Integration and the Structured Coalescent

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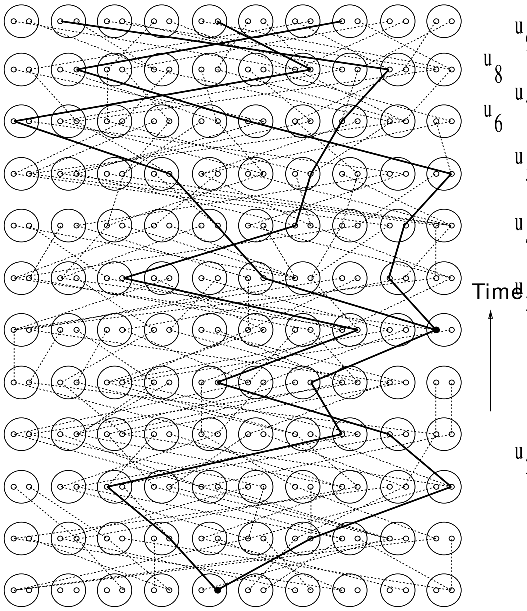
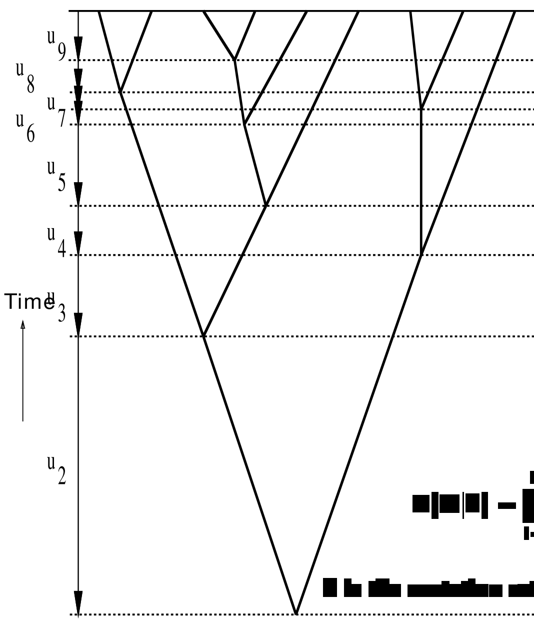
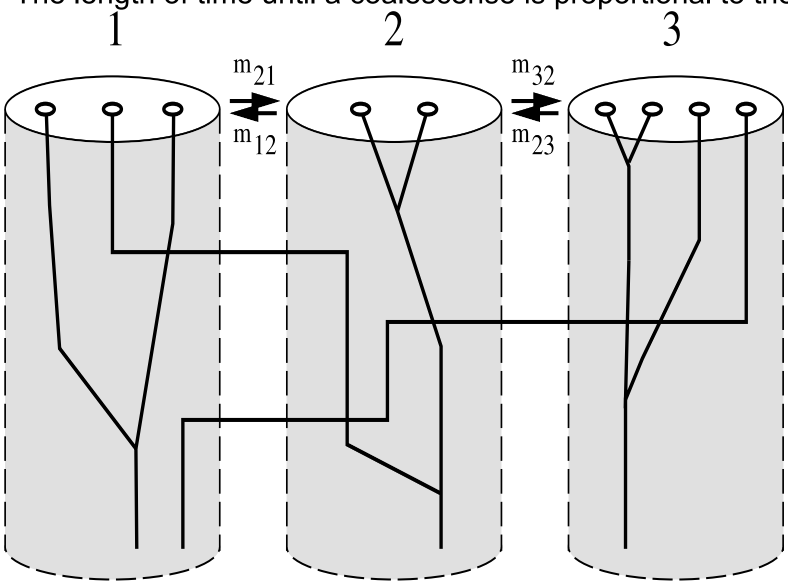




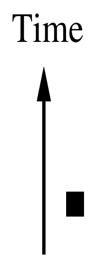
[illegible]

[illegible]

The Wright Fisher Model describes a randomly mating population. Where every individual in a generation comes from a random union of gamates. When looking backward in time all individuals have a common ancestor. The relationships form a tree. The length of time until a coalescense is proportional to the population size.



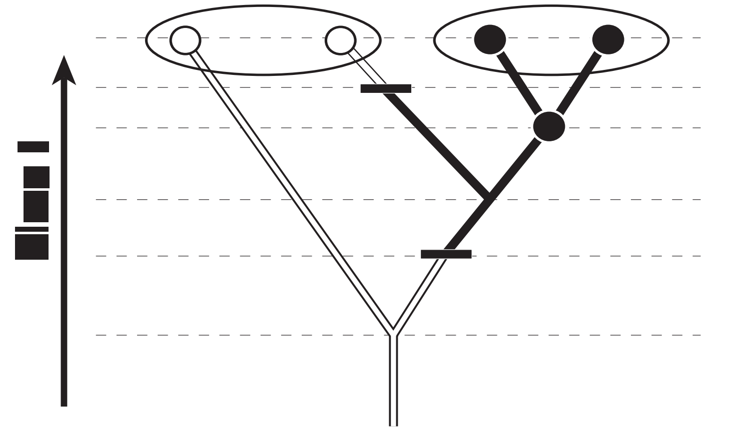
The coalescent framework can be extended to a non random mating population. The example to the left shows three populations exchanging migrants. This is known as the structured coalescent.



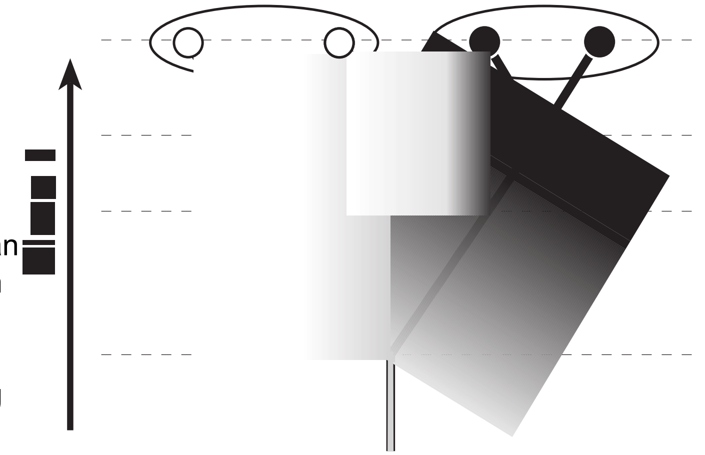
$$[illegible](t) = \sum_{[illegible]} \sum_{[illegible]} \sum_{[illegible]} \frac{P(L_{[illegible]} \in k|t)P(L_{[illegible]} \in k|t)}{[illegible]}$$

$$P([illegible]|t, t_{[illegible]}) = [illegible](t)e^{[illegible]}$$

$$P(G|M, [illegible]) = \prod_{[illegible]}^{[illegible]} P([illegible]|u_{[illegible]}, u_{[illegible]})$$



Typically MCMC is used to sample trees like the one above. This includes sampling migration events in addition to different tree topologies.



We use a time continuous Markov chain model for location probability and a non-homogeneous Poisson process for coalescent times one can calculate the probability of just the topology. This allows us to sample from a much smaller sample space.