Inferring species associations from co-occurrence data

- Combining BIEN plots and occurrences
Step 1. Obtain observed and expected community data

- Observed species x site matrix $O$
- Regional null species x site matrix $N$

Step 2. Calculate observed and null co-occurrence scores

- Observed species x species matrix $C(O)$
- Null species x species matrix $\mu[C(O)]$
- Mean co-occurrence score
- Null species x species matrix $\sigma[C(\bar{N})]$
- Standard deviation co-occurrence score
Step 3. Calculate strength and direction of each association

Species x species matrix $\text{SES(O,N)}$
standardized effect size co-occurrence score

Step 4. Threshold values to detect significant associations

Species x species matrix $\text{A}$
Thresholded standardized effect size co-occurrence score

Step 5. Represent association matrix as weighted network

Positive association
Negative association
Combining plots and occurrences

• 1009 FIA plots (abundance data)
• 139 tree species

• MaxEnt modelling for null:
  • BIEN occurrence data
  • “Standard” approach

• LOESS regression for null:
  • 5132 FIA plots
Testing for drivers of associations
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Main advantages of approach

• Spatially explicit null model:
  • Autocorrelation
  • Test deviations from a priori null expectation (e.g. broad scale drivers) based on independent

• Takes into account indirect species associations

• With network metrics, can test for drivers
A network approach for inferring species associations from co-occurrence data

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