Day 1 - unassessed quiz

Modern Statistics & Machine Learning for Population Health in Africa

Machine Learning & Global Health Network
24/3/2025

Recap
Stan model architecture

```
data{ }

parameters{ }

model{ }

generated quantities{ }
```

Bayesian hierarchical model

Predictors of anaemia in in Kenyan schoolchildren[1]

- $n = 1523$ schoolchildren in $n_s = 30$ primary schools in western Kenya
- set of $K = 5$ predictors (age, sex, parasitic worm infections, nutritional status and socio-economic status)

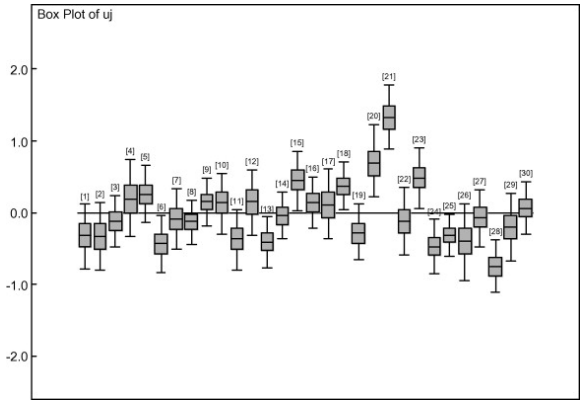
$$
\begin{aligned}
\text{Anaemic}_{ij} &\sim \text{Bernoulli}(\pi_{ij}) \\
\text{logit}(\pi_{ij}) &\sim (\alpha_0 + \alpha_j) + \mathbf{X}_{ij}\boldsymbol{\beta} \\
\boldsymbol{\beta} &\sim \text{Normal}(0, 1), \\
\alpha_j &\sim \text{Normal}(\alpha_0, \sigma^2) \\
\alpha_0 &\sim \text{Normal}(0, 2^2) \\
\sigma &\sim \text{Half-Cauchy}(0, 1),
\end{aligned}
$$

where $i = 1, \ldots, n$ denotes the individual pupil $j = 1, \ldots, n_s$ denotes the school, $X \in \mathbb{R}^{n \times K}$ is a design matrix of covariates and $\boldsymbol{\beta} \in \mathbb{R}^K$ is a vector of coefficients corresponding to the K predictors.

[1] Koukounari A, Estambale BB, Njagi JK, Cundill B, Ajanga A, Crudder C, Otido J, Jukes MC, Clarke SE, Brooker S. Relationships between anaemia and parasitic infections in Kenyan schoolchildren: a Bayesian hierarchical modelling approach. Int J Parasitol. 2008 Dec;38(14):1663-71. doi: 10.1016/j.ijpara.2008.05.013. Epub 2008 Jun 12. PMID: 18621051; PMCID: PMC2649416.

Bayesian hierarchical model

Predictors of anaemia in in Kenyan schoolchildren



Bayesian hierarchical model

Predictors of anaemia in in Kenyan schoolchildren

Quiz 1 (unassessed): In groups of three, complete the google form at `https://forms.gle/ayxaunjowiRsbkTz6`

You can refer to the lecture notes/tutorials/practical labs from today, but should **not** use any generative AI tools.