CSE 5526

Programming Assignment 2

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Analysis

1. RBF network with variable Gaussian width

By inspection of the graphs, it is clear that the RBF network generated function does not approximate the original function well enough. As K increases, more oscillations are seen in the generated function as it tries to over-fit the sampled data points. K=2 and η = 0.02 gives the best approximation of the original function.

2. RBF network with same Gaussian width

The function generated using RBF bases with same Gaussian width is a close approximation of the original function. For both η = 0.01 and 0.02, as K increases from 2 to 7, the generated function moves closer to the original function and at K=7 and η=0.02, the RBF network best generalized the desired original function. Beyond K=7, the generalization error seems to increase as the function appears to shift away from the desired function.

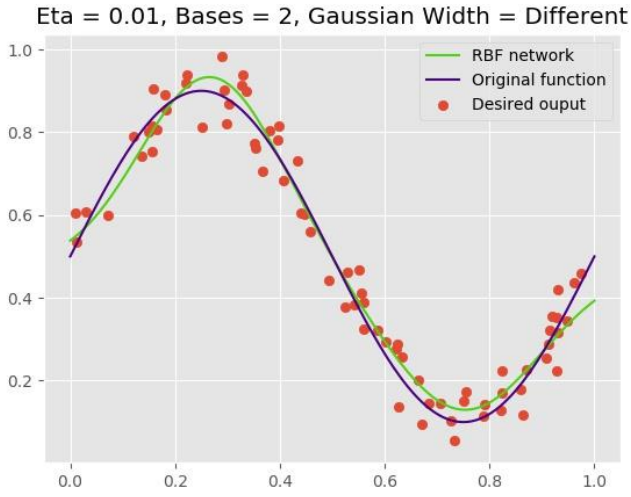
3. Learning rate (η) 0.01 vs 0.02

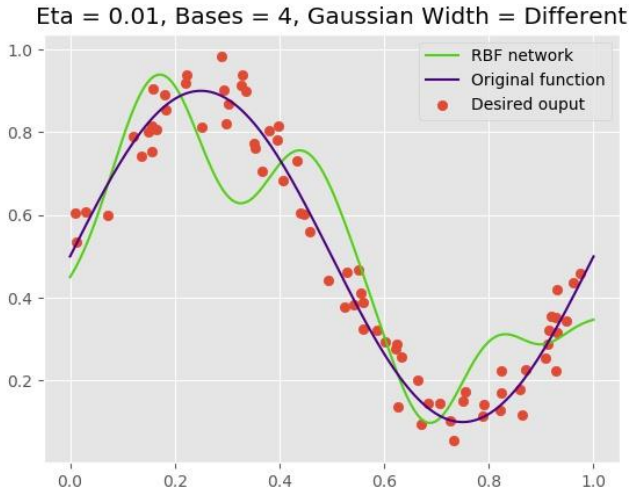
Learning rate increase did not seem to affect the RBF network generated function by much as the networks converged quickly within 100 epochs. But, in the network with variable Gaussian width, for higher values of K, learning rate η=0.02 results in the approximated function to move closer to original function slightly. An increase in number of oscillations is also noticeable.

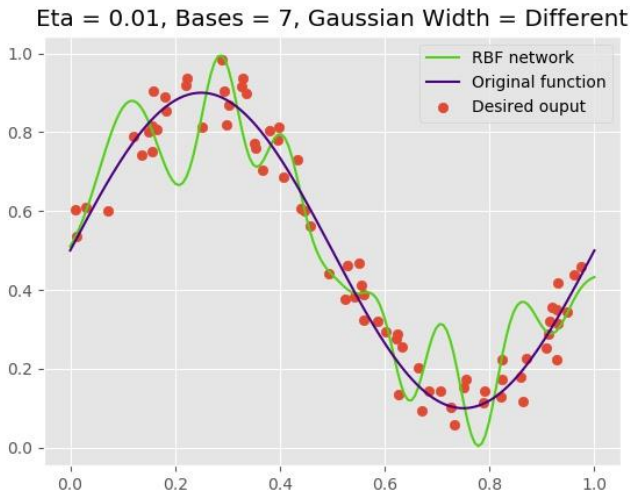
4. Same vs Variable Gaussian Width

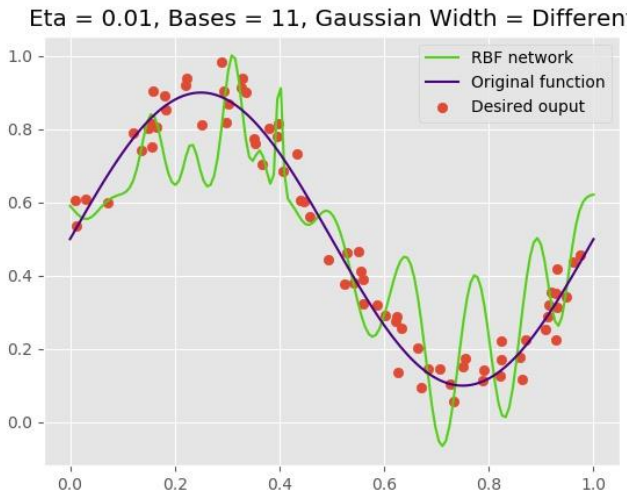
RBF networks having same Gaussian width for all bases performs better as compared to network having different Gaussian widths. The separate Gaussian widths seem to be too narrow to overlap and generate reasonable approximations of the original function.

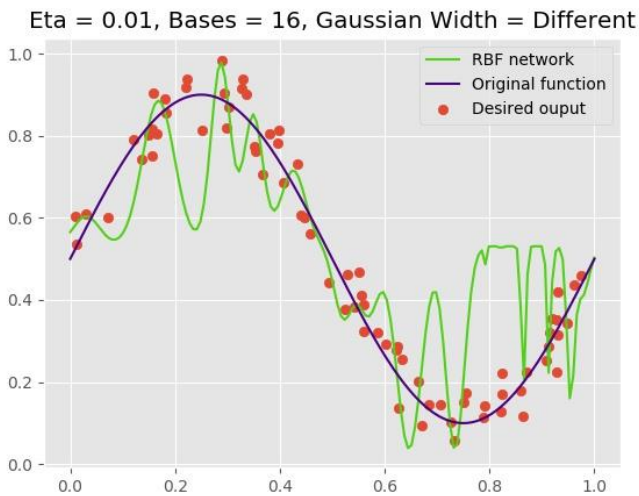
Variable Gaussian Width with η= 0.01



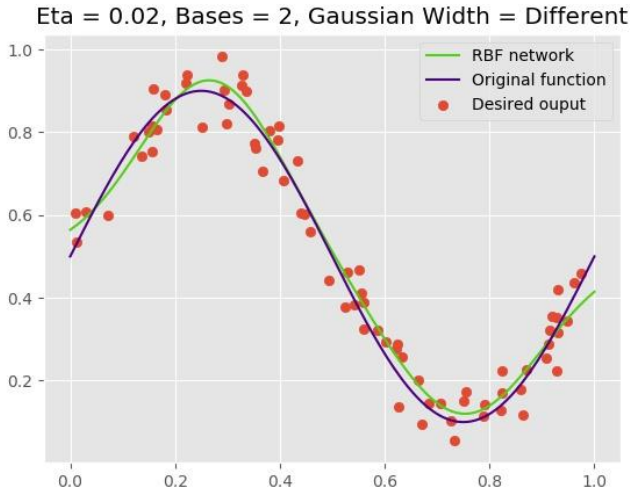


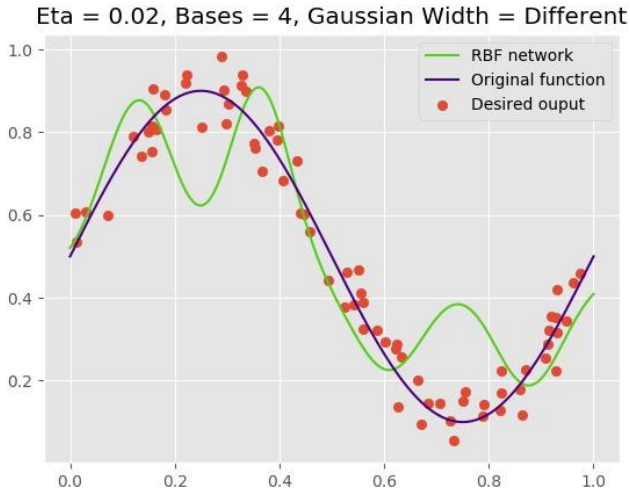


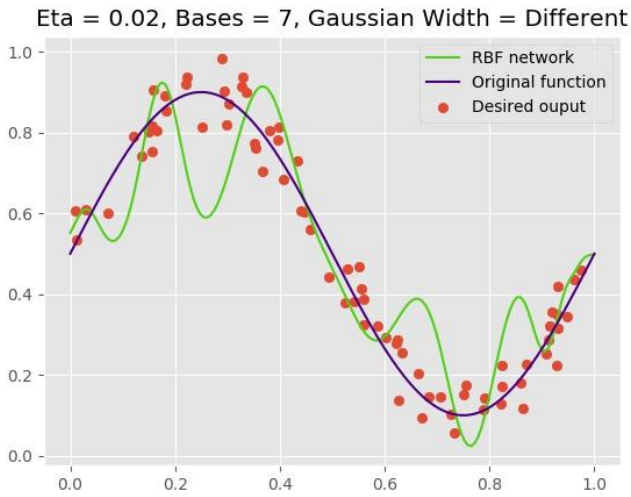


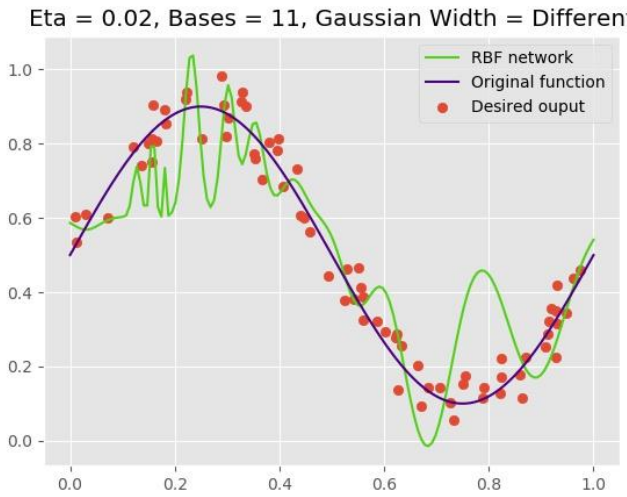


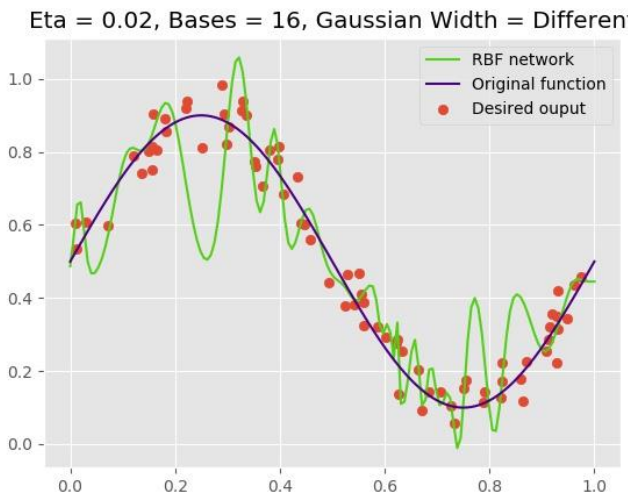
Variable Gaussian Width with η = 0.02



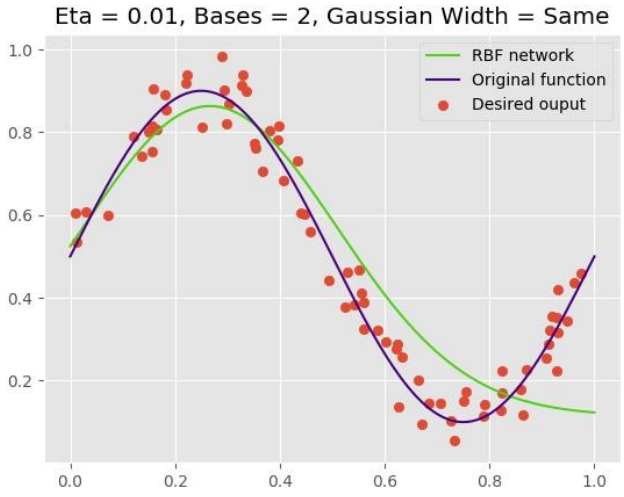


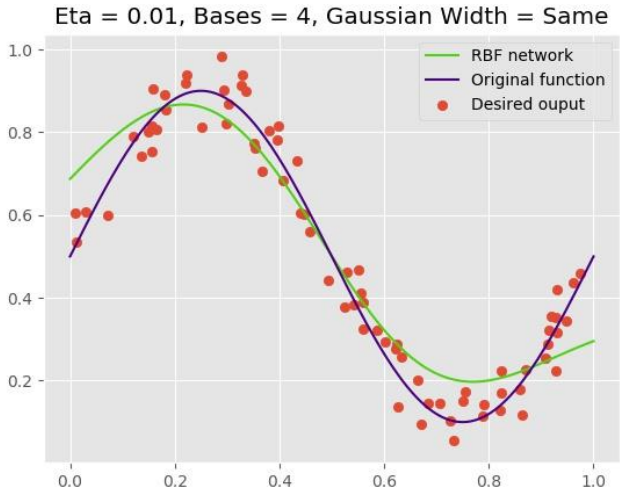


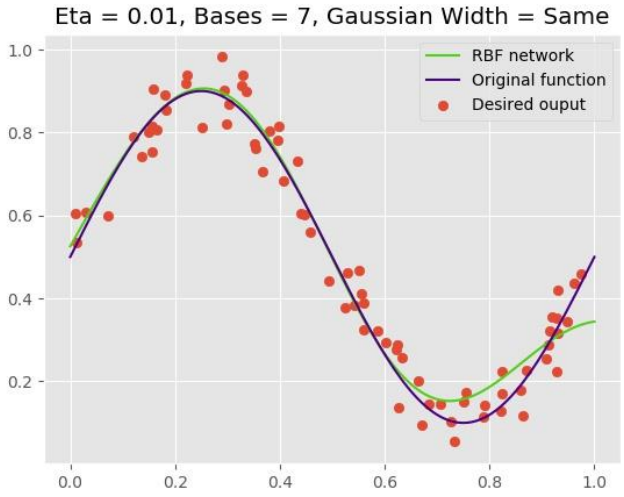


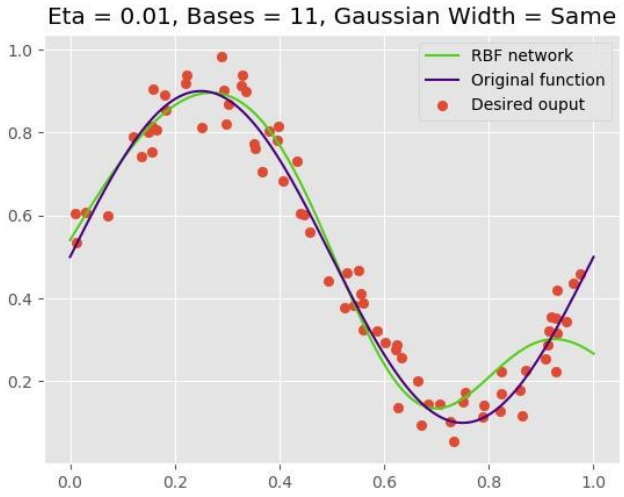


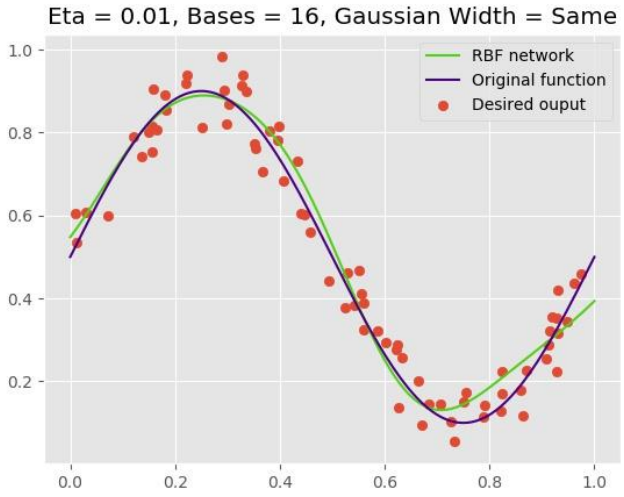
Same Gaussian Width with η= 0.01











Same Gaussian Width with η= 0.02