notebook_for_blog

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In [1]:
```
import os
import pyopencl as pcl
import numpy as np
import scipy.stats as ss
import pandas as pd
import math
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt
```

In [2]:
```
x0_1 = ss.norm(loc=10.0, scale=2.0)
x0_0 = ss.norm(loc=7.0, scale=2.0)
x1_1 = ss.norm(loc=5.0, scale=3.0)
x1_0 = ss.norm(loc=-5.0, scale=3.0)

nsamps=1024

X_1 = pd.DataFrame(index=range(nsamps),
                   columns=['x0','x1', 'y'])
X_0 = pd.DataFrame(index=range(nsamps),
                   columns=['x0','x1', 'y'])

X_1.loc[:, 'x0'] = x0_1.rvs(size=(nsamps,)).astype(np.float32)
X_1.loc[:, 'x1'] = x1_1.rvs(size=(nsamps,)).astype(np.float32)
X_1.loc[:, 'y'] = np.ones(shape=(nsamps,)).astype(np.float32)

X_0.loc[:, 'x0'] = x0_0.rvs(size=(nsamps,)).astype(np.float32)
X_0.loc[:, 'x1'] = x1_0.rvs(size=(nsamps,)).astype(np.float32)
X_0.loc[:, 'y'] = np.zeros(shape=(nsamps,)).astype(np.float32)


X_all = pd.concat((X_1, X_0), ignore_index=True)

X_all = X_all.reindex(np.random.permutation(X_all.index))

X = X_all.loc[:, ['x0', 'x1']]
y = X_all.loc[:,'y']
```

In [3]:
```
def sig(X, theta):
```

```
        lin = X.dot(theta)
        sig = 1.0 / (1.0 + np.exp(-lin))
        return sig


    def lr_cost(X, theta, y):
        est = sig(X, theta)
        log_est = np.log(est)
        cost = y*log_est + (1-y) * (1-log_est)
        cost *= -1
        return cost

    def cost_ss(est, actual):
        cost = ((est - actual)**2.0)
        cost /= 2.0
        return cost

    def grad(X, theta, y):
        diff = y - sig(X, theta)
        g = np.zeros(X.shape)
        for i in range(X.shape[0]):
            for j  in range(X.shape[1]):
                g[i,j] = diff[i] * X[i,j]
        return g

    def fit_params(X, y, theta):
        tol = 1e-5
        learning_rate = 1e-2
        costs = [np.inf]
        for i in range(0, 1000):
            my_cost = lr_cost(X, theta, y)
            my_cost = my_cost.sum()
            costs.append(my_cost)
            if abs(my_cost - costs[-2]) < tol:
                break
            else:
                my_gradient = grad(X, theta, y)
                my_gradient = my_gradient.mean(axis=0)
                theta = theta + learning_rate * my_gradient

        return theta, costs
```

In [4]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, train_size=0.6)
new_t = np.random.normal(size=(X_train.shape[1], )).astype(np.float32)
fitted_theta, outcost = fit_params(X_train.values, y_train.values, new_t)
```

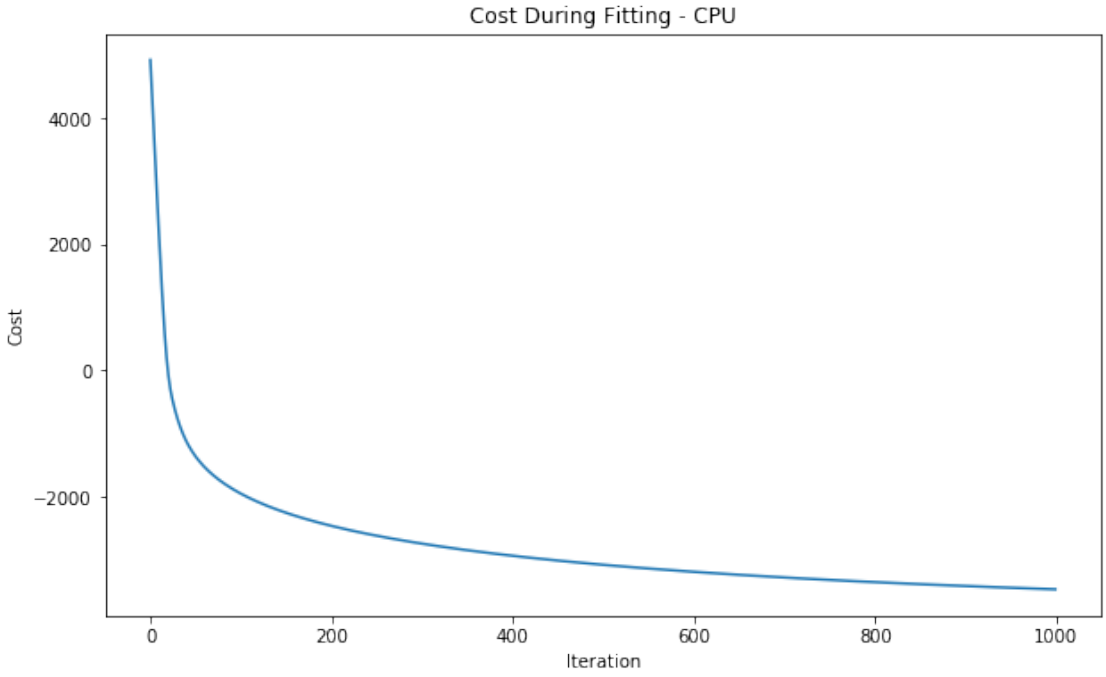
In [5]:
```
fitted_theta
```

Out[5]:
```
array([ 0.0446463 ,  1.02113246])
```

In [9]:
```
print('cost on test set: ', lr_cost(X_test.values, fitted_theta, y_test.values).sum())
print('average sum of square error on test set: ',cost_ss(sig(X_test.values, fitted_thet
```

```
cost on test set:  -2514.30615455
average sum of square error on test set:  0.0197783443436
```

In [11]:
```
plt.figure(figsize=(10,6))
plt.plot(outcost[1:])
plt.xlabel('Iteration')
plt.ylabel('Cost')
plt.title('Cost During Fitting - CPU')
plt.show()
```



In [ ]: