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IoT Analytics Project 3 – Forecasting

1) Simple moving average model

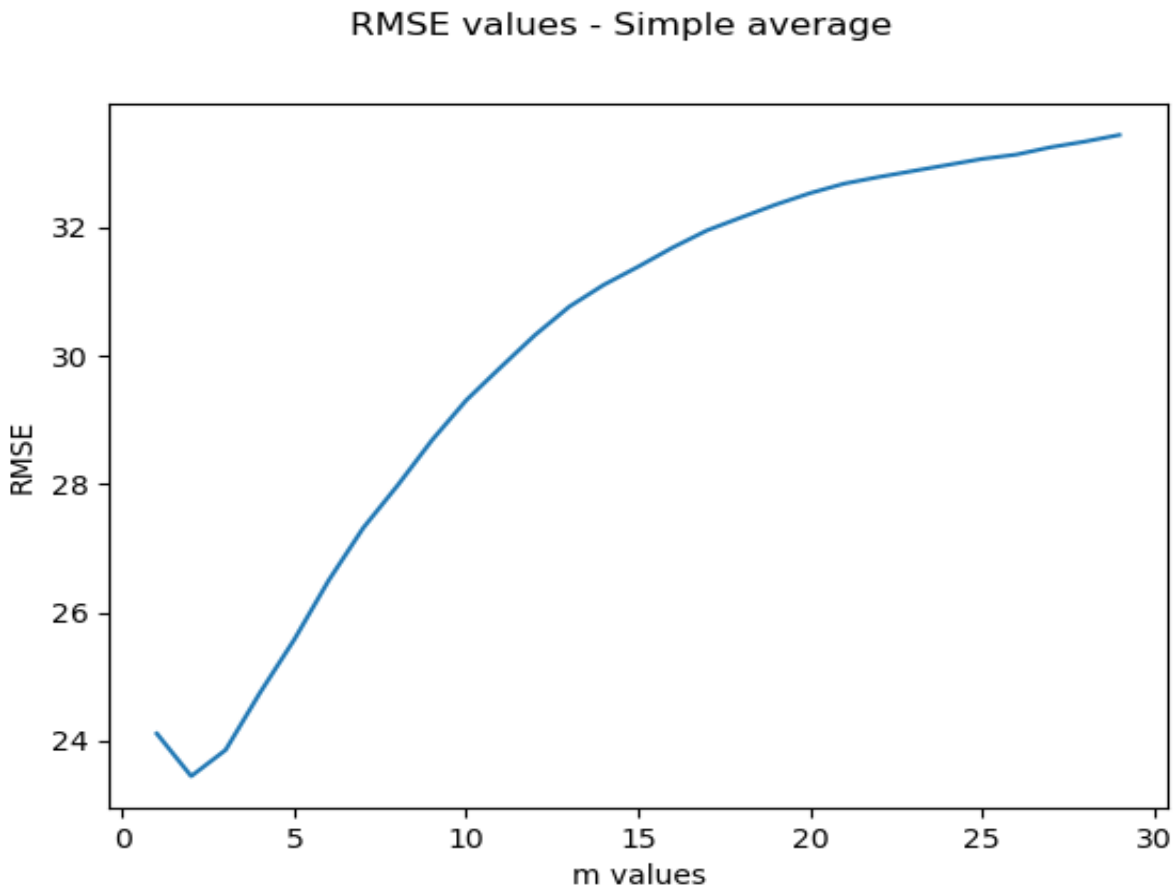
1.1.) I have applied simple moving average model for particular m value = 1 and continued

1.2.) Computed the RMSE as mentioned in the document. For m=1 I got the RMSE = `24.1158545897`

1.3.) If m is varied above 30 the RMSE kept on increasing. Hence, calculated RMSE by varying m from 1 – 30 which are the following:

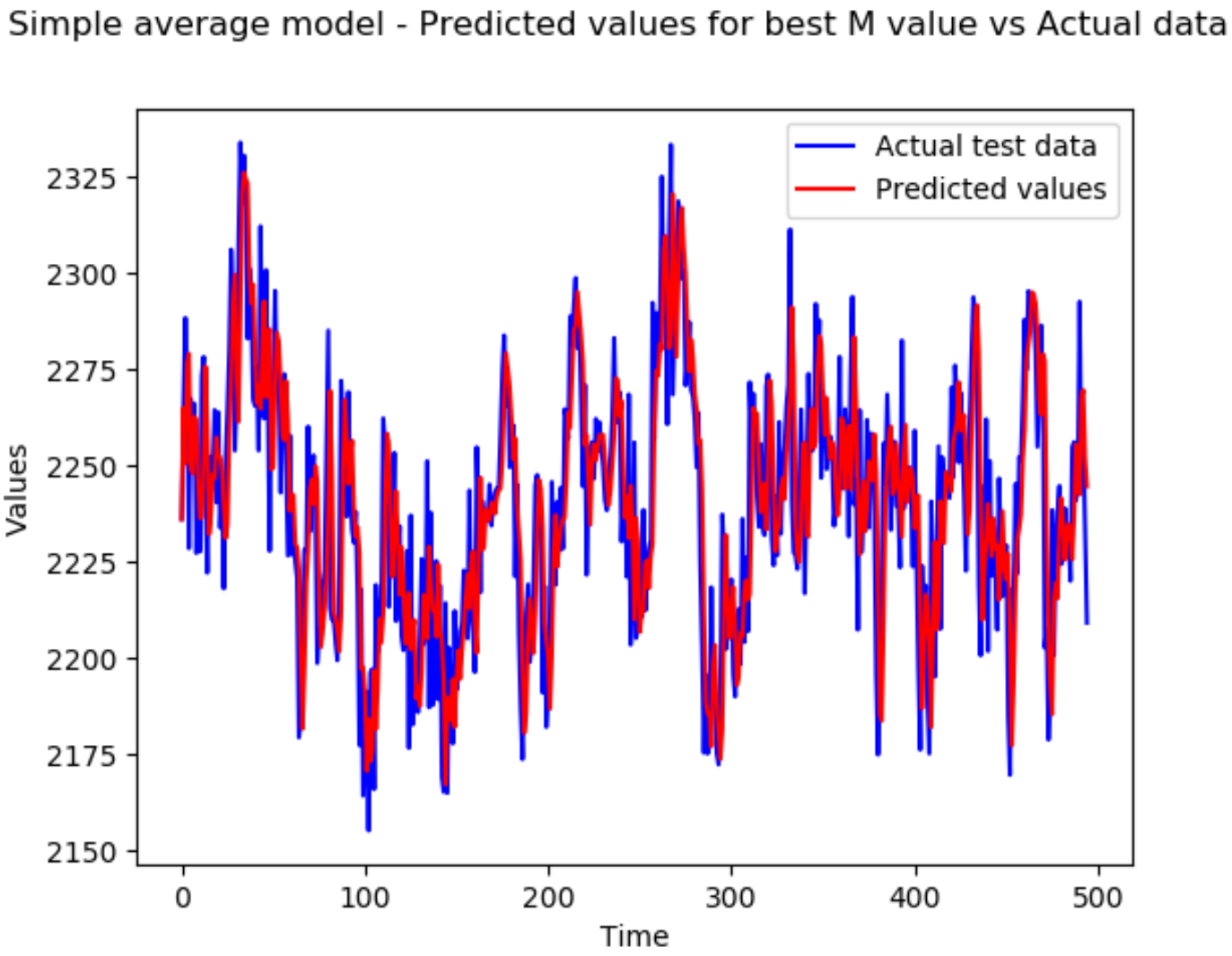
```
[24.11585458970253, 23.452436793708323, 23.860545605788513,
24.75165697763714, 25.58301342270184, 26.503951579391753, 27.317820356543436,
27.98033338626437, 28.685323958452205, 29.310114759821435, 29.823187274752097,
30.325866164563475, 30.76932288465112, 31.108497254817777, 31.39082307949699,
31.688296406914855, 31.95602952924296, 32.15937265645, 32.35854997825146,
32.537158148413695, 32.6865499360016, 32.789177851084084, 32.88334965685646,
32.976475331134864, 33.07056774745335, 33.13858788490296, 33.25278791834793,
33.34178821850649, 33.44428354497997]
```

1.4) RMSE vs m graph



I got the least RMSE value for m = 2

Plotting the predicted values against original testing data for m = 2 (lowest RMSE)



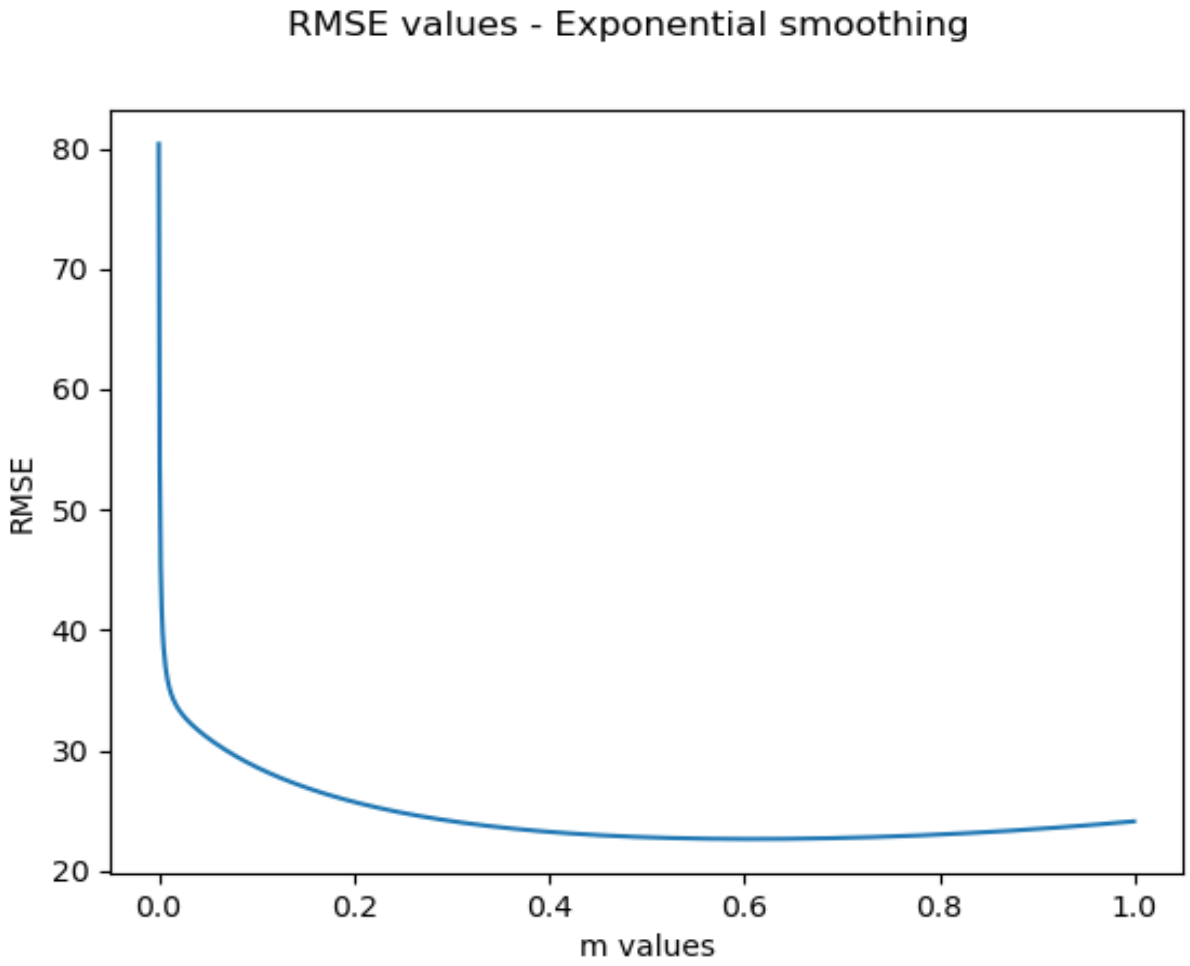
2) Exponential smoothing model

2.1) I applied the exponential smoothing algorithm for the training data set as mentioned in the document for alpha = 0.2

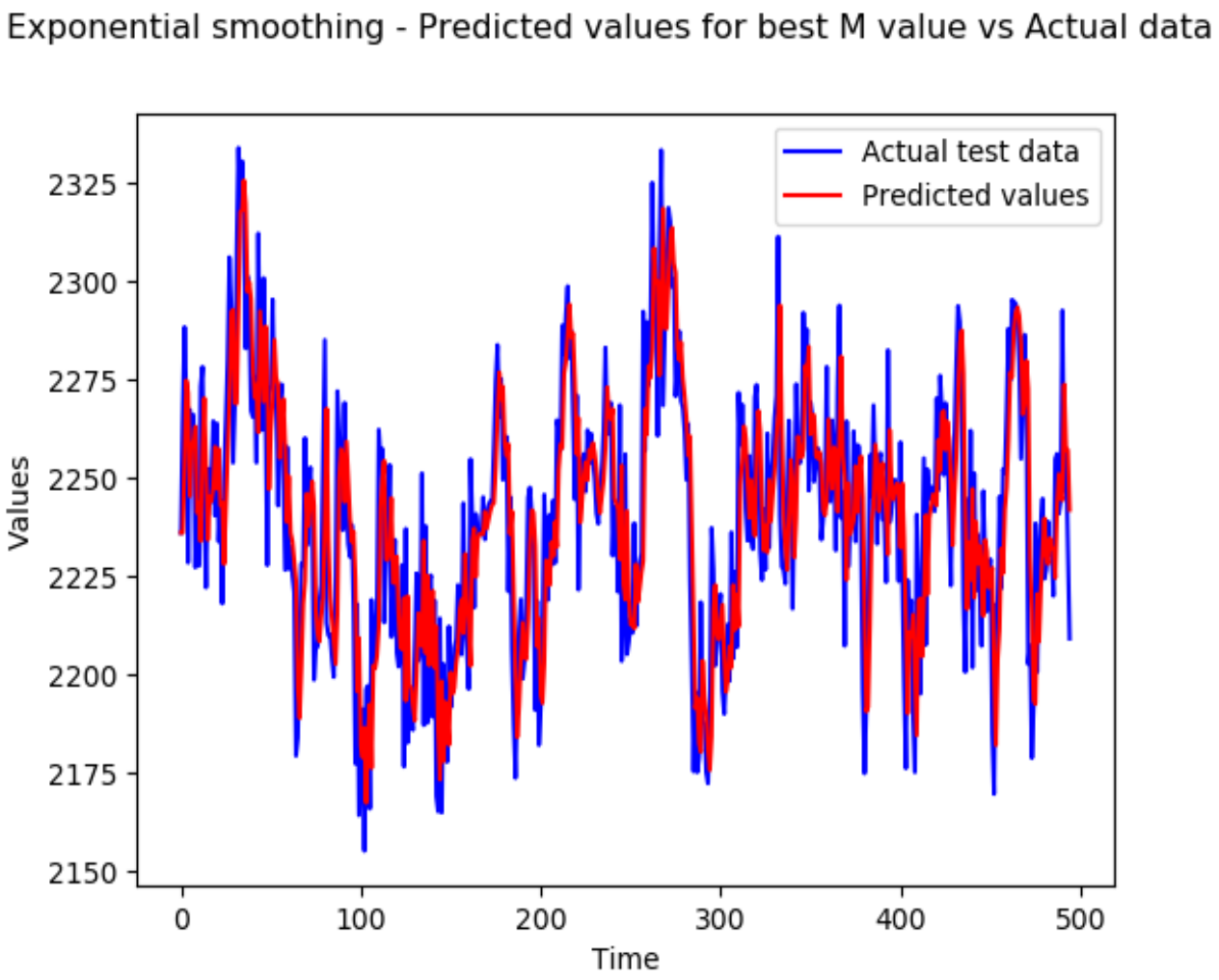
2.2) I also calculated the RMSE value for the above prediction which is `25.7141816753 when alpha = 0.2`

By varying alpha value over 0 – 1 and taking the alpha value with the least RMSE I got alpha = 0.609 for least RMSE

Graph of RMSE vs alpha value



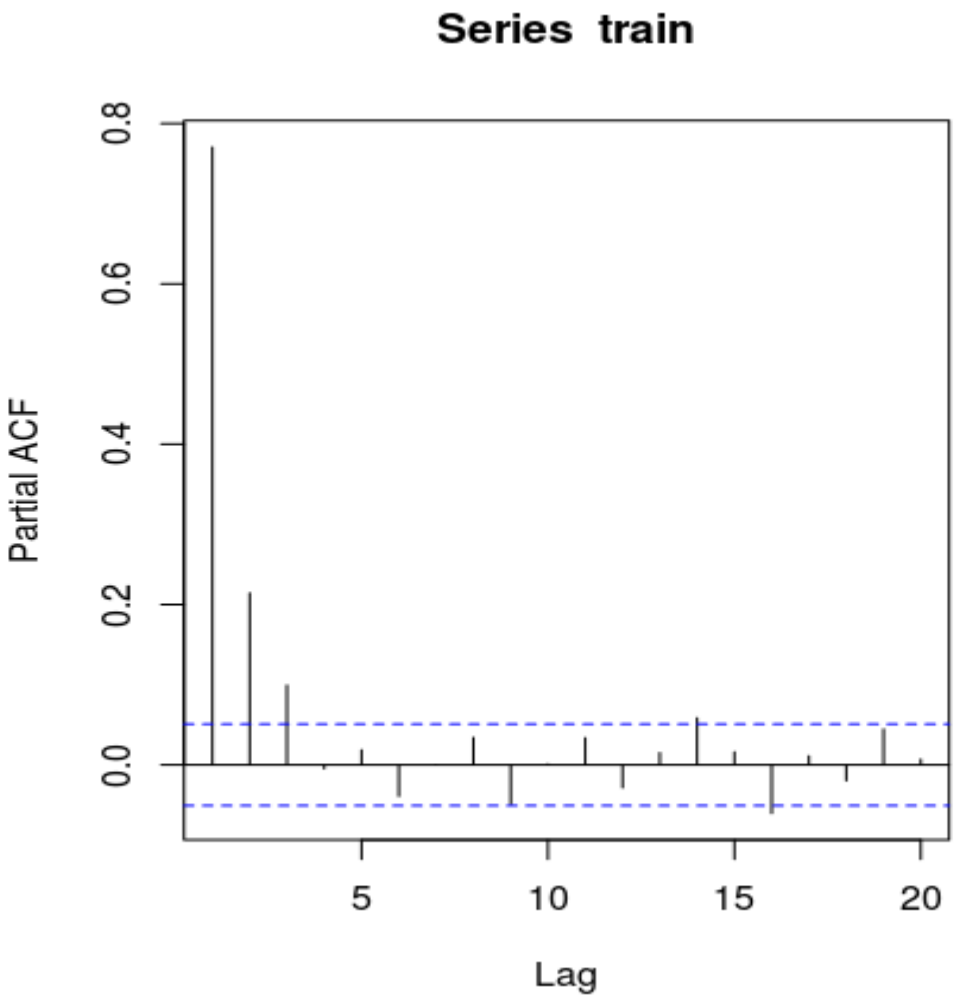
2.3) Since alpha = 0.609 for best RMSE value, I plotted the predicted values against original values as the follows:



3) AR(q)

3.1.) I have applied the autoregressive algorithm AR(p) to the training data set for a given value p = 5

3.2.) Following is the PACF I got :



The plot is only until 20 since the autocorrelation values are below threshold after 20. The significant values lie in the range(1,20)

The sharp cutoff is occurring at p=3 and the value at p=3 is positive, hence 3 is the best value to use as p.

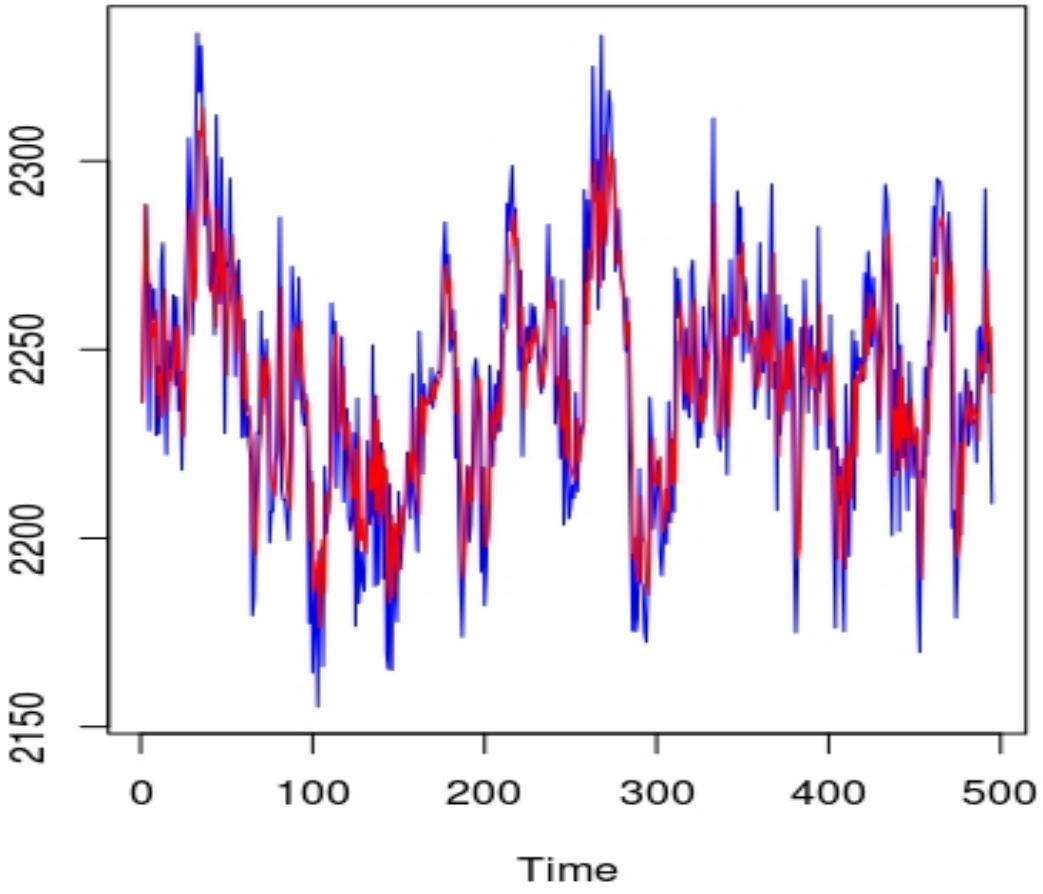
3.3.)

The parameters of AR(3) are
ar1 = Coefficient at lag 1
ar2 = Coefficient at lag 2
ar3 = Coefficient at lag 3

```
ar1          ar2          ar3          intercept
0.5850       0.1548       0.0993        359.9316

RMSE value = 22.64485
```

Plot of predicted values(red) against the original test data(blue)



4)Run all three models on the test data, and chose the best one

After running all the models on the test data following are the RMSE values that I have got for

Simple moving average : 23.79207
Exponential smoothing : 23.25000
AR(q) : 22.64485

Hence the best model is AR(p) where p = 3