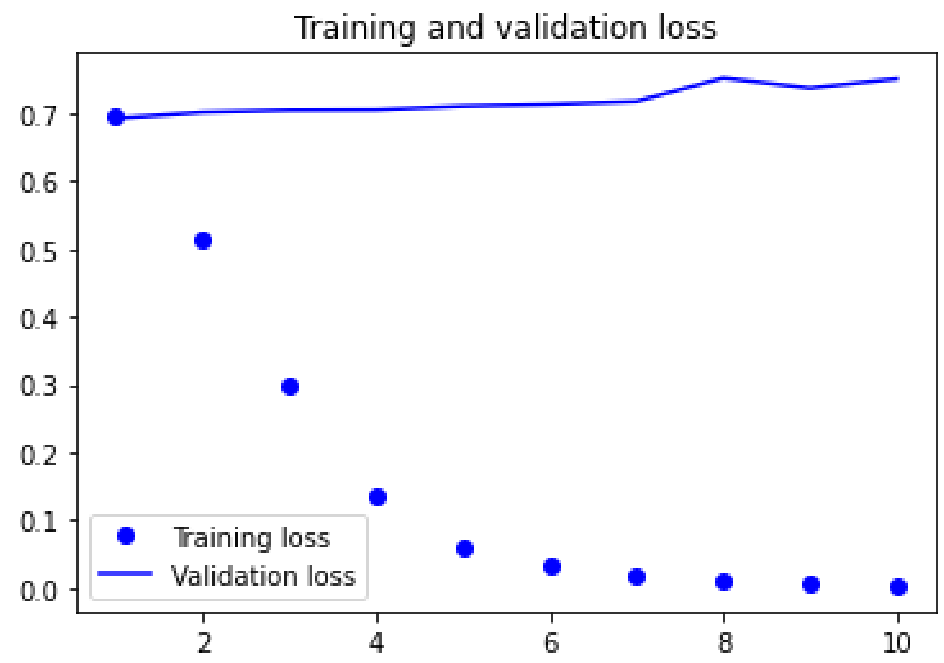
Accuracy – model with-out pretrained word-embedding



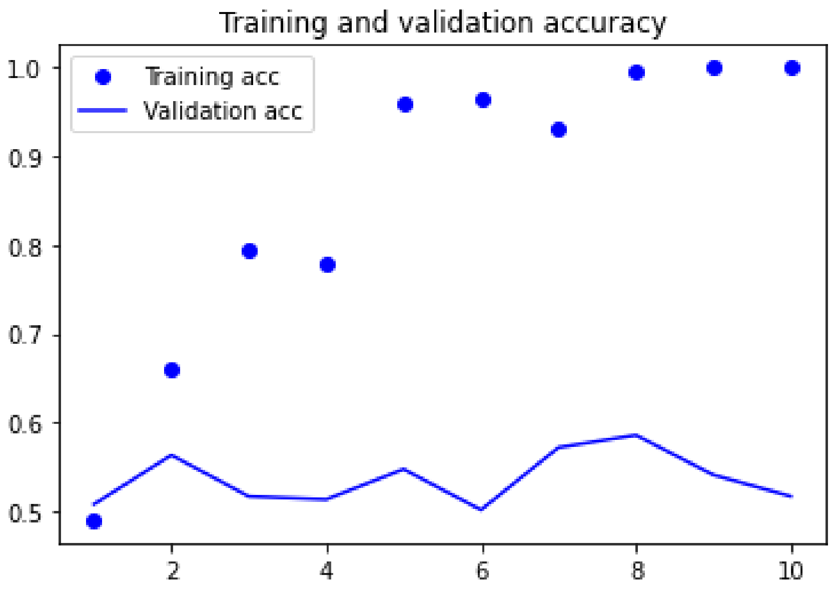
Mohammad Javad Passlar @ Computeronic

Which is the best ? - Loss

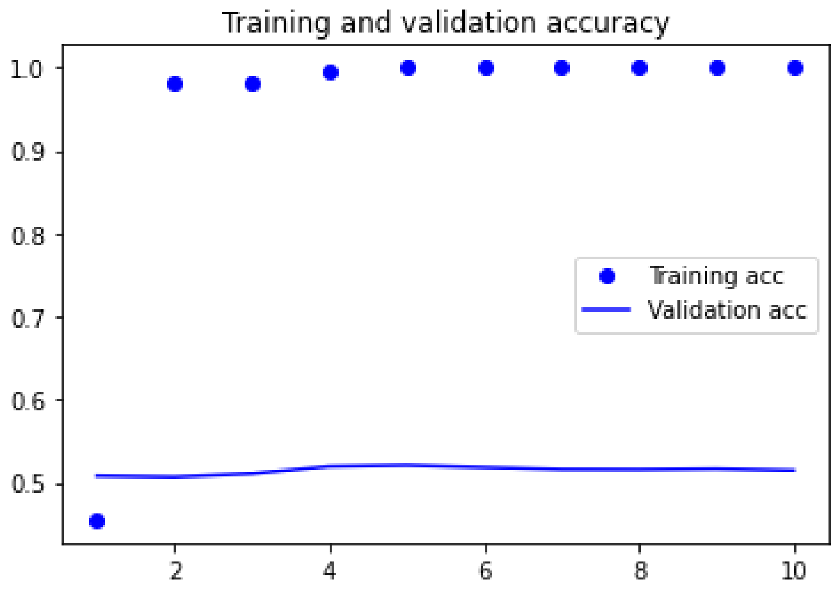




Which is the best ? - Accuracy



Training and validation accuracy



Training and validation accuracy