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Assignment 8

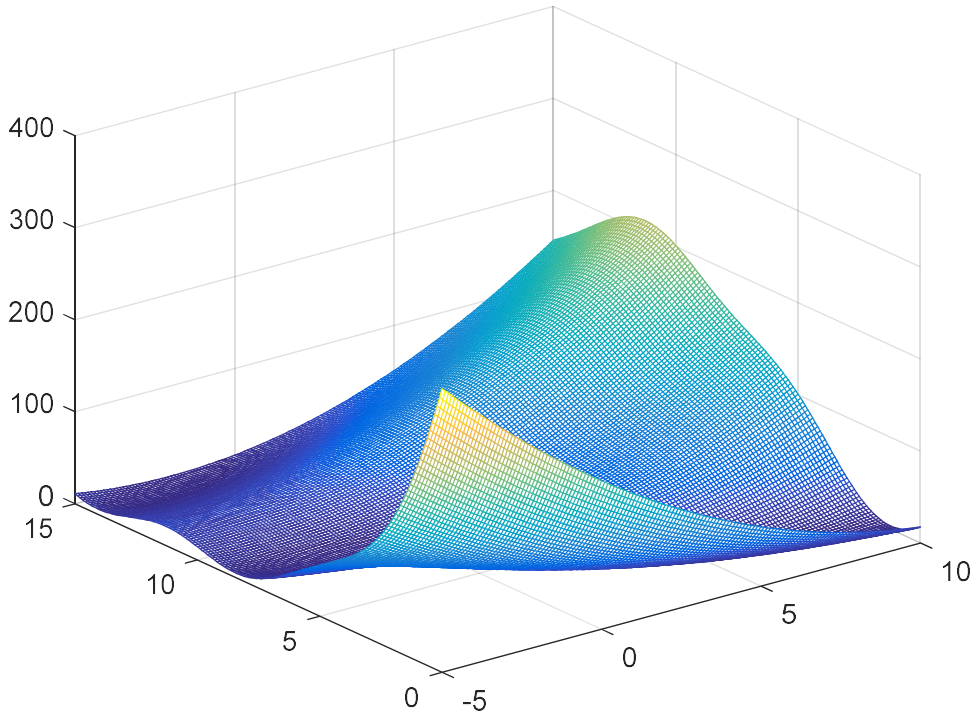
Task 1

Used the Branin Function to perform this Task.

$$f(x,y) = \left(y - \frac{5.1}{4\pi^2}x^2 + \frac{5}{\pi}x - 6\right)^2 + 10\left(1 - \frac{1}{8\pi}\right)\cos(x) + 10$$

Added Gaussian mean zero noise to the above value.

Plot



Task 2

Spearmint Package was used to run the Bayesian Optimization for the above function.

Matern52 Covariance Function was used.

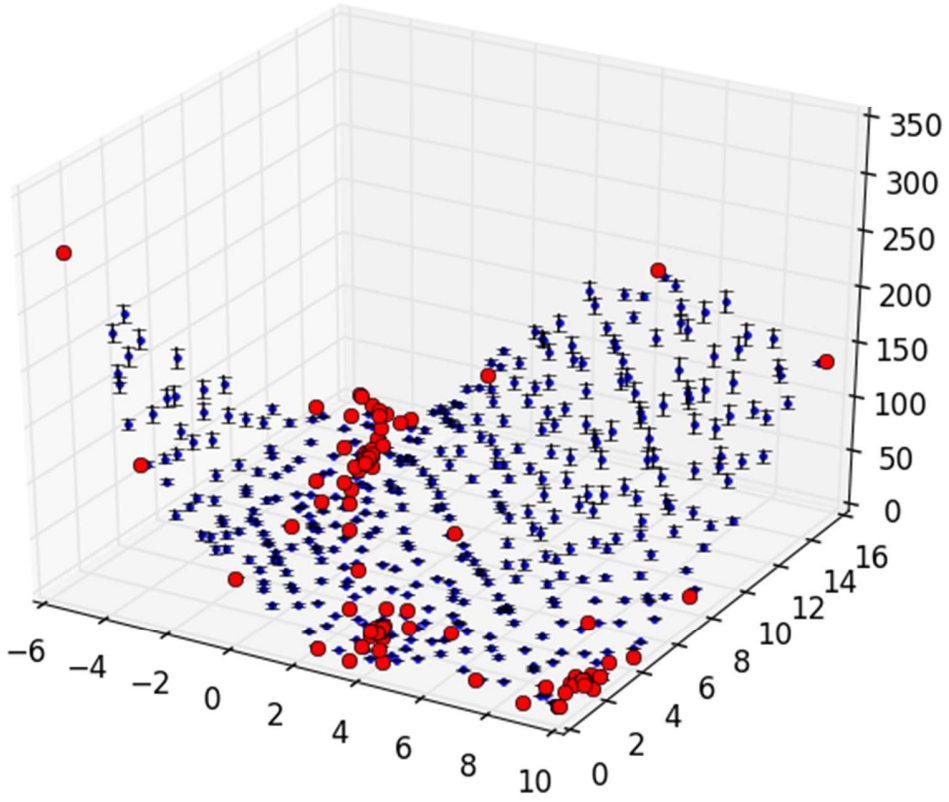
Expected Improvement Acquisition Function was used.

The spearmint package finds the Global Minima.

True Minima of the above function : **0.2430**

Minima observed running Spearmint : **0.270087**

Plot



Task 3

Multiarm bandit optimization Matlab Code

```
clc;
K = 3; %No of arms
theta = [0.50 0.85 0.10];
T = 1000;
alpha = 1;
beta = 1;
s = zeros(K,1);
f = zeros(K,1);
x = 0:0.01:1;

for t=1:T
    % Choose action.
    theta_hat = zeros(1,K);
    for i=1:K
        theta_hat(1,i) = betarnd(s(i)+alpha, f(i)+beta);
    end
    [~, action] = max(theta_hat);

    % Pull lever.
    reward = rand <= theta(action);

    % Update.
    s(action) = s(action) + reward;
    f(action) = f(action) + 1 - reward;
    for i=1:K
        y = betapdf(x,s(i)+alpha,f(i)+beta);
        plot(x,y)
        hold on;
    end
    hold off;
end
```