eval_pyro_sim

November 12, 2018

```
In [1]: import numpy as np
        import matplotlib.pyplot as plt
        %matplotlib inline
        import pickle
        import seaborn as sns
        import pandas as pd
```

```
In [67]: #with open('pyro_bo_test.pkl', 'rb') as f:
         #    res_dict = pickle.load(f)
```

```
In [2]: with open('pyro_bo_mrep_40_v2.pkl', 'rb') as f:
            res_dict = pickle.load(f)
```

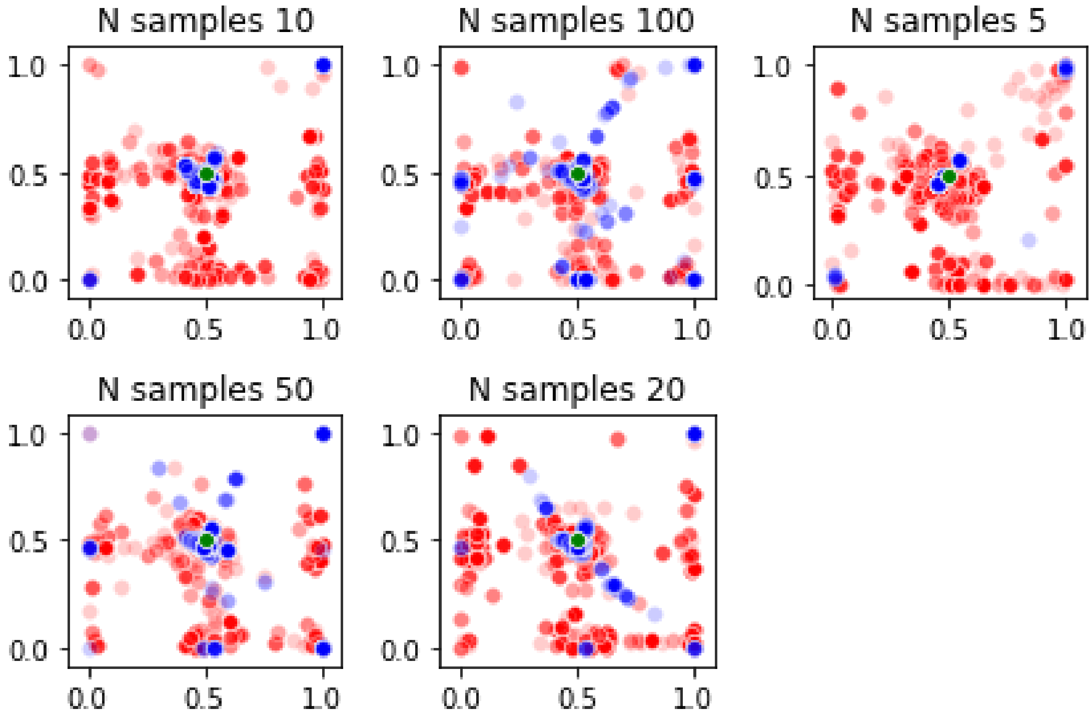
```
In [39]: len(res_dict['MC']['10'])
         print res_dict['MC'].keys()
         n_samples = '5'
```

```
[u'10', u'100', u'5', u'50', u'20']
```

```
In [40]: mc_y = np.array([res['y'] for res in res_dict['MC'][n_samples]])
         rqmc_y = np.array([res['y'] for res in res_dict['RQMC'][n_samples]])
```

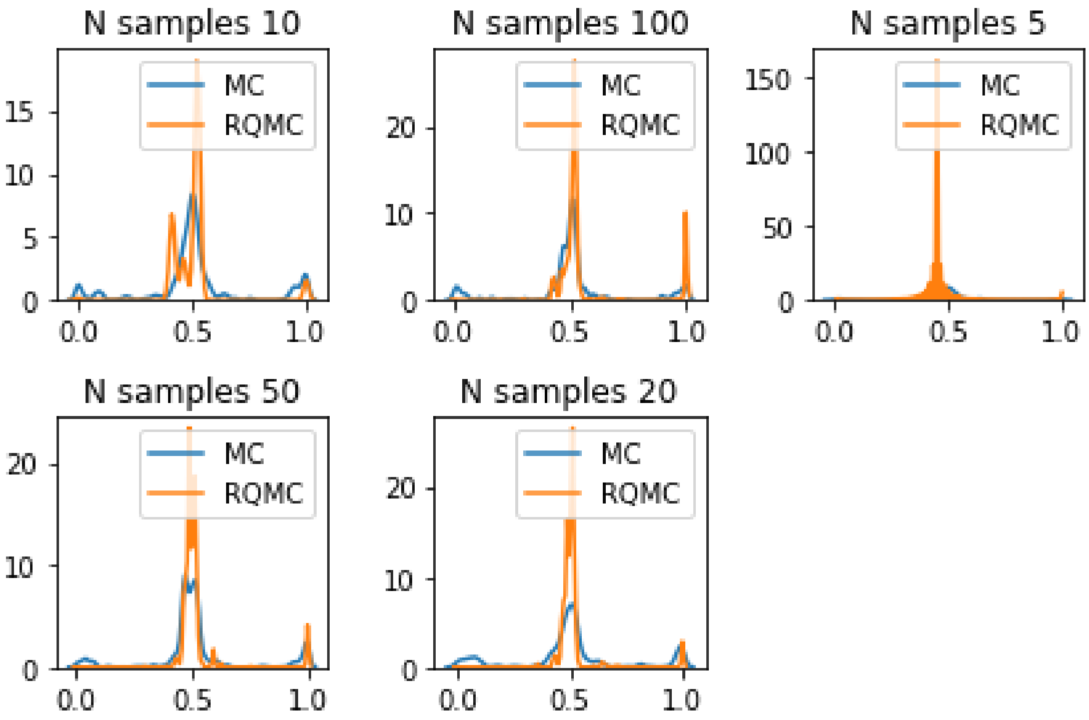
```
In [41]: mc_x = np.array([res['X'] for res in res_dict['MC'][n_samples]])
         rqmc_x = np.array([res['X'] for res in res_dict['RQMC'][n_samples]])

         mc_x_reshape = mc_x[:,7:,:].reshape(-1,2)
         rqmc_x_reshape = rqmc_x[:,7:,:].reshape(-1,2)
```

```
In [11]: def plot_scatter(res_dict):
             plt.figure()
             i = 1
             for n_samples in res_dict['MC']:
                 mc_y = np.array([res['y'] for res in res_dict['MC'][n_samples]])
                 rqmc_y = np.array([res['y'] for res in res_dict['RQMC'][n_samples]])
                 mc_x = np.array([res['X'] for res in res_dict['MC'][n_samples]])
                 rqmc_x = np.array([res['X'] for res in res_dict['RQMC'][n_samples]])
                 mc_x_reshape = mc_x[:,7:,:].reshape(-1,2)
                 rqmc_x_reshape = rqmc_x[:,7:,:].reshape(-1,2)
                 plt.subplot(2,3,i)
                 sns.scatterplot(mc_x_reshape[:,0], mc_x_reshape[:,1], color='red', alpha=0.2)
                 sns.scatterplot(rqmc_x_reshape[:,0], rqmc_x_reshape[:,1], color='blue', alpha=
                 sns.scatterplot([0.5], [0.5], color='green', alpha=1)
                 plt.title("N samples %s" % n_samples)
                 i +=1
             plt.tight_layout()
         plot_scatter(res_dict)
```



```
In [18]: def plot_coordinate(res_dict):
             plt.figure()
             i = 1
             for n_samples in res_dict['MC']:
                 mc_y = np.array([res['y'] for res in res_dict['MC'][n_samples]])
                 rqmc_y = np.array([res['y'] for res in res_dict['RQMC'][n_samples]])
                 mc_x = np.array([res['X'] for res in res_dict['MC'][n_samples]])
                 rqmc_x = np.array([res['X'] for res in res_dict['RQMC'][n_samples]])
                 mc_x_reshape = mc_x[:,7:,:].reshape(-1,2)
                 rqmc_x_reshape = rqmc_x[:,7:,:].reshape(-1,2)
                 plt.subplot(2,3,i)
                 sns.kdeplot(mc_x_reshape[:,0], label='MC')
                 sns.kdeplot(rqmc_x_reshape[:,0], label='RQMC')
                 plt.title("N samples %s" % n_samples)
```

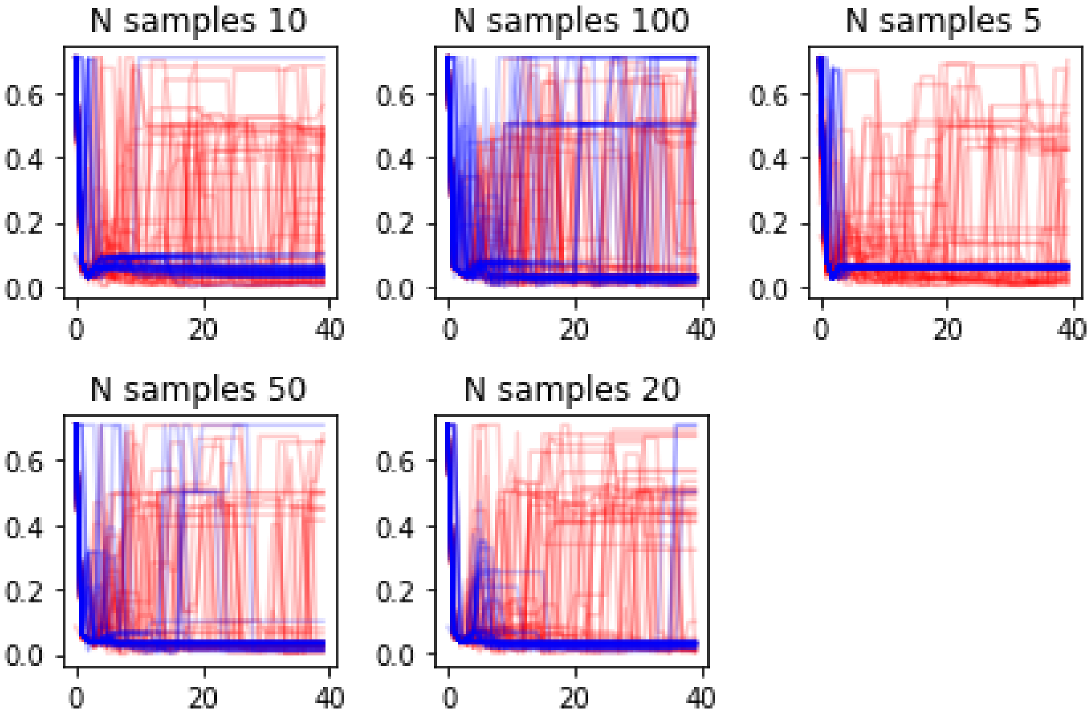
```
        i +=1
    plt.tight_layout()
plot_coordinate(res_dict)
```



In [20]:
```
#sns.kdeplot(mc_x_reshape[:,1], label='MC')
#sns.kdeplot(rqmc_x_reshape[:,1], label='RQMC')
```

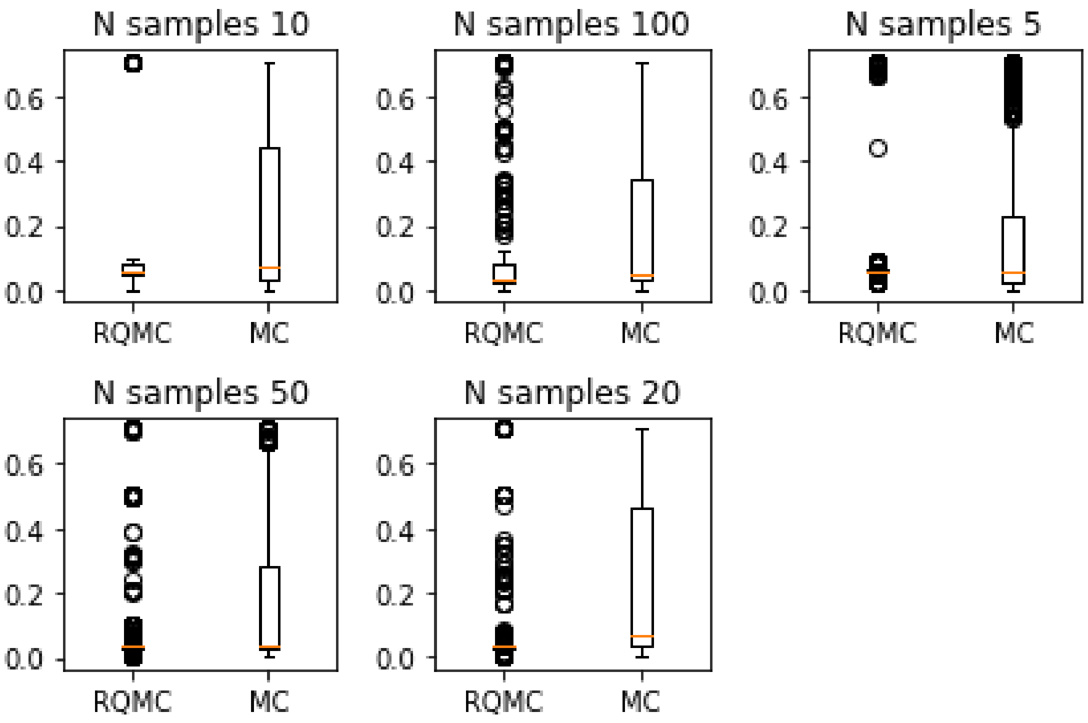
In [19]:
```
#df1 = pd.DataFrame(mc_x_reshape, columns=['x1', 'y1'])
#df2 = pd.DataFrame(rqmc_x_reshape, columns=['x2', 'y2'])


# plot
# ========================================
#graph = sns.jointplot(x=df1.x1, y=df1.y1, color='r')

#graph.x = df2.x2
#graph.y = df2.y2
#graph.plot_joint(plt.scatter, marker='x', c='b', s=50)
```

In [13]:
```
def plot_lines(res_dict):
    plt.figure()
    i = 1
    for n_samples in res_dict['MC']:
        mc_y = np.array([res['y'] for res in res_dict['MC'][n_samples]])
        rqmc_y = np.array([res['y'] for res in res_dict['RQMC'][n_samples]])
        mc_x = np.array([res['X'] for res in res_dict['MC'][n_samples]])
        rqmc_x = np.array([res['X'] for res in res_dict['RQMC'][n_samples]])
        mc_x_reshape = mc_x[:,7:,:].reshape(-1,2)
        rqmc_x_reshape = rqmc_x[:,7:,:].reshape(-1,2)
        plt.subplot(2,3,i)
        plt.plot(mc_y[:,7:].transpose(),alpha=0.2, color="red" ) #.min(axis=1)
        plt.plot(rqmc_y[:,7:].transpose(), alpha=0.2, color="blue")
        plt.title("N samples %s" % n_samples)
        i +=1
    plt.tight_layout()
plot_lines(res_dict)
```



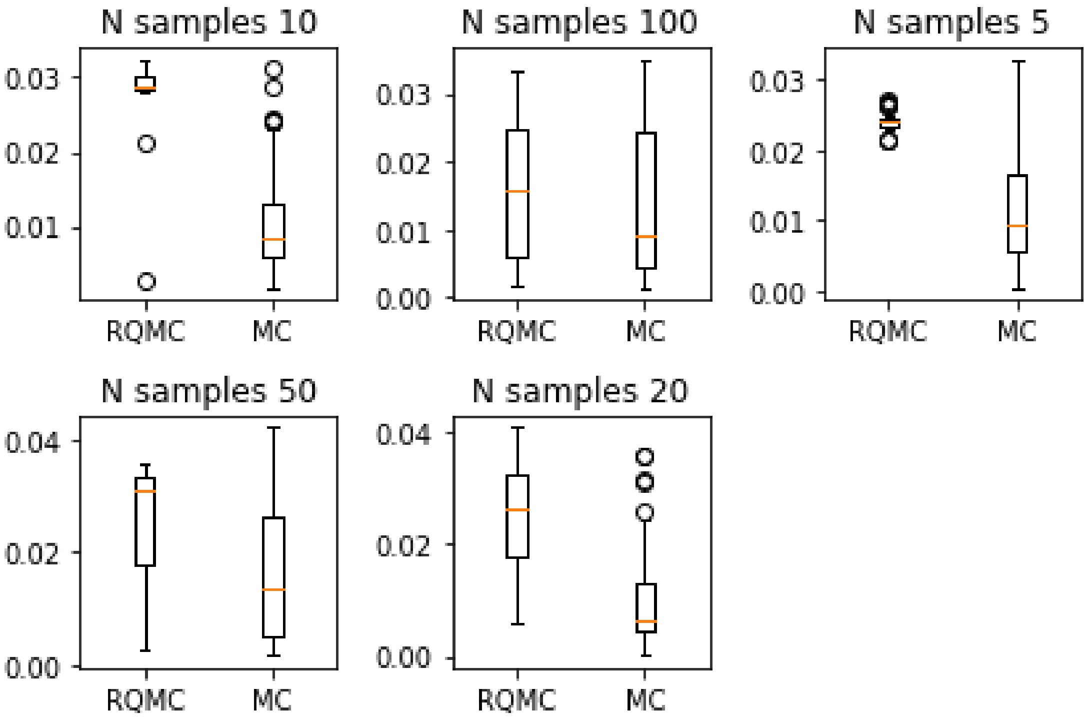
```
In [15]: def plot_boxplot_all(res_dict):
             plt.figure()
             i = 1
             for n_samples in res_dict['MC']:
                 mc_y = np.array([res['y'] for res in res_dict['MC'][n_samples]])
                 rqmc_y = np.array([res['y'] for res in res_dict['RQMC'][n_samples]])
                 mc_x = np.array([res['X'] for res in res_dict['MC'][n_samples]])
                 rqmc_x = np.array([res['X'] for res in res_dict['RQMC'][n_samples]])
                 mc_x_reshape = mc_x[:,7:,:].reshape(-1,2)
                 rqmc_x_reshape = rqmc_x[:,7:,:].reshape(-1,2)
                 plt.subplot(2,3,i)
```

```
        plt.boxplot([rqmc_y[:,7:].flatten(), mc_y[:,7:].flatten()], labels=['RQMC', '
        plt.title("N samples %s" % n_samples)
        i +=1
    plt.tight_layout()
plot_boxplot_all(res_dict)
```



```
In [17]: #print np.log(np.mean(rqmc_y[:,7:].min(axis=1)**2)), np.log(np.mean(mc_y[:,7:].min(ax


         def plot_boxplot_min(res_dict):
             plt.figure()
             i = 1
             for n_samples in res_dict['MC']:
                 mc_y = np.array([res['y'] for res in res_dict['MC'][n_samples]])
                 rqmc_y = np.array([res['y'] for res in res_dict['RQMC'][n_samples]])
                 mc_x = np.array([res['X'] for res in res_dict['MC'][n_samples]])
                 rqmc_x = np.array([res['X'] for res in res_dict['RQMC'][n_samples]])
                 mc_x_reshape = mc_x[:,7:,:].reshape(-1,2)
                 rqmc_x_reshape = rqmc_x[:,7:,:].reshape(-1,2)
                 plt.subplot(2,3,i)
                 plt.boxplot([rqmc_y[:,7:].min(axis=1), mc_y[:,7:].min(axis=1)], labels=['RQMC
                 plt.title("N samples %s" % n_samples)
                 i +=1
```

```
    plt.tight_layout()
plot_boxplot_min(res_dict)
```


N samples 10
RQMC
MC
N samples 100
RQMC
MC
N samples 5
RQMC
MC
N samples 50
RQMC
MC
N samples 20
RQMC
MC