**Stochastic block model (SBM)**

We assume that the latent random variable , which indicates the latent membership of location i, is given by:

Similarly, we assume that the latent variable , which indicates the latent membership of species j, is given by:

Based on these two latent variables, we assume that:

Priors:

#------------------------------

FCDs

* For

*For existing groups*

Taking logs, this becomes:

*For new groups*

Where is the number of species that were present in location i and were assigned to group k (i.e., ) and is the number of species that were assigned to group k (i.e., )

Taking logs, this becomes:

We draw this variable from a multinomial distribution.

* For

*For existing groups*

Taking logs, this becomes:

*For new groups*

Where is the number of locations for which species j is present and belongs to group k (i.e., ) and is the number of locations that belong to group k (i.e., )

Taking logs, this becomes:

We draw this variable from a multinomial distribution.

* For

where and

* For

Where and

* For

Where and

* For

Taking log, this becomes:

* For

Taking log, this becomes: