



Bayes' theorem

$$P(\text{parameters} \mid \text{data, model}) = \frac{\overset{\text{likelihood}}{P(\text{data} \mid \text{parameters, model})} \overset{\text{priors}}{P(\text{parameters} \mid \text{model})}}{P(\text{data} \mid \text{model})}$$

↙ posterior
↗ marginal probability of the data

Putting everything together

posterior

$$P(\text{tree, parameters} \mid \text{data}) =$$

probability of the character
data given everything else*

↙

probability of the timetree
given the timetree model

↙

priors on model parameters

↙ ↘ ↘

$$\frac{P(0101... \mid \text{tree, parameters}) P(\text{tree} \mid \text{data}) P(\text{parameters}) P(\text{substitution}) P(\text{clock})}{P(0101... \mid \text{data})}$$

↗ marginal probability of the data

*the timetree, the parameters and the tripartite model