cnn

August 29, 2018

1 Convolution Neural Network - Chess Prediction

- Seung Hyun Kim (skim449)
- Last run : 8/29 .18

```
In [1]: %matplotlib inline

        import tensorflow as tf
        import numpy as np

        import matplotlib.pyplot as plt

        import loader
```

```
/Users/skim0119/github/chess_godeep/venv/lib/python3.6/importlib/_bootstrap.py:219: RuntimeWarni
  return f(*args, **kwds)
```

```
In [2]: # Pepare Dataset
        x_dataset, t_dataset = loader.load()
```

```
388405 data loaded
```

```
In [3]: # Test Train Split
        nData = len(x_dataset)
        train_ratio = 0.8
        indices = np.arange(nData)
        np.random.shuffle(indices)
        train_idx, test_idx = indices[:int(nData*train_ratio)], indices[int(nData*train_ratio):]
        x_train, t_train, x_test, t_test = x_dataset[train_idx,:], t_dataset[train_idx,:], \
                                           x_dataset[test_idx,:], t_dataset[test_idx,:]
```

```
In [4]: def batch_data(size, x_train, t_train):
            """
            This method pulls mini-batch from x_train and t_train
            """
            sup_index = len(x_train)
            indices = np.random.randint(0,sup_index,size)
            return x_train[indices], t_train[indices]
```

```
In [6]: #Graph
        tf.reset_default_graph()

        x = tf.placeholder(tf.float32, shape=(None, 8, 8, 6)) # input layer (one-hot board)
        t = tf.placeholder(tf.float32, shape=(None, 2)) # return probability of winning (sigmoid

        global_step = tf.Variable(0, trainable=False, name='global_step')

        with tf.name_scope('conv1'):
            # First convolution filter with kernel size 2x2, and pool by 2x2
            # input : [8, 8, 6]
            # output : [4,4,24]
            kernel_1 = tf.Variable(tf.random_uniform([2,2,6,24], -1.0, 1.0))
            conv1 = tf.nn.conv2d(x,
                                 kernel_1,
                                 strides=[1,1,1,1],
                                 padding = 'SAME')
            conv1_act = tf.nn.relu(conv1)
            conv1_pool = tf.nn.max_pool(conv1_act,
                                        ksize=[1,2,2,1],
                                        strides=[1,2,2,1],
                                        padding = 'SAME')
            #x = tf.nn.dropout(x, 0.5)

        with tf.name_scope('conv2'):
            # Second convolution filter with kernel size 2x2
            # input : [4,4,24]
            # output : [4,4,48]
            kernel_2 = tf.Variable(tf.random_uniform([2,2,24,48], -1.0, 1.0))
            conv2 = tf.nn.conv2d(conv1_pool,
                                 kernel_2,
                                 strides=[1,1,1,1],
                                 padding = 'SAME')
            conv2_act = tf.nn.relu(conv2)

        with tf.name_scope('Dense1'):
            length = 4*4*48
            x_flat = tf.reshape(conv2_act, [-1,length]) # flatten
            weight_1 = tf.Variable(tf.truncated_normal(shape=[length, 2]))
            bias_1 = tf.Variable(tf.truncated_normal(shape=[2]))
            dense1 = tf.matmul(x_flat, weight_1) + bias_1
            output = tf.sigmoid(dense1)
        """
        with tf.name_scope('Dense2'):
            # softmax
            weight_2 = tf.Variable(tf.truncated_normal(shape=[length, 2]))
            bias_2 = tf.Variable(tf.truncated_normal(shape=[2]))
            dense2 = tf.matmul(dense1, weight_2) + bias_2
            output = tf.sigmoid(dense2)
        """
        with tf.name_scope('optimizer'):
            Loss = tf.reduce_mean(tf.square(output - t))
            Optimizer = tf.train.AdamOptimizer().minimize(Loss, global_step=global_step)
            tf.summary.scalar('loss', Loss)

        # Save
        merged = tf.summary.merge_all()

In [7]: # Session
        sess = tf.Session()
        saver = tf.train.Saver(tf.global_variables())

        writer = tf.summary.FileWriter('./logs', sess.graph)

        ckpt = tf.train.get_checkpoint_state('./model')
        if ckpt and tf.train.checkpoint_exists(ckpt.model_checkpoint_path):
            saver.restore(sess, ckpt.model_checkpoint_path)
        else:
            sess.run(tf.global_variables_initializer())

        loss_table = []
        pred_table = []

        # Epoch
        max_epoch = 100000
        prediction_sample_size = 1000
        batch_size = 50
        progbar = tf.keras.utils.Progbar(max_epoch)
        for epoch in range(max_epoch):
            progbar.update(epoch) # update progress bar

            x_train_batch, t_train_batch = batch_data(batch_size, x_train, t_train)

            feed_dict = {x:x_train_batch, t:t_train_batch}
            _, loss = sess.run([Optimizer, Loss], feed_dict=feed_dict)


            if epoch % 100 == 0:
                loss_table.append(loss)
               #print("\n", epoch, "epoch, Loss : ", loss)
                summary = sess.run(merged, feed_dict=feed_dict)
                writer.add_summary(summary, global_step=sess.run(global_step))

                # run prediction with test
                x_test_batch, t_test_batch = batch_data(prediction_sample_size, x_test, t_test)
                result = sess.run(output, feed_dict={x:x_test_batch})
                is_correct = np.equal(result.argmax(1), t_test_batch.argmax(1))
                pred_table.append(sum(is_correct)/prediction_sample_size)
                """
                correct_prediction = 0
                for i in range(prediction_sample_size):
                    if (result[i][0] > result[i][1] and t_test_batch[i][0]) \
                        or (result[i][0] < result[i][1] and t_test_batch[i][1]):
                        correct_prediction += 1
                pred_table.append(correct_prediction / prediction_sample_size)
                """
            if epoch % 10000 == 0:
                saver.save(sess, './model/chess.ckpt', global_step=global_step)

        saver.save(sess, './model/chess.ckpt', global_step=global_step)
```

```
 99992/100000 [============================>.] - ETA: 0s
```

Out[7]: './model/chess.ckpt-100000'

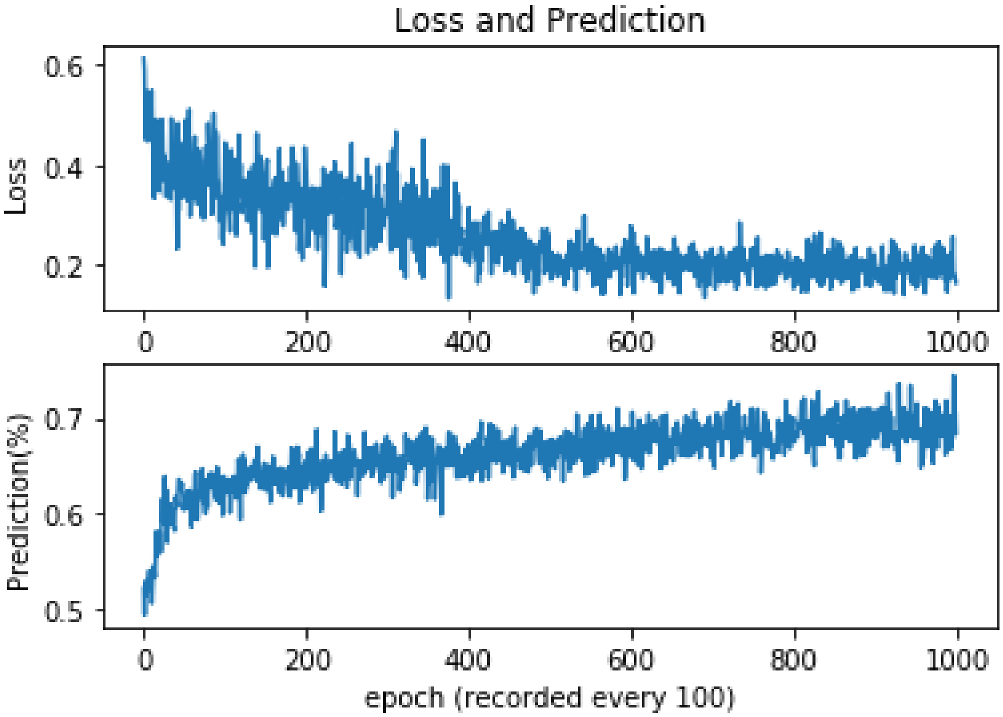
In [8]:

```
# Pred/Loss Graph
plt.subplot(2, 1, 1)
plt.plot(loss_table)
plt.title('Loss and Prediction')
plt.ylabel('Loss')

plt.subplot(2, 1, 2)
plt.plot(pred_table)
plt.xlabel('epoch (recorded every 100)')
plt.ylabel('Prediction(%)')

print('Average of Last 10 Loss : ', sum(loss_table[-10:])/10)
print('Last Prediction : ', "{0:0.2f}".format(pred_table[-1]*100),'%')
```

```
Average of Last 10 Loss :  0.19849198311567307
Last Prediction :  68.40 %
```


Loss and Prediction
Loss
0.6
0.4
0.2
0
200
400
600
800
1000
Prediction(%)
0.7
0.6
0.5
0
200
400
600
800
1000
epoch (recorded every 100)