



## Bayes theorem

$$P(\text{model} \mid \text{data}) = \frac{P(\text{data} \mid \text{model}) P(\text{model})}{P(\text{data})}$$

likelihood      priors

posterior      marginal likelihood of the data

## Putting everything together

posterior

$$P(\text{tree, fossil ages, model parameters} \mid \text{phylogenetic data, fossil ages}) =$$

likelihood of the data given the model      probability of the timetree given the tree model      priors on model parameters

$$\frac{P(\text{0101...} \mid \text{tree, fossil ages, model parameters}) P(\text{tree} \mid \text{fossil ages}) P(\lambda) P(\mu) P(\rho) P(\text{0} \rightarrow \text{1}) P(\text{clock})}{P(\text{0101...})}$$

marginal likelihood of the data