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Macroevolution of ecological networks

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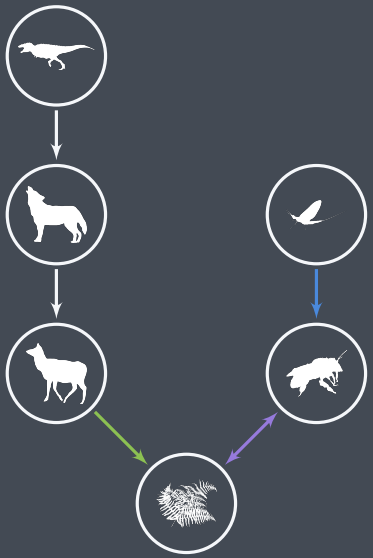
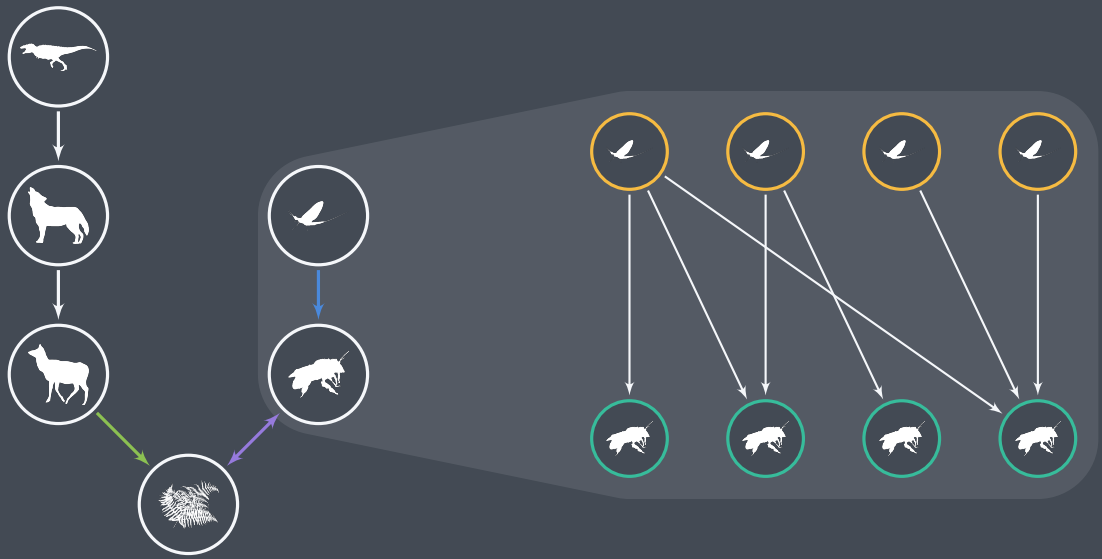
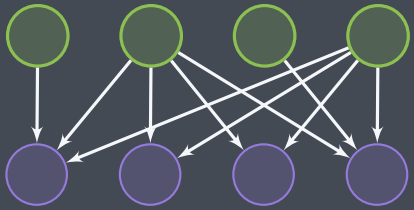
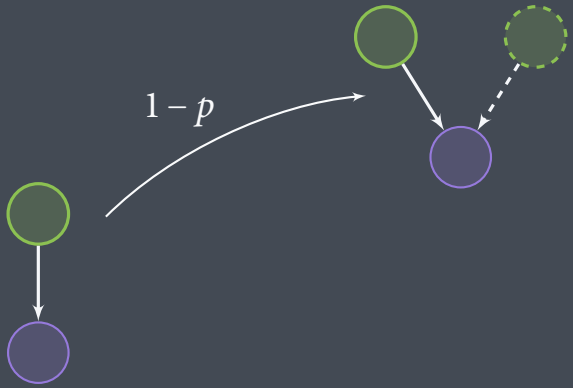
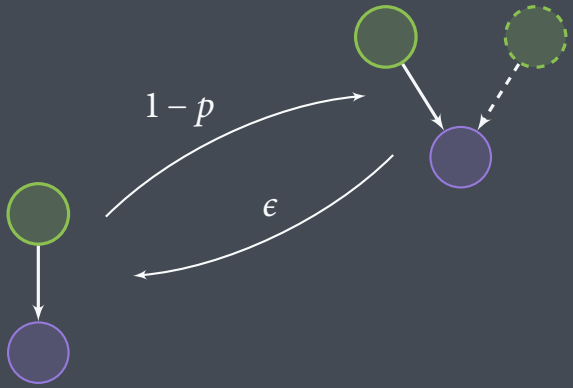


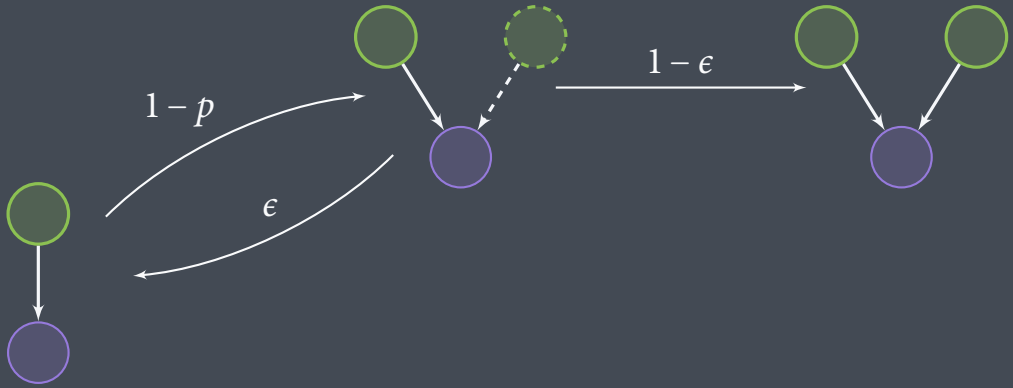


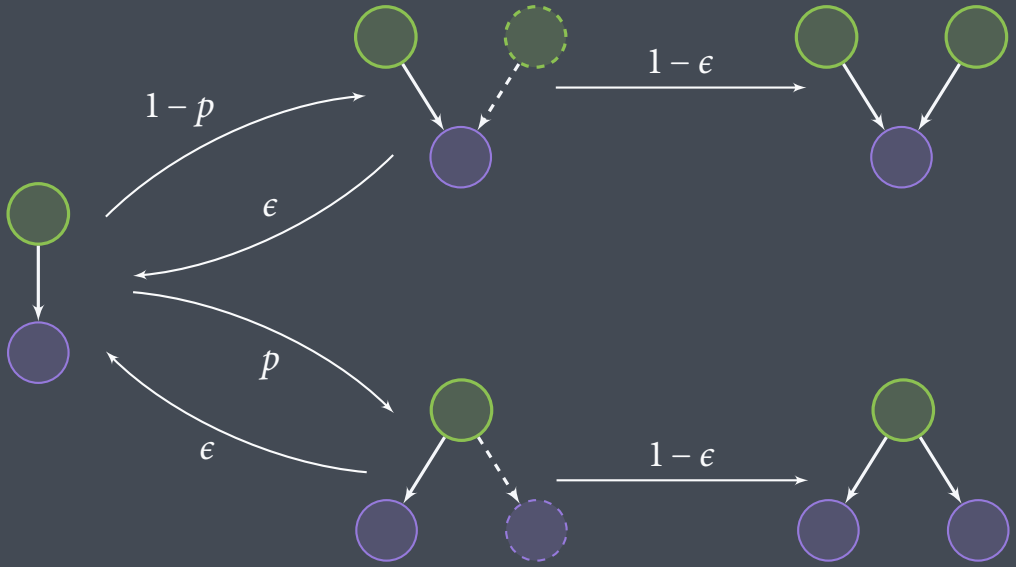


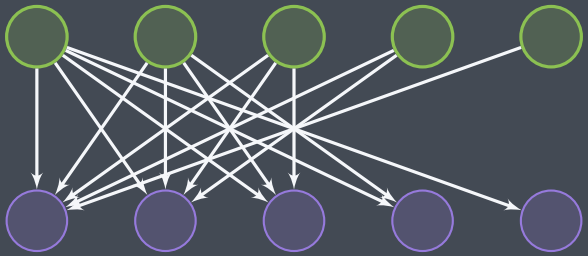
$$\frac{\mathrm{d}}{\mathrm{dt}}x = \frac{1}{2}\mu\sigma^2 N^{\star}(x)\frac{\partial}{\partial x'}\omega(x', x)$$

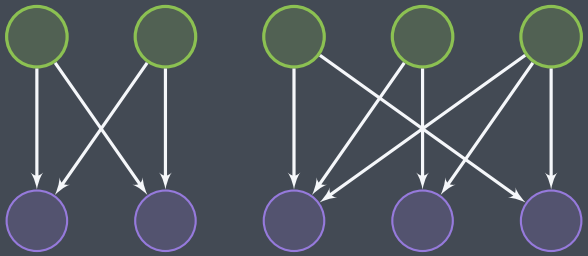

1 − p

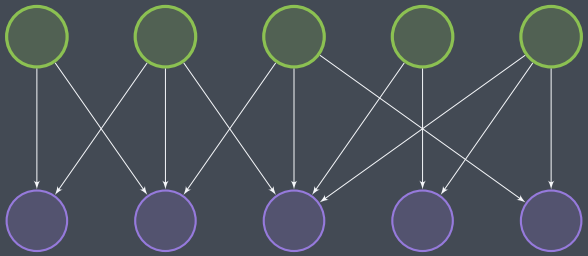

1 − p
ϵ

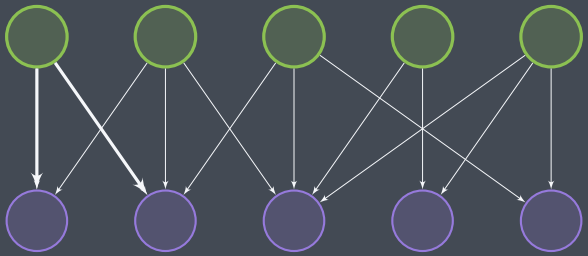

1 − p
ϵ
1 − ϵ

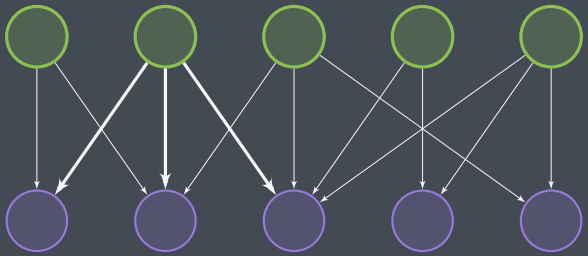

1 − p
ϵ
p
ϵ
1 − ϵ
1 − ϵ

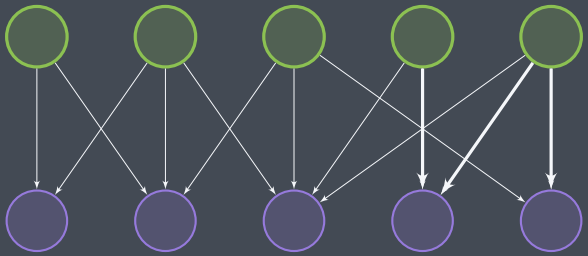


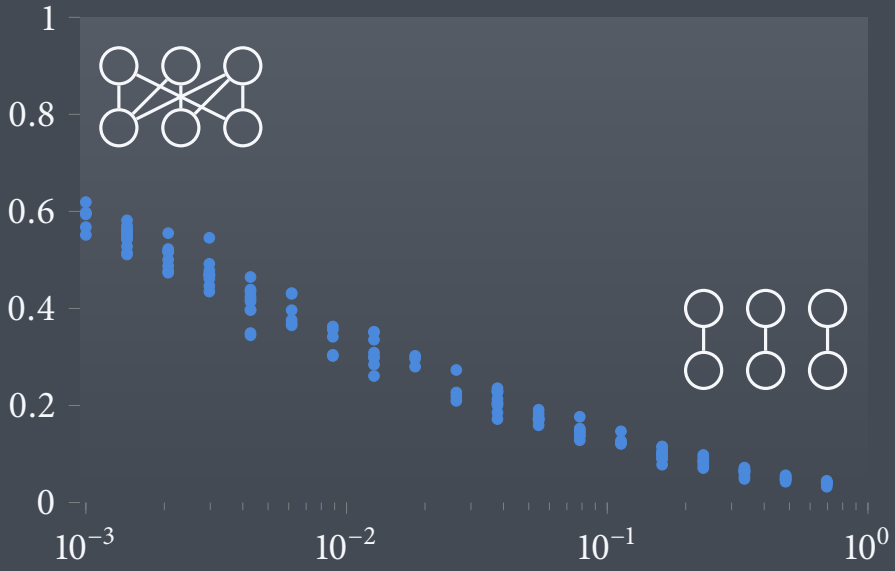


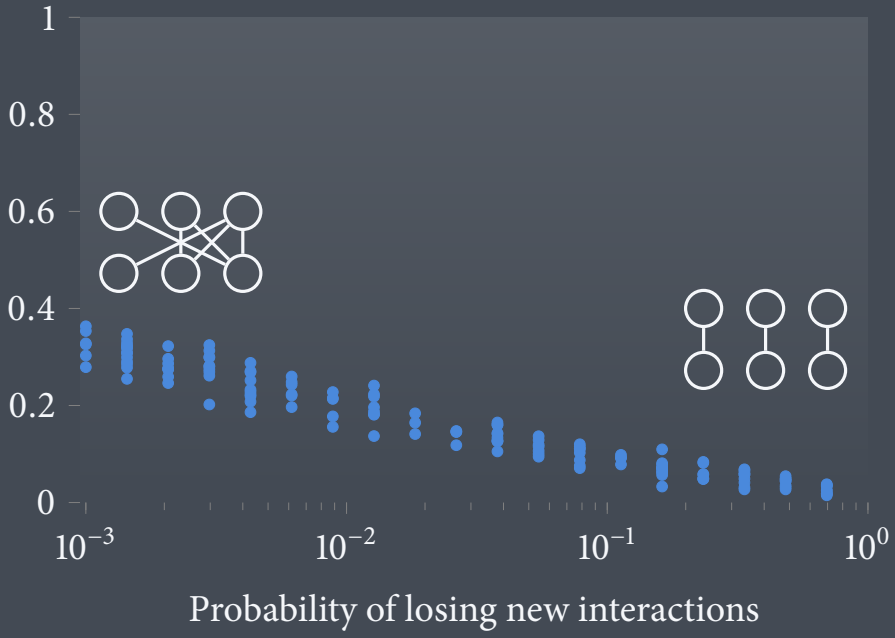


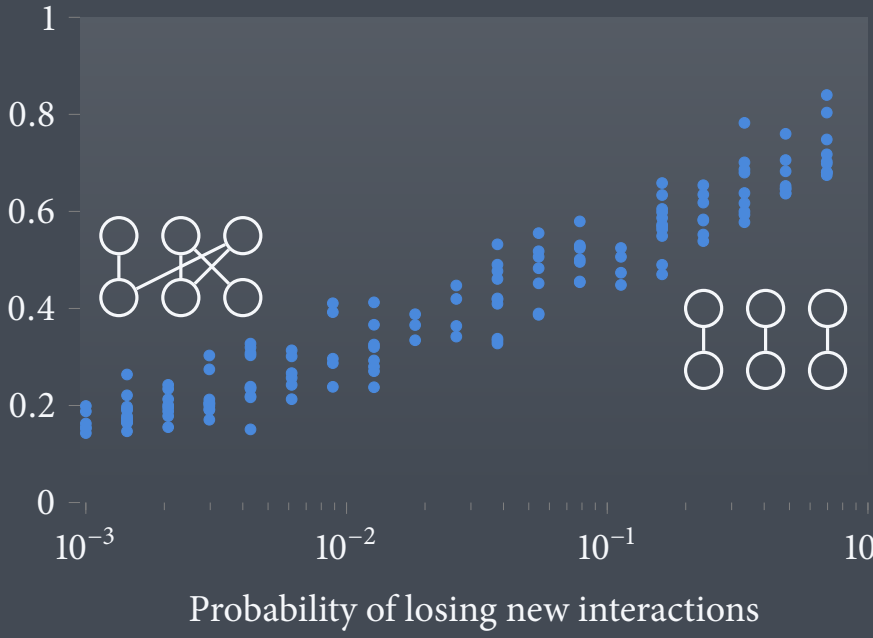







1
0.8
0.6
0.4
0.2
0
10^{-3}
10^{-2}
10^{-1}
10^{0}
Probability of losing new interactions


1
0.8
0.6
0.4
0.2
0
10^{-3}
10^{-2}
10^{-1}
10^{0}
Probability of losing new interactions


1
0.8
0.6
0.4
0.2
0
10^{-3}
10^{-2}
10^{-1}
10^{0}
Probability of losing new interactions

$$f(\theta) = \mathbf{s}_{\text{sim.}} \quad \approx \quad \mathbf{s}_{\text{obs.}}$$

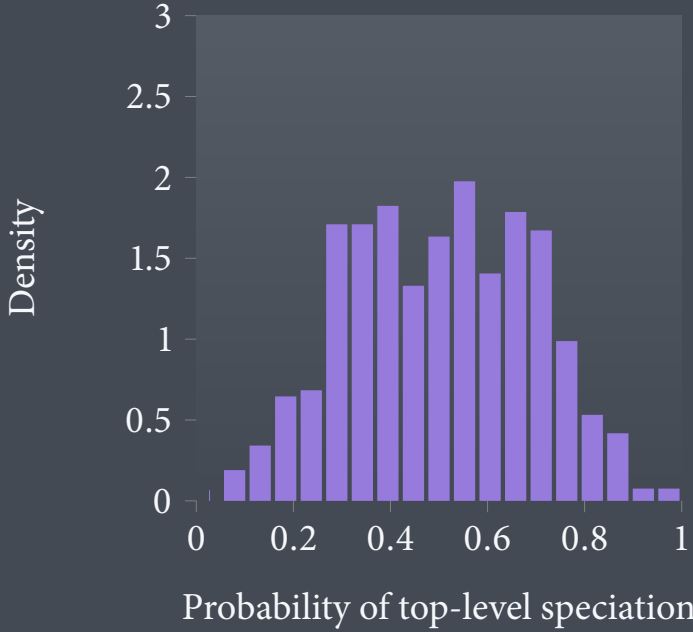
- draw parameter set θ from the prior

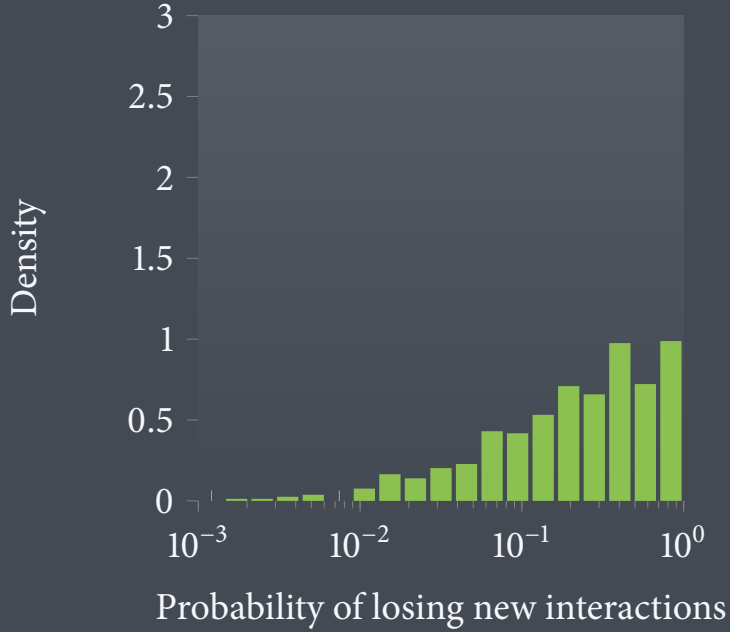
- draw parameter set θ from the prior
- simulate network

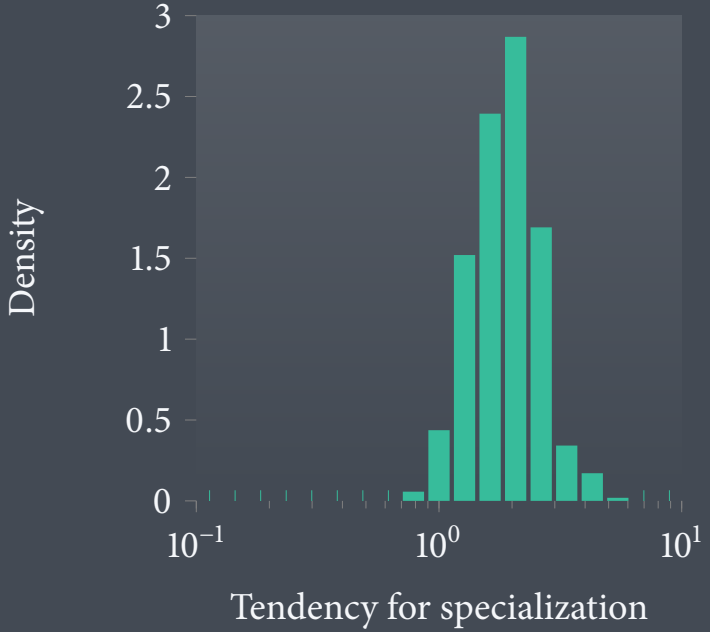
- draw parameter set θ from the prior
- simulate network
- compute $\mathbf{s}_{\text{sim.}}$

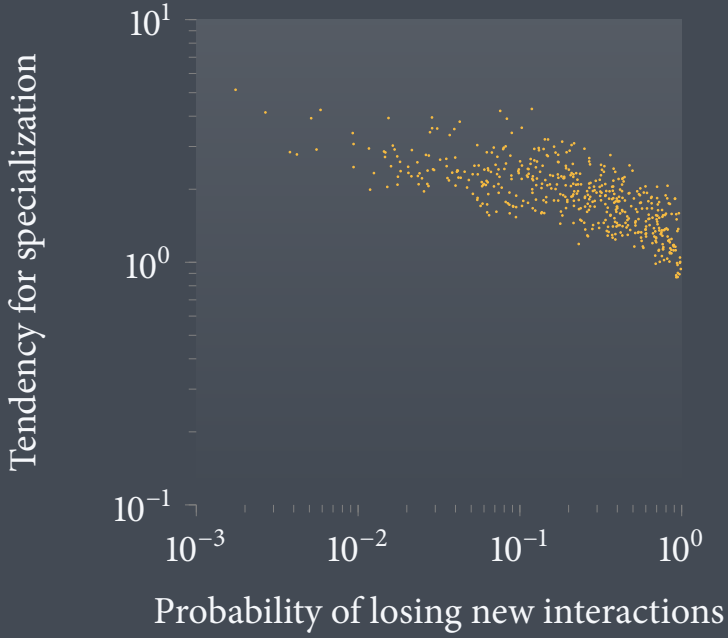
- draw parameter set θ from the prior
- simulate network
- compute $\mathbf{s}_{\text{sim.}}$
- measure distance d_θ between $\mathbf{s}_{\text{sim.}}$ and $\mathbf{s}_{\text{obs.}}$

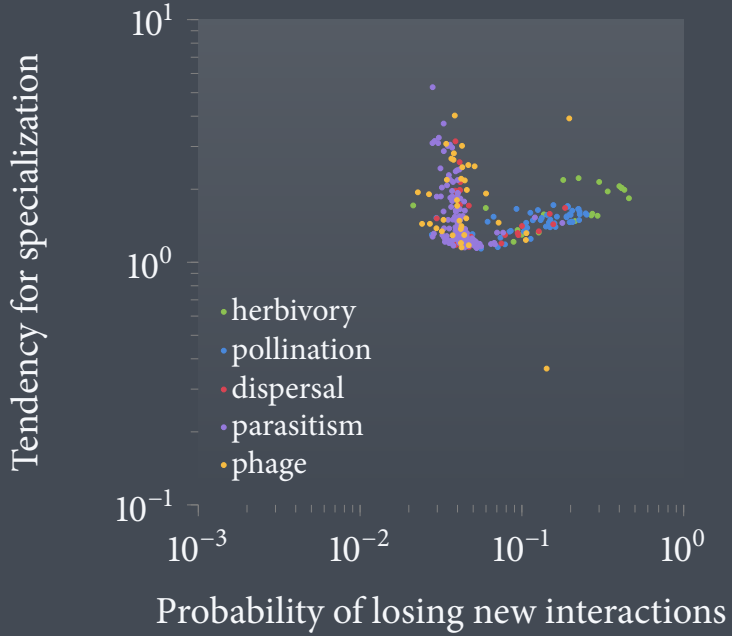
- draw parameter set θ from the prior
- simulate network
- compute $\mathbf{s}_{\text{sim.}}$
- measure distance d_θ between $\mathbf{s}_{\text{sim.}}$ and $\mathbf{s}_{\text{obs.}}$
- is d_θ small? Yeah, we have the posterior!

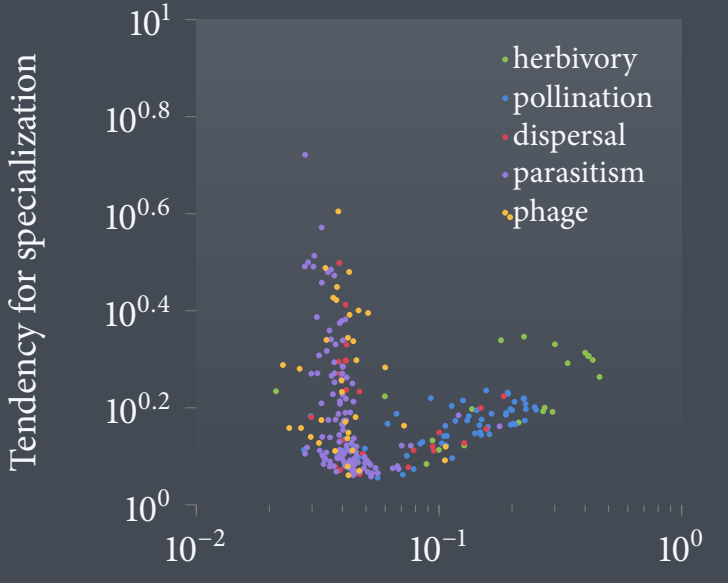

Density
3
2.5
2
1.5
1
0.5
0
0
0.2
0.4
0.6
0.8
1
Probability of top-level speciation

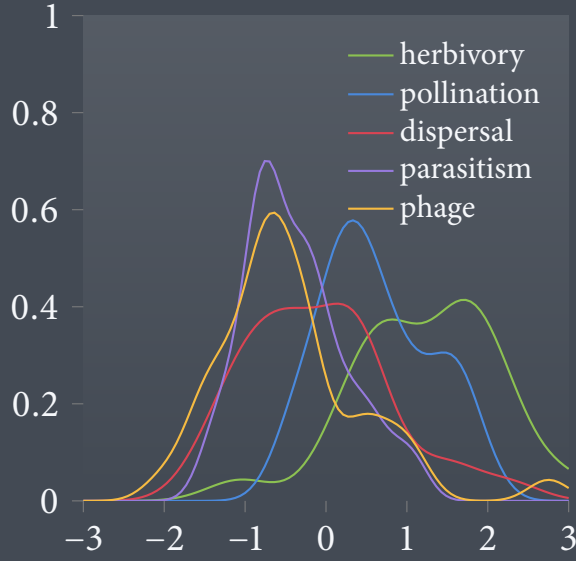

3
2.5
2
1.5
1
0.5
0
Density
10^{-3}
10^{-2}
10^{-1}
10^{0}
Probability of losing new interactions

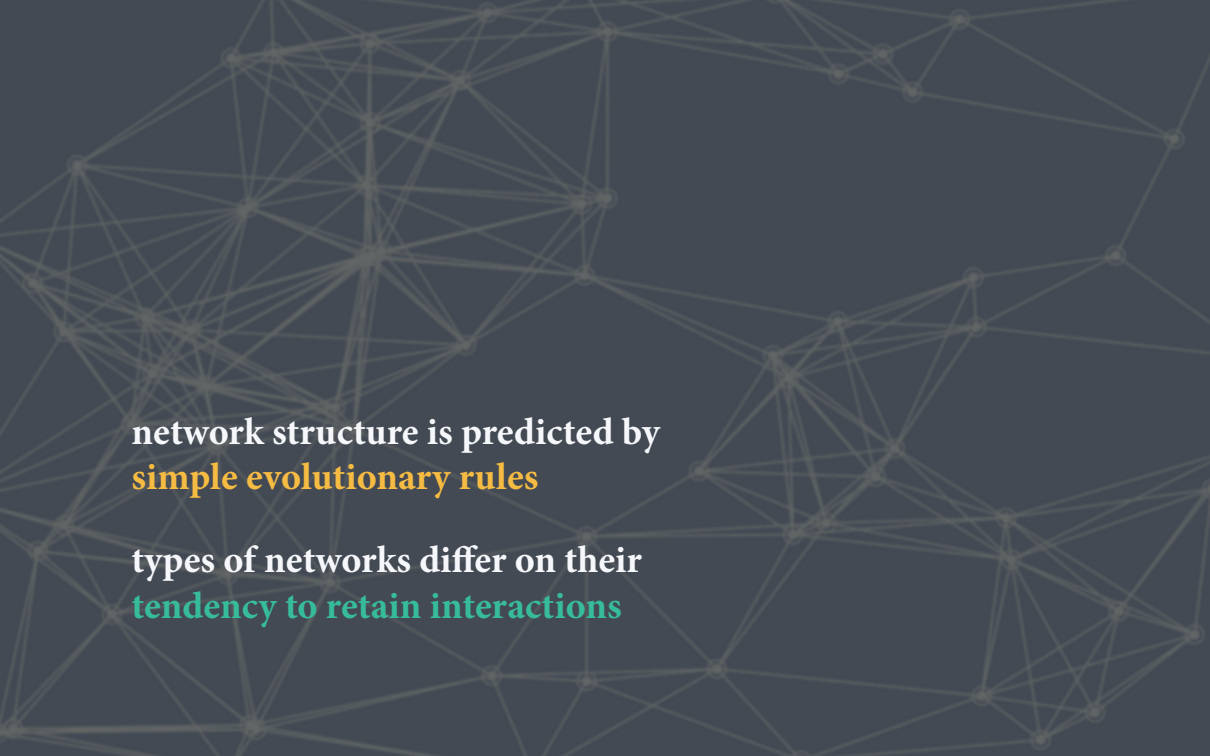

3
2.5
2
1.5
1
0.5
0
Density
10^{-1}
10^{0}
10^{1}
Tendency for specialization


10^{1}
10^{0}
10^{-1}
Tendency for specialization
10^{-3}
10^{-2}
10^{-1}
10^{0}
Probability of losing new interactions


Tendency for specialization
10^1
10^0
10^{-1}
herbivory
pollination
dispersal
parasitism
phage
10^{-3}
10^{-2}
10^{-1}
10^0
Probability of losing new interactions


Tendency for specialization
10^{1}
$10^{0.8}$
$10^{0.6}$
$10^{0.4}$
$10^{0.2}$
10^{0}
herbivory
pollination
dispersal
parasitism
phage
10^{-2}
10^{-1}
10^{0}
Probability of losing new interactions


1
0.8
0.6
0.4
0.2
0
herbivory
pollination
dispersal
parasitism
phage
−3
−2
−1
0
1
2
3
Model performance (z-score)


network structure is predicted by
simple evolutionary rules
types of networks differ on their
tendency to retain interactions