demo_PVRS_illustration

June 1, 2019

```
In [1]: from bayes_opt import BayesOpt
        import matplotlib.pyplot as plt
        from bayes_opt.test_functions import functions
        from bayes_opt.visualization import vis_variance_reduction_search as viz
        import warnings
        import sys

        warnings.filterwarnings("ignore")
```

1 Use a branin function

```
In [2]: myfunction=functions.branin(sd=0)
```

2 Initialize Bayesian optimization

```
In [3]: func=myfunction.func


        acq_func={}
        acq_func['name']='pvrs'
        acq_func['dim']=myfunction.input_dim


        func_params={}
        func_params['function']=myfunction


        acq_params={}
        acq_params['acq_func']=acq_func
        gp_params = {'kernel':'SE','lengthscale':0.2*myfunction.input_dim,'noise_delta':1e-8}


        bo=BayesOpt(gp_params,func_params,acq_params)
```

```
In [4]: # initialize BO using 3*dim number of observations
        bo.init(gp_params,n_init_points=1*myfunction.input_dim)
```

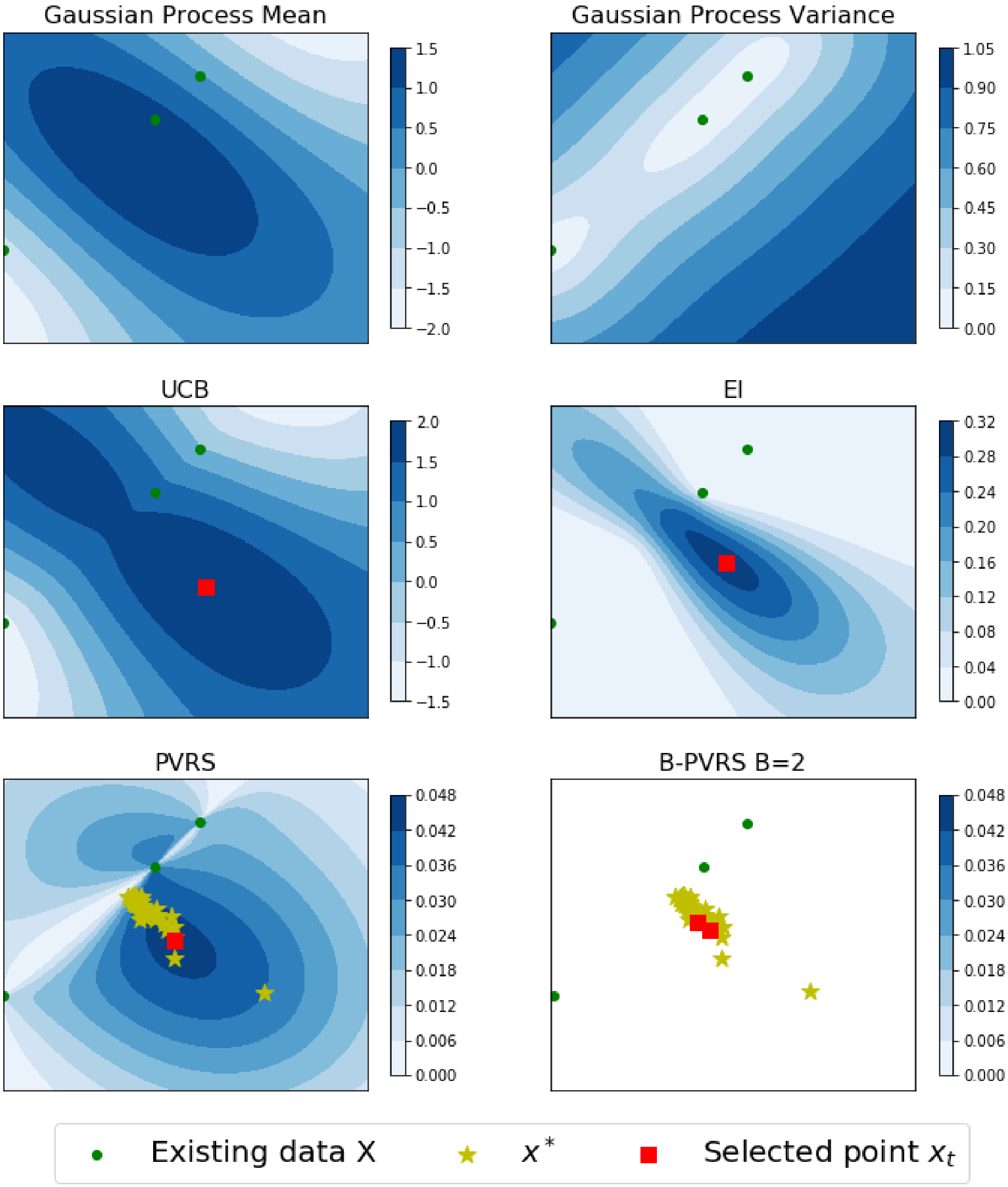
3 Suggest an experiment

```
In [5]: bo.maximize()
        print("recommemded x={}, current inferred value ={:.4f}, best inferred value ={:.4f}".
```

```
recommemded x=[ 3.10235312 12.90709232], current inferred value =-112.6429, best inferred valu
```

4 Visualize the PVRS

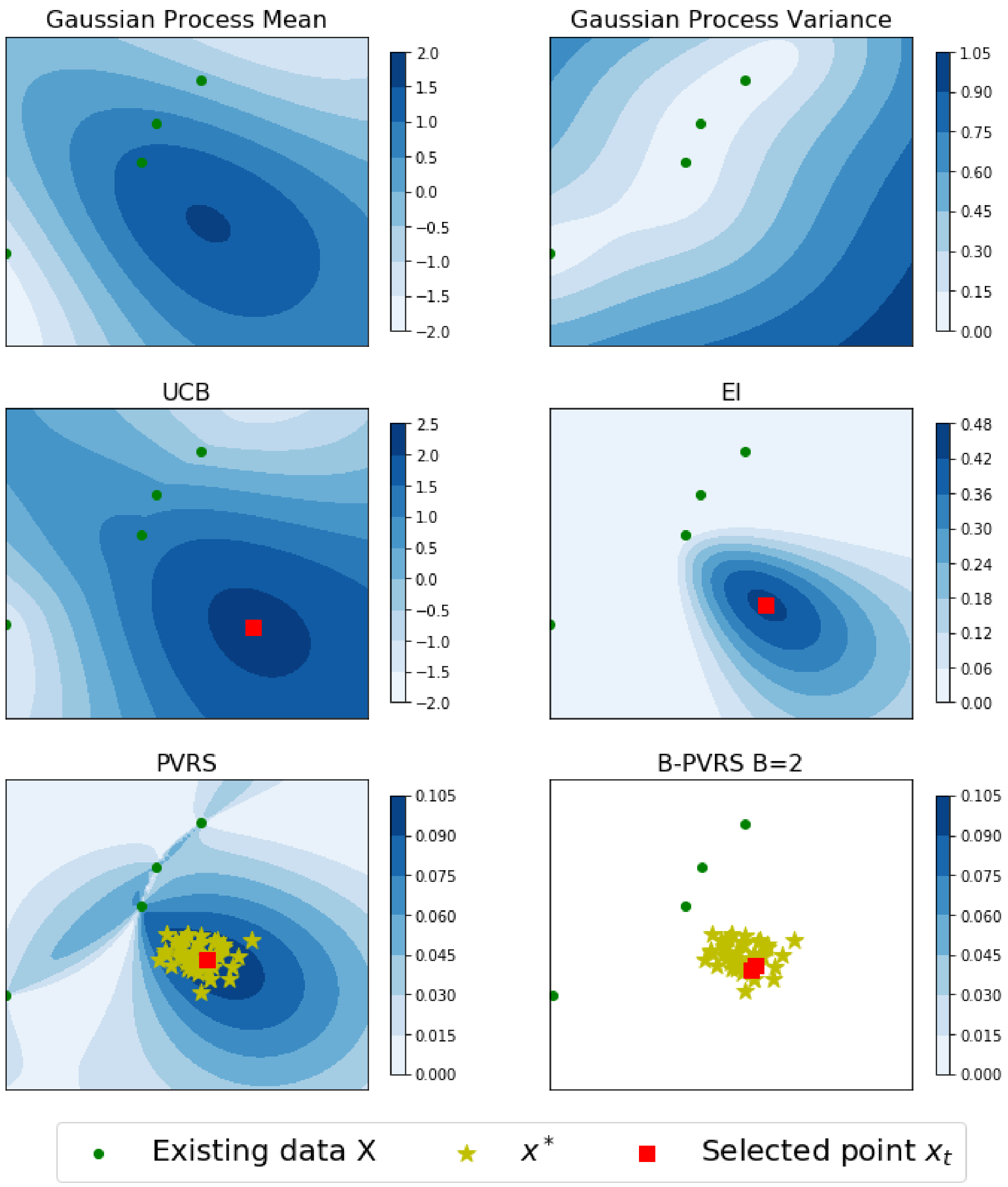
```
In [6]: viz.plot_bo_2d_pvrs(bo)
```



5 Suggest a next experiment and visualize it

```
In [7]: bo.maximize()
        print("recommemded x={}, current inferred value ={:.4f}, best inferred value ={:.4f}".f
        viz.plot_bo_2d_pvrs(bo)
```

```
recommemded x=[0.59378716 8.88172948], current inferred value =-32.3679, best inferred value =-
```



6 Run for 5 additional experiments

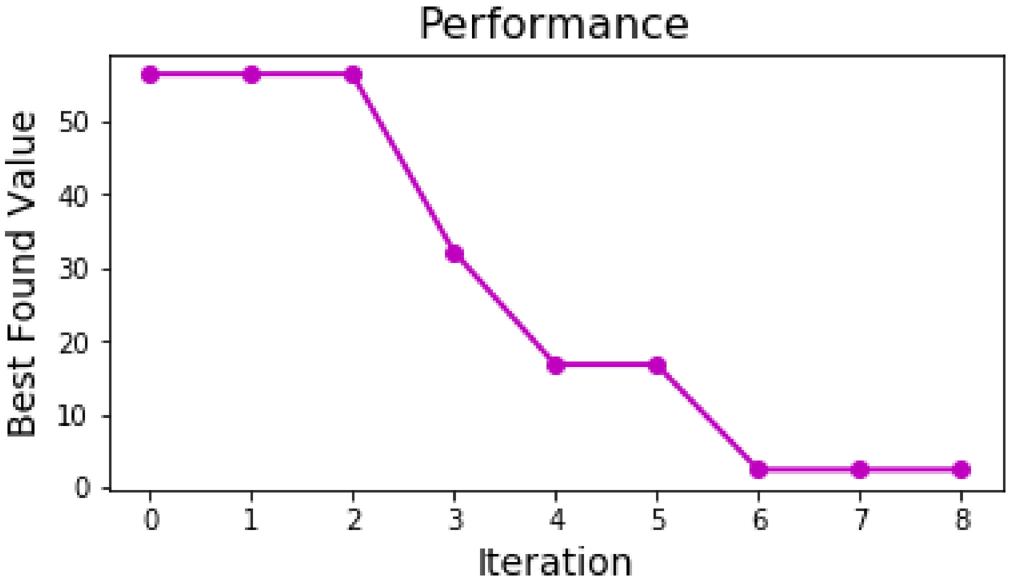
```
In [8]: NN=5
        for index in range(0,NN):

            bo.maximize()
```

7 Plot the final performance

```
In [9]: fig=plt.figure(figsize=(6, 3))
        myYbest=[bo.Y_original[:idx+1].max()*-1 for idx,val in enumerate(bo.Y_original)]
        plt.plot(range(len(myYbest)),myYbest,linewidth=2,color='m',linestyle='-',marker='o')
        plt.xlabel('Iteration',fontsize=14)
        plt.ylabel('Best Found Value',fontsize=14)
        plt.title('Performance',fontsize=16)
```

```
Out[9]: Text(0.5,1,'Performance')
```


Performance
Best Found Value
Iteration