GUIA 12

σ^2 = conocida

12.2 X = Longitud (cm) $\sim N(\mu, 4)$

$$\begin{cases} P(\mu=10) = 0,25 \\ P(\mu=14) = 0,75 \end{cases}$$

X_1 = long de la varilla $\Rightarrow$ 12,1 cm

- No tengo datos de μ pero se que es una VAD

$$p_{T|\underline{X}=\underline{x}}(\theta) = \frac{f_{\underline{X}|T=\theta}(\underline{x})\, p_T(\theta)}{\sum f_{\underline{X}|T=\theta}(x)\, p_T(\theta)}$$

$\underline{x}$ = 12,1 cm MUESTRA

siendo T la distribución de μ.

Calculo

$$\sum f_{\underline{X}|T=\theta_\mu}(x) \cdot p_T(\theta_\mu) = \underbrace{f_{\underline{X}|T=10}(x)}_{\substack{\text{NORMAL} \\ \text{CON EL VALOR} \\ \text{DE } \mu}} \underbrace{p_T(10)}_{0,25} + \underbrace{f_{\underline{X}|T=14}(x)}_{} \underbrace{p_T(14)}_{0,75}$$

$\Rightarrow N(10,4)$ $\qquad$ $N(14,4)$

$$\rightarrow \frac{1}{\sqrt{2\pi 4}}\left[\frac{1}{4} e^{-\frac{(12,1-10)^2}{8}} + \frac{3}{4} e^{-\frac{(12,1-14)^2}{8}}\right] = 0,124 = A$$

$$p_{T|\underline{X}=R_1}(\mu) = \begin{cases} \dfrac{f_{\underline{X}|T=10}(12,1)\, p_T(10)}{A} & \text{si } \mu = 10 \\[2ex] \dfrac{f_{\underline{X}|T=14}(12,1)\, p_T(14)}{A} & \text{si } \mu = 14 \end{cases}$$

$$p_{T|\underline{X}=12,1}(\mu) = \begin{cases} \dfrac{\frac{1}{\sqrt{2\pi 4}} e^{-\frac{(12,1-10)^2}{8}}}{A} \cdot \dfrac{1}{4} & \text{si } \mu = 10 \\[2ex] \dfrac{\frac{1}{\sqrt{2\pi 4}} e^{-\frac{(12,1-10)^2}{8}}}{A} \cdot \dfrac{3}{4} & \text{si } \mu = 14 \end{cases}$$

GUÍA 12

ESTIMACIÓN BAYESIANA

σ: desvío estandar
σ^2: varianza

(12.2) L = longitud varilla (cm) $\sim N(\mu, 2^2)$.

μ V.A discreta = VAD.

a priori $\rightarrow \begin{cases} \mathbb{P}(\mu = 10) = 0,25 \\ \mathbb{P}(\mu = 14) = 0,75 \end{cases}$

$\rightarrow X_1 = 12,1$.

Se observa que la long de la varilla es 12,1 cm

Estimar la $\mathbb{P}$ de que la long. de otra varilla del mismo tipo sea mayor que 13 cm. $\rightarrow \mathbb{P}(X_2 > 13 \mid X_1 = 12,1) = ?$

es V.A.D :

$$p_{T \mid \underline{X} = \underline{x}}(\theta) = \frac{f_{\underline{X} \mid T = \theta}(x)\, p_T(\theta)}{\sum f_{\underline{X} \mid T = \theta}(x)\, p_T(\theta)} = (*)$$

T : distribución de μ.

$$\underbrace{f_{\underline{X} \mid T = 10}(x)}_{\sim N(10,4)} \underbrace{p_T(10)}_{0,25 = 1/4} + \underbrace{f_{\underline{X} \mid T = 14}(x)}_{\sim N(14,4)} \underbrace{p_T(14)}_{0,75 = 3/4} = (*)$$

$$= \frac{1}{\sqrt{2\pi 4}} \left[\frac{1}{4} e^{-\frac{(12,1-10)^2}{8}} + \frac{3}{4} e^{-\frac{(12,1-14)^2}{8}} \right] = 0,124 = (\Delta).$$

$$p_{T \mid X = 12,1}(\mu) = \begin{cases} \dfrac{f_{\underline{X} \mid T = 10}(12,1)\, p_T(10)}{0,124} & \text{si } \mu = 10. \\ \dfrac{f_{X \mid T = 14}(12,1)\, p_T(10)}{0,124} & \text{si } \mu = 14 \end{cases}$$

$$\Rightarrow p_{T|X=12,1}(\mu) \begin{cases} \dfrac{\frac{1}{\sqrt{2\pi 4}}\, e^{-\frac{(12,1-10)^2}{8}}}{0,124} \cdot \dfrac{1}{4} \quad \text{si } \mu = 10. \rightarrow 0,232. \\ \dfrac{\frac{1}{\sqrt{2\pi 4}}\, e^{-\frac{(12,1-14)^2}{8}}}{0,124} \cdot \dfrac{3}{4} \quad \text{si } \mu = 14 \rightarrow 0,768. \end{cases}$$

$$\Rightarrow \mathbb{P}(X_2 > 13 \mid X_1 = 12,1) = \underbrace{\mathbb{P}(X_2 > 13 \mid \mu = 10)}_{\sim N(10,4)} \cdot \underbrace{\mathbb{P}(\mu = 10 \mid X_1 = 12,1)}_{0,232} + \underbrace{\mathbb{P}(X_2 > 13 \mid \mu = 14)}_{\sim N(14,4).} \cdot \underbrace{\mathbb{P}(\mu = 14 \mid X_1 = 12,1)}_{0,768}.$$

$$\Rightarrow \mathbb{P}(X_2 > 13 \mid \mu = 10) = 1 - \phi\left(\underbrace{\frac{13-10}{\sqrt{4}}}_{1,5}\right)$$

PARA ~~ESTA~~ NORMALIZAR UNA NORMAL!

$$= 1 - \phi(1,5)$$

$$\Rightarrow \mathbb{P}(X_2 > 13 \mid \mu = 14) = 1 - \phi(-0,5) \underset{\text{Prop.}}{=} \cancel{1} - \cancel{1} + \phi(0,5)$$

$$\Rightarrow \boxed{\mathbb{P}(X_2 > 13 \mid X_1 = 12,1) = [1 - \underbrace{\phi(1,5)}_{0,93319}] \cdot 0,232 + \underbrace{\phi(0,5)}_{0,69146} \cdot 0,768. = 0,5465.}$$

[redacted] [redacted]

FECHA [redacted]

(12.7) X # de muertes de soldados ~ $Poi(\mu)$.
en 1 caballería por año.

Muertes:	0	1	2	3	4	total.
Frecuencia:	109	65	22	3	1.	→ 200 muertes

A priori
$\mu \sim \gamma$ → media: $1/2$ → v/λ ⇒ $1/2$ ⇒ $\frac{v}{\lambda} = \frac{1}{2}$ ⇒ $\underline{2v = \lambda}$
→ varianza: $1/8$ → $v/\lambda^2 = 1/8$

⇒ $\frac{v}{\lambda^2} = \frac{v}{(2v)^2} = \frac{1}{8}$.

$= \frac{1}{4v} = \frac{1}{8}$

⇒ $v = \frac{8}{4} = 2$

⇒ $\lambda = 4$.

Calcular la media a posteriori de μ

$\mu \sim \gamma(2, 4)$

Y #muertes por año de 10 ~~soldados~~ caballerías.

$Y = \sum_{i=1}^{10} X_i \sim Poi(10\mu)$
Propiedad.

Z = Muertos por 20 años. $= \sum_{i=1}^{20} Y_i \sim Poi(20 \cdot 10\mu)$
$= Poi(200\mu)$.

esta es la que necesito.
y tiene que ser $Z = 200$ (para que coincida con los datos de la tabla).

[redacted]

NOTA

como se distribuye p para cualquier $\underline{x}$

(12.4) $T = p \sim \text{Beta}(v_1, v_2)$

$$f_{T|\underline{X}=\underline{x}}(p) = \frac{p_{\underline{X}|T=p}(\underline{x}) \cdot f_T(p)}{\int_{-\infty}^{\infty} p_{\underline{X}|T=p}(\underline{x})\, f_T(p)\, dp}$$

Busco como se distribuye X para $T=p$

- $p_{\underline{X}|T=p}(\underline{x}) =$ Binomial (por enunciado de los n tiros) $= \binom{n}{x} p^x (1-p)^{n-x}$

- $f_T(p) = \dfrac{\Gamma(v_1+v_2)}{\Gamma(v_1)\Gamma(v_2)}\, p^{v_1-1} (1-p)^{v_1-1}$

$$\int_{-\infty}^{\infty} \frac{\Gamma(v_1+v_2)}{\Gamma(v_1)\Gamma(v_2)}\, p^{v_1-1}(1-p)^{v_2-1} \binom{n}{x} p^x (1-p)^{1-x}\, dp$$

$$\frac{\Gamma(v_1+v_2)}{\Gamma(v_1)\Gamma(v_2)} \binom{n}{x} \underbrace{\int_{-\infty}^{\infty} p^{v_1-1+x} (1-p)^{(v_2+n-x)}\, dp}_{\text{Beta}(v_1 \cancel{-1}+x,\ v_2-n\cancel{+x})}$$

$$\frac{\Gamma(v_1+v_2)}{\Gamma(v_1)\Gamma(v_2)} \binom{n}{x} \cdot \frac{\Gamma(v_1+x)\Gamma(v_2+n-x)}{\Gamma(v_1+v_2+n)}$$

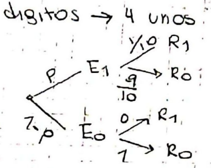
$$f_{T|\underline{X}=\underline{x}}(p) = \frac{\cancel{\binom{n}{x}} p^x (1-p)^{n-x} \cdot \frac{\cancel{\Gamma(v_1+v_2)}}{\cancel{\Gamma(v_1)\Gamma(v_2)}} p^{v_1-1}(1-p)}{\cancel{\frac{\Gamma(v_1+v_2)}{\Gamma(v_1)\Gamma(v_2)}} \cancel{\binom{n}{x}} \frac{\Gamma(v_1+x)\Gamma(v_2+n-x)}{\Gamma(v_1+v_2+n)}}$$

(12.6) $P(E_1) = p$ $\qquad p \sim \text{Beta}(3,3)$

$P(R_1|E_1) = \frac{9}{10}$

$P(R_0|E_0) = 1$

5 digitos $\rightarrow$ 4 unos



ARBOL DE PROBA.

$\bar{X}|T=p$ cantidad de 1s recibidos en 5 digitos.

Cuento el caso que RECIBE $\underline{1}$

$\Rightarrow \sim \text{Bin}(5, p(\frac{9}{10}+0))$ sale del arbol, lo sumo

$$p_{\bar{X}|T=p}(x) = \binom{5}{x}\left(p \cdot \frac{9}{10}\right)^x \left(1 - p\cdot\frac{9}{10}\right)^{5-x}$$

$$p_{\bar{X}|T=p}(4) = \binom{5}{4}\left(p\frac{9}{10}\right)^4 \left(1 - p\frac{9}{10}\right)^1$$

Además,

$$f_T(p) = \frac{\Gamma(3+3)}{\Gamma(3)\Gamma(3)} p^2 (1-p)^2$$

$$\int_0^1 \frac{\Gamma(6)}{\Gamma(3)^2} p^2(1-p)^2 \cdot p^4 \left(\frac{9}{10}\right)^4 \left(1 - p\frac{9}{10}\right) dp$$

$$\frac{\Gamma(6)}{\Gamma(3)^2} \left(\frac{9}{10}\right)^4 \underbrace{\int_0^1 p^2 (1-p)^2 p^4 \left(1 - p\frac{9}{10}\right) dp}_{\underline{\text{DUDA}}\ ?}$$

$$\frac{\Gamma(V_2+V_1+n)}{\Gamma(V_1+x)\,\Gamma(V_2+n-x)} \cdot p^{V_1+x-1}\,(1-p)^{V_2+n-x-1}$$

$$\Longrightarrow f_{T|X=x}(p) \sim \text{Beta}(V_1+x,\ V_2+n-x)$$

$$E[T \mid X=x] = \frac{V_1+x}{V_2+n-x+V_1+x} = \frac{V_1+x}{V_2+V_1+n}$$

ⓑ $V(T \mid X=x) \overset{\text{tarea}}{=} \dfrac{(V_2+n-x)(V_1+x)}{(V_2+V_1+n)^2\,(V_1+V_2+n+1)}$

: Distribuir y luego tender V_1 y V_2 al infinito

ⓒ

ⓓ

cont de 1s en la muestra

$$P(M=2 \mid X=4) =$$

Todo lo que puedo recibir

$$M \mid T=p \sim \text{Bin}(2, p) \rightarrow P(M=\underbrace{2}_{x} \mid T=p) = \binom{2}{2} p^2$$

<u>Duda</u>

(12.7)

Muertes	0	1	2	3	4
Frecuencia	109	65	22	3	1

$T \sim \text{Gamma}(2,4)$

$f_T(\mu) = 16\mu e^{-4\mu}$

X = "Muertos por año" ~ Poi(μ) — mano caballería

Y = "Muertes por año de 10 soldados"

Z = "Muertos por 20 años " " "

$Y = \sum_{i=1}^{10} X_i \sim Poi(10\mu)$ GUÍA 7

$Z = \sum_{i=1}^{20} Y_i \sim Poi(10 \cdot 20 \cdot \mu)$

→ A partir de X e Y armo Z que es lo que me piden y necesito

$$f_{Z|T=\mu}(3) = \frac{(200\mu)^3 e^{-200\mu}}{3!}$$

Cont de muertos (tabla) = 122

$$\Rightarrow f_{T|Z=122}(\mu) = \frac{p_{Z|T=\mu}(122) \cdot f_T(\mu)}{\int_{-\infty}^{\infty} p_{Z|T=\mu}(122)\, f_T(\mu)}$$

$$\int_{-\infty}^{\infty} \frac{(200\mu)^{122}}{122!} e^{-200\mu} \cdot 16\mu e^{-4\mu}\, d\mu$$

$$\frac{(200)^{122}}{122!} \cdot 16 \int_{-\infty}^{\infty} \mu^{123} e^{-204\mu}\, d\mu$$

Estadística

$\sum X_i = Y$ = Cont de accidentes en 100 personas ~ Poi(100μ)

(12.8) Cont de accidentes ~ Poi(μ) = X_i

n = 100

Cont accidentes	0	1	2	3	4	5
Frecuencia	10	29	25	17	13	6

→ $\sum$ 212

A priori $\mu \sim \text{exp}(2) \rightarrow f_U(\mu) = \frac{1}{2} e^{-\frac{1}{2}\mu}$

$$f_{U|Y=y}(\mu) = \frac{P_{Y|U=\mu}(y)\, f_U(\mu)}{\int_{-\infty}^{\infty} p_{Y|U=\mu}(y)\, f_U(\mu)\, d\mu}$$

$$\int_{-\infty}^{\infty} \frac{(100\mu)^{212} e^{-100\mu}}{212!} \frac{1}{2} e^{-\frac{1}{2}\mu}\, d\mu$$

$$= \frac{1}{2} \frac{100^{212}}{212!} \underbrace{\int_{-\infty}^{\infty} \mu^{211} e^{-\frac{201}{2}\mu}\, d\mu}$$

$$= \frac{1}{2} \frac{100^{212}}{212!} \cdot \frac{212!}{\left(\frac{201}{2}\right)^{213}} \underbrace{\int_{-\infty}^{\infty} \frac{\left(\frac{201}{2}\right)^{213}}{212!} \mu^{212} e^{-\frac{201}{2}\mu}\, d\mu}_{\Gamma\left(213, \frac{201}{2}\right)}$$

$$\Rightarrow f_{U|Y=212}(\mu) = \frac{\frac{(100\mu)^{212} e^{-100\mu}}{212!} \cdot \cancel{\frac{1}{2}} e^{-\frac{\mu}{2}}}{\cancel{\frac{1}{2}} \cdot \frac{100^{212}}{\left(\frac{201}{2}\right)^{213}}} = \underbrace{\frac{\mu^{212} e^{-\frac{201}{2}\mu} \left(\frac{201}{2}\right)^{213}}{212!}}_{\Gamma\left(213, \frac{201}{2}\right)}$$

convierto en una gamma

$$16\,\frac{200^{122}}{122!}\cdot\frac{123!}{204^{124}}\underbrace{\int_{-\infty}^{\infty}\frac{204^{124}}{123!}\mu^{123}e^{-204\mu}\,d\mu}_{=1}$$

$$\underbrace{\frac{16\cdot 123}{204^2}\left(\frac{200}{204}\right)^{122}}_{K}$$

$$f_{T|Z=122}(\mu)=\frac{\dfrac{(200\mu)^{122}e^{-\mu 200}}{122!}\cdot 16\,\mu\, e^{-4\mu}}{K}$$

$$f_{T|Z=122}(\mu)=\frac{204^{124}}{123!}\mu^{123}e^{-204\mu}\sim\Gamma(124,204)$$

$$E[T|Z=122]=\frac{124}{204}$$

a) $$p_{X_{101}|Y=212}(0)=\int_0^{\infty}P(X_{101}=0|U=\mu)\,f_{U|Y=212}(\mu)\,d\mu$$

$$=\int_0^{\infty}\underbrace{p_{X_{101}|Y=212}(0)}_{\sim Poi(\mu)}\,f_{U|Y=212}(\mu)\,d\mu$$

→ esto lo saque antes.

$$=\int_0^{\infty}\frac{\mu^0\cdot e^{-\mu}}{0!}\,\frac{\left(\frac{201}{2}\right)^{213}}{212!}\,\mu^{212}\cdot e^{-\frac{201}{2}\mu}\,d\mu$$

$$=\frac{\left(\frac{201}{2}\right)^{213}}{212!}\underbrace{\int_0^{\infty}\mu^{212}\,e^{-\frac{203}{2}\mu}\,d\mu}_{\sim\Gamma\left(213,\frac{203}{2}\right)}=\frac{\left(\frac{201}{2}\right)^{213}}{\left(\frac{203}{2}\right)^{213}}\underbrace{\int_0^{\infty}\frac{\left(\frac{203}{2}\right)^{213}}{212!}\cdots}_{=1}$$

$$=\left(\frac{201}{203}\right)^{213}=\underbrace{0{,}121}$$

b) Ic: $1-\alpha=0{,}95$

$n=100$

$\sum x_i=212$ Pivote: $T=\dfrac{\overline{X}-\mu}{\sqrt{\overline{X}/n}}\sim N(0;1)$

$$P\left(-z_{1-\frac{\alpha}{2}}<\frac{\overline{X}-\mu}{\sqrt{\overline{X}/n}}<z_{1-\alpha/2}\right)$$

$$-z_{1-\frac{\alpha}{2}}\sqrt{\frac{\overline{X}}{n}}-\overline{X}<-\mu<z_{1-\frac{\alpha}{2}}\sqrt{\frac{\overline{X}}{n}}-\overline{X}$$

$$Ic(\underline{x})=\left(-1{,}96\sqrt{\frac{2{,}12}{100}}+2{,}12\;;\;1{,}96\sqrt{\frac{2{,}12}{100}}+2{,}12\right)$$

$= \left(-0{,}2854 \, , \, 2{,}404 \right)$

12.9 X: "tiempo hasta la segunda falla" $\sim \Gamma(2, \lambda)$

a priori $\lambda \sim exp(1) = T$

$\underline{x} = 3/4$

$$f_{T|\underline{x}=3/4}(\lambda) = \frac{f_{\underline{x}|T=\lambda}(3/4)\, f_T(\lambda)}{\int_{-\infty}^{\infty} f_{\underline{x}|T=\lambda}(3/4)\, f_T(\lambda)\, d\lambda}$$

$$\int_{-\infty}^{\infty} \lambda^2 \frac{3}{4} e^{-\lambda 3/4} \cdot e^{\lambda}\, d\lambda$$

$$= \frac{2 \frac{3}{4}}{\left(\frac{7}{4}\right)^3} \underbrace{\int_{-\infty}^{\infty} \frac{\left(\frac{7}{4}\right)^3}{2} \lambda^2 e^{-7/4\lambda}\, d\lambda}_{\Gamma(3, 7/4)}$$

$$= \frac{3}{4}\, 2 \left(\frac{4}{7}\right)^3 = \frac{96}{343}$$

$$f_{T|\underline{x}=3/4}(\lambda) = \frac{\lambda^2\, 3/4 \cdot e^{-3/4\lambda} e^{-\lambda}}{3/4 \cdot 2 \cdot \frac{1}{(7/4)^3}} = \underbrace{\frac{\left(\frac{7}{4}\right)^3 \lambda^2 e^{-7/4\lambda}}{2}}_{\sim \Gamma(3, 7/4)}$$

modo?

$$E\left[T \mid X = 3/4\right] = \frac{3}{7/4} = \frac{12}{7}$$

Guia 7

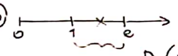
2 A $\longrightarrow$ PP(2) por hora

S_3: "tiempo hasta que transcurra el tercer evento"

$$P\left(S_3 > \tfrac{1}{2}\right) = 0{,}9197$$

$S_3 \sim \Gamma(3, 2)$

B



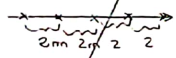
$N_{(1,2)} \sim Poi(2)$

$$P\left(N_{(1,2)} = 1\right) = 2 \cdot e^{-2}$$

73 $\longrightarrow$ PP(10) por hora

2 minutos en reacondicionarse y no registra ninguna partícula en ese intervalo.

Primeras 5 partículas son registradas por el contador



T_i: "Tiempo entre la partícula i y la $i+1$" $i = 1,2,3,4$

$T_i \sim exp(\lambda) = exp(10)$

Quiero la proba de que las primeras 5 partículas sean registradas.

$$P\left(T_1 > \tfrac{2}{60}, T_2 > \tfrac{2}{60}, T_3 > \tfrac{2}{60}, T_4 > \tfrac{2}{60}\right) =$$ como la emisión de cada partícula es independiente sus probabilidades lo son.

$$= P\left(T_1 > \tfrac{2}{60}\right) \cdot P\left(T_2 > \tfrac{2}{60}\right) \cdot P\left(T_3 > \tfrac{2}{60}\right) \cdot P\left(T_4 > \tfrac{2}{60}\right) = \left(e^{-\frac{10 \cdot 2}{60}}\right)^4 = 0{,}2636$$

12.10 X: "Tiempo de realización de una tarea en min" $\sim \mathcal{U}(1, 1+\theta)$

3 muestras

A priori θ / $f_T(\theta) = \frac{192}{\theta^4} \mathbb{1}\{\theta > 4\} \rightarrow Par(4,3)$

$$f_{\theta|\underline{X}^n = \underline{x}^n}(\theta) = \frac{f_{\underline{X}^n | \Theta = \theta}(\underline{x}^n)\, f_{\Theta}(\theta)}{\int_{-\infty}^{\infty} f_{\underline{X}^n | \Theta = \theta}(\underline{x}^n)\, f_{\Theta}(\theta)}$$

$$f_{X^n | \Theta = \theta}(x^3) = \underbrace{f_{X_1 | \Theta = \theta}()}_{1/\theta} \cdot \underbrace{f_{X_2 | \Theta = \theta}()}_{1/\theta} \cdot \underbrace{f_{X_3 | \Theta = \theta}()}_{1/\theta}$$

$$= \frac{1}{\theta^3} \mathbb{1}\{3 < 1+\theta\}\, \mathbb{1}\{5 < 1+\theta\}\, \mathbb{1}\{8 < 1+\theta\}$$

$$= \frac{1}{\theta^3} \mathbb{1}\{8 < 1+\theta\} = \frac{1}{\theta^3} \mathbb{1}\{\theta > 7\}$$

$$\int_7^{\infty} \frac{1}{\theta^3} \cdot \frac{192}{\theta^4}\, d\theta = \frac{192}{6.7^6} \underbrace{\int_7^{\infty} \frac{1}{\theta^7}\, 6.7^6\, d\theta}_{Par(m,6)} = \frac{192}{6.7^6}$$

$$f_{\Theta | \underline{X} = \underline{x}^3}(\theta) = \frac{\frac{192}{\theta^7} \mathbb{1}\{\theta > 7\}}{\frac{192}{6.7^6}}$$

$$= \frac{192 \cdot 6.7^6}{\theta^7 \cdot 192} = \frac{6.7^6}{\theta^7} \mathbb{1}\{\theta \geq 7\} \sim Par(7,6)$$

Esperanza ?

7.4 $\times \times \times \times \rightarrow$ PP (2) por seg

tic, toc, tic, tac

Registro solo los toc's

Se que es el primer segundo registro un toc

$S_1 < 1$ $\quad P(tic) = 1/2$

$P(toc) = 1/2$

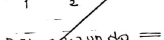
x toc

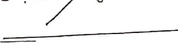
• tic

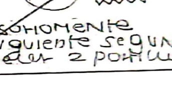
Tengo varias opciones


$N_1(0,1) = 3 \wedge N_1(1,2) = 0$

$N_1, N_2, N_3 \sim Poi(1 \cdot 2)$


$N_2(0,1) = 2 \wedge N_2(1,2) = 0$ Descripción gráfica


$N_3(0,1) = 2 \wedge N_3(1,2) = 1$



2 por segundo = **PROMEDIO**, NO NECESARIAMENTE EN EL SIGUIENTE SEGUNDO VAN A APARECER 2 PARTÍCULAS

$P(\text{No halla x en el 2do} \mid \text{Hay x en el 1}) =$

$P(N_1(0,1) = 3, N_1(1,2) = 0) + P(N_2(0,1) = 2, N_2(1,2) = 0) + P(N_3(0,1) = 2, P(1,2) = 1) \cdot \frac{1}{P(\text{hay x en el 1ro})}$

$\overset{\text{y como son intervalos indep}}{=} \dfrac{\frac{2^3 e^{-2}}{3!} e^{-2} + \frac{2^2 e^{-2}}{2!} e^{-2} + \frac{e^{-2}}{2!} 2^2 \cdot 2 \cdot e^{-2}}{P(N(0,1) = 2) + P(N(0,1) = 3)}$

$$= \frac{\frac{2^3}{3!} e^{-2} e^{-2} + \frac{2^2 \cdot e^{-2} e^{-2}}{2!} + \frac{e^{-2} e^{-2} \cdot 2 \cdot 2^2}{2!}}{\frac{e^{-2} \cdot 2^2}{2!} + \frac{2^3}{3!} e^{-2}}$$

$= 0{,}2977$