

COL776 (Assignment -3)

J. Shikhar Murty

Implementation Language: Python

Experiments

Gibbs sampling on OCR datasets:

data-loops.dat

Algorithm	Char accuracy	Word accuracy	Log likelihood	Time taken
Gibbs	53.2374	7.1429	-7.5979	61.20
LBP	56.8345	7.1429	-7.5454	7.311

data-loopsWS.dat

Algorithm	Char accuracy	Word accuracy	Log likelihood	Time taken
Gibbs	65.8951	14.6154	-6.9397	295.6
LBP	67.9012	15.3846	-6.9084	34.06

data-tree.dat

Algorithm	Char accuracy	Word accuracy	Log likelihood	Time taken
Gibbs	68.0965	14.2857	-6.6070	175.9
LBP	67.5603	16.6667	-6.6065	21.95

data-treeWS.dat

Algorithm	Char accuracy	Word accuracy	Log likelihood	Time taken
Gibbs	65.7837	13.0435	-7.2200	399.2
LBP	66.7770	16.8478	-7.2095	48.21

Comments:

- 1) The performance of the 2 algorithms is very similar, however LBP takes much less time compared to gibbs sampling.
- 2) 20,000 iterations of gibbs sampling were performed with an initial burn-in of 10,000 iterations

Evaluation:

Markov Network

Dataset	Avg-Acc (test)	Avg-LL (test)
Hepar2	78.1065	-20.6913
Andes	77.0985	-110.3366
Insurance	76.7606	-17.6943

Bayesian Network

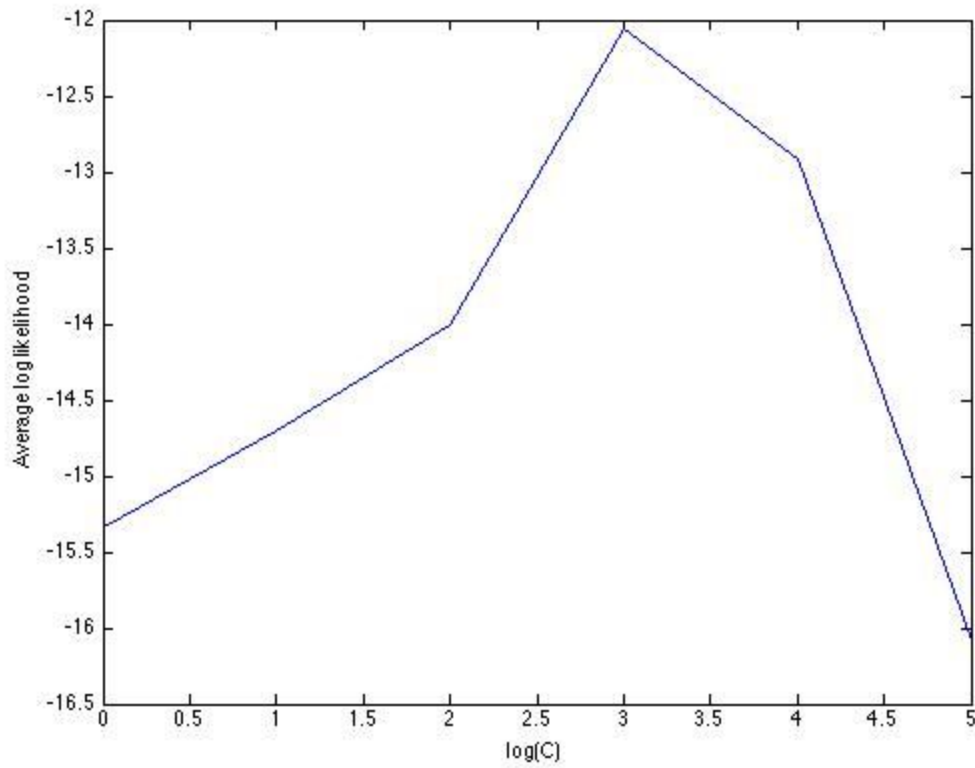
Dataset	Avg-Acc (test)	Avg-LL (test)
Hepar2	78.9941	-16.2037
Andes	78.1022	-61.2748
Insurance	83.0986	-5.8233

Comments:

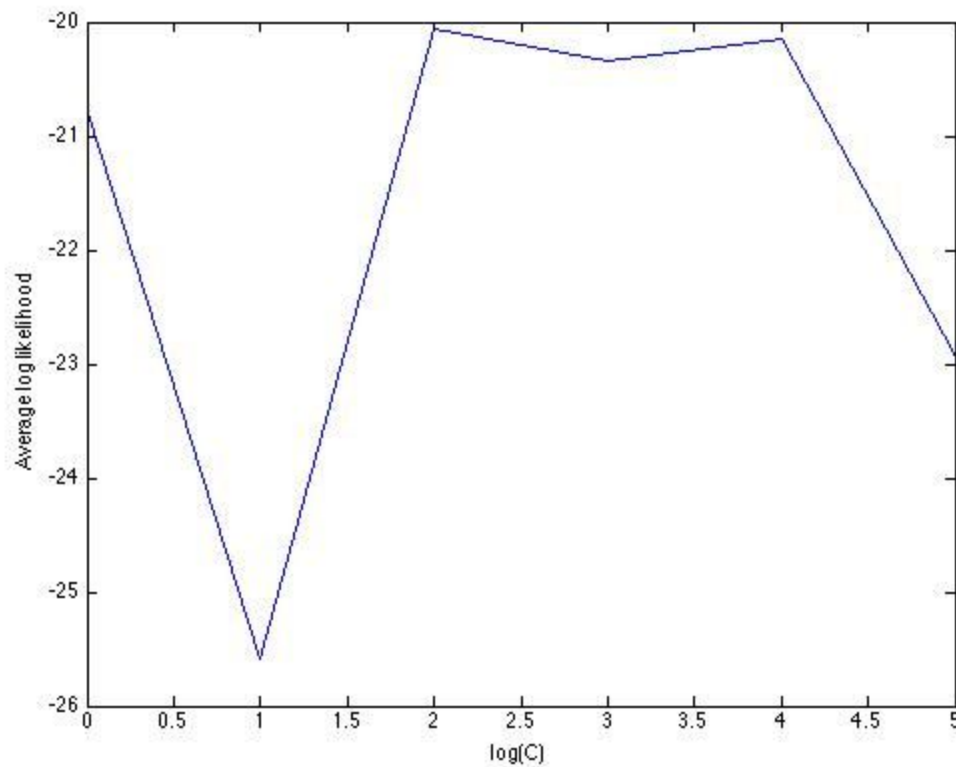
- 1) The convergence criteria used for gradient descent was checking if each of the updates are less than an epsilon. If so, stop the loop.
- 2) The learning rate was fixed to 0.5 for insurance, and 0.1 for andes and hepar2.

- 3) Note that the performance of both the bayesian Network and the Markov Network are very similar except for the insurance dataset.

Varying C for datasets



Insurance dataset



Hepar2 Dataset

Comments

- 1) For the insurance dataset, the average log-likelihood peaks at $C = 1000$, indicating that we could expect optimal performance around this value of C . After this, increasing C further decreases the log likelihood.
- 2) For the hepar2 dataset, an anomalous value is obtained for $C=10$, and on increasing C beyond that the log likelihood decreases further.