Correlated Errors Likelihood

- Up to this point, we've assumed a simple likelihood function, with only one random effect

$$\mathscr{L}_1\left(\beta_1, \sigma^2 \,|\, y_1, \ldots, y_n\right) = \left(\sqrt{2\pi\sigma^2}\right)^{-n} \exp\left\{-\frac{1}{2\sigma^2}\sum\left(y_i - X\beta\right)^2\right\}$$

- A more appropriate model includes structured random effects

$$\mathscr{L}\left(\beta, V \,|\, y_1, \ldots, y_n\right) = (2\pi)^{-nK/2}\left|V\right|^{-n/2} \exp\left\{-\frac{1}{2}\sum\left(y_n - X\beta\right) V^{-1}\left(y_n - X\beta\right)\right\}$$

  where V is a matrix describing the spatial correlation model, e.g.

$$V[s_i, s_j] = \mathbf{Cov}\left(s_i, s_j\right) = c_0 + \sigma^2 \exp\left(-\left\| s_i - s_j \right\| / \alpha\right)$$

Correlated Errors Likelihood

- [ ] But then I've got to explain that, to this guy.