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 [1]:
```
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 [2]:
```
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 [3]:
```
X_train = np.load('./wine/X_train.npy')
y_train = np.load('./wine/y_train.npy')
X_test = np.load('./wine/X_test.npy')
y_test = np.load('./wine/y_test.npy')
X_deploy = np.load('./wine/X_deploy.npy')
y_deploy = np.load('./wine/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 113
Number of validation examples 29
Number of testing examples 36
```

In [4]:
```
exec(open("core.py").read())  # pyhton 3x
```

2.1 Run Thompson Sampling pruning Algorithm

```
In [5]: algo = Thompson_Sampling([], [])
        Alg_name = 'Thompson_Sampling Algorithm'
        path = './Thompson_Sampling/'
        sys.path.append("./Thompson_Sampling")
        exec(open("mnist_cnnFORTESTING.py").read())
```

```
29 test samples


/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 score: 0.111571490765
Test accuracy: 0.965517222881
The time for running this method is 0.04523801803588867 seconds
Finsh playing start pruining:
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 0.972222222222
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Test accuracy after pruning: 0.944444444444
Test accuracy after pruning: 0.944444444444
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.916666666667
Test accuracy after pruning: 0.916666666667
Test accuracy after pruning: 0.944444444444
Test accuracy after pruning: 0.944444444444
Test accuracy after pruning: 0.888888888889
Test accuracy after pruning: 0.888888888889
Test accuracy after pruning: 0.916666666667
Test accuracy after pruning: 0.888888888889
Test accuracy after pruning: 0.944444444444
Test accuracy after pruning: 0.944444444444
Test accuracy after pruning: 0.944444444444
```
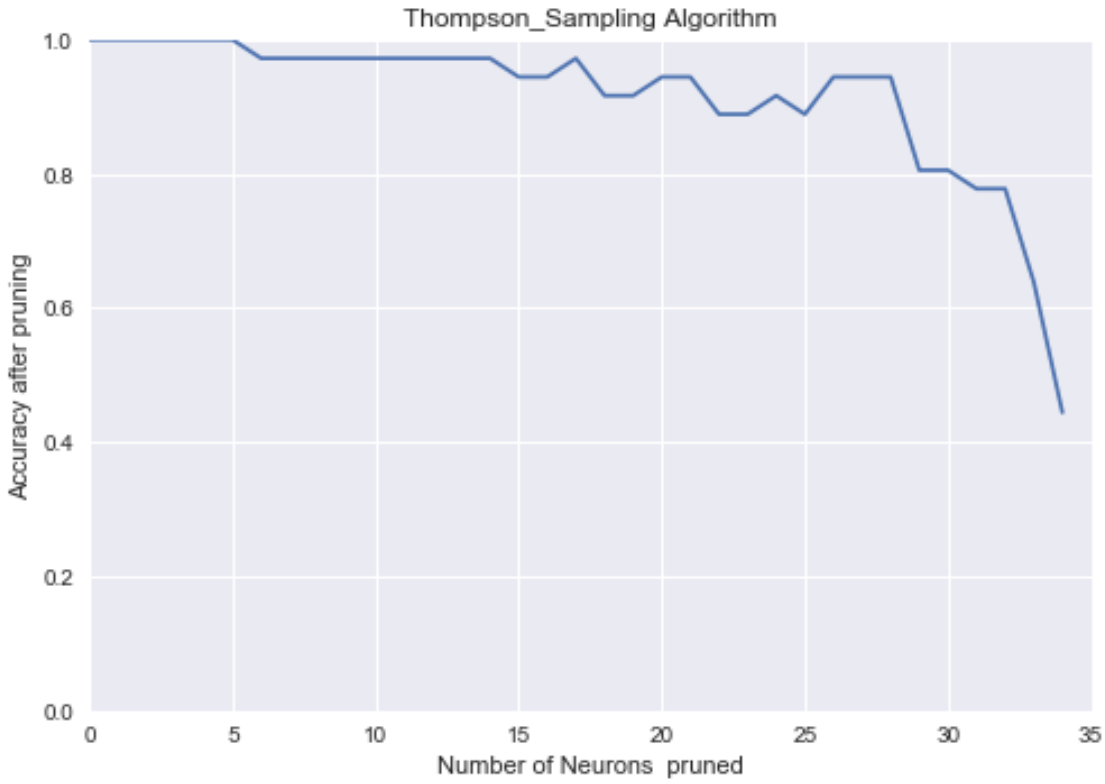

```
Test accuracy after pruning: 0.805555555556
Test accuracy after pruning: 0.805555555556
Test accuracy after pruning: 0.777777777778
Test accuracy after pruning: 0.777777777778
Test accuracy after pruning: 0.638888888889
Test accuracy after pruning: 0.444444444444
```



2.2 Run UCB1 pruning Algorithm

```
In [6]: algo = UCB1([], [])
        Alg_name = 'UCB1 Algorithm'
        path = './UCB1/'
        sys.path.append("./UCB1")
        exec(open("mnist_cnnFORTESTING.py").read())
```

```
29 test samples
Test score: 0.111571490765
Test accuracy: 0.965517222881
The time for running this method is 0.04781603813171387 seconds
Finsh playing start pruining:
Test accuracy after pruning: 1.0
```

```
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
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Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 1.0
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 1.0
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Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.972222222222
Test accuracy after pruning: 0.888888888889
Test accuracy after pruning: 0.611111111111
Test accuracy after pruning: 0.611111111111
Test accuracy after pruning: 0.611111111111
Test accuracy after pruning: 0.611111111111
Test accuracy after pruning: 0.444444444444
```
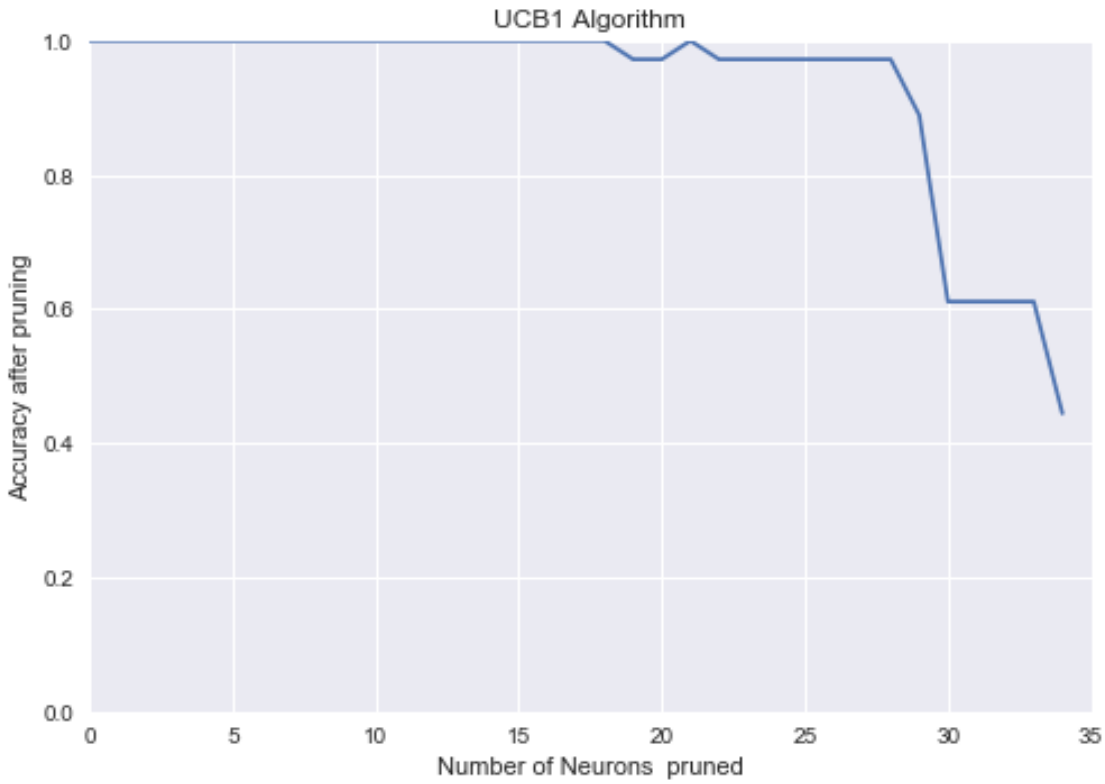
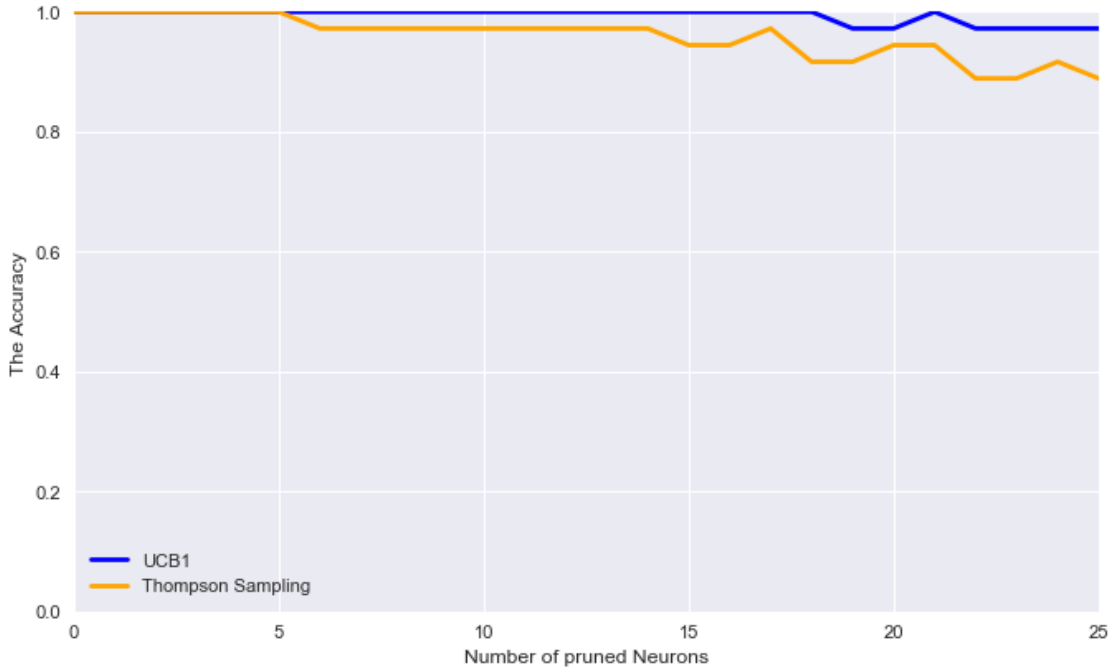



3 Compare the accuracy

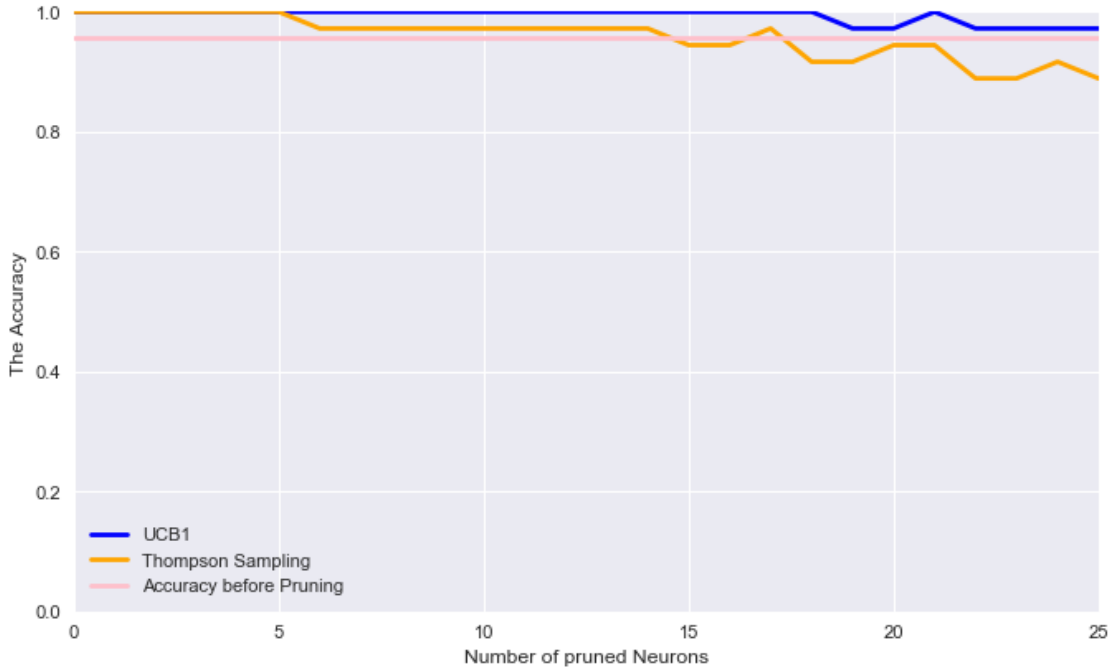
```
In [7]: ucb1 = np.load('./UCB1/AccuracyAftrerPrune.npy')
        ThompsonSampling = np.load('./Thompson_Sampling/AccuracyAftrerPrune.npy')
        Accuracy = np.load('AccuracyBeforePruning.npy')

In [8]: 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="Th
        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 [9]: 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 [10]: 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 [11]:
```
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)
```