Assignment 3 Report

Q1a) The coefficients are:

1.0e+04 *

7.7731

0.0142

-0.6362

And the predicted value for [1,1400,4] is 2.5085e+05

Q1b) Normalization has been done according to the following formula

X = x -min(x)/range(x)

normalised coefficients are

1.0e+05 *

2.1320

4.9330

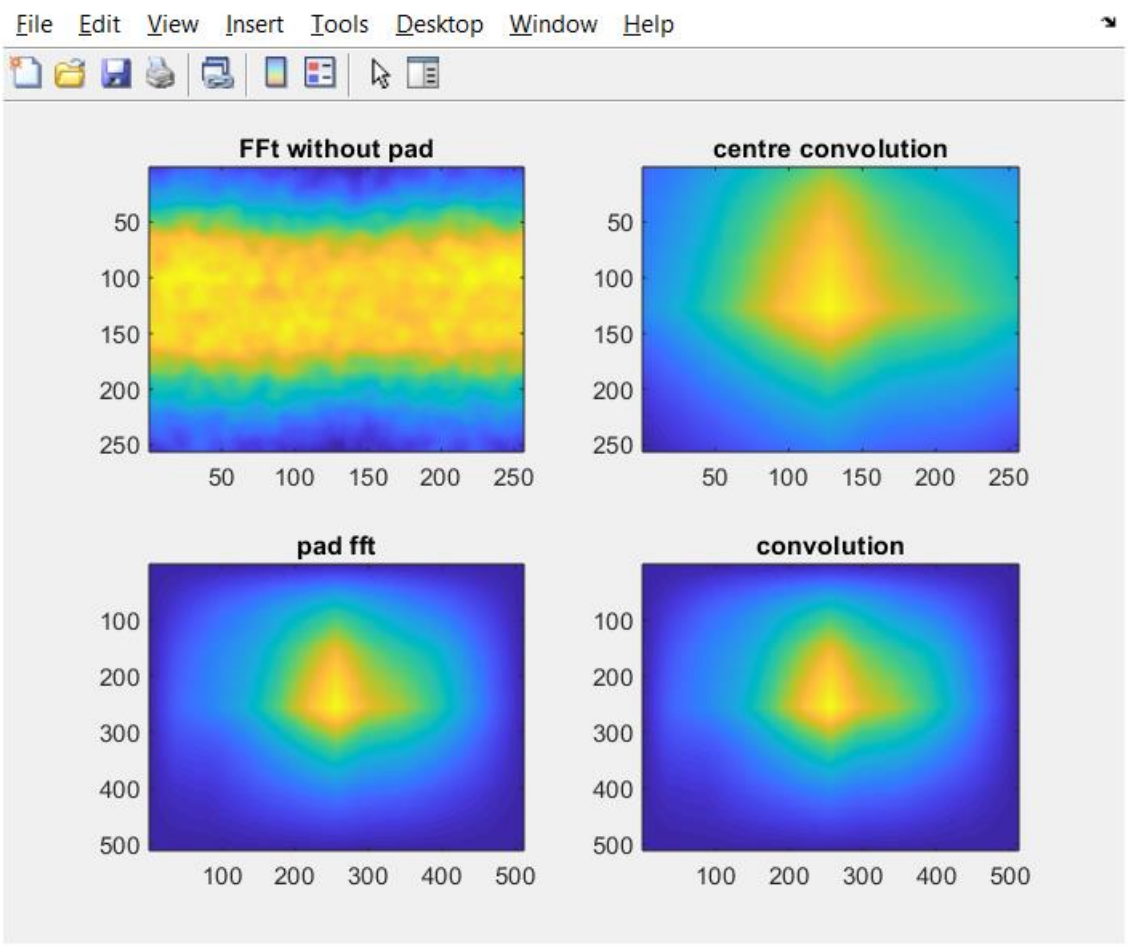
-0.2545

No normalization does not result in any effect as norm is same.

Q1c) Yes the mean passes through plane of regression with accuracy of 5.820766e-10

Q1d) No, this method is inefficient for large values of N as the complexity of computing the inverse is O(where n ~ nlog27) 10^6. Hence it not computationally efficient.

Q2)



2a) So no fft without pad and centre of convolution is not same as seen in plot

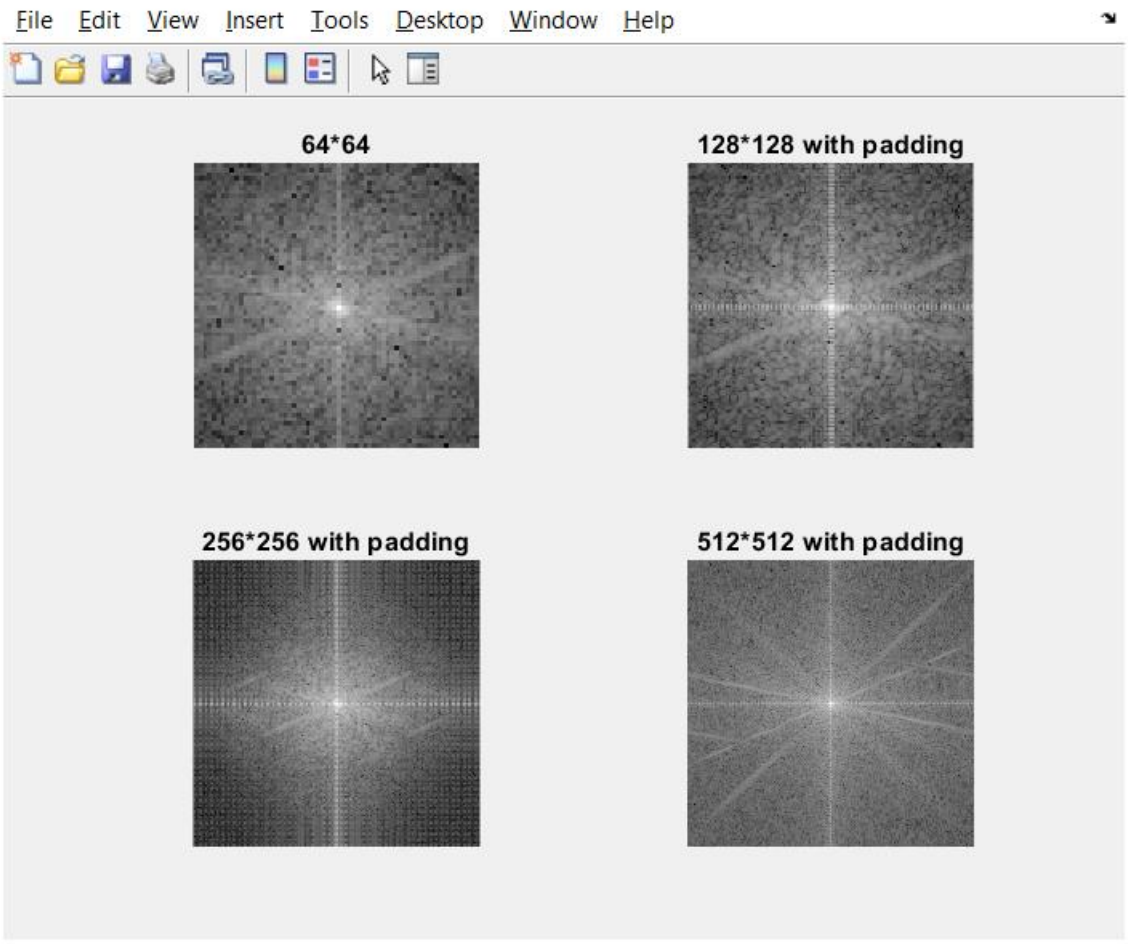
2b) The mean squared error is 1.7807e+17

2c) error mean square with pad is 9.7026e-15. Also we see from the plot.

The reasons can be that when we pad the linear convolution gets converted to circular convolution which is in fact the type of convolution for which the convolution theorem is true.

Hence, it gives more accurate results.

Q3)

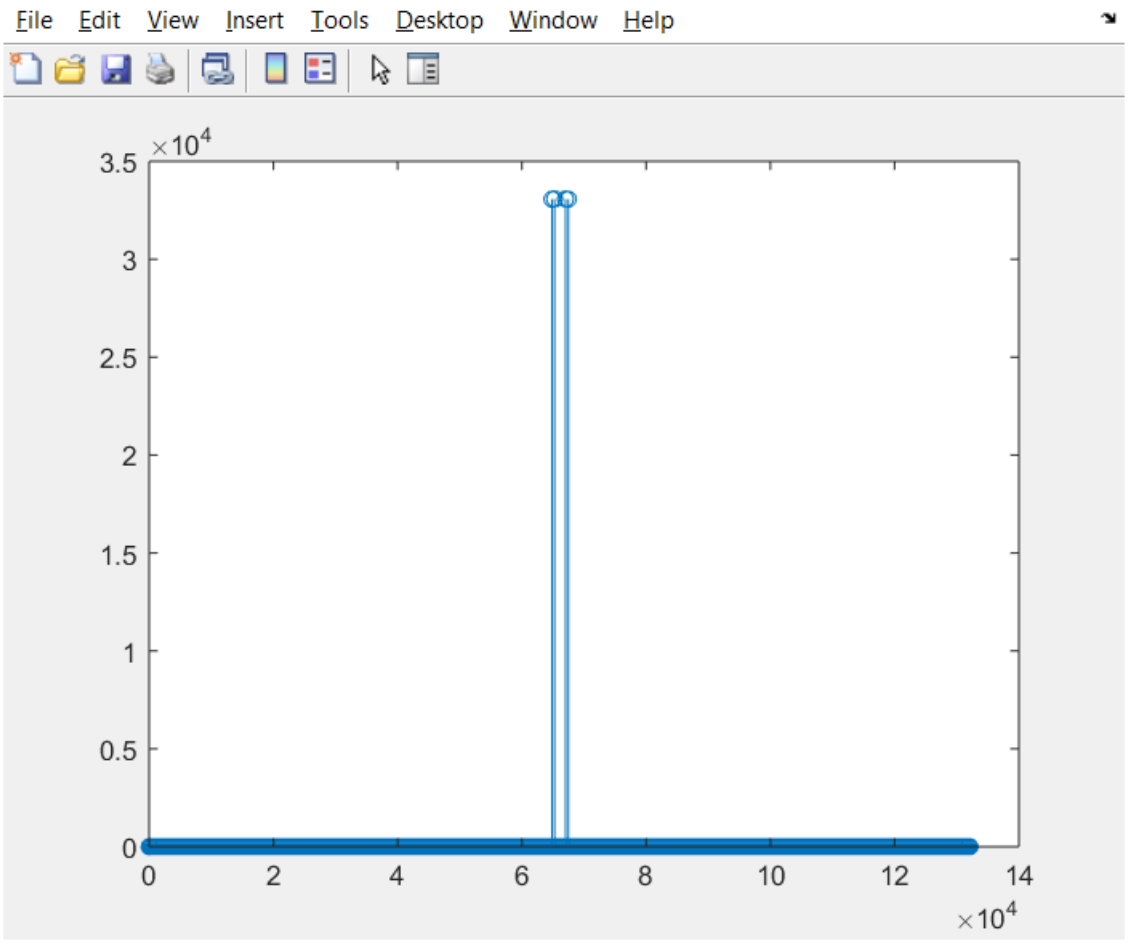


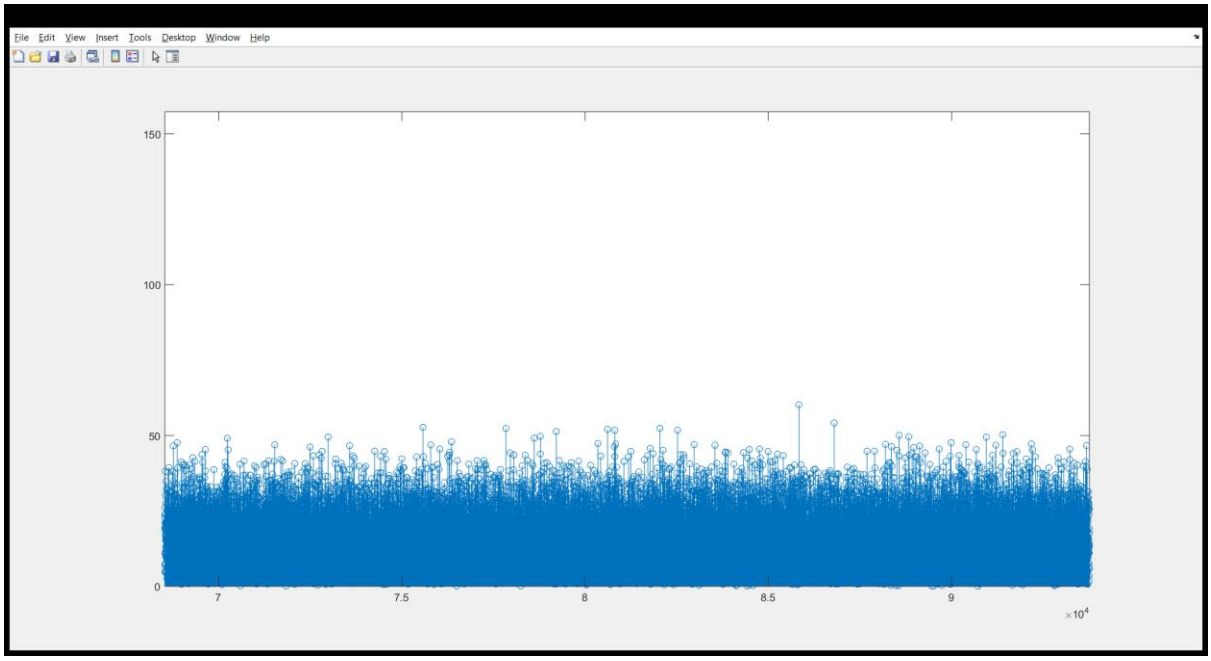
We observe that the central portion remains same even after padding. The only difference is that we see horizontal and vertical disturbances in the signal.

These occur as we introduce discontinuity when we pad with zeros. The effect is seen as sic function in the Fourier Domain.

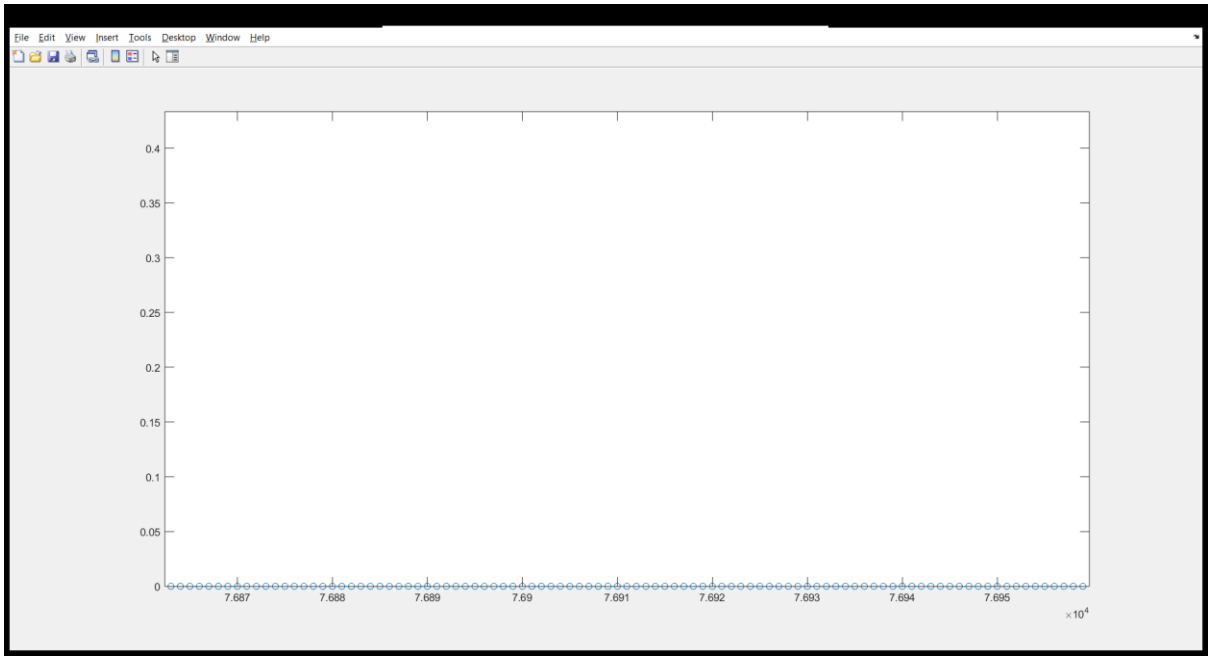
Also the resolution is increased as more data points.

Q4)





we can see the noise apart from the peaks of data



Noise removed .

In order to denoise I just zeroes all values except the 2

frequencies.

Alternatively I designed a lowpass filter which filters the frequency

Q5) We have been given that the signal overlap for about 5 sec.

So in order to find the first part, I performed correlation of the

starting of each chunk with ending of every other chunk.

The min correlation index was the first number.

Then I used this to compare its end with starting of all other tones.

In this way I found out the order.

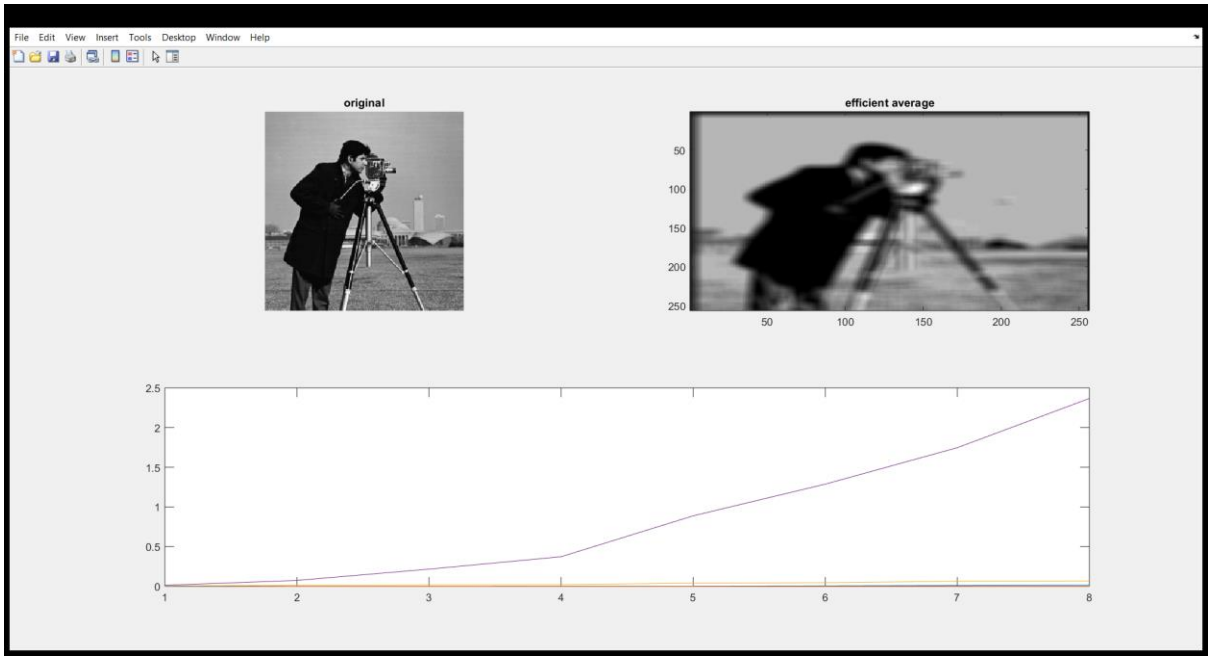
Order 35142

For denoising I applied medfilt and then smooth it with sgolay and gaussian.

Q6a)

Here I created a simple average filter and the image is as shown

Q6b)



I have implemented 4 methods with simple matrix to convolve

2) An optimisation with applying rows and colums

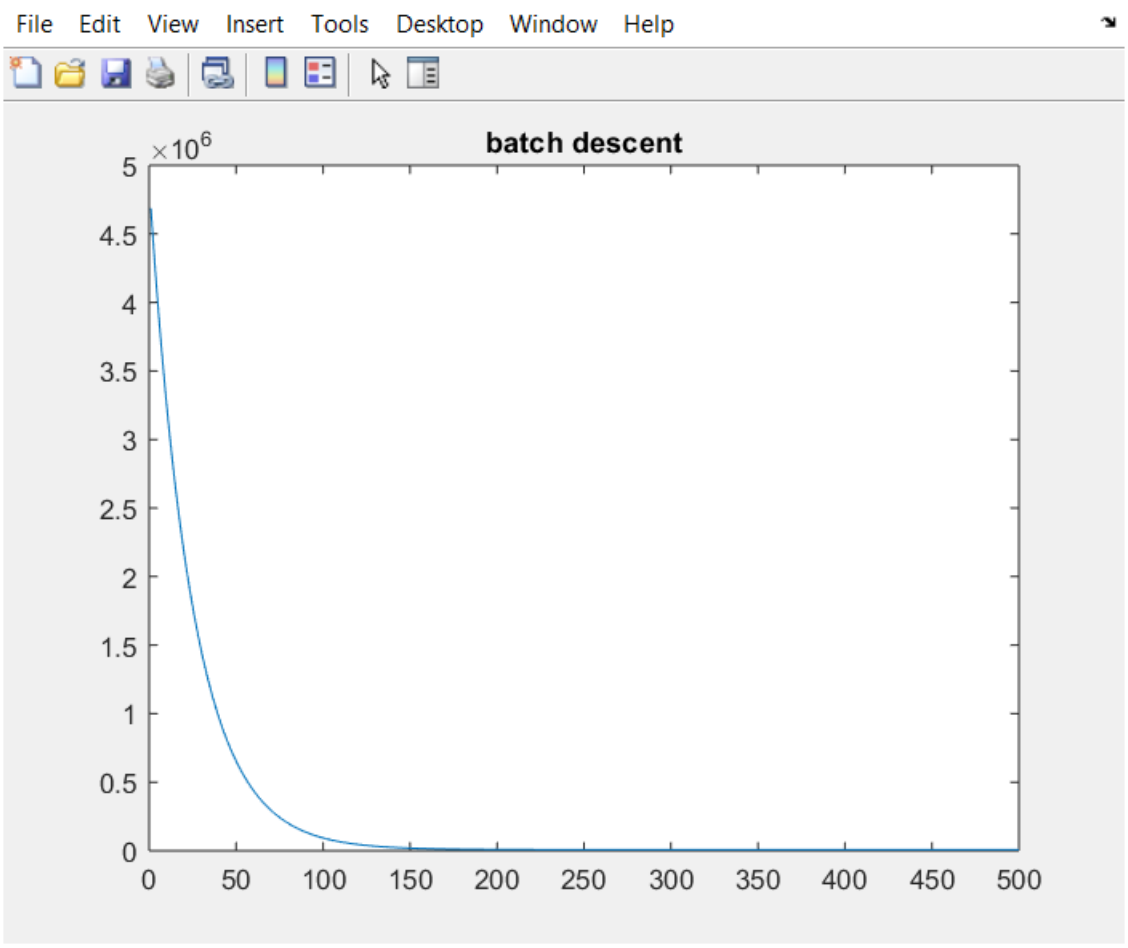
3)Scratch with convolution also implemented

4)optimisation over scratch

In 2) we apply first rowwise then columnwise thus reducing complexity to order k^3.

In4) we do dp to get other rows after we have 1st row

Q7)



theta is:

1.0e+03 *

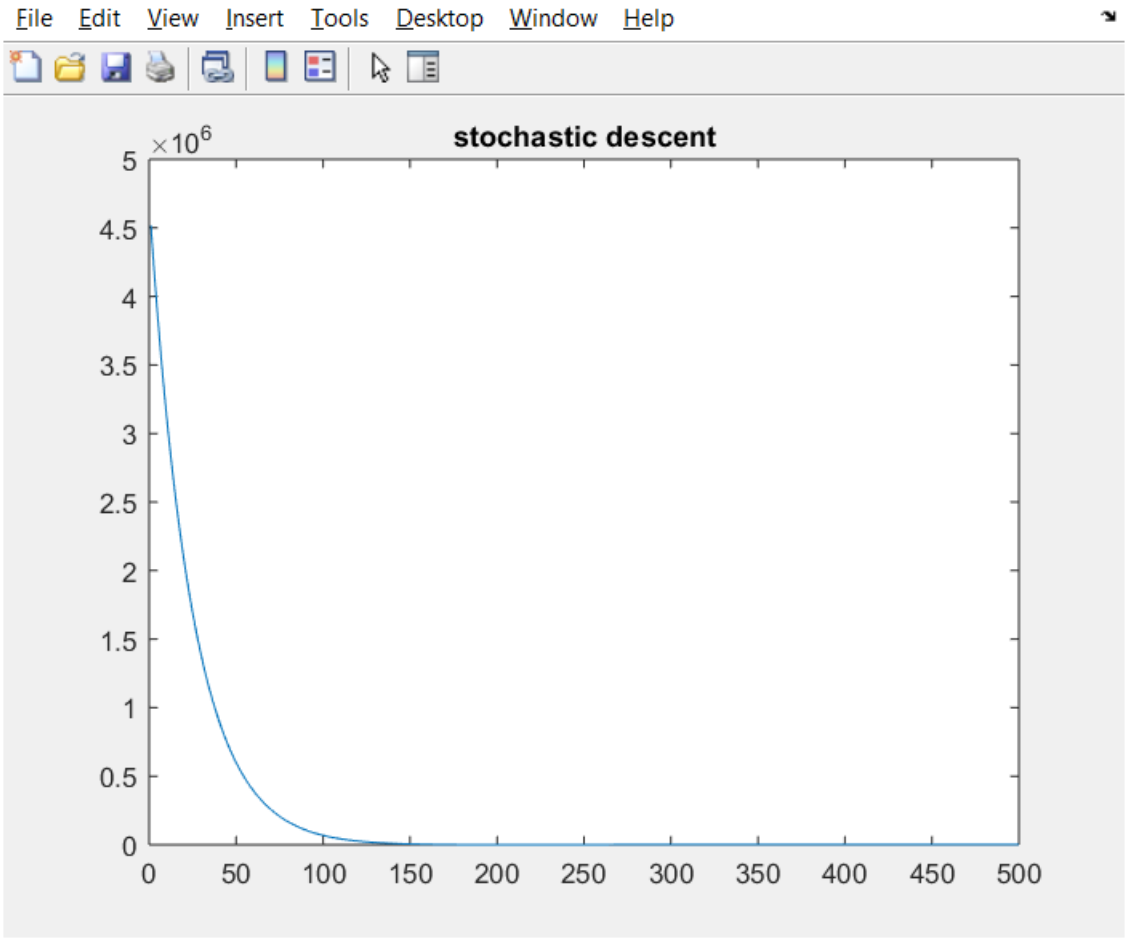
3.1215

-0.0137

0.0434

norm error is

3.2725e+04



theta is:

1.0e+03 *

3.1215

-0.0013

0.0019

norm error is

182.4010

So stochastic is better as norm error is less.

Also we have a mini batch version which will perform more better than batch but less than stochastic