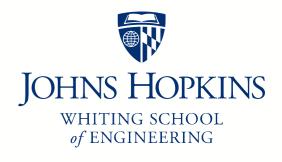
Johns Hopkins Engineering 625.464 Computational Statistics

An Expectation Maximization Example

Module 3 Lecture 3C



The Peppered Moth Example

objerne U CITI alleles moths carbonia cc cI CT N=Nc+NI+NT insularia II IT typica TT Want to know prob Par Pared Lata Complete data

Y= (Ncc, NcI) NcT)

NII, NIT, NTT) Pc+PI+PT=1 CC CI LT II IT T PC Pert Per PI PIR PT X=MLY) = (nectnestler, NIIIthIT, NTT)

Peppered Moth MLE Problem and tels
Want to know for Pt, Pt Le red to find
P=(Pt, Pt, Pt, Pt, We red to find) Multinomial } = (NCC, NCT, NCT, NII, NIT, NIT, NIT, R.V. $f_{J}(y|p) = \binom{n}{n_{ec}-n_{TI}} \binom{pc}{pc} \cdot (2pcp_{I}) \cdot (2pcp_{I})^{ncT}$ logfy(y/p) = nec logp24 ncz log 2pcpz + net log 2pcpt +nzt log pzz + nzt log 2pzp+ nt logpz2+ log (ne-nt)

Peppered Moth EM Algorithm

Peppered Moth EM Algorithm

$$\begin{bmatrix}
\begin{bmatrix}
\nabla C \\
\nabla C
\end{bmatrix}
\end{bmatrix}
= \frac{\int C (PC^{(t)})^{2}}{(PC^{(t)})^{2}} + \frac{\partial C}{\partial C} + \frac{\partial C}{\partial$$

EM Algorithm

M Step

$$\frac{dQ(\rho|\rho^{(t)})}{d\rho_{L}} = \frac{2n_{cc} + n_{ct} + n_{ct}}{p_{L}} - \frac{n_{L_{1}} + n_{L_{1}} + n_{r_{1}}}{n_{r_{1}}}$$

$$\frac{dQ(\rho|\rho^{(t)})}{dQ(\rho|\rho^{(t)})} = \frac{2n_{L_{1}} + n_{L_{1}}}{p_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}}$$

$$\frac{dQ(\rho|\rho^{(t)})}{d\rho_{L}} = \frac{2n_{L_{1}} + n_{L_{1}}}{p_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}}$$

$$\frac{dQ(\rho|\rho^{(t)})}{d\rho_{L_{1}}} = \frac{2n_{L_{1}} + n_{L_{1}}}{n_{L_{1}}} + \frac{n_{L_{1}}}{n_{L_{1}}} + \frac{n_$$

$$P_{C} = \frac{1}{2} \sum_{n=1}^{(t)} \sum_{n=1}^{(t)$$