Online Algorithms in Computational Biology

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Phylogenetic inference

Alignment

Mouse	CTCGTATCCCTTGTAACTCCGTCCCACTCCTTTTAT
Elephant	CTCATAGCACTTGTAACTCCGTCCCACGCCTTTTCT
Human	CTCGTATCCCTTGTAACTCCGTCCCACTCCTTTTTT
Pig	CTCCTAGCACTTGTAACTCCGTCCCACCCCTTTTGT

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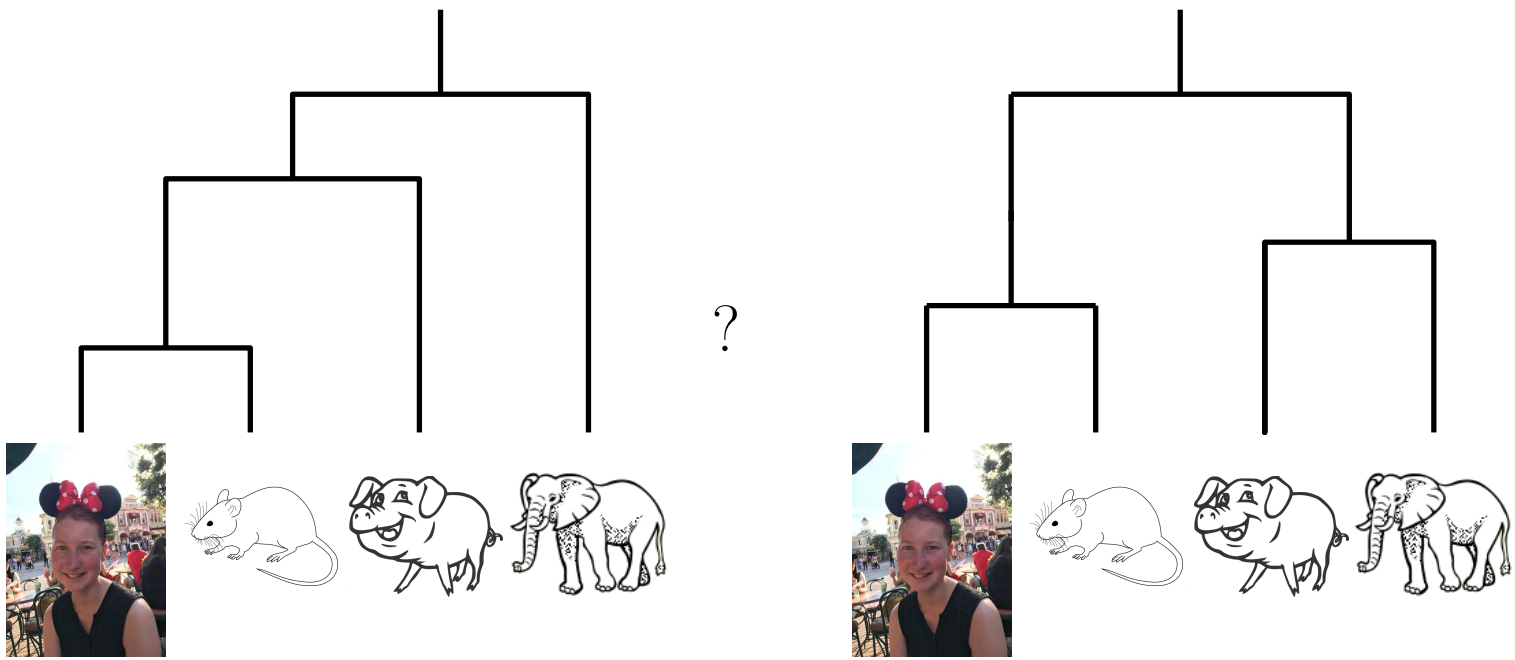

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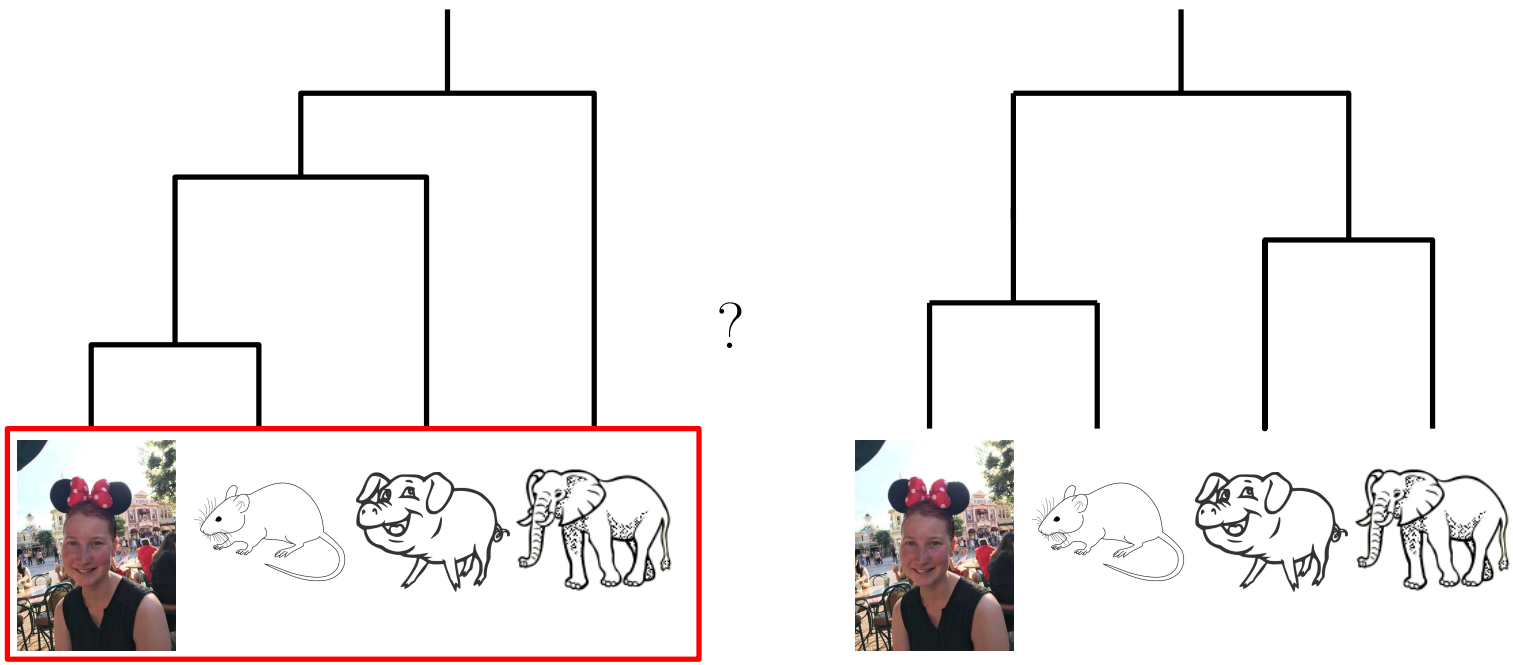

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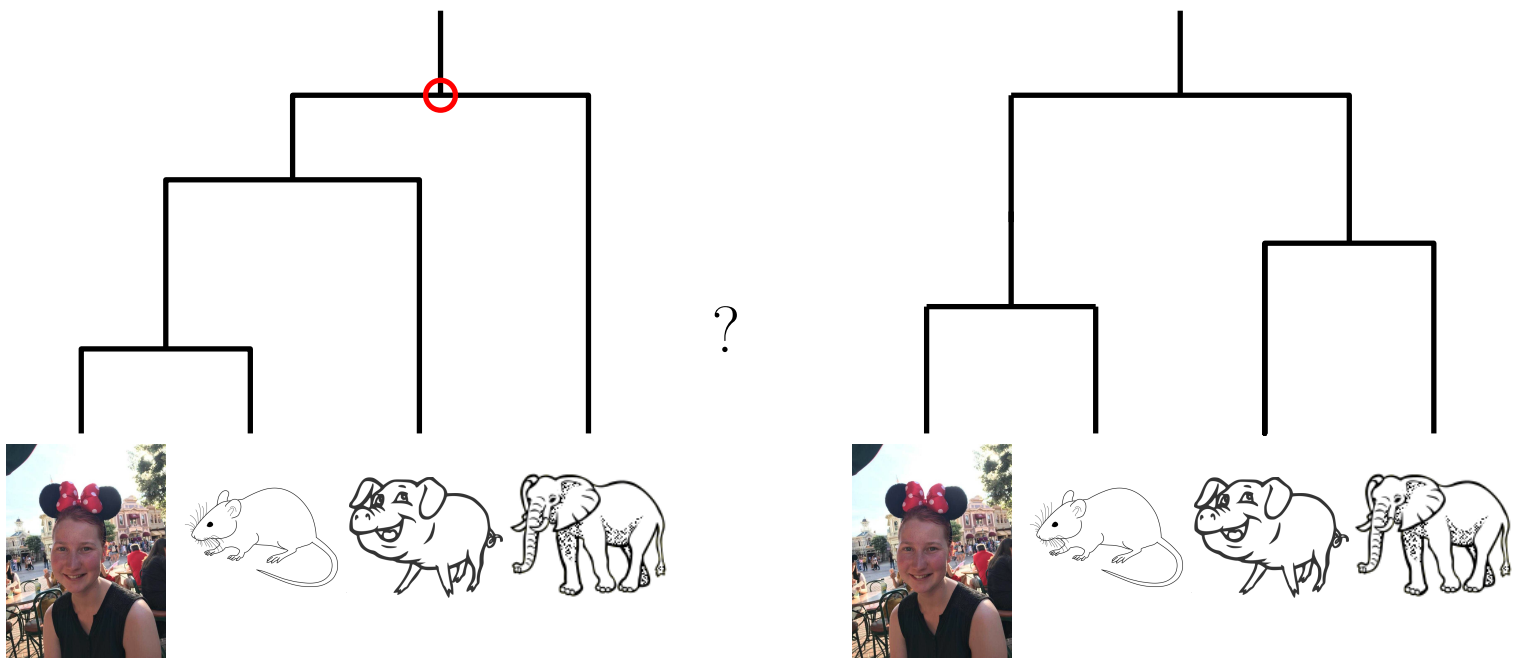

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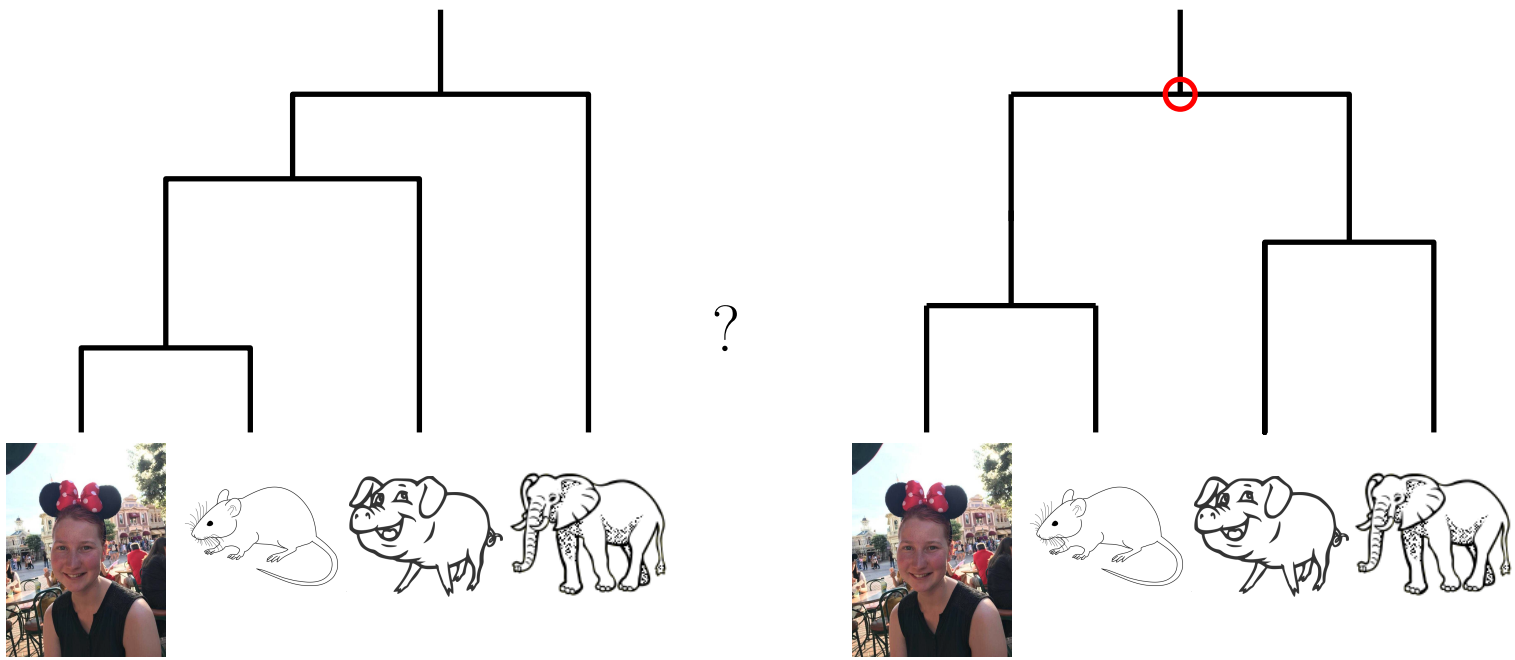

Phylogenetic inference

n	Number of trees
4	15
5	105
6	945
7	10395
	...
50	$2.752921 \cdot 10^{76}$

Online Phylogenetic Inference

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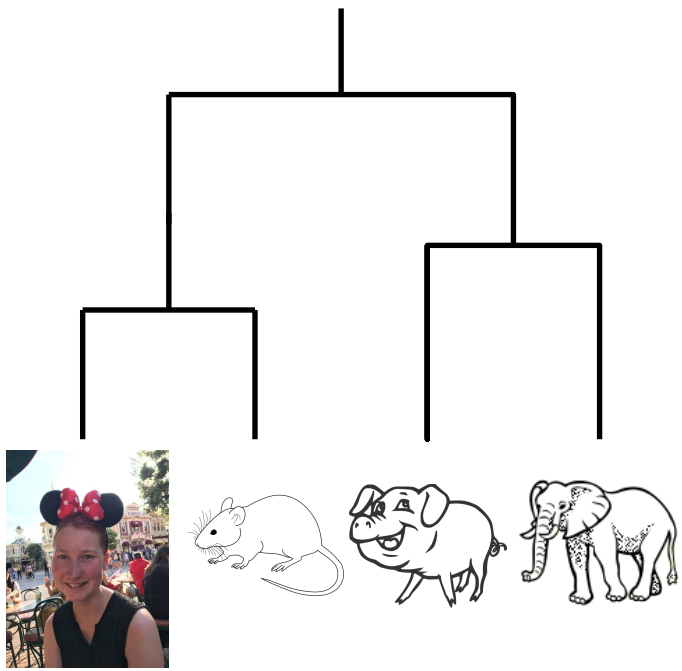

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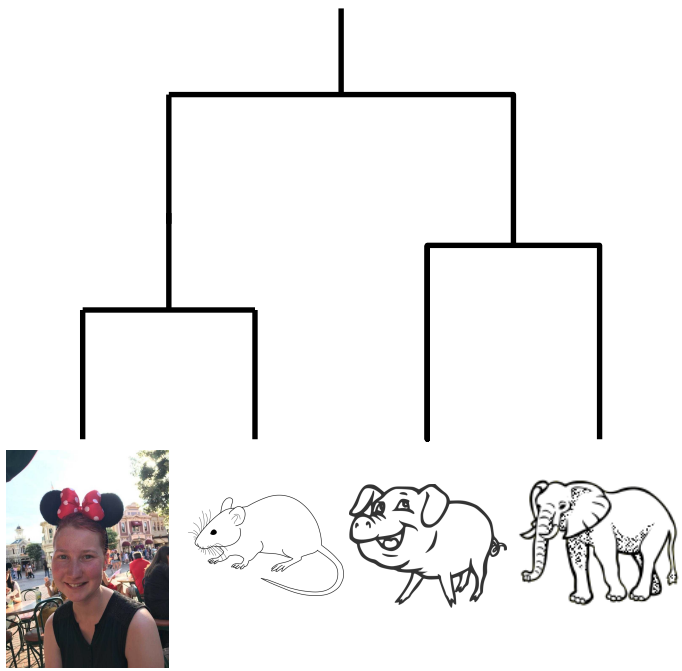

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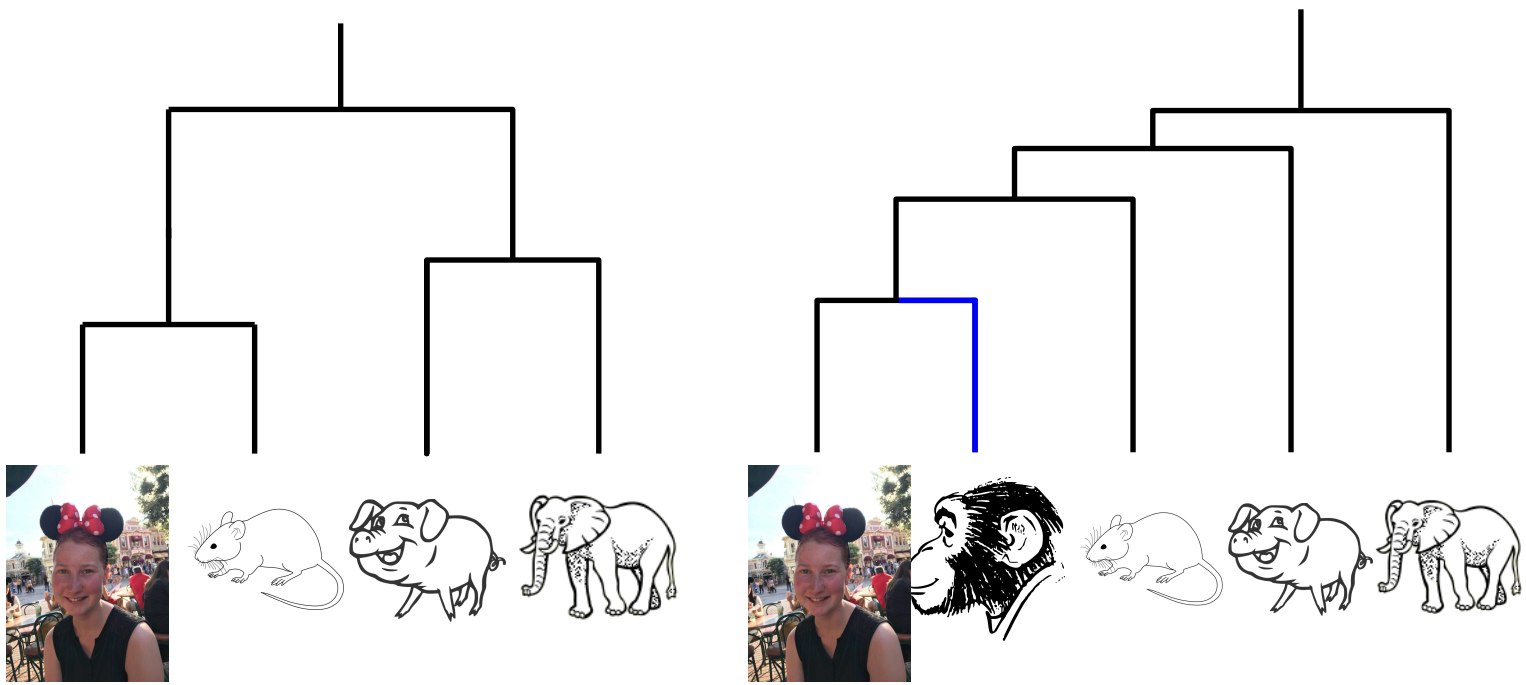

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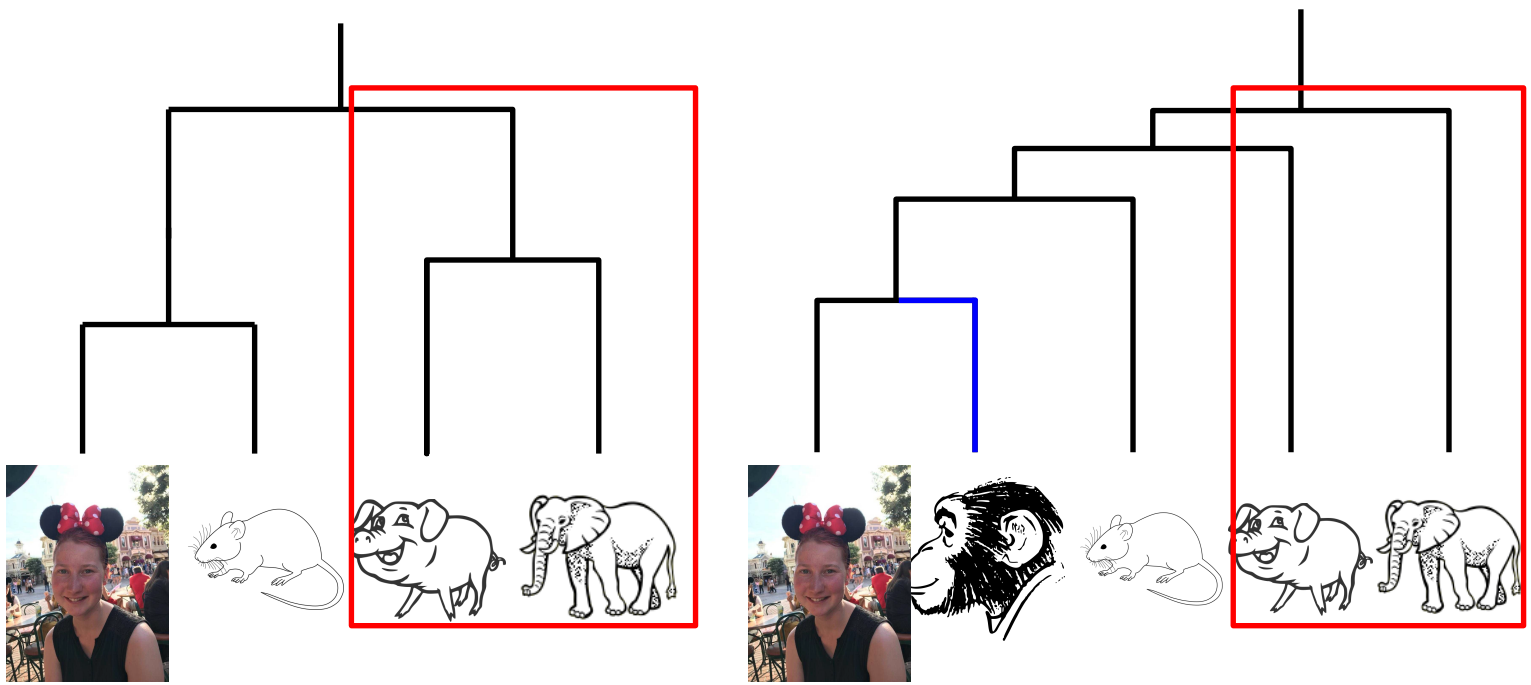

Bayesian Inference

$$\pi(\text{tree}|\text{data})$$

Bayesian Inference

posterior

$$\boxed{\pi(\text{tree}|\text{data})}$$

Bayesian Inference

$$\overbrace{\boxed{\pi(\text{tree}|\text{data})}}^{\text{posterior}} = \frac{\pi(\text{data}|\text{tree}) \quad \pi(\text{tree})}{\pi(\text{data})}$$

Bayesian Inference

$$\underbrace{\boxed{\pi(\text{tree}|\text{data})}}_{\text{posterior}} = \frac{\overbrace{\boxed{\pi(\text{data}|\text{tree})}}^{\text{likelihood}} \quad \pi(\text{tree})}{\pi(\text{data})}$$

Bayesian Inference

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Bayesian Inference

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Bayesian Inference

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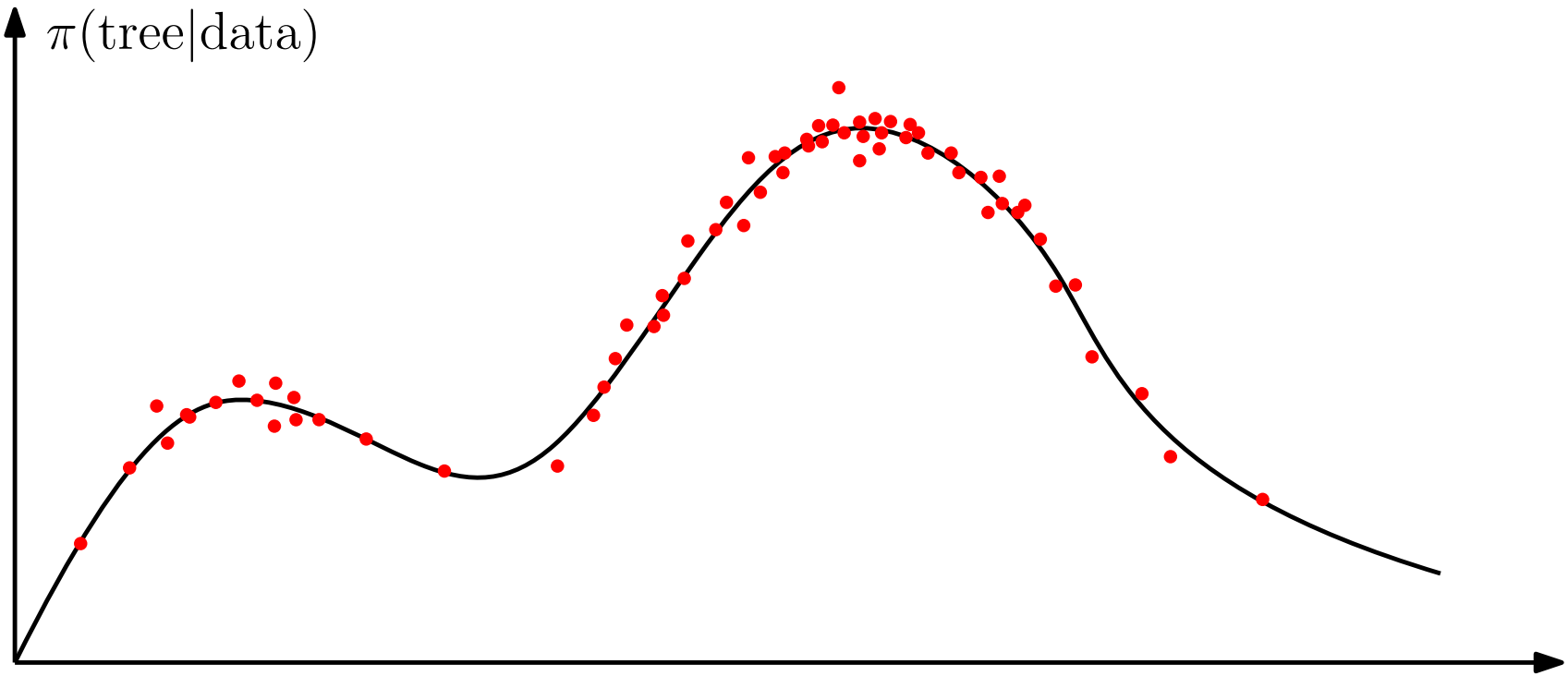
$$\pi(\text{data}) = \sum_{\text{tree}} \pi(\text{tree}|\text{data})\pi(\text{tree})$$

Bayesian Inference



Online Bayesian

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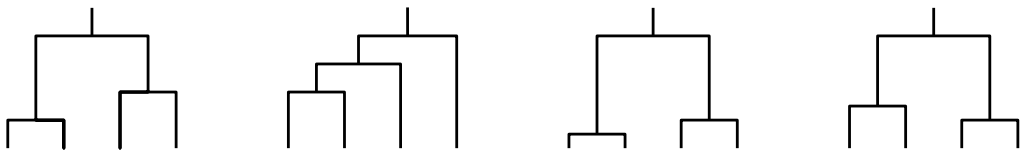

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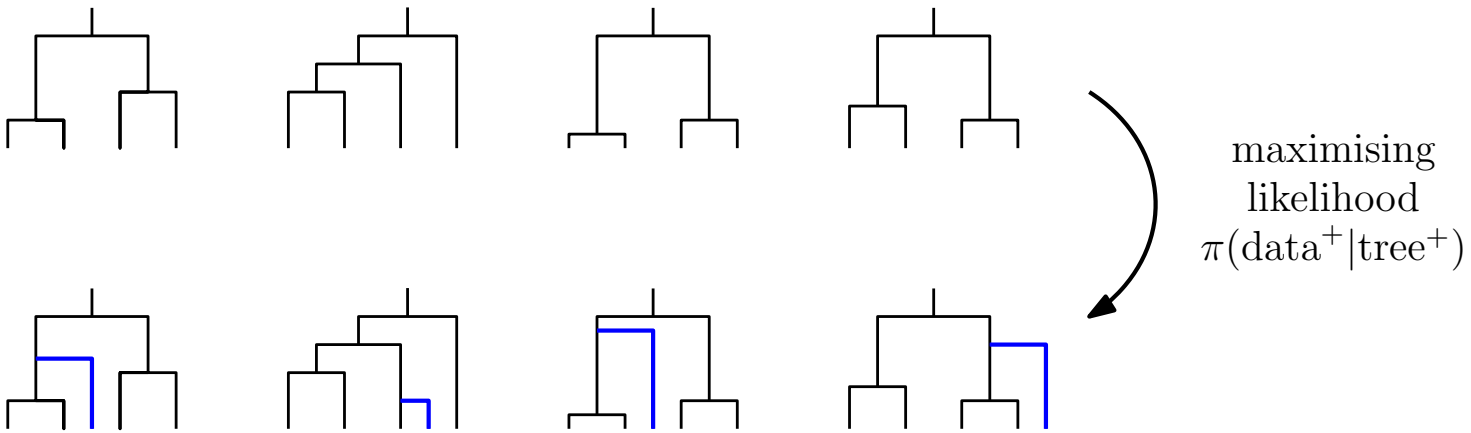

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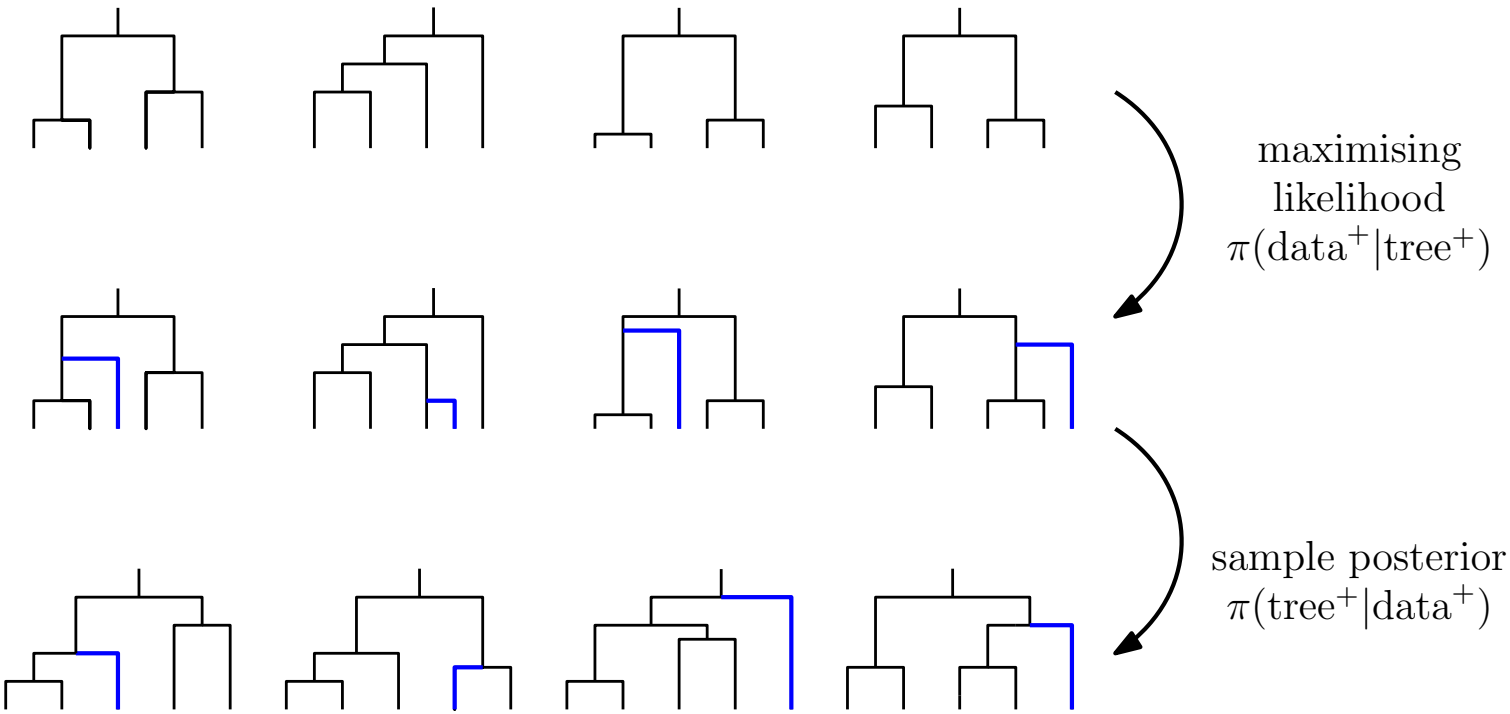

Thank you