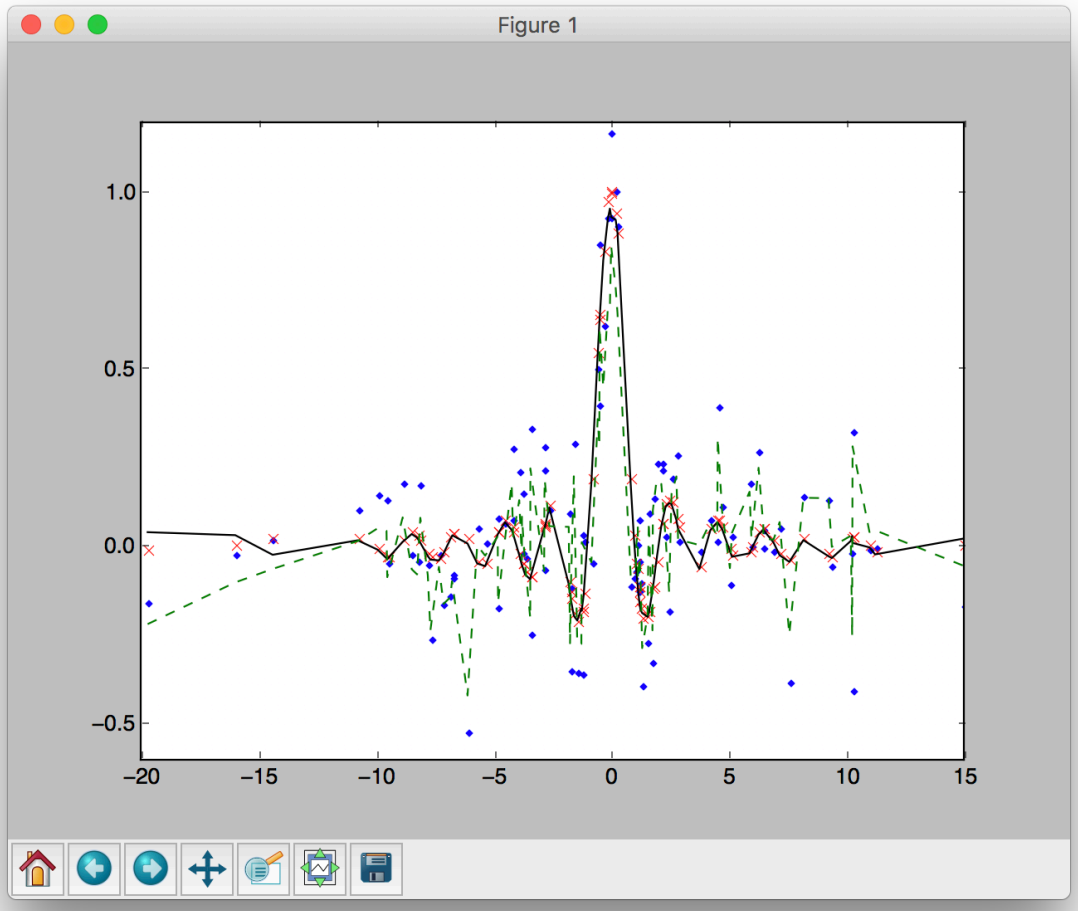
Problem 1:

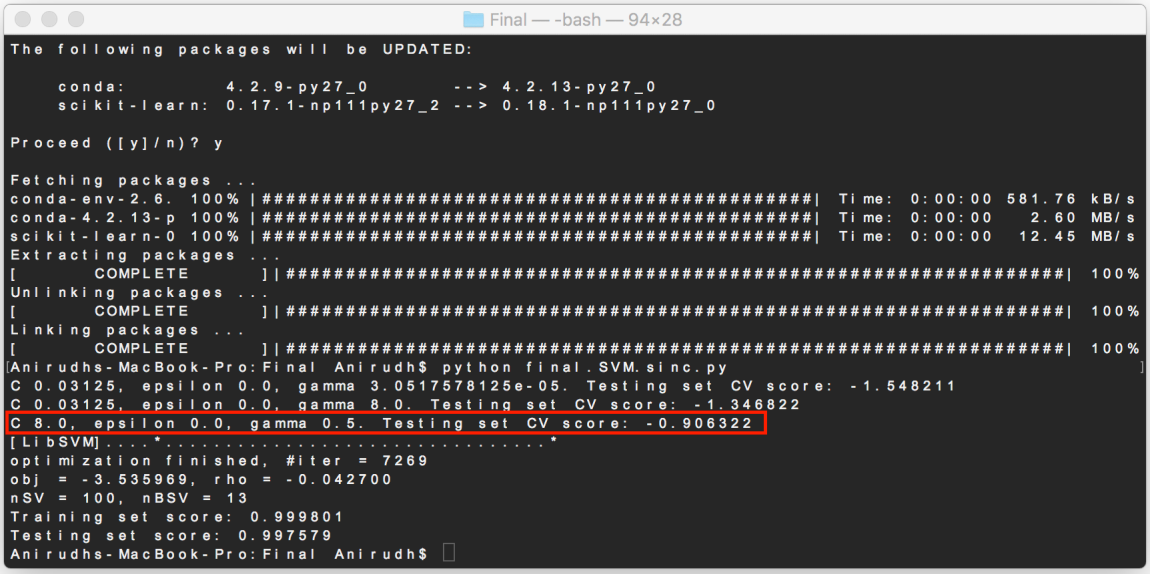
The program which implements 10-fold cross-validation approach to find the best set of hyper-parameters C, ε (epsilon) and γ (gamma) in a Support Vector Machine for Regression (SVR) is downloaded.

The program which generates data points of the "sinc" function contaminated with random noise is downloaded and given the file name finalGenData.py

The program for samples N=100 is run and the output plot along with the best hyper-parameters are obtained.



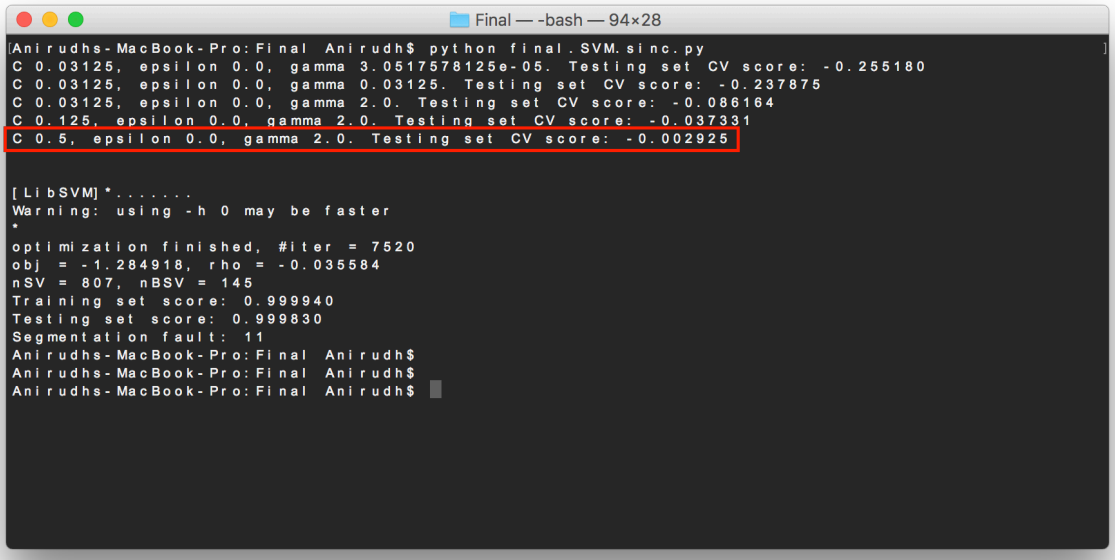
The downloaded program is run and the hyper-parameters are obtained for every ‘Score’ which is better than the ‘bestScore’ i.e., for Score > bestScore, the best values of C, ε (epsilon) and γ (gamma) are obtained.



After all the iterations are done, the Training set score, Testing set score are calculated and obtained which have a negligible difference which shows the accuracy of the system.

Now, the program is modified and conducted for the samples N=1000.

The best hyper-parameters are noted for a highest Testing CV score as follows

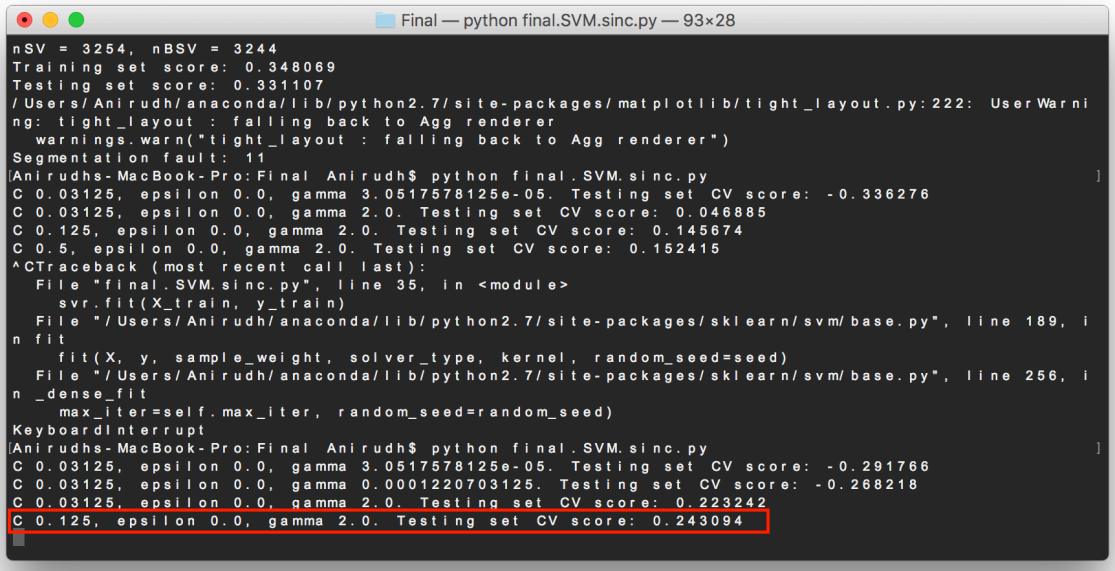


These values are posted in the google forms as provided.

Now, the same program is modified and conducted and conducted for samples N=10000.

The program was run for almost five hours but it didn't give out the answer. So, the latest value of bestScore hyper-parameters are considered as the best parameters.

The results obtained were



As we can observe, as we are increasing the number of samples, the best values of C is considerably reducing to a very smaller number, ε (epsilon) remained constant and γ (gamma) increased with increasing Training set CV score. Also, the as we increase the number of samples, the Training set score and Testing set scores are converging to a greater extent.

Problem 2:

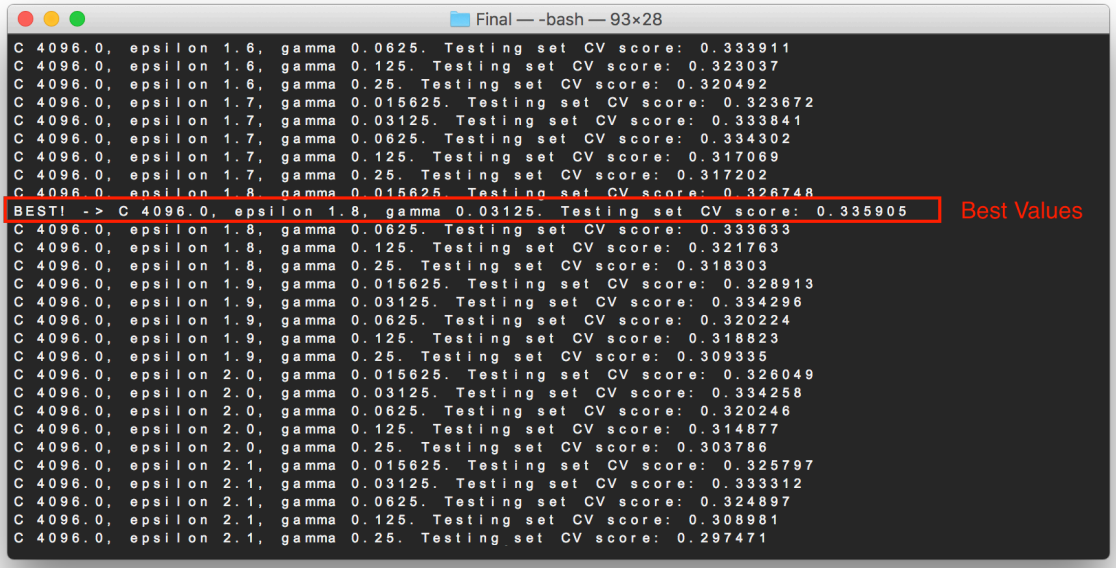
The given program was coded and saved with a file name finalGetDigits.py

The program which implements 10-fold cross-validation approach to find the best set of hyper-parameters C, ε (epsilon) and γ (gamma) in a Support Vector Machine for Regression (SVR) is downloaded.

The downloaded program is run and iterations are seen for increasing values of hyper parameters C (power of 2s from 2^6), ε (adding 0.1 from 0.5 to 2.5) and γ (twice from 0.015625 to 0.25) and the values of Testing set CV score are noted.

Also, the best values of the hyper parameters (best C, best ε and best γ) are obtained for the best value of Testing set CV score (where a maxima occurs)

For example,



The best values (hyper-parameters) are obtained for every 'Score' which is better than the 'bestScore' i.e., for Score > bestScore, the best values of C, ε (epsilon) and γ (gamma) are obtained.

When ever a maxima is seen in Training set CV score, best values are noted.

The final output of the program after all the 51267 iterations is