$$\text{Poisson} = F(k,\lambda) = \frac{\lambda^k e^{-\lambda}}{k!}$$

$$\text{Normal} = F(\mu,\sigma,x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

Entonces

$$L_i(\mu,\varepsilon) = \frac{1}{n!} e^{-(\mu s+\varepsilon b)} (\mu s+\varepsilon b)^n \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(\varepsilon-1)^2}{2\sigma^2}}$$

$$L_i(\mu,\varepsilon) = \frac{1}{(n_i)!} e^{-(\mu s_i+\varepsilon b_i)} (\mu s_i+\varepsilon b_i)^{n_i} \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(\varepsilon-1)^2}{2\sigma^2}}$$

$$L(\mu,\varepsilon) = \prod_{i=1}^{N} L_i(\mu,\varepsilon)$$

$$\ln(L) = \ln\left(\prod_{i=1}^{N} L_i(\mu,\varepsilon)\right) = \sum_{i=1}^{N} \ln(L_i(\mu,\varepsilon))$$

Entonces

$$\sum_{i=1}^{N}\left(\ln((n_i)!^{-1}) - (\mu s_i+\varepsilon b_i) + n_i \ln(\mu s_i+\varepsilon b_i) - \frac{1}{2}\ln(2\pi\sigma^2) - \frac{(\varepsilon-1)^2}{2\sigma^2}\right)$$

$$= -\sum_{i=1}^{N} \ln(n_i!) - \sum_{i=1}^{N}(\mu s_i+\varepsilon b_i) + \sum_{i=1}^{N} n_i \ln(\mu s_i+\varepsilon b_i) - \frac{1}{2}\ln(2\pi\sigma^2) N - \frac{N(\varepsilon-1)^2}{2\sigma^2}$$

$$= -\sum_{i=1}^{N} \ln(n_i!) - \sum_{i=1}^{N} \mu s_i - \sum_{i=1}^{N} \varepsilon b_i + \sum_{i=1}^{N} n_i \ln(\mu s_i+\varepsilon b_i) - \frac{N}{2}\ln(2\pi\sigma^2) - \frac{N(\varepsilon-1)^2}{2\sigma^2}$$

$$= -\sum_{i=1}^{N} \ln(n_i!) - \mu\sum_{i=1}^{N} s_i - \varepsilon\sum_{i=1}^{N} b_i + \sum_{i=1}^{N} n_i \ln(\mu s_i+\varepsilon b_i) - \frac{N}{2}\ln(2\pi\sigma^2) - \frac{N(\varepsilon-1)^2}{2\sigma^2} = F$$

entonces

$$\frac{\partial F}{\partial \mu} = -\sum_{i=1}^{N} s_i + \sum_{i=1}^{N} n_i \frac{1}{\mu s_i+\varepsilon b_i} \cdot s_i = 0$$

$$\frac{\partial F}{\partial \varepsilon} = -\sum_{i=1}^{N} b_i + \sum_{i=1}^{N} n_i \frac{1}{\mu s_i+\varepsilon b_i} b_i - \frac{N}{2\sigma^2}(2)(\varepsilon-1) = 0$$

Para el caso $N=3$

$$\frac{\partial F}{\partial \mu} = -(S_1+S_2+S_3) + \frac{(n_1 S_1)}{\mu S_1+\varepsilon b_1} + \frac{(n_2 S_2)}{\mu S_2+\varepsilon b_2} + \frac{(n_3 S_3)}{\mu S_3+\varepsilon b_3} = 0$$

$$\frac{\partial F}{\partial \varepsilon} = -(b_1+b_2+b_3) + \frac{(n_1 b_1)}{\mu S_1+\varepsilon b_1} + \frac{(n_2 b_2)}{\mu S_2+\varepsilon b_2} + \frac{(n_3 b_3)}{\mu S_3+\varepsilon b_3} - \frac{N}{\sigma^2}(\varepsilon-1) = 0$$

Entonces quedan estas ecuaciones implicitas en donde se despejan μ y ε respectivamente.