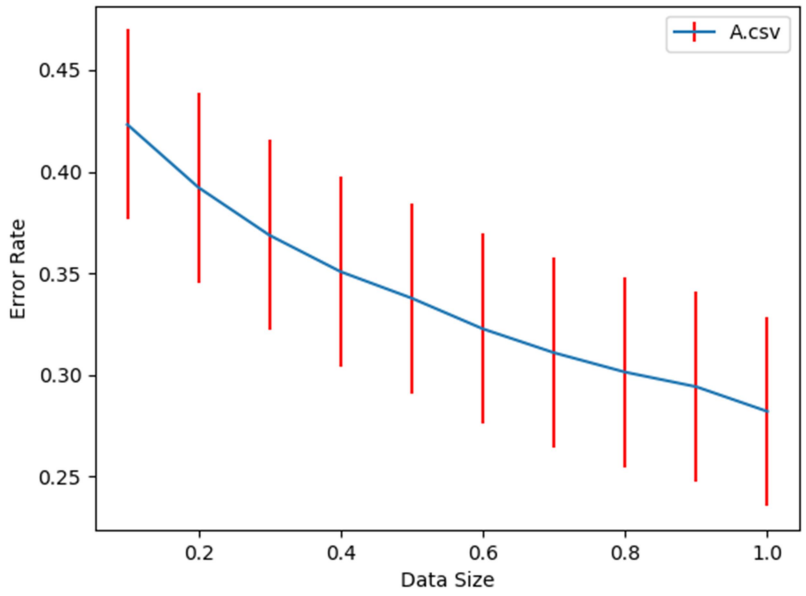
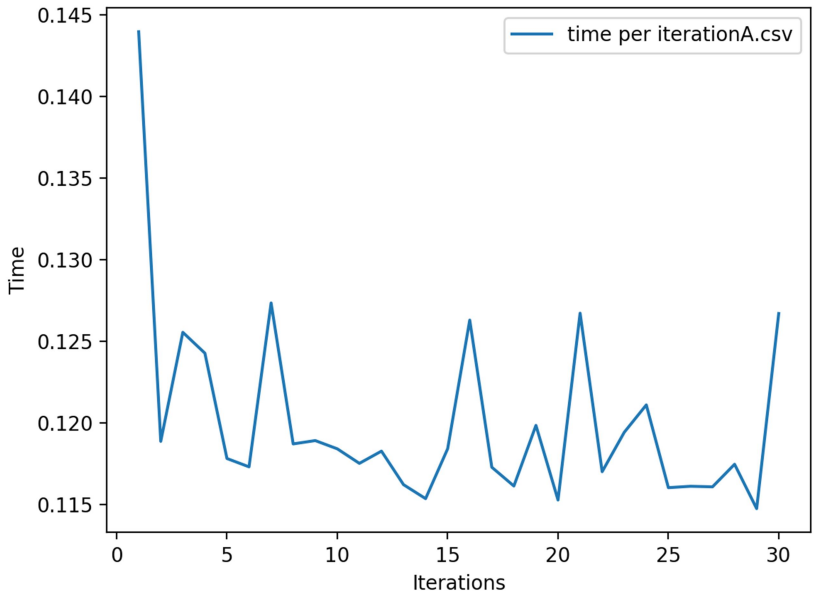
Bayesian Regression

Dataset - A

Error Rate Graph



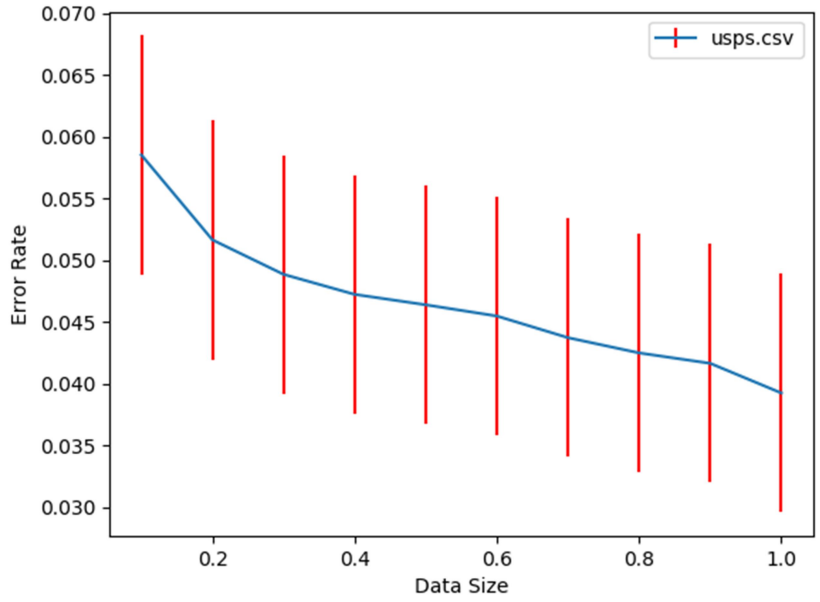
Statistics for time/iteration



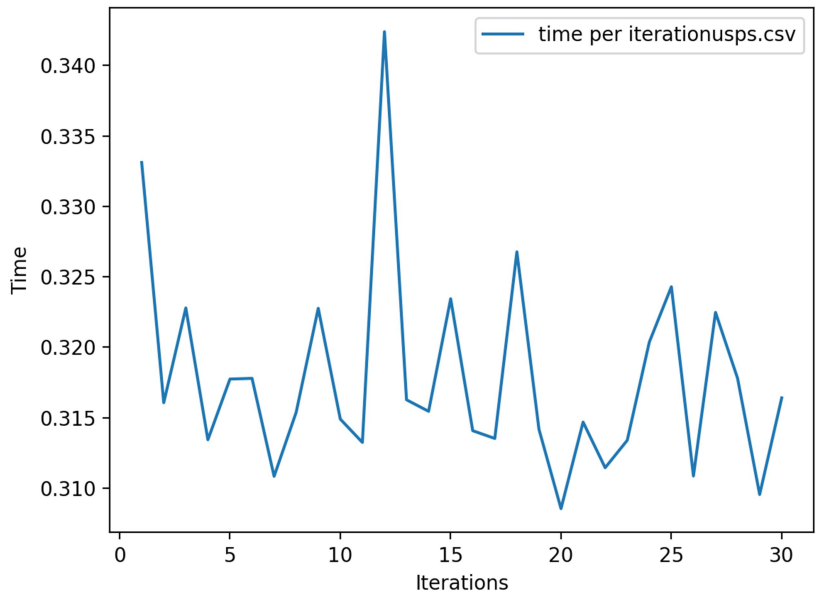
Bayesian Regression

Dataset – usps

Error Rate Graph



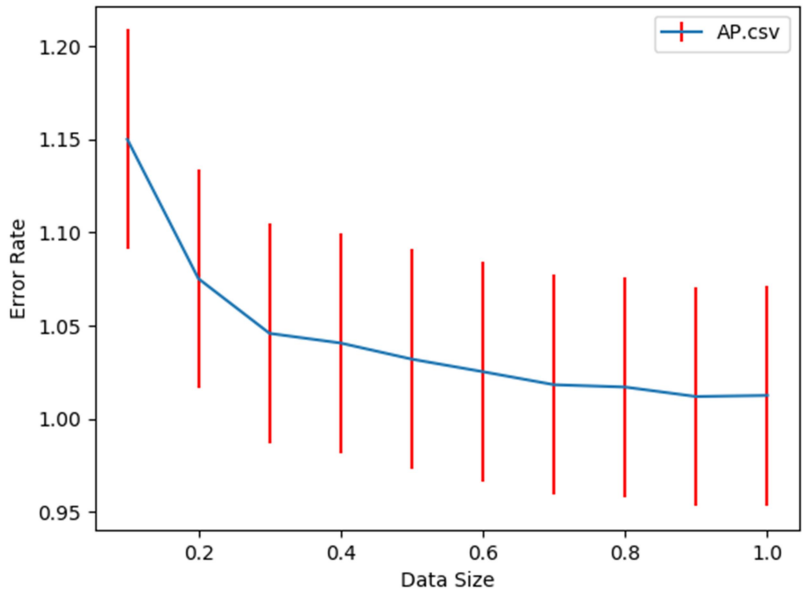
Statistics for time/iteration



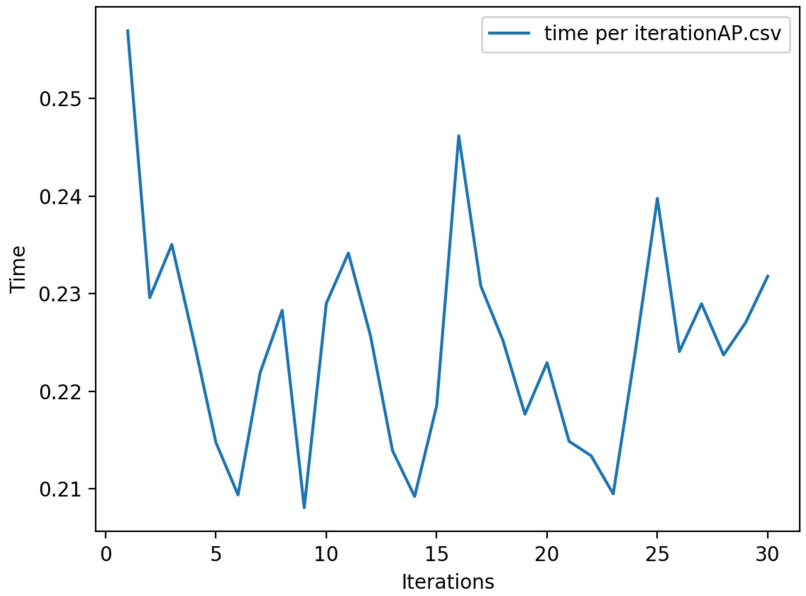
Poisson Regression

Dataset – AP

Error Rate Graph



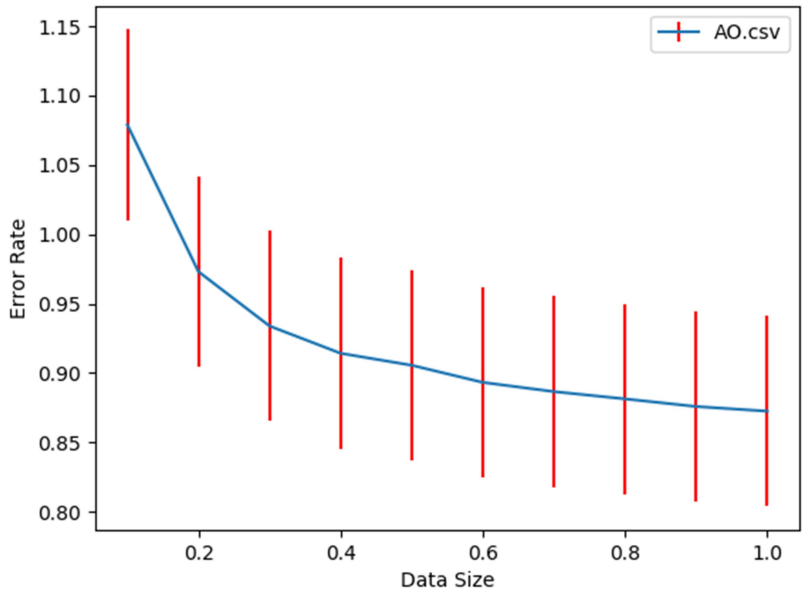
Statistics for time/iteration



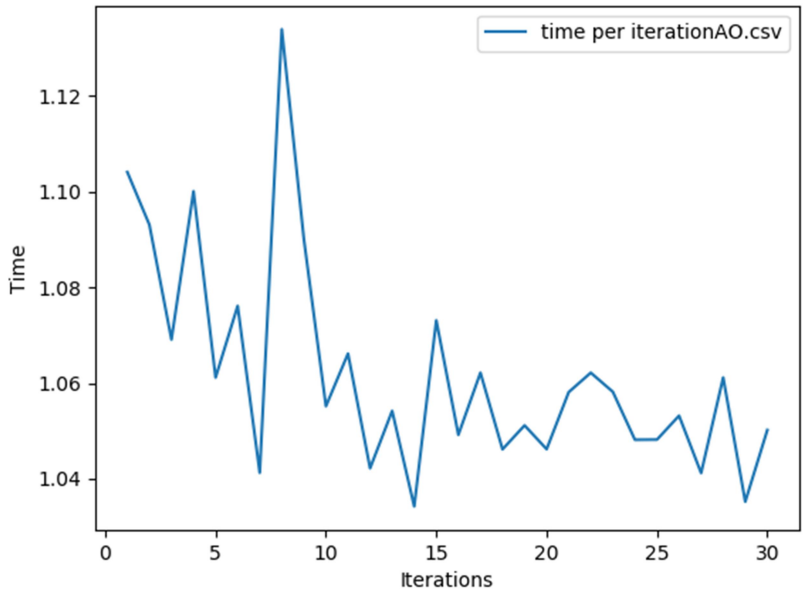
Ordinal Regression

Dataset – AO

Error Rate Graph



Statistics for time/iteration



Discussion of Results:

Statistics of time per iteration

Dataset	Average time required for one iteration*	Minimum time required for one iteration*	Maximum time required for one iteration*	Total time required*	Average WMAP convergence time*
A	0.1421	0.1366	0.1645	4.3413	0.0133
USPS	0.7411	0.7081	0.8876	22.36018	0.0729
AP	0.3297	0.3051	0.3580	9.9723	0.0305
AO	1.0926	1.0462	1.2596	32.8561	0.1065

*All the above values are approximate and are in seconds

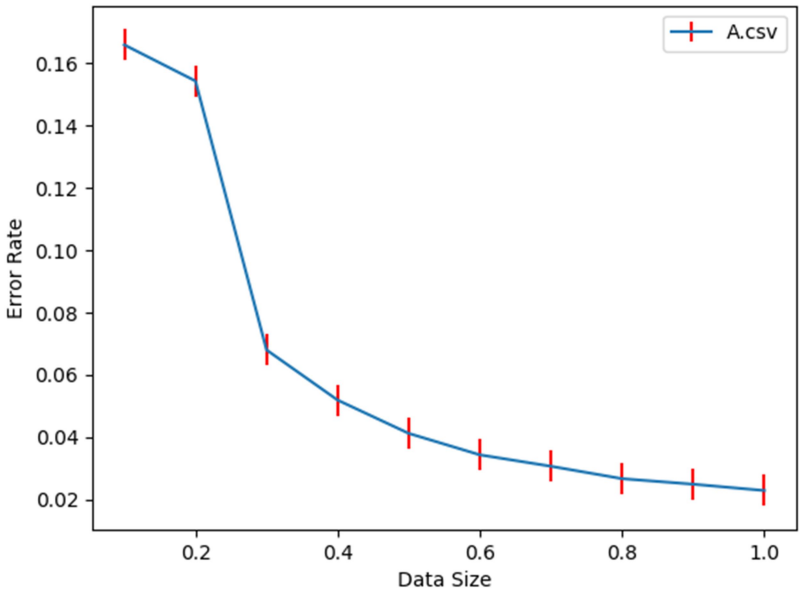
- Yes, all the learning curves are almost as expected. Accuracy for all the 4 dataset predictions in the start is approximately 40-45% which later decreases to 30-35% as the iterations increase.
- Learning time for Bayesian is completely dependent on the dataset, whereas Poisson shows a good learning time compared to Ordinal algorithm for classification and likelihood model.
- For Bayesian and Poisson approach time cost is not much as y_hat is (n X 1). But for ordinal as the yhat number of column increases to the size of classifiers making it a 2D array of (n X m) creating the need for nested loop and thus increasing time. (n = size of dataset, m = K)

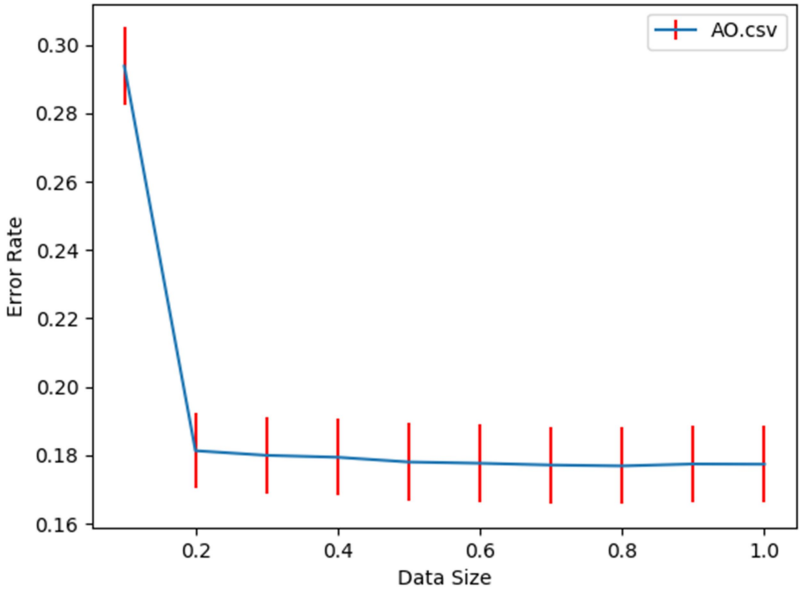
Model Selection for Alpha

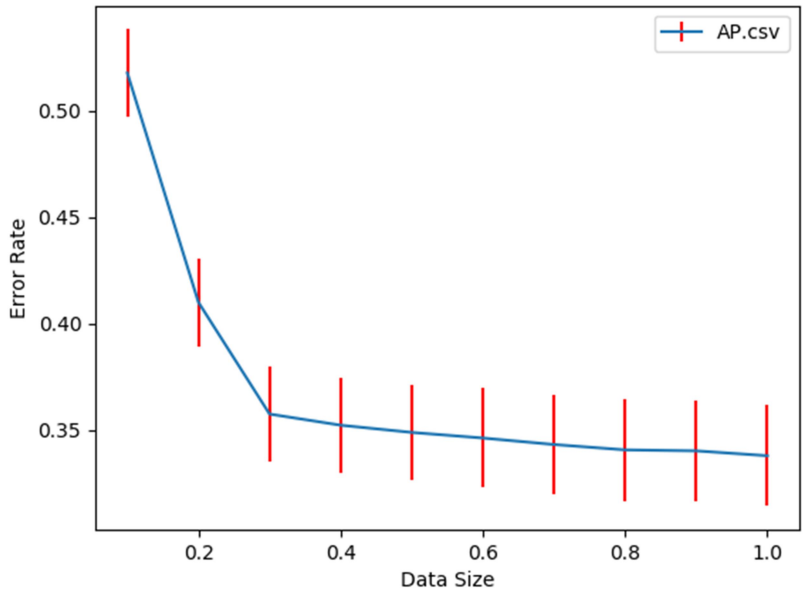
- For model selection of alpha I have used Bayesian approach.
- In Bayesian approach we converge alpha beta value to get the value of our unknown parameter lambda.(convergence value 10^-7 or 100 loops(for time efficiency))
- This lambda value is used as alpha value for calculating wmap.
- In the below graphs we can clearly see that by using BMS for alpha value our prediction accuracy for all the 4 data sets have increased.
- I am calculating alpha for data part [0.1…1] for 30 iterations and using it to calculate wmap for the corresponding iteration.
- Downside to this is that it is not time efficient.

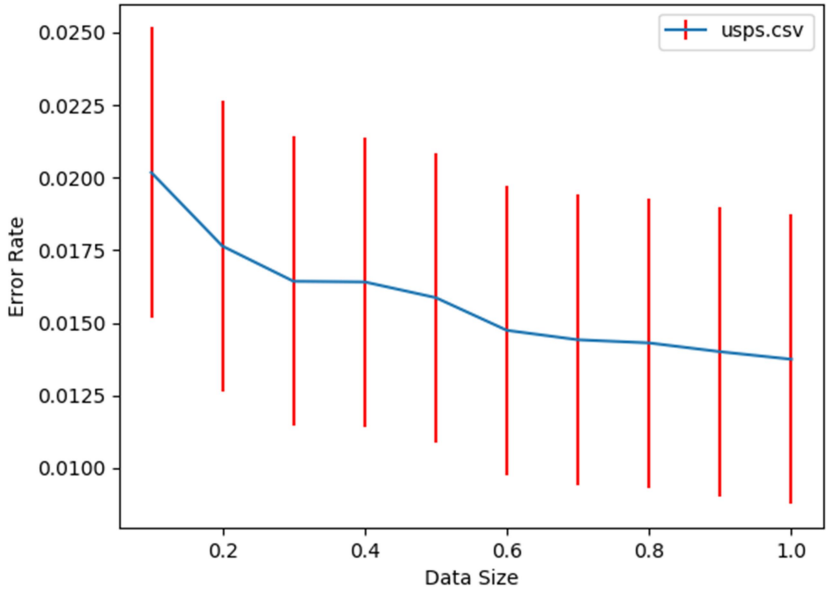
Alpha Values

Dataset USPS - 0.0771
Dataset A - 0.0285
Dataset AP – 0.0364
Dataset AO - 0.1135


A.csv
Error Rate
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.2
0.4
0.6
0.8
1.0
Data Size


AO.csv
Error Rate
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.2
0.4
0.6
0.8
1.0
Data Size


AP.csv
0.50
0.45
0.40
0.35
Error Rate
0.2
0.4
0.6
0.8
1.0
Data Size


usps.csv
0.0250
0.0225
0.0200
0.0175
0.0150
0.0125
0.0100
Error Rate
0.2
0.4
0.6
0.8
1.0
Data Size