AMS 206
7 Mar 19

①

MCMC; regression

$k = 572$

$\underset{\sim}{\theta} = (\lambda_{C_1}, \lambda_{C_2}, \dots, \lambda_{E_{285}})$

$(C_i \mid \lambda_{C_i}\, \mathbb{P}\, \mathcal{B}) \overset{I}{\sim} \text{Poisson}(\lambda_{C_i})$

$i = 1, \dots, n_C = 287$

(indep)

$(E_j \mid \lambda_{E_j}\, \mathbb{P}\, \mathcal{B}) \overset{I}{\sim} \text{Poisson}(\lambda_{E_j})$

$j = 1, \dots, n_E = 285$

too many parameters

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$(C_i \mid \lambda_C\, \mathbb{P}\, \mathcal{B}) \overset{IID}{\sim} \text{Poisson}(\lambda_C)$

$i = 1, \dots, n_C$

$k = 2$

$\underset{\sim}{\theta} = (\lambda_C, \lambda_E)$

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$(E_j \mid \lambda_E\, \mathbb{P}\, \mathcal{B}) \overset{IID}{\sim} \text{Poisson}(\lambda_E)$

$j = 1, \dots, n_E$

~~Poisson~~

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2 - independent samples

$$C: \begin{bmatrix} 1 \\ 0 \\ \vdots \end{bmatrix} n_C = 287 \qquad E: \begin{bmatrix} 0 \\ 2 \\ \vdots \end{bmatrix} n_E = 285$$

$y_i$ = # hosp. for person $i$ ($i = 1, \ldots, n = 572$)

$$
\begin{array}{c|c|cc}
 & y & x & \leftarrow \text{dummy variable} \\
\text{C} & 1 & C & 0 \\
 & 0 & & \\
 & 1 & & \\
 & 1 & C & 0 \\
\hline
\text{E} & 0 & E & 1 \\
 & 2 & & \\
 & & & \\
 & & E & 1
\end{array}
$$

$\left\{ \begin{array}{l} 1 = E \\ 0 = C \end{array} \right\}$ $I(E)$

fixed

FEPR model

$(i = 1, \ldots, n)$

$(y_i \mid \lambda_i \, \mathbb{P}\mathcal{B}) \stackrel{I}{\sim} \text{Poisson}(\lambda_i)$

$\log(\lambda_i) = \gamma_0 + \gamma_1 x_i$ $\leftarrow \{0,1\}$

$\in \mathbb{R}$ (regression coefficients)

simple linear regression

$x_i = 0 \to \log \lambda_i = \gamma_0 \leftrightarrow \lambda_i = e^{\gamma_0} = \lambda_C$

$x_i = 1 \to \log \lambda_i = \gamma_0 + \gamma_1 \leftrightarrow \lambda_i = e^{\gamma_0 + \gamma_1} = \lambda_E$

$$\boxed{\frac{\lambda_E - \lambda_C}{\lambda_C}} = \frac{e^{\gamma_0 + \gamma_1} - e^{\gamma_0}}{e^{\gamma_0}} = e^{\gamma_1} - 1 \doteq \gamma_1$$

$(e^x = 1 + x + O(x^2))$

$(i = 1, \ldots, n = 572)$

$$(Y_i \mid \lambda_i \, P \, B) \overset{I}{\sim} \text{Poisson}(\lambda_i)$$

$$\log(\lambda_i) = \gamma_0 + \gamma_1 x_{i1} + \gamma_2 x_{i2} + \gamma_3 x_{i3} + \cdots + \gamma_k x_{ik} + e_i$$

$x_{i1}$: $\binom{1}{0}$ E / C

$x_{i2}$: age

$x_{i3}$: sickness

$x_{ik}$: social isolation

random-effects Poisson regression (REPR) model

$\theta_i$ in THT2 2(B)

random effects $\leftarrow$ $e_i$

$e_i$: IID $N(0, \sigma_e^2)$ $\leftarrow$ conventional