ASSIGNMENT 4

Generate 1000 real number for the variable X from the uniform distribution U [0,1]. Construct the training set T = { (x1,y1),(x2,y2),.....,(x1000,y1000)} using the relation

$$Yi = \sin(2 \pi xi) + \varepsilon i \text{ where } \varepsilon i \sim N(0,0.25).$$

In the similar way construct a testing set of size 50

I,e. Test = { (x'1,y'1),(x'2,y'2),.....,(x'50,y'50)}.

1. Find the best fit using Least Square gradient descent, considering polynomial basis function of order 8. Find the best RMSE MAE and R^2 by tuning the value regularization parameter λ. Also obtain the corresponding plot of best fit.

2. Find the best fit using a direct method, considering Least Square RBF (Gaussian) Kernel . Find the best RMSE ,MAE and R^2 by tuning the value RBF (Gaussian Kernel) and regularization parameter . Also obtain the corresponding plot of best fit.

3. Find the best fit using kernel gradient descent, considering RBF (Gaussian Kernel). Find the best RMSE and MAE by tuning the value RBF (Gaussian Kernel) and regularization parameter sigma. Also obtain the corresponding plot of best fit.

4. Modify the training set T by picking up randomly 20 data points from the training set T and scale their yi values by 25. Find the best fit using normal gradient descent and kernel gradient descent, considering RBF (Gaussian

Kernel). Find the best RMSE and MAE by tuning the value RBF (Gaussian Kernel) and regularization parameter sigma. Also obtain the corresponding plot of best fit.

5. Consider the motorcycle dataset. Find the best fit using Least Square kernel Regression using stochastic gradient descent, considering RBF (Gaussian Kernel). Find the best RMSE and MAE by tuning the value RBF (Gaussian Kernel) and regularization parameter .Also obtain the corresponding plot of best fit.