Temporal Structure

Spatiotemporal Structure

Spatiotemporal + Covariates

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$$\begin{aligned} Y_t^{\mathbf{I}} \sim \mathsf{Poisson}(\mu_t^{\mathbf{I}}) \\ \log(\mu_t^{\mathbf{I}}) &= \beta_{1t}^{\mathbf{I}} + \beta_{2t}^{\mathbf{I}} \log(I_{t-1}) \\ &+ \alpha_t^{\mathbf{I}} \log(S_{t-1}/N) \end{aligned} \begin{cases} Y_{it}^{\mathbf{I}} \sim \mathsf{Poisson}(\mu_{it}^{\mathbf{I}}) \\ \log(\mu_{it}^{\mathbf{I}}) &= \beta_{1t}^{\mathbf{I}}(\mathbf{U}_i) + \beta_{2t}^{\mathbf{I}}(\mathbf{U}_i) \log(I_{i,t-1}) \\ &+ \alpha_t^{\mathbf{I}} \log(S_{i,t-1}/N_i) \end{aligned}$$

$$Y_{it}^{I} \sim \text{Poisson}(\mu_{it}^{I})$$

$$\log(\mu_{it}^{I}) = \beta_{1t}^{I}(\mathbf{U}_{i}) + \beta_{2t}^{I}(\mathbf{U}_{i}) \log(I_{i,t-1})$$

$$+ \alpha_{t}^{I} \log(S_{i,t-1}/N_{i})$$

$$+ \text{covariate effect}_{i}$$

$$Y_t^{ extbf{D}} \sim \mathsf{Poisson}(\mu_t^{ extbf{D}})$$
 $\mathsf{log}(\mu_t^{ extbf{D}}) = eta_{1t}^{ extbf{D}} + eta_{2t}^{ extbf{D}} \mathsf{log}(I_{t-\delta})$

$$\begin{aligned} Y_t^{D} \sim \mathsf{Poisson}(\mu_t^{D}) & Y_{it}^{D} \sim \mathsf{Poisson}(\mu_{it}^{D}) \\ \log(\mu_t^{D}) &= \beta_{1t}^{D} + \beta_{2t}^{D} \log(I_{t-\delta}) \end{aligned} \begin{vmatrix} Y_{it}^{D} \sim \mathsf{Poisson}(\mu_{it}^{D}) \\ \log(\mu_{it}) &= \beta_{1t}^{D} (\mathbf{U}_i) + \beta_{2t}^{D} (\mathbf{U}_i) \log(I_{i,t-\delta}) \end{vmatrix}$$

$$Y_{it}^{\mathbf{D}} \sim \mathsf{Poisson}(\mu_{it}^{\mathbf{D}})$$
 $\log(\mu_{it}^{\mathbf{D}}) = \beta_{1t}^{\mathbf{D}}(\mathbf{U}_i) + \beta_{2t}^{\mathbf{D}}(\mathbf{U}_i) \log(I_{i,t-\delta})$
 $+ \mathsf{covariate\ effect}_i$







Epidemic Data

Area-level Epidemic Data (U_i: spatial coordinates)

Area-level Epidemic Data Control Measures Local Features (Covariates)