New LDA formulation

Let be the total number of individuals from species s in location l. Our data are given by:

Our priors are given by:

In this new formulation, we do not condition on (i.e., the number of individuals/words in each location/document). This is beneficial for several reasons:

1. can change substantially, which can potentially provide useful information. The standard LDA model, however, will not detect an effect if remains the same. This is more-or-less the situation with the dataset from the Amazonian experimental fire
2. It is simpler to interpret the meaning of slope coefficients in this formulation than in the multinomial regression formulation. In the latter, the vector indicates how community k changes relative to the reference group.

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Full conditional distributions:

- after marginalizing out and

Obviously, we only need to sample this if

- for

Taking logs, this becomes:

- for

This implies that

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Likelihood calculation