Ravi Rajpurohit UTA ID- 1002079916 Homework 1 Parametel = 9



Quy 1. Parameter = q Geometric Distribution => Pq(K) = (1-q)\*-1q datapoints are independent @ Dataset = \( \) \( \) \( \),....., \( \) \( \)

Max. likelihood for the distributions L(2/k, --- kn) = P(k, --- kn/2)

since data is independent L(2/k,...kn) = p(k,/2)\* p(k2/4)..... x p(kn/9) = r P(k1/4)

= Ti (1-9) 1-19

adding log for log likelihood  $log(L(q)k,...kn))=log(\Pi_{io}(1-q)^{ki-1}q)$ 

= \(\frac{2}{1-q}\) \(\left(1-q)\) \(\frac{1}{q}\)

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d log(L(q/k;...kn))=d(nlogq+ 2 k;-nlog(1-q)=1

de 

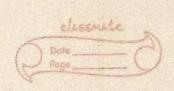
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- m - 2 ki-n = 0

 $= \frac{n}{2} - \frac{1}{2} \frac{ki - n}{(1 - q)} = 0$ 

 $\frac{7}{9} - \frac{2}{4} \frac{1-4}{1-4} = 0$ 

 $n(1-2) = (\frac{2}{2}k_1-n) = 0$   $2 = \frac{n}{2k_1}$ 



Dataset 
$$D = [2,2,2,4,1,1,2,2,2,3,2,2,3]$$

$$= \frac{1}{2} + \frac{1}{2} +$$

$$P_{\alpha,\beta}(q) = q^{\alpha-1}(1-q)^{\beta-1} - (\alpha+1-\alpha)(\beta-1)$$

$$q = \underset{p(0)}{\operatorname{argmax}} \left( \begin{array}{c} P(0|q) \times P(q) \\ p(0) \end{array} \right)$$

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$$p(0/2) \times p(q) = (Ti_{i=1}^{i}(1-q)^{k_{i-1}}) \times (q^{\alpha-1}(1-q)^{\beta-1})$$

$$8(\alpha, \beta)$$

$$+\beta-1\log(1-q)-\log(\beta(\alpha-\beta))$$

$$= \operatorname{angmax}(n\log q+\sum_{i=1}^{n}k_i-n)+\log(\lambda-q)+(\alpha-1)\log q$$

$$\frac{1}{2}$$
 $\frac{d \text{ erivation } :=}{d \text{ (n Log q + ( $\frac{1}{2}$  ki-n) x Log (1-q)+( $\alpha$ -1), Log q+( $\beta$ -1) deg ( $\beta$  ( $\alpha$ ,  $\beta$ ))) = 0$ 
 $\frac{1}{2}$ 
 $\frac{1}{2}$ 

$$\frac{n}{2} - \frac{1}{2} \cdot \frac{k_{1}-n}{1-q} + \frac{\alpha-1}{q} - \frac{\beta-1}{1-q} = 0$$

a) 
$$\frac{(c-1+n-\frac{2}{2})(c-n+\beta-1)}{2}$$

$$\alpha - 1 + \gamma = 2\alpha + 2\beta + 2 \cdot \hat{z} \cdot ki$$

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$$\alpha - 1 + \gamma = 2$$

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