1. We need to develop an auto regression model for to predict the stock price for PRAN group. We have been given stock values for one month. Use AR (6) model for your prediction. Let’s design the AR model and measure it’s quality with regards to unseen test data.
   1. Select first 60% data for training and 40% data for test
   2. Your AR model should be as follows:

*Yt+1 = c0 + c1yt-5 + c2yt-4 + c3yt-3 + c4yt-2 + c5yt-1 + c6yt*

Where *yt* is the stock value at time *t*. So the future value *yt+1* can be predicted using the above equation.

* 1. Learn the coefficients (all c’s) using the train data.
  2. Use the learned coefficients to predict the stock values for the test data.
  3. Plot actual stock value (red line) and predicted stock value (blue line) for the test data
  4. Calculate SSE for actual stock and predicted stock values. Then calculate R2

Data:

|  |  |
| --- | --- |
| 5-Oct-2020 | 34 |
| 6-Oct-2020 | 67 |
| 7-Oct-2020 | 66 |
| 8-Oct-2020 | 71 |
| 9-Oct-2020 | 77 |
| 10-Oct-2020 | 79 |
| 11-Oct-2020 | 80 |
| 12-Oct-2020 | 79 |
| 13-Oct-2020 | 86 |
| 14-Oct-2020 | 88 |
| 15-Oct-2020 | 87 |
| 16-Oct-2020 | 88 |
| 17-Oct-2020 | 89 |
| 18-Oct-2020 | 92 |
| 19-Oct-2020 | 94 |
| 20-Oct-2020 | 95 |
| 21-Oct-2020 | 93 |
| 22-Oct-2020 | 96 |
| 23-Oct-2020 | 96 |
| 24-Oct-2020 | 97 |
| 25-Oct-2020 | 97 |
| 26-Oct-2020 | 99 |
| 27-Oct-2020 | 100 |
| 28-Oct-2020 | 101 |
| 29-Oct-2020 | 101 |
| 30-Oct-2020 | 102 |
| 31-Oct-2020 | 105 |
| 1-Nov-2020 | 106 |
| 2-Nov-2020 | 106 |
| 3-Nov-2020 | 110 |
| 4-Nov-2020 | 110 |

1. In this part, you we will fit the following two cubic polynomials *p(t)* and *q(t)* at the same time*.*



Train data:

*p(1) = 2,*

*p(2) = 7,*

*p(5) =2,*

*p(7) =12,*

*p(8) = 13,*

*p(10) =6,*

*p(17) = 6,*

*q(5) = 4,*

*q(10) = 5,*

*q(12) = 10,*

*q(10) = 8,*

*q(12) = 19,*

*p(7) = q(7),*

*p’(19) = q’(10),*

*p’’(1) = q’’(7),*

*Test Data:*

*p(6) =1,*

*p(10) =2,*

*p(18) = 30,*

*p(20) =36,*

*p(22) = 16,*

*q(15) = 14,*

*q(20) = 15,*

*q(22) = 29,*

*q(18) = 18,*

1. From train data, create vandermonde matrix A. And output vector b\_train
2. Use A and b\_train, calculate the coefficients c\_hat = [c0, c1, c2, d0, d1, d2]T. You cannot use pinv() function anyway.
3. Now you have coefficients for both polynomials.
4. Use the corresponding coefficients to calculate the predicted output *p\_test\_hat* for test input *t* for polynomial *p*. Plot actual *p(t)* and *p\_test\_hat(t)* for test input *t*
5. Use the corresponding coefficients to calculate the predicted output *q\_test\_hat* for test input *t* for polynomial *q*. Plot actual q*(t)* and q*\_test\_hat(t)* for test input *t*