

## Species co-occurrence – Looking at species associations differently

F. G. Blanchet<sup>a</sup> and O. Ovaskainen<sup>a</sup>

<sup>a</sup> Mathematical Biology Group  
Department of Biosciences  
University of Helsinki  
PO Box 65 (Viikinkaari 1), Finland  
guillaume.blanchet@helsinki.fi

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**Abstract:** Species interact with both biotic and abiotic aspects of their surrounding. Although there has been a broad interest in better understanding how species co-occur, very few approaches have been efficient in modelling species co-occurrence. A reason for the few modelling tools available to estimate species associations is partly due to sparseness of community data combined with the typically large number of species found in an ecological community. We propose an approach that models species co-occurrence by estimating the positive and negative correlations among species within a community. From the estimated matrix of correlations, it becomes possible to make inferences about the association among interacting species. We use a sparse Bayesian factor approach to parameterize the model, which is efficient to accurately estimate high-dimensional correlation matrices and thus makes our technique applicable to species-rich communities. This modelling approach can be included in a broader modelling framework where species characteristics (such as traits and phylogenetic relationships) and habitat structure can be considered to refine our understanding of why species are found in a particular location. The theoretical developments presented here are currently being implemented in an R package, making this new modelling framework available to a broad audience and allowing it to be applicable to a range of data. The application of our new method will be illustrated with simulated and real ecological data.