

Bayesian Modelling - Assignment 5:

Q1)

(a) Between z_4 and z_8 , we have 4 paths:

- $z_4 \leftarrow z_1 \leftrightarrow z_3 \leftrightarrow z_6 \leftarrow z_5 \rightarrow z_8$ $\{z_6 \text{ blocks}\}$
- $z_4 \leftarrow z_1 \rightarrow z_3 \rightarrow z_2 \rightarrow z_5 \rightarrow z_8$ $\{z_2 \text{ blocks}\}$
- $z_4 \leftarrow z_1 \rightarrow z_2 \rightarrow z_5 \rightarrow z_8$ $\{z_2 \text{ blocks}\}$
- $z_4 \leftarrow z_1 \rightarrow z_2 \leftarrow z_3 \rightarrow z_6 \leftrightarrow z_5 \rightarrow z_8$ $\{z_2, z_6 \text{ block}\}$

Hence, S does d-separate z_4 and z_8 since it blocks all possible paths between them.

(b)

$z_2 \leftarrow z_3$	• $z_2 \perp z_6 \mid \{z_3, z_5\}$
$\downarrow \quad \downarrow$	
$z_5 \rightarrow z_6$	• $z_3 \perp z_5 \mid \{z_2, z_6\}$

(Q2) We have a three-level hierarchy.

(a) We will represent the occupancy of building i of subregion j of region k as:

$$x_{ijk}$$

We define β_k for $k=1,2,3$ to have some distribution,
 θ_j for $j=1, \dots, n_k$.

Where we have n_{jk} observations in subregion j (buildings) and n_k number of regions (3 in this case).

