

Support Vector Regression

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Introduction

For this homework, we had to implement Support Vector Regression (SVR) with two kernels, that we have already seen on previous homework.

Sine data set

We applied both kernels to the 1-dimensional *sine* data set. For each kernel we have to decide on epsilon value and kernel and regularization parameters. Chosen parameters are seen in table 1.

After applying SVR on *sine* data set, we have calculated the support vectors and plot everything. Results are seen on figure 1.

Housing data set

We now applied SVR with both kernels to *housing2r* data set. We have used first 80% of the data for training set and the remaining 20% for test set. For each kernel we plotted RMSE on the testing set versus a kernel parameter value. We have plotted two different curves for each kernel, one with regularization parameter $\lambda = 1$ and the other λ set from internal cross validation. We have also plotted the number of support vector. Results for polynomial kernel are seen on figure 2, 3 and for RBF on figure 4, 5.

Comparison with kernelized ridge regression

If we assume that results from previous homework were correct, we can see that they are very different. RMSE for SVR are much lower than RMSE for kernelized ridge regression

for the RBF kernel. For polynomial kernel, RMSE are low for low M and then they jump sky high. We can also see that now, if we increase sigma value, we get bigger RMSE, what is exactly the opposite to the RMSE for ker. ridge reg. Therefore it seems that we get lower error for SVR and that is why I prefer this algorithm more.

kernel	kernel param	reg param	epsilon
Polynomial	11	1	0.5
RBF	0.2	1	0.5

Table 1. In this table we can see the parameters that were chosen for each kernel when performing SVR on *sine* data set.

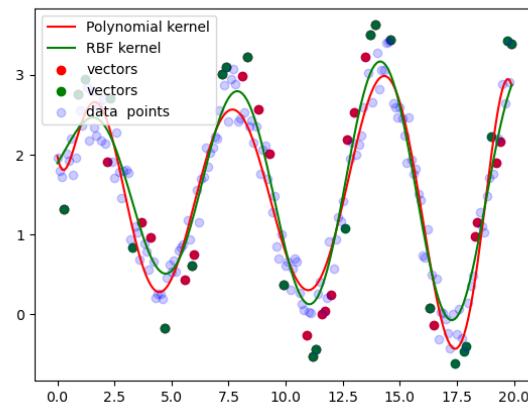


Figure 1. On this figure we can see the results when applying SVR on *sine* data set. Data points are shown with light blue dots and fitted curve for every kernel with different colors. Dots that are colored with green and red color are representing the support vectors for each kernel.

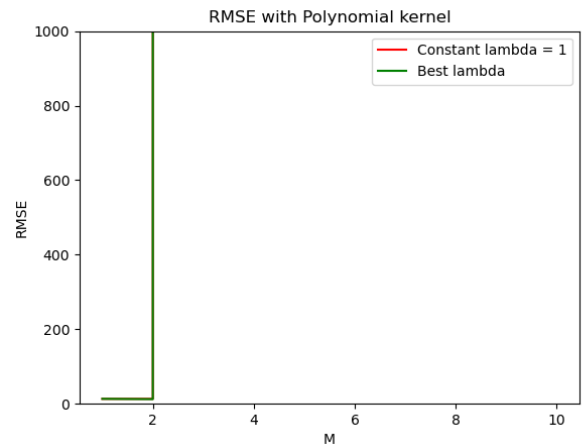


Figure 2

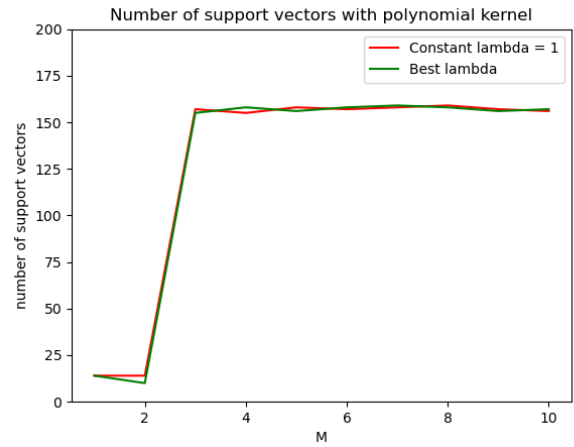


Figure 3

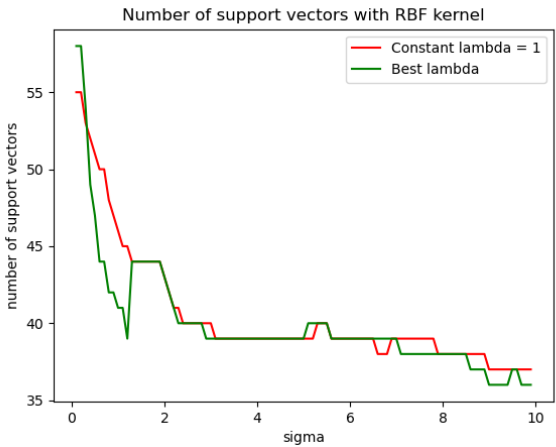


Figure 5

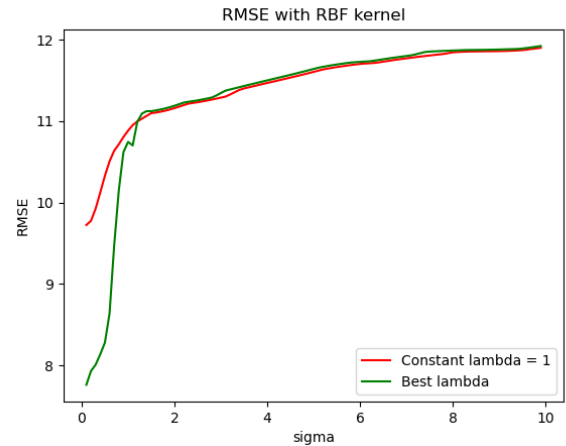


Figure 4