Hwk9

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0.1 CS 559 Hwk 9

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```
In [192]: import numpy as np
          import pandas as pd
          import matplotlib.pyplot as plt
          from matplotlib.patches import Circle
          from scipy.spatial.distance import euclidean
          from scipy.spatial.distance import cdist
          from scipy.interpolate import RectBivariateSpline
```

Q1. (100pts) In this computer project, we will design an RBF network. You cannot use any existing machine learning library. As usual, please include the computer codes in your report. We will use the same sun- mountain setup as in HW8.

(a) Redo steps (a) and (b) of HW8.

```
In [193]: np.random.seed(21)
          X = np.random.uniform(0,1,size=200).reshape((2,100))
          # ith column of X is X_i

          ctgy = np.ones(100)
          for i in range(X.shape[1]):
              if (X[1,i] >= 0.2 * np.sin(10*X[0,i])+0.3) and ((X[1,i]-0.8)**2 + (X[0,i]-0.5)**2
                      ctgy[i] = -1
          t = np.arange(0,1,0.002)
          yt = 0.2* np.sin(10*t) +0.3
          X = np.vstack((X,ctgy))
          C1 = X[:,X[2,:] ==1][0:2,:]
          CN1 = X[:,X[2,:] ==-1][0:2,:]

          fig = plt.figure()
          ax = fig.add_subplot(1, 1, 1)
          ax.add_patch(Circle((0.5,0.8), 0.15, color = 'b', fill = False))
          ax.plot(t,yt,color = 'b')
          pt1 = plt.scatter(x = C1[0,:], y = C1[1,:],c ='r', marker = 'x')
          pt2 = plt.scatter(x = CN1[0,:], y = CN1[1,:],c ='k', marker = 'd')
```