Pruning Multiple neurons at one play

March 28, 2017

Compute the performance of MAB methods of pruning Multiple neurons at one time
MAP for choosing multi arms at one time

In [5]:
```
import numpy as np
import time
import sys
from numpy import *
import matplotlib.pyplot as plt
from sklearn import metrics
%matplotlib inline
#plt.rcParams['figure.figsize'] = (15, 6)
```

1 Load Bokeh

In [6]:
```
from bokeh.layouts import row, gridplot
from bokeh.plotting import figure, output_notebook, show
from bokeh.models import Legend
TOOLS = 'box_zoom,box_select,crosshair,resize,reset,lasso_select,pan,save,poly_select,ta
output_notebook()
```

2 Load the data

In [7]:
```
X_train = np.load('./adult/X_train.npy')
y_train = np.load('./adult/y_train.npy')
X_test = np.load('./adult/X_test.npy')
y_test = np.load('./adult/y_test.npy')
X_deploy = np.load('./adult/X_deploy.npy')
y_deploy = np.load('./adult/y_deploy.npy')
print('Number of training examples',len(X_train))
print('Number of validation examples',len(X_test))
print('Number of testing examples',len(X_deploy))
```

```
Number of training examples 17712
Number of validation examples 4428
Number of testing examples 3908
```

In [8]:
```
exec(open("core.py").read())  # pyhton 3x
```

2.1 Run Thompson Sampling pruning Algorithm

```
In [9]: algo = Thompson_Sampling([], [])
        Alg_name = 'Thompson_Sampling Algorithm'
        path = './Thompson_Sampling/'
        sys.path.append("./Thompson_Sampling")
        exec(open("mnist_cnnFORTESTING.py").read())
```

```
/Library/Frameworks/Python.framework/Versions/3.6/lib/python3.6/site-packages/sklearn/cross_vali
  "This module will be removed in 0.20.", DeprecationWarning)
Using Theano backend.


Test fraction correct (NN-Score) = 0.35
Test fraction correct (NN-Accuracy) = 0.84
The time for running this method is 0.8135659694671631 seconds
Finsh playing start pruining:
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
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Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.83
Test after pruning= 0.81
Test after pruning= 0.82
Test after pruning= 0.81
Test after pruning= 0.82
Test after pruning= 0.81
Test after pruning= 0.80
Test after pruning= 0.79
Test after pruning= 0.78
Test after pruning= 0.77
Test after pruning= 0.77
Test after pruning= 0.77
Test after pruning= 0.76
Test after pruning= 0.75
Test after pruning= 0.75
Test after pruning= 0.74
Test after pruning= 0.74
Test after pruning= 0.74
Test after pruning= 0.74
Test after pruning= 0.74
```
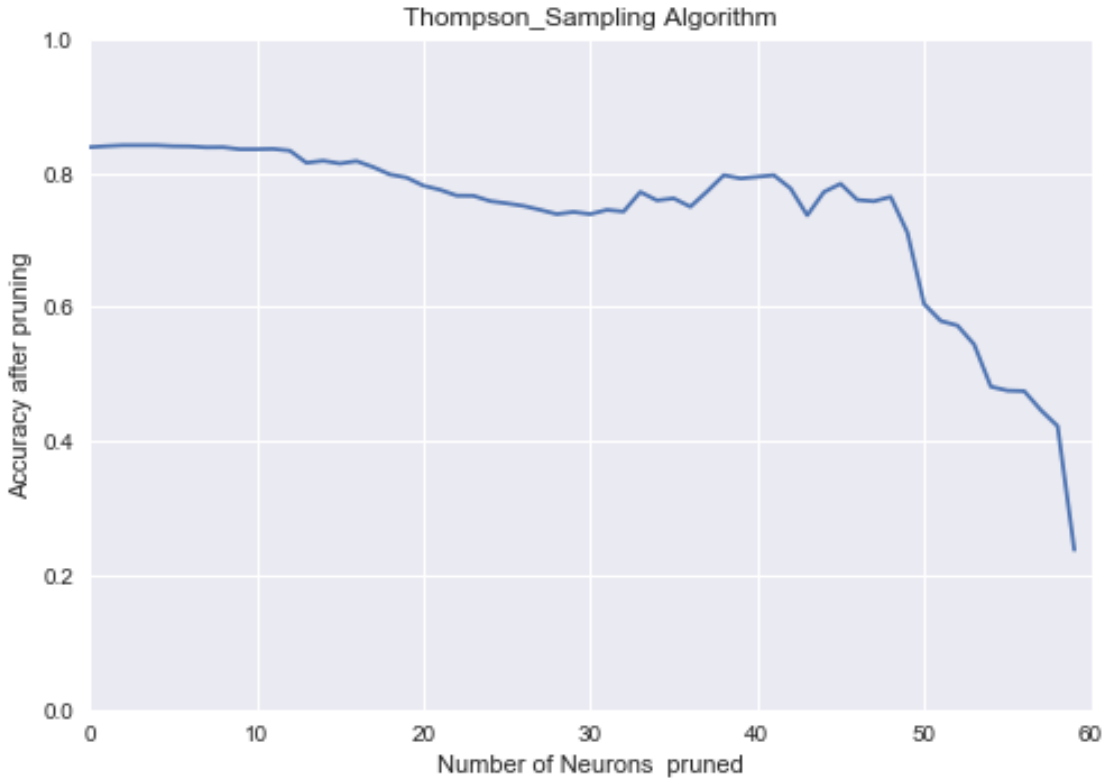

```
Test after pruning= 0.74
Test after pruning= 0.77
Test after pruning= 0.76
Test after pruning= 0.76
Test after pruning= 0.75
Test after pruning= 0.77
Test after pruning= 0.80
Test after pruning= 0.79
Test after pruning= 0.79
Test after pruning= 0.80
Test after pruning= 0.78
Test after pruning= 0.74
Test after pruning= 0.77
Test after pruning= 0.78
Test after pruning= 0.76
Test after pruning= 0.76
Test after pruning= 0.76
Test after pruning= 0.71
Test after pruning= 0.60
Test after pruning= 0.58
Test after pruning= 0.57
Test after pruning= 0.54
Test after pruning= 0.48
Test after pruning= 0.48
Test after pruning= 0.47
Test after pruning= 0.45
Test after pruning= 0.42
Test after pruning= 0.24
```



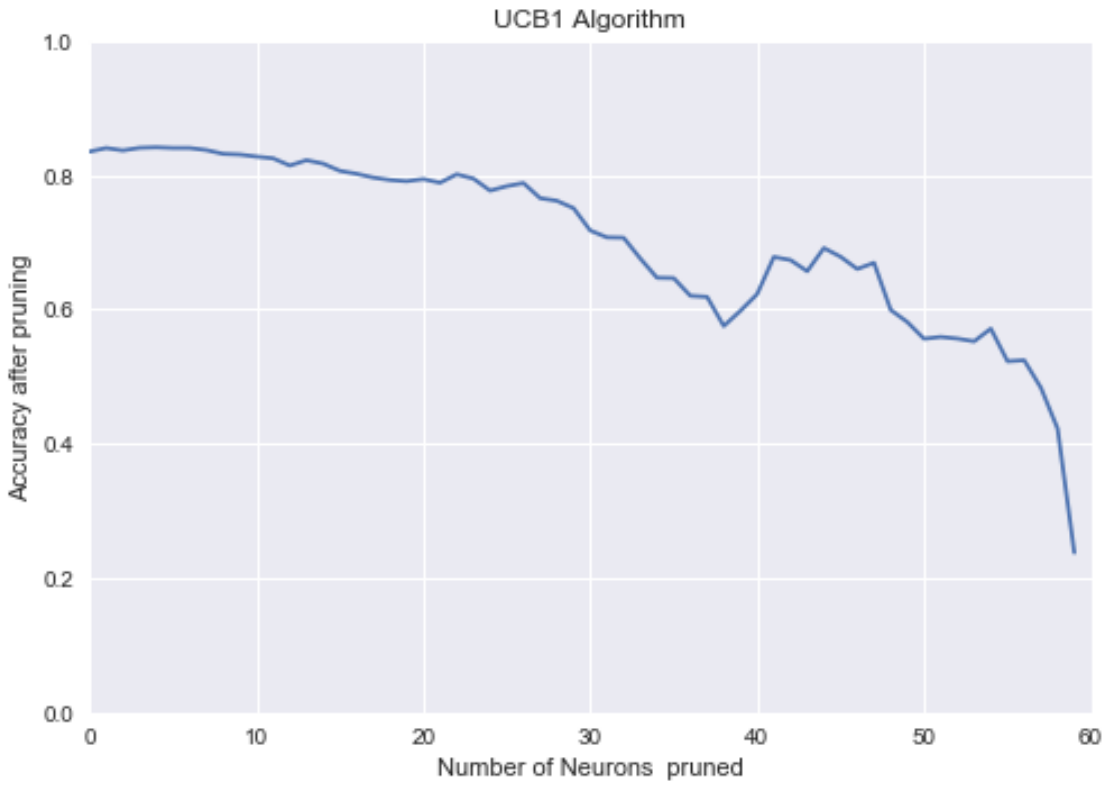
2.2 Run UCB1 pruning Algorithm

```
In [10]: algo = UCB1([], [])
         Alg_name = 'UCB1 Algorithm'
         path = './UCB1/'
         sys.path.append("./UCB1")
         exec(open("mnist_cnnFORTESTING.py").read())
```

```
Test fraction correct (NN-Score) = 0.35
Test fraction correct (NN-Accuracy) = 0.84
The time for running this method is 0.8126180171966553 seconds
Finsh playing start pruining:
Test after pruning= 0.83
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.84
Test after pruning= 0.83
Test after pruning= 0.83
```

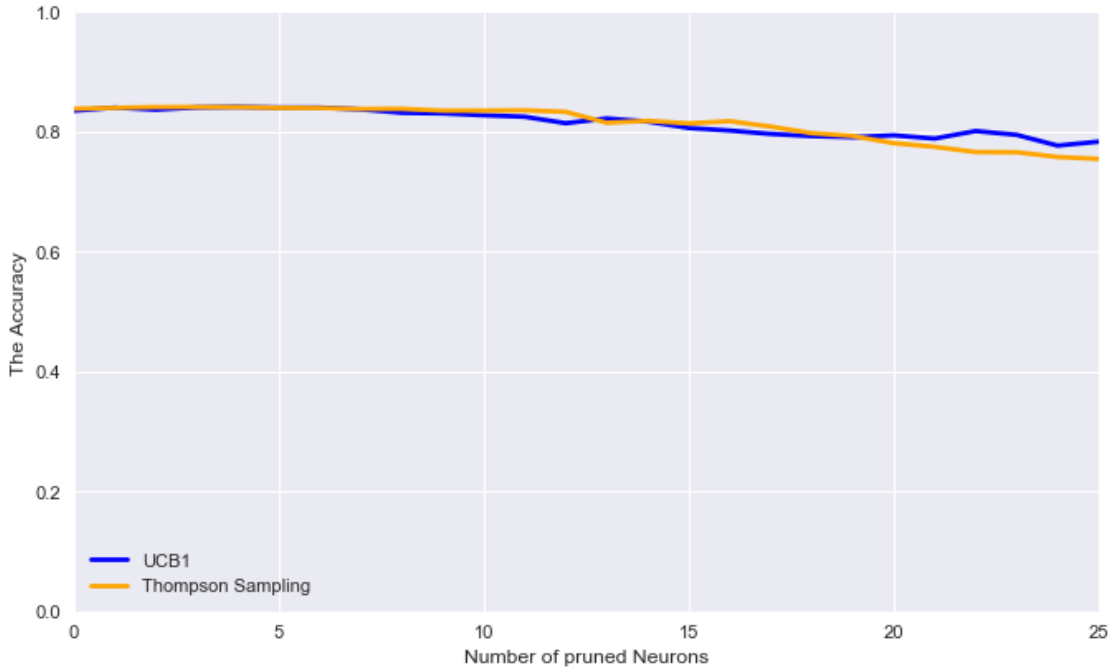
```
Test after pruning= 0.83
Test after pruning= 0.82
Test after pruning= 0.81
Test after pruning= 0.82
Test after pruning= 0.82
Test after pruning= 0.81
Test after pruning= 0.80
Test after pruning= 0.80
Test after pruning= 0.79
Test after pruning= 0.79
Test after pruning= 0.79
Test after pruning= 0.79
Test after pruning= 0.80
Test after pruning= 0.79
Test after pruning= 0.78
Test after pruning= 0.78
Test after pruning= 0.79
Test after pruning= 0.77
Test after pruning= 0.76
Test after pruning= 0.75
Test after pruning= 0.72
Test after pruning= 0.71
Test after pruning= 0.71
Test after pruning= 0.68
Test after pruning= 0.65
Test after pruning= 0.65
Test after pruning= 0.62
Test after pruning= 0.62
Test after pruning= 0.58
Test after pruning= 0.60
Test after pruning= 0.62
Test after pruning= 0.68
Test after pruning= 0.67
Test after pruning= 0.66
Test after pruning= 0.69
Test after pruning= 0.68
Test after pruning= 0.66
Test after pruning= 0.67
Test after pruning= 0.60
Test after pruning= 0.58
Test after pruning= 0.56
Test after pruning= 0.56
Test after pruning= 0.56
Test after pruning= 0.55
Test after pruning= 0.57
Test after pruning= 0.52
Test after pruning= 0.52
Test after pruning= 0.48
```

```
Test after pruning= 0.42
Test after pruning= 0.24
```



3 Compare the accuracy

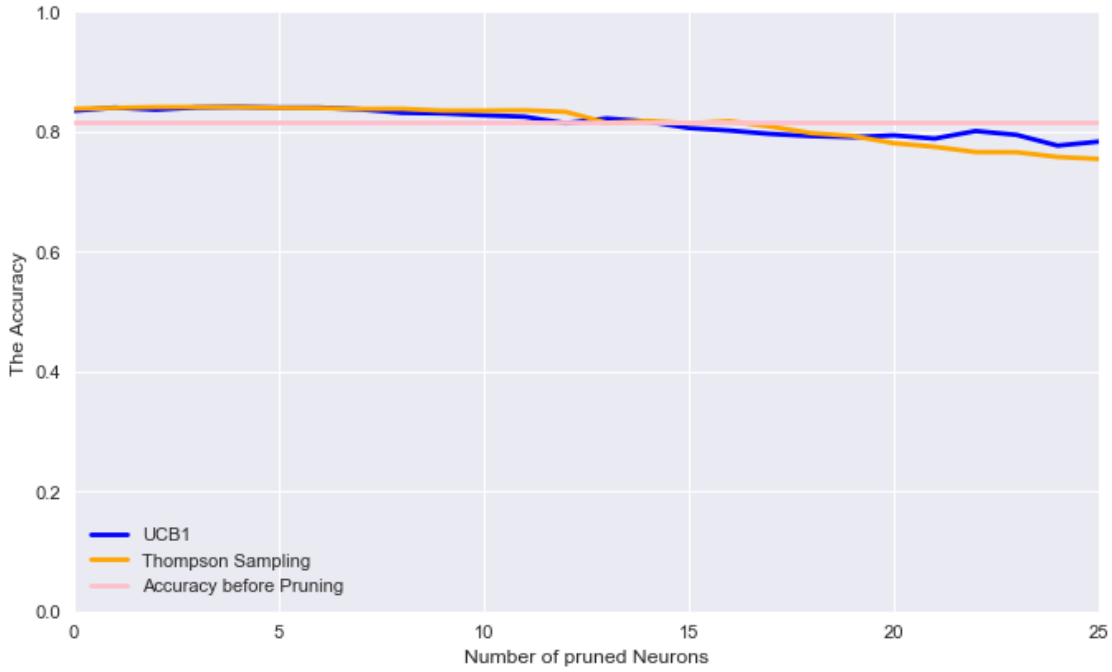
```
In [11]: ucb1 = np.load('./UCB1/AccuracyAftrerPrune.npy')
         ThompsonSampling = np.load('./Thompson_Sampling/AccuracyAftrerPrune.npy')
         Accuracy = np.load('AccuracyBeforePruning.npy')

In [12]: fig = plt.figure(figsize=(10, 6), dpi=80)
         ax = fig.add_subplot(111)
         N = len(ucb1)
         ind = np.arange(N)                # the x locations for the groups
         plt.plot(ind , ucb1 , color="blue", linewidth=2.5, linestyle="-", label="UCB1")
         plt.plot(ind , ThompsonSampling, color="orange", linewidth=2.5, linestyle="-", label="T
         plt.legend(loc = 3)
         plt.axis([0, 25, 0, 1])
         plt.xlabel('Number of pruned Neurons')
         plt.ylabel('The Accuracy')
         plt.grid(True)
         plt.show()
```




```
In [13]: p1 = figure(title="The Performance over the number of neurons' pruned", tools=TOOLS)
         p1.line(ind, ucb1, legend="ucb1", line_color="blue", line_width=2)
         p1.line(ind, ThompsonSampling, legend="Thompson Sampling", line_color="red", line_width
         p1.title.align = "center"
         show(p1)
```

4 Comparing All algorithms with the model before pruning

```
In [14]: fig = plt.figure(figsize=(10, 6), dpi=80)
         ax = fig.add_subplot(111)
         N = len(ucb1)
         Acc = [Accuracy for col in range(N)]
         ind = np.arange(N)                # the x locations for the groups
         plt.plot(ind , ucb1 , color="blue", linewidth=2.5, linestyle="-", label="UCB1")
         plt.plot(ind , ThompsonSampling, color="orange", linewidth=2.5, linestyle="-", label="T
         plt.plot(ind , Acc, color="pink", linewidth=2.5, linestyle="-", label="Accuracy before
         plt.legend(loc = 3)
         plt.axis([0, 25, 0, 1])
         plt.xlabel('Number of pruned Neurons')
         plt.ylabel('The Accuracy')
         plt.grid(True)
         plt.show()
```



In [15]:
```
p1 = figure(title="The Performance over the number of neurons' pruned", tools=TOOLS)
p1.line(ind, ucb1, legend="ucb1", line_color="green", line_width=2)
p1.line(ind, ThompsonSampling, legend="Thompson Sampling", line_color="red", line_width
p1.line(ind, Acc, legend="Accuracy", line_dash=(4, 4), line_color="blue", line_width=2)
p1.title.align = "center"
show(p1)
```