

SNAPP



SNAPP

**MCMC
Prior distributions**

MCMC

Markov-chain Monte Carlo

Monte Carlo methods



Monte Carlo methods

Stanisław Ulam

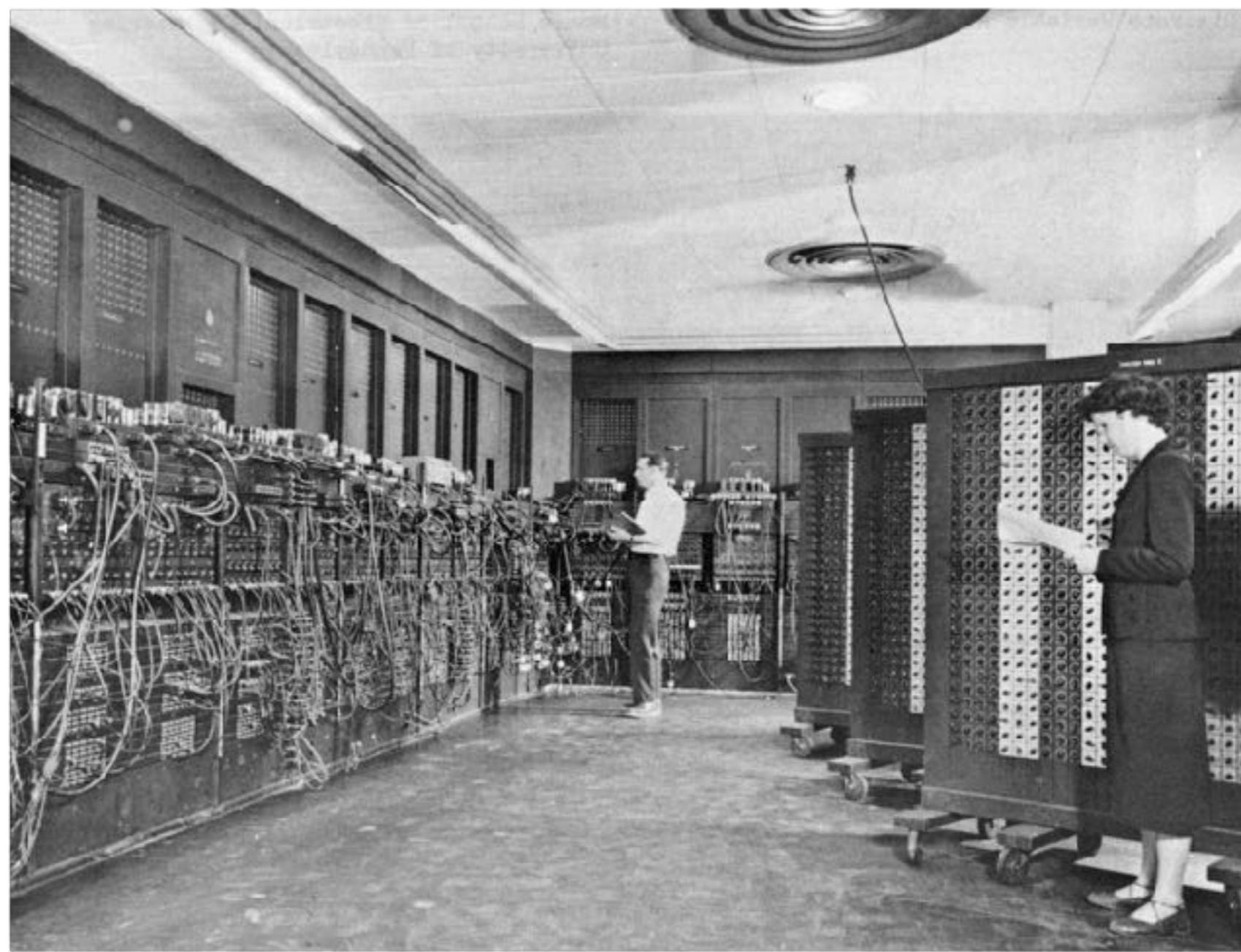


***“What are the chances
that a Canfield solitaire
laid out with 52 cards will
come out successfully?”***

Stanisław Ulam, 1946

Monte Carlo methods

ENIAC
1946



Monte Carlo methods

Stanisław Ulam

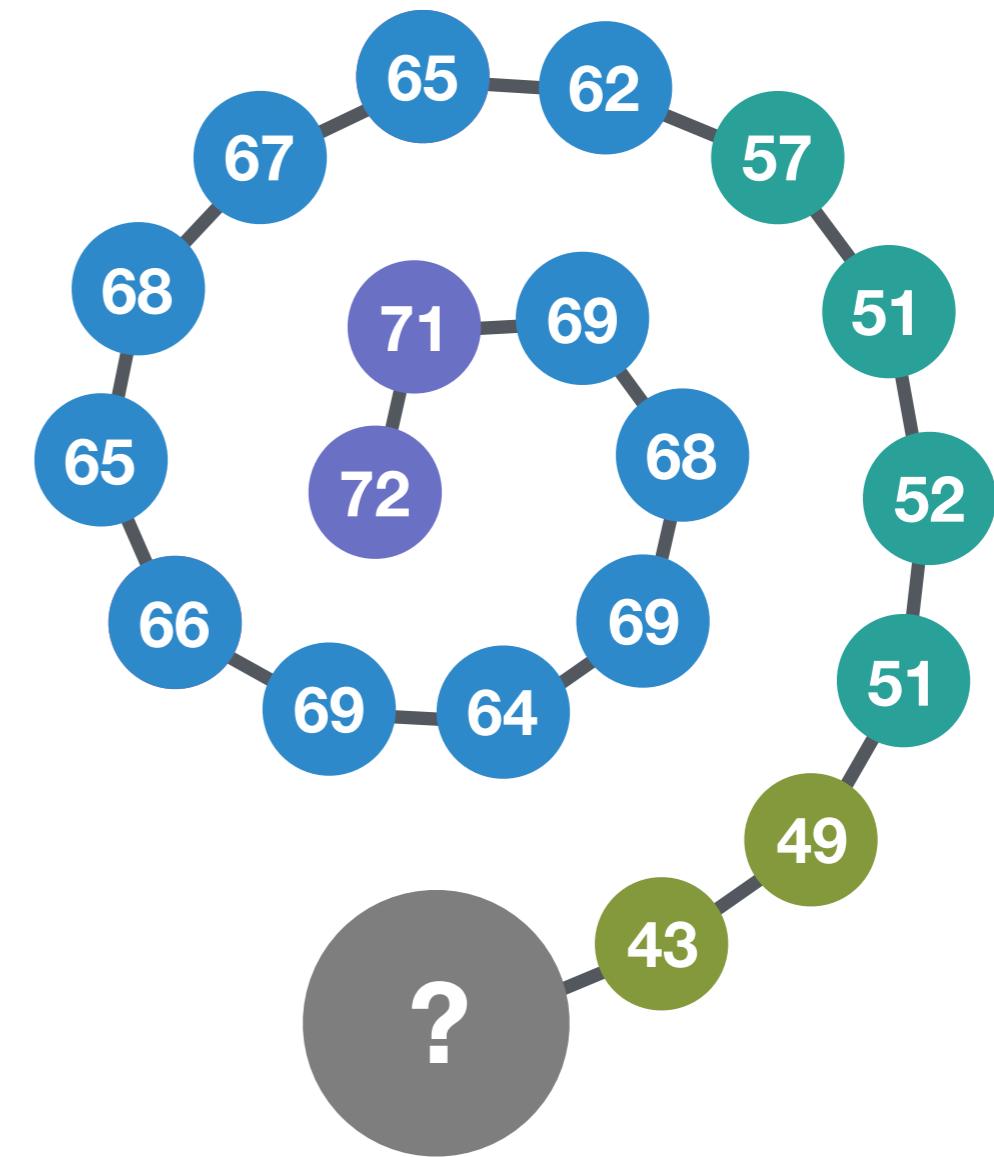


“Stan had an uncle who would borrow money from relatives because he ‘just had to go to Monte Carlo’.”

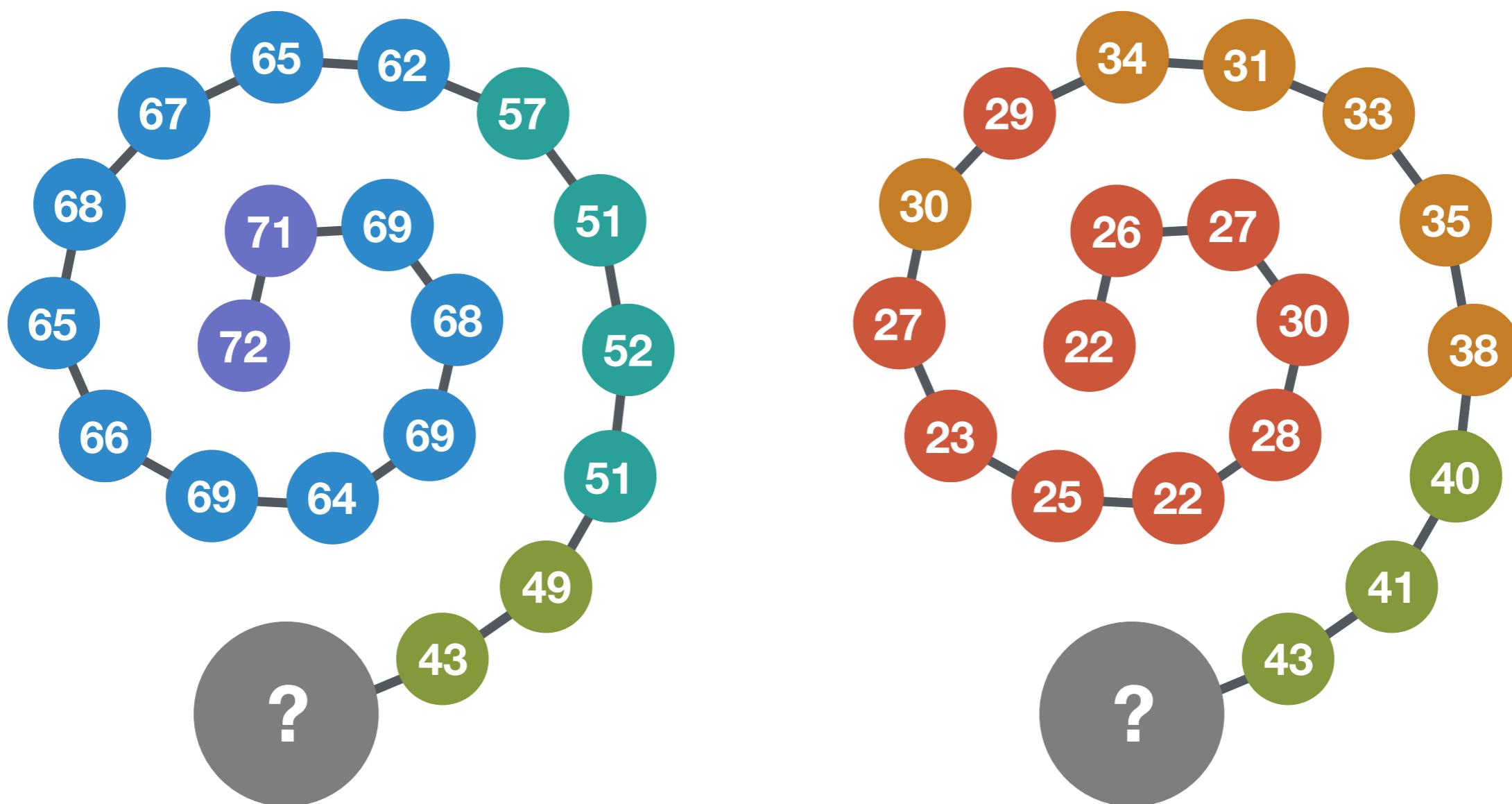
Nicholas Metropolis

Markov chains

Andrey Markov

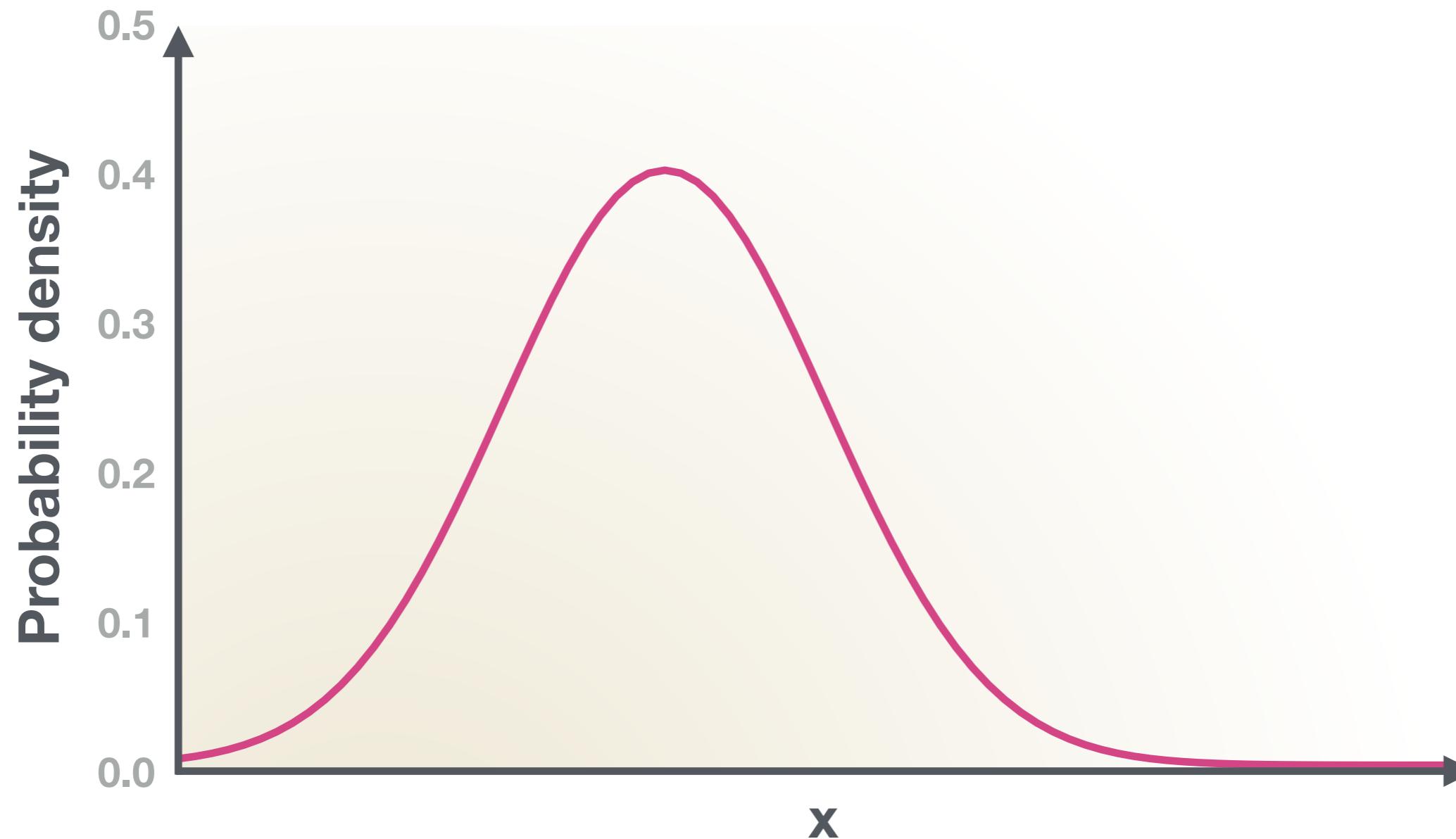


Markov chains



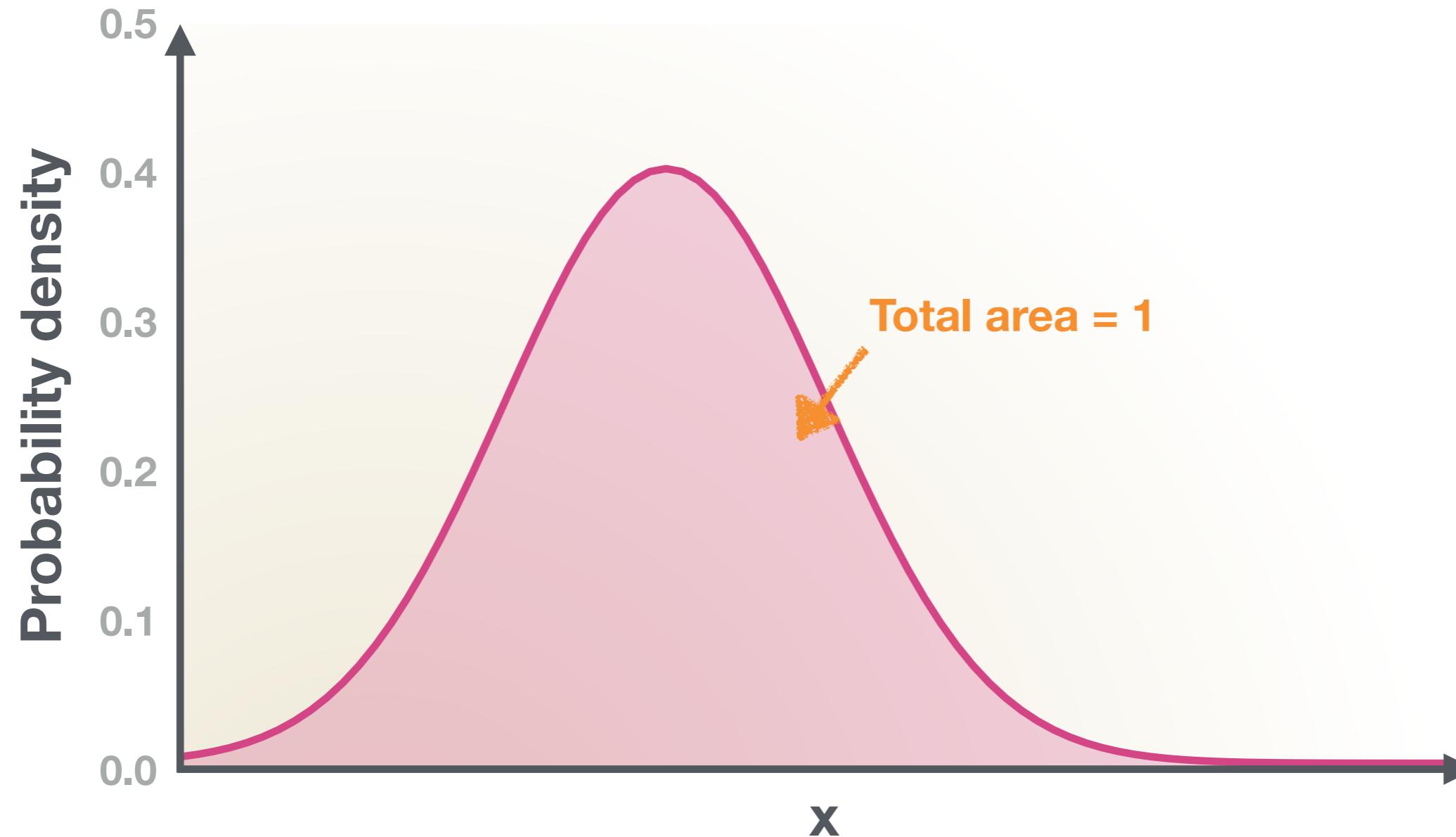
MCMC

Markov-chain Monte Carlo



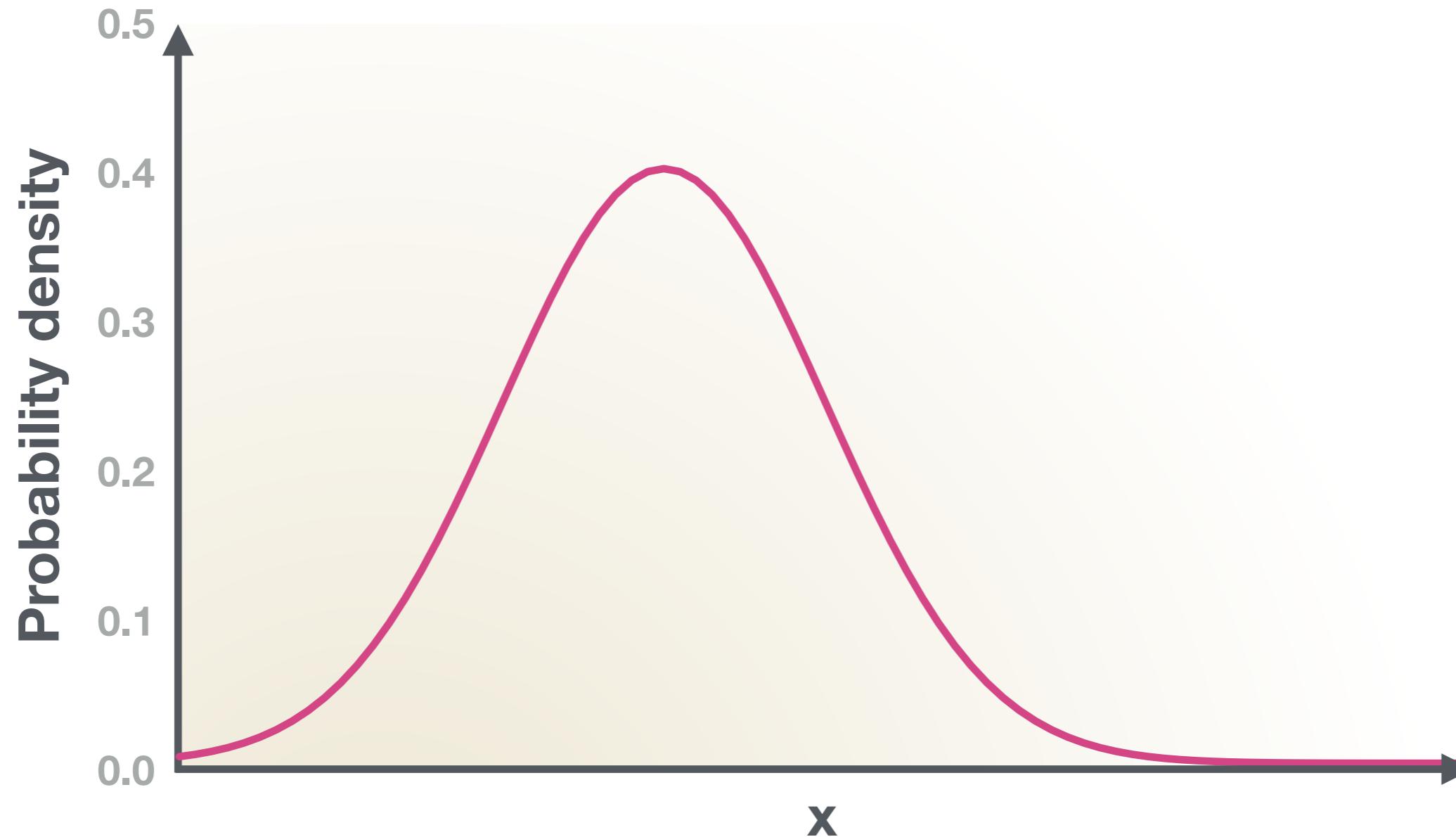
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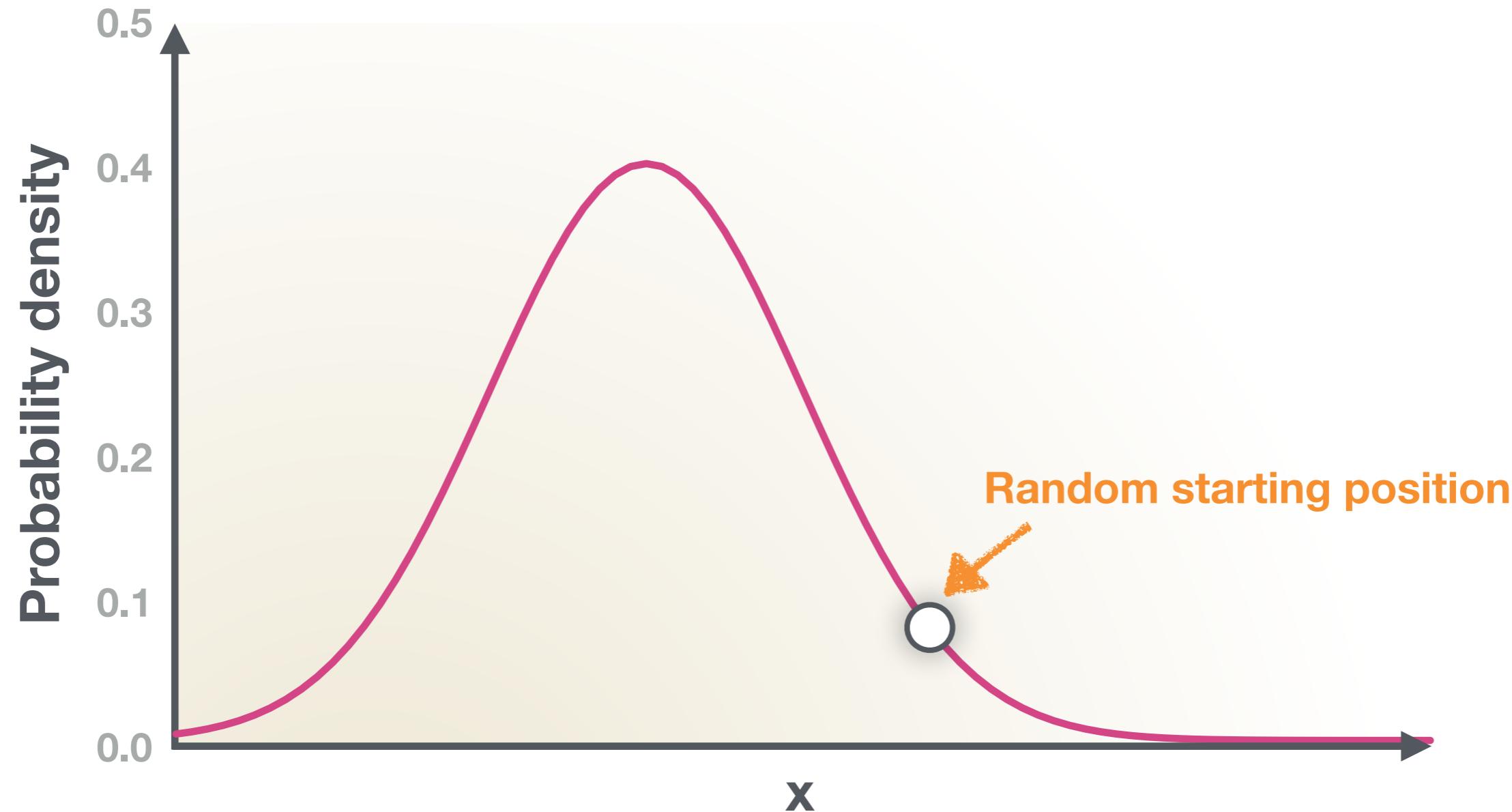
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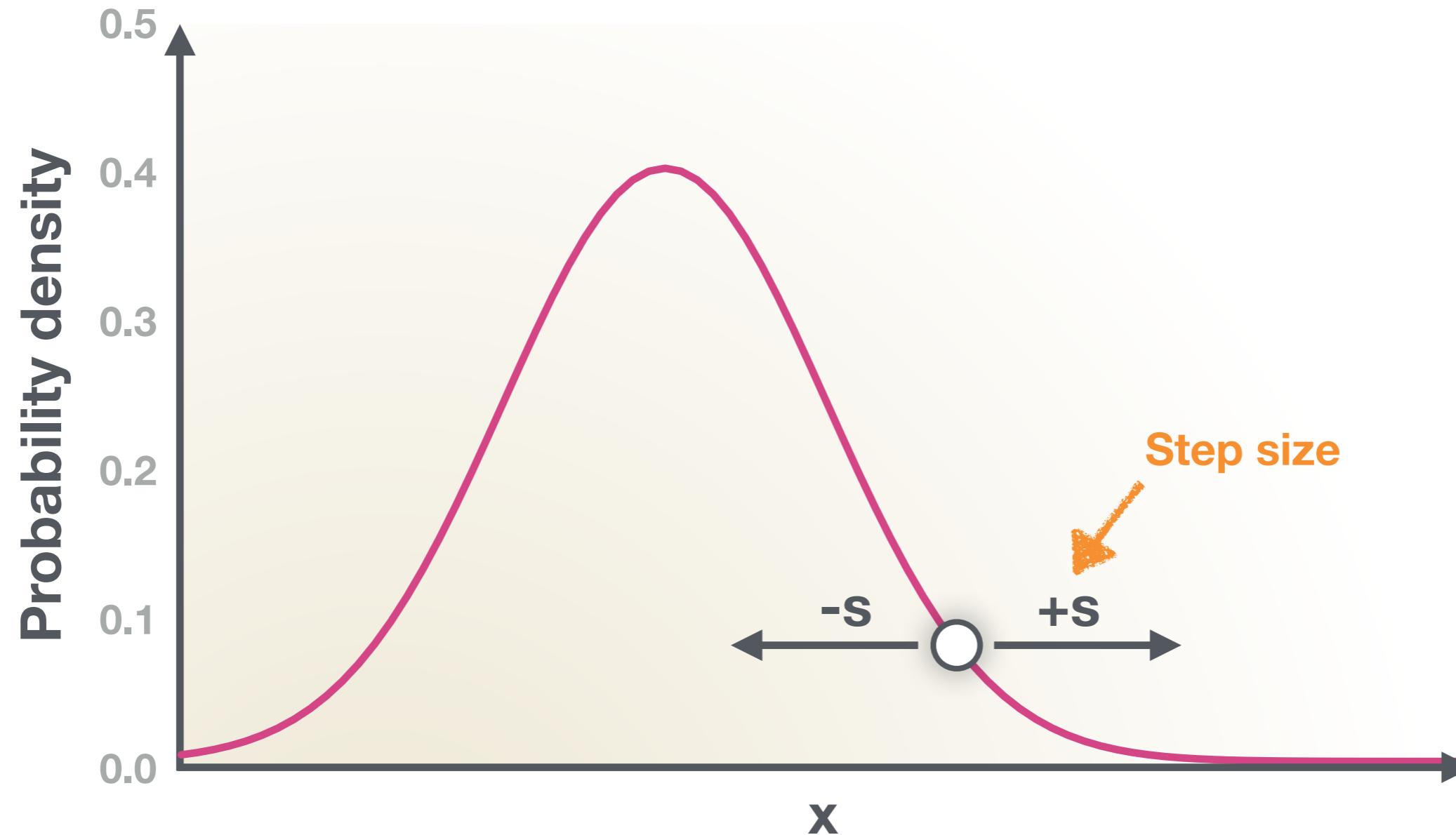
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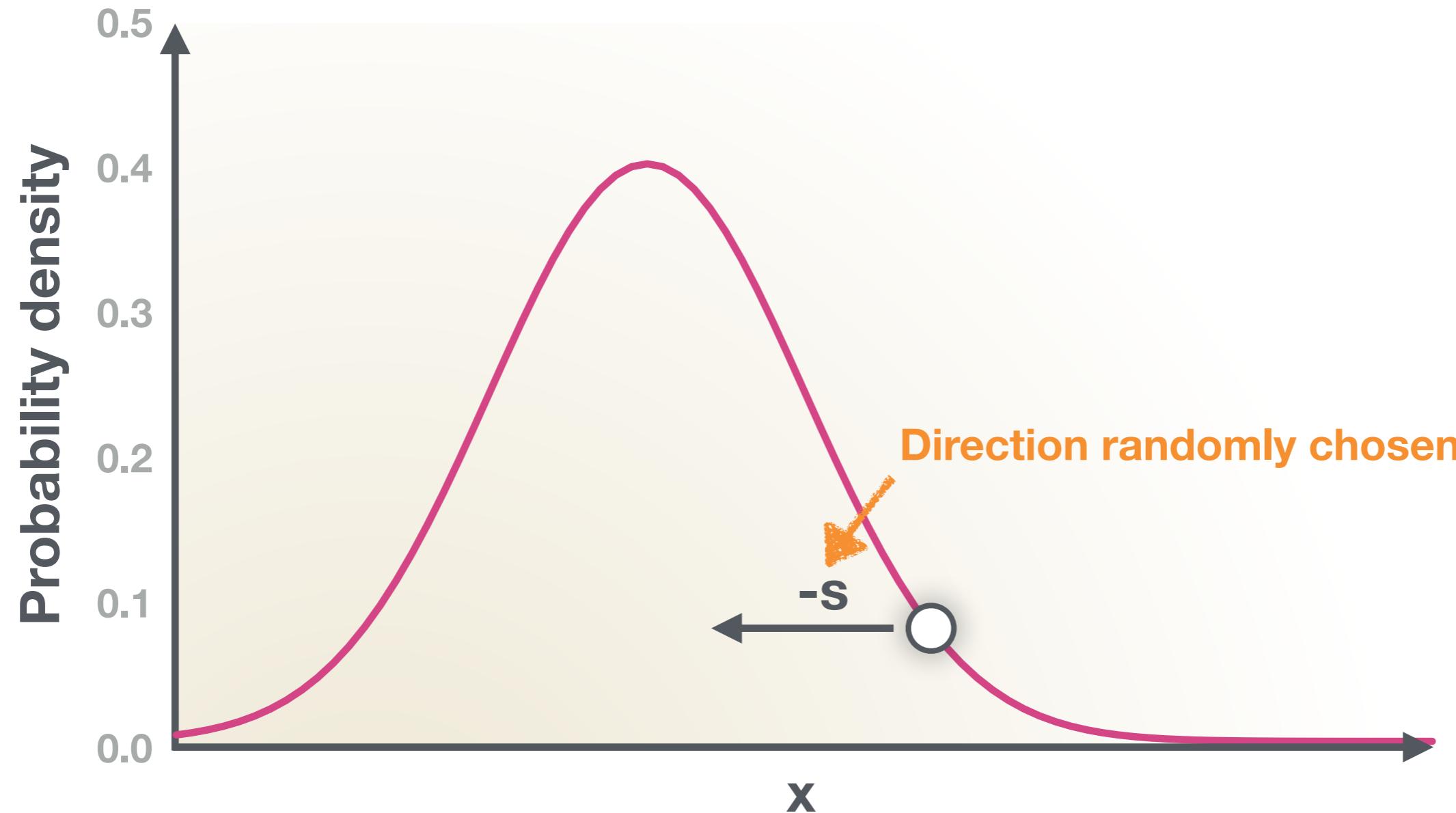
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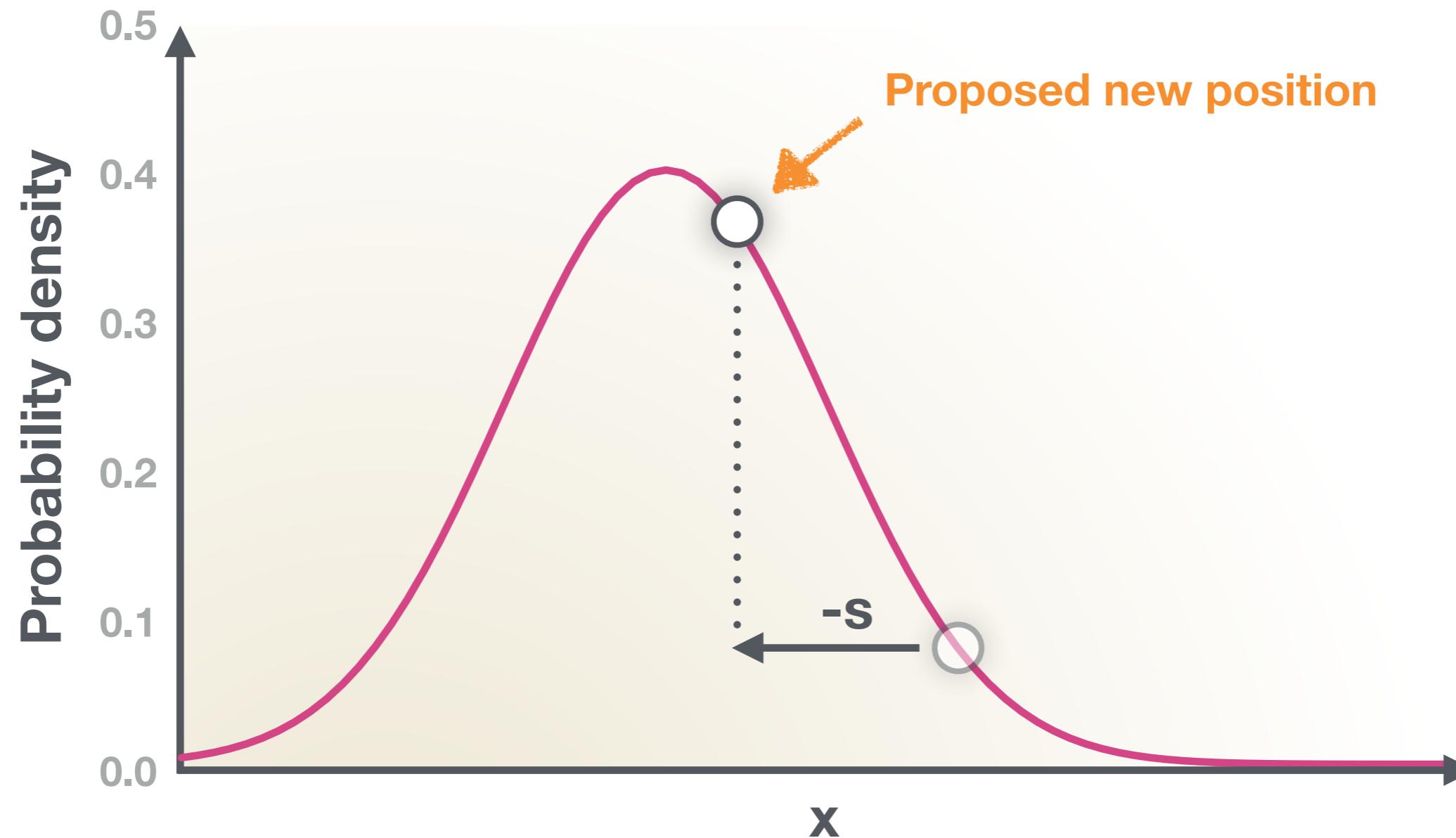
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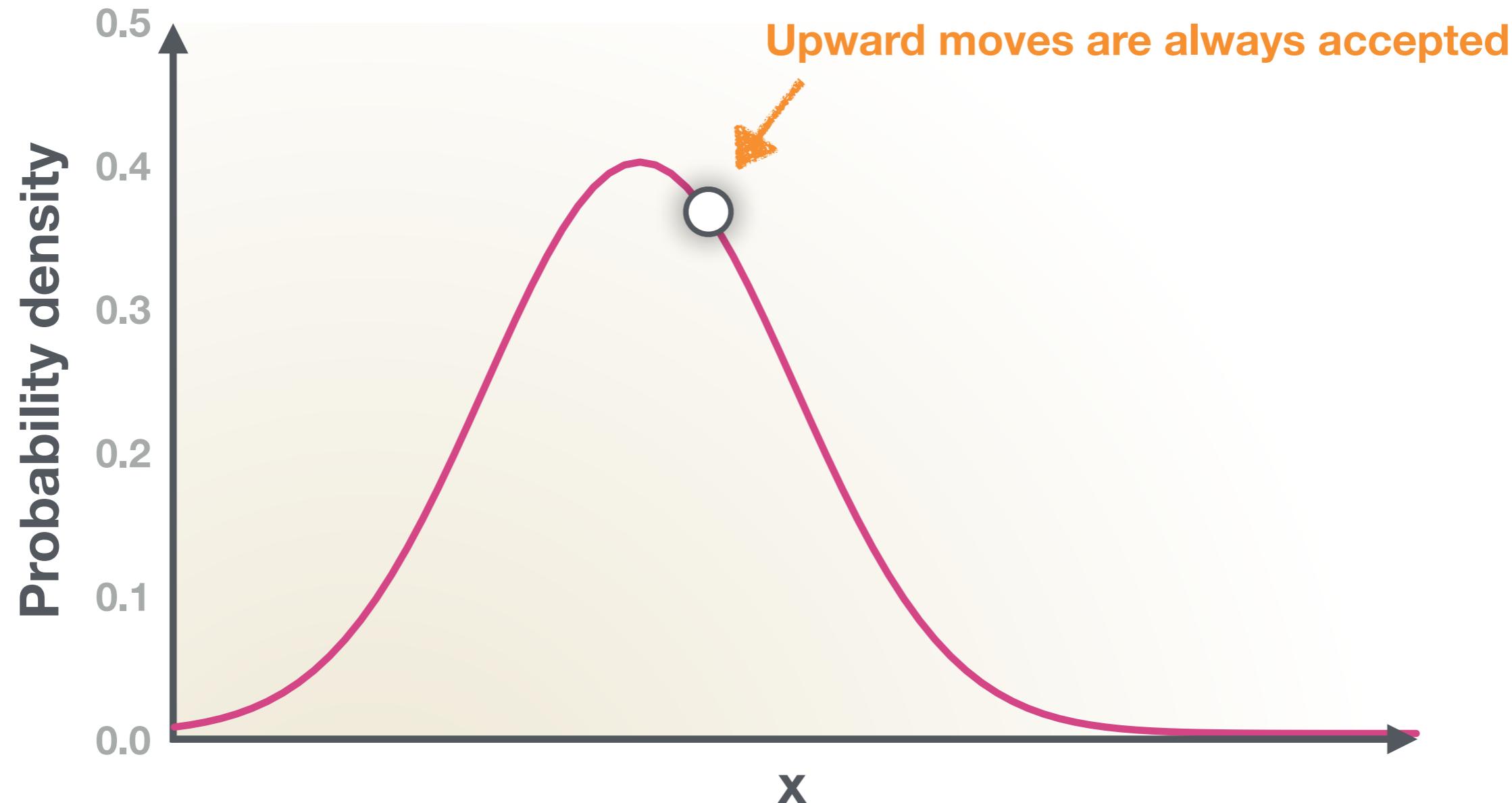
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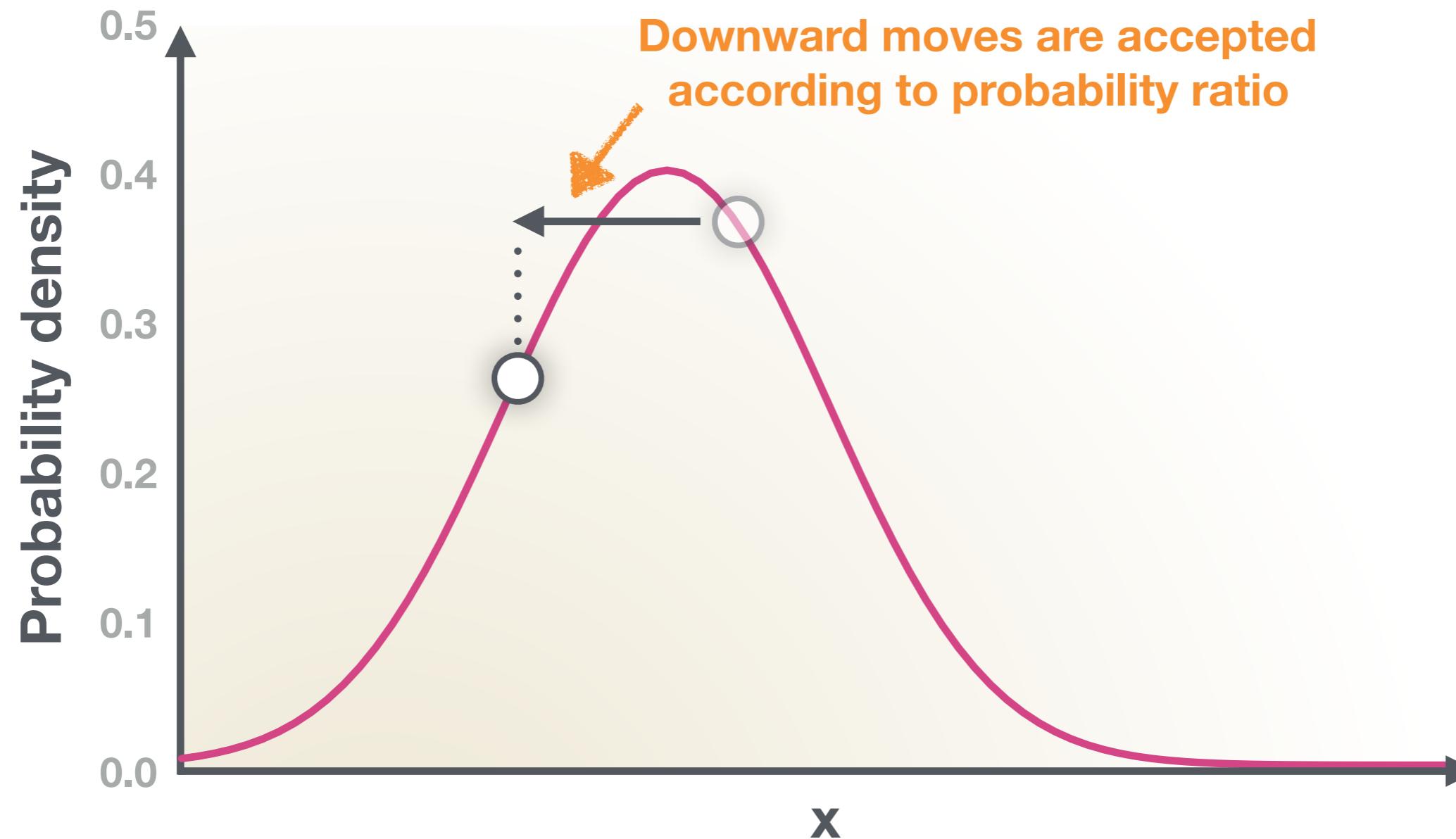
MCMC

Markov-chain Monte Carlo



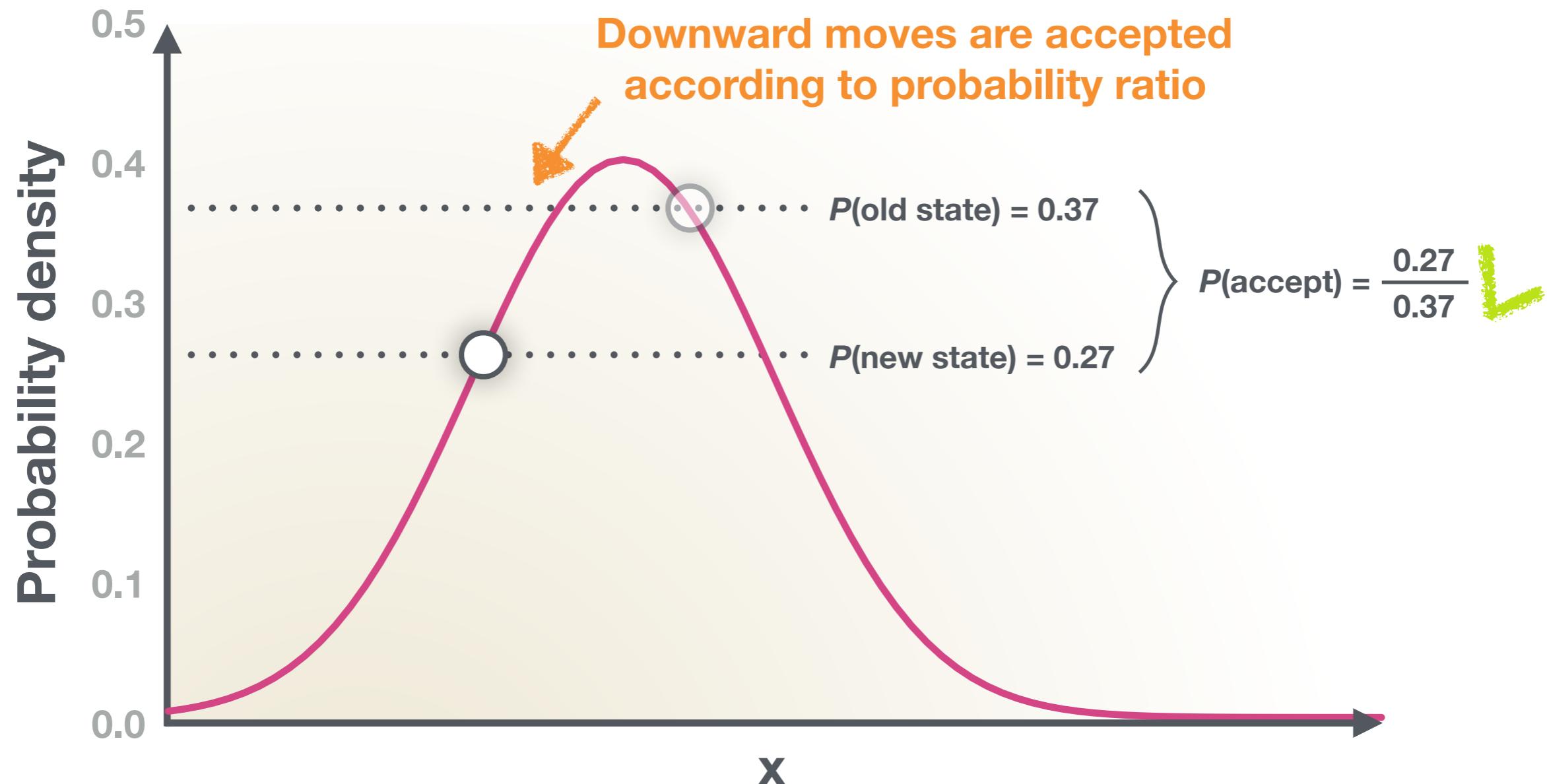
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Markov-chain Monte Carlo



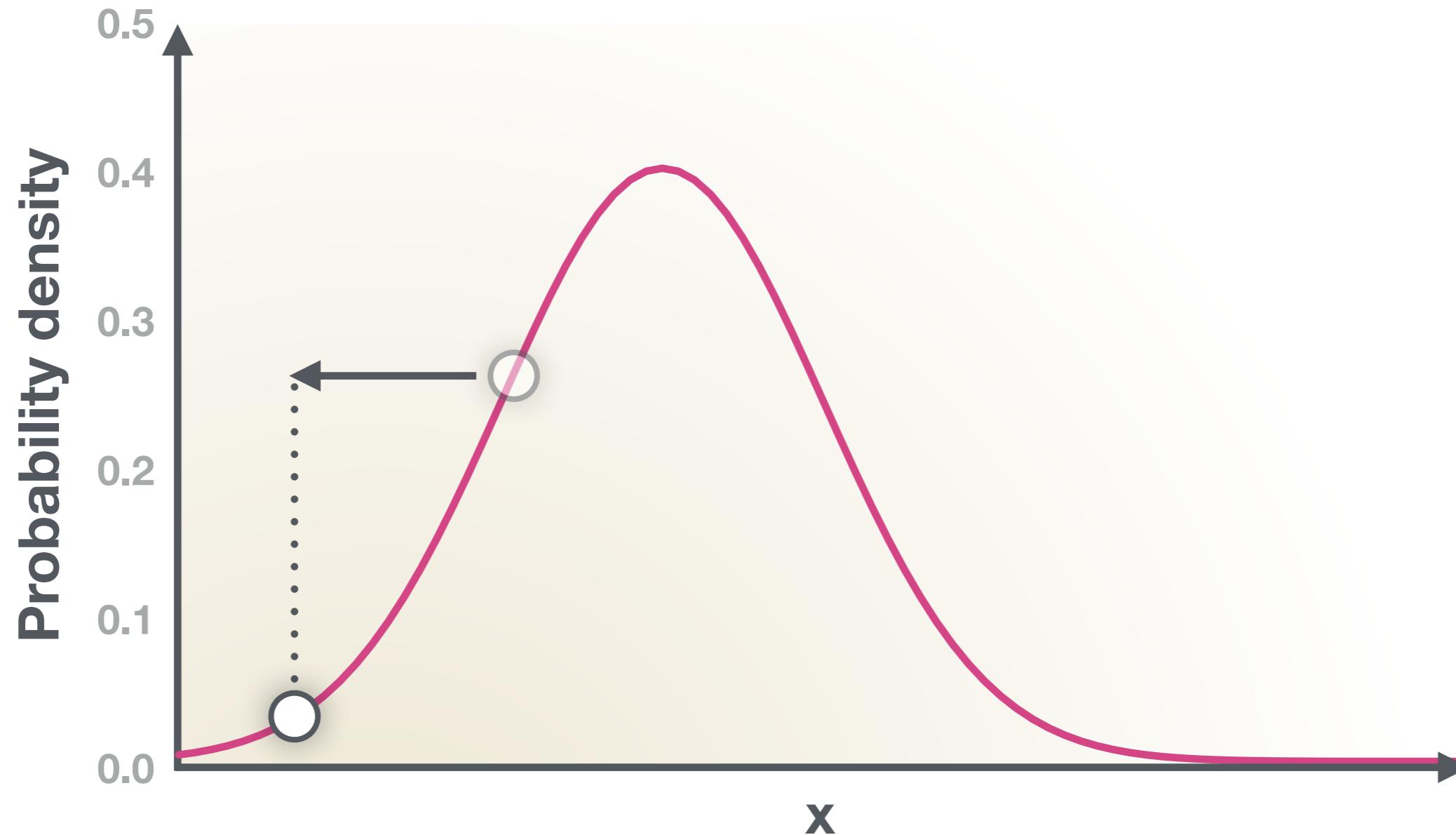
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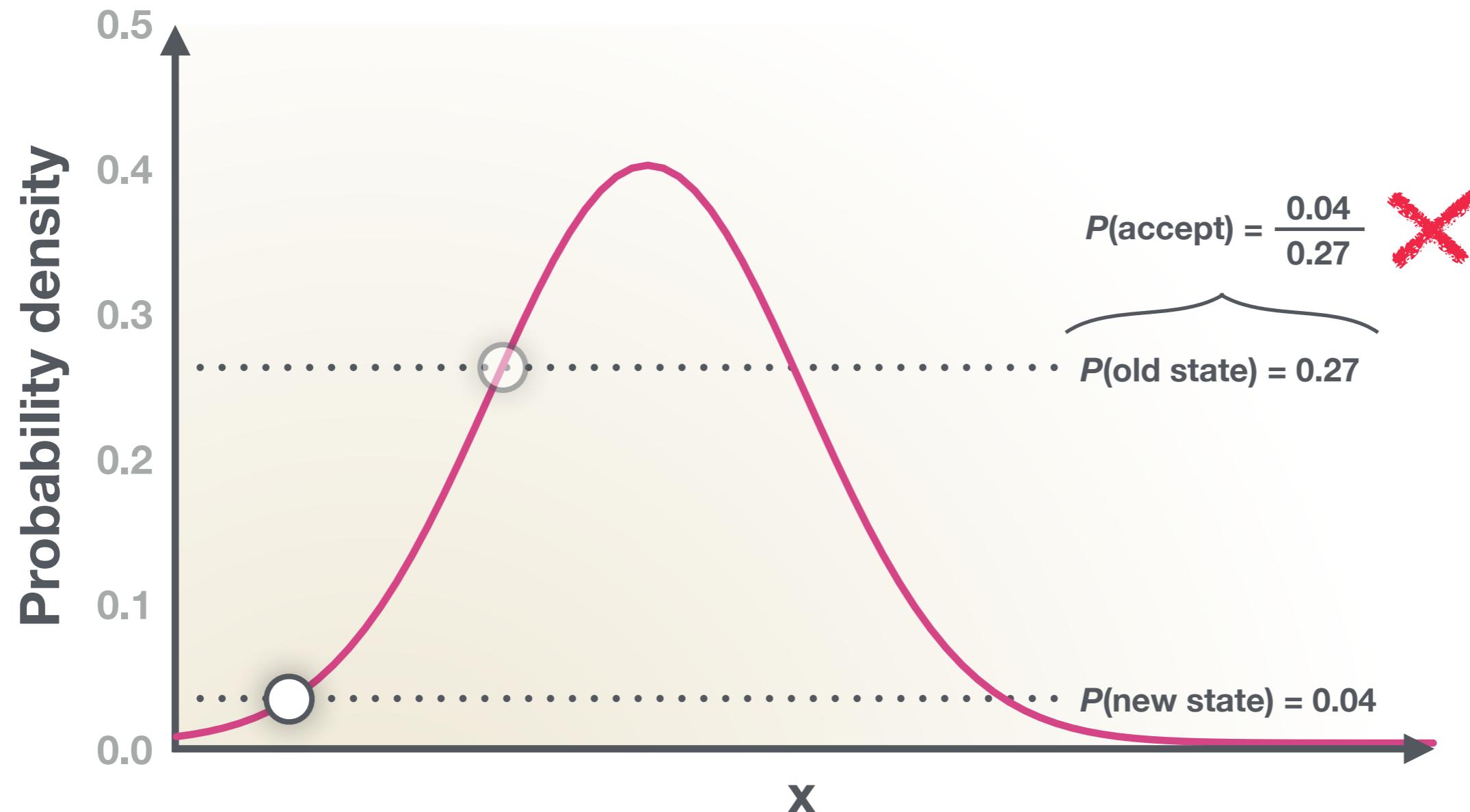
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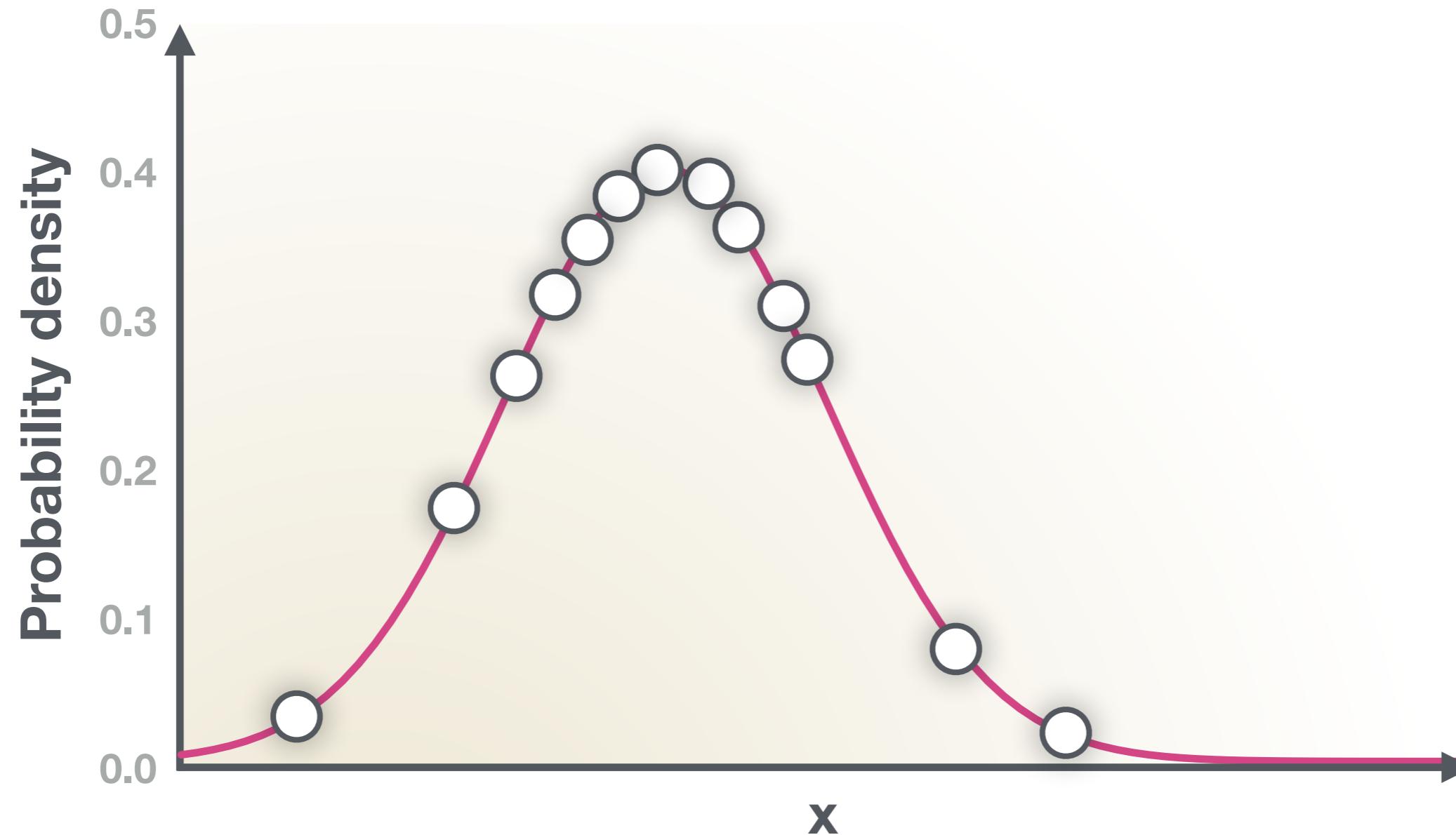
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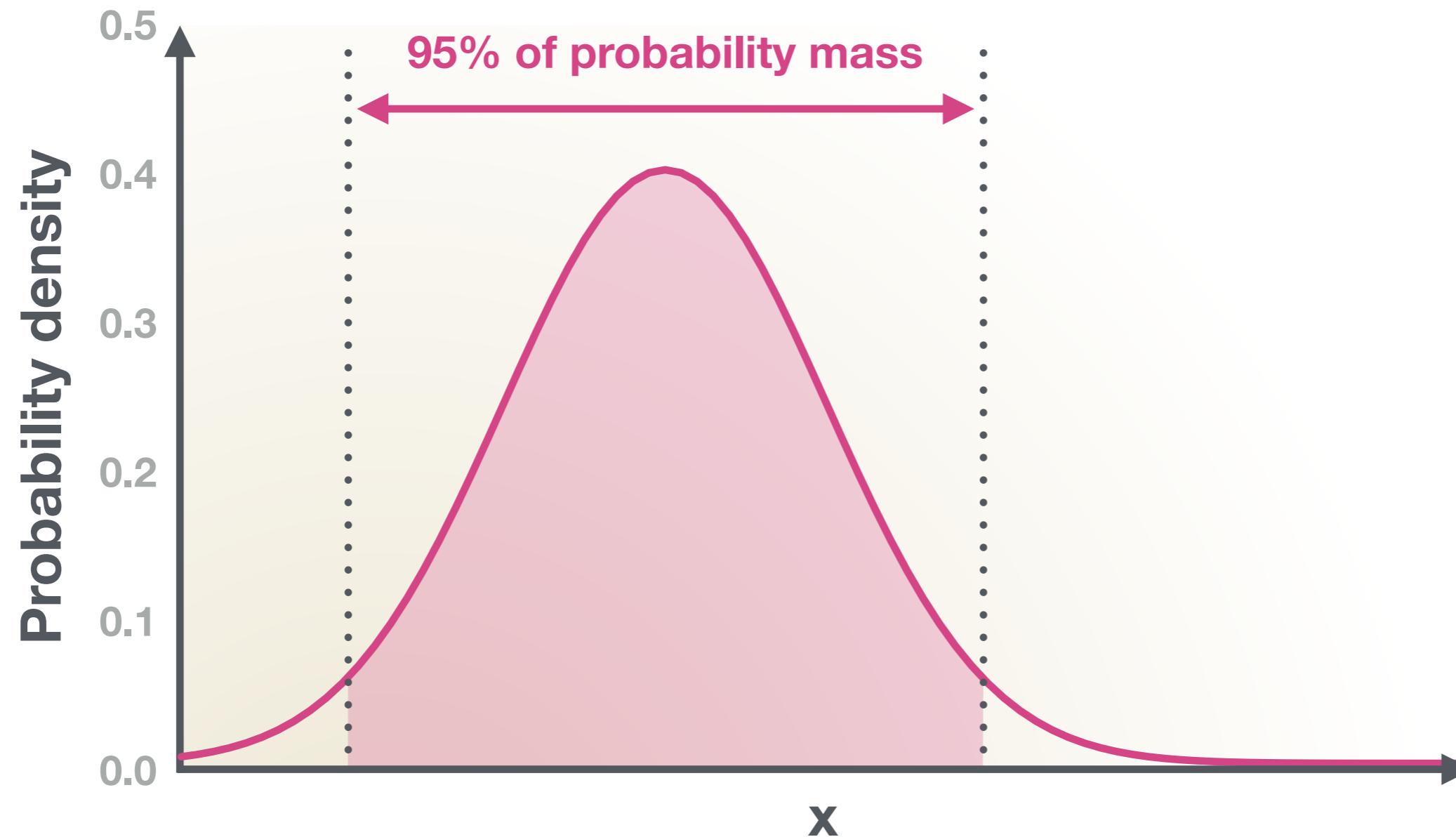
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Markov-chain Monte Carlo



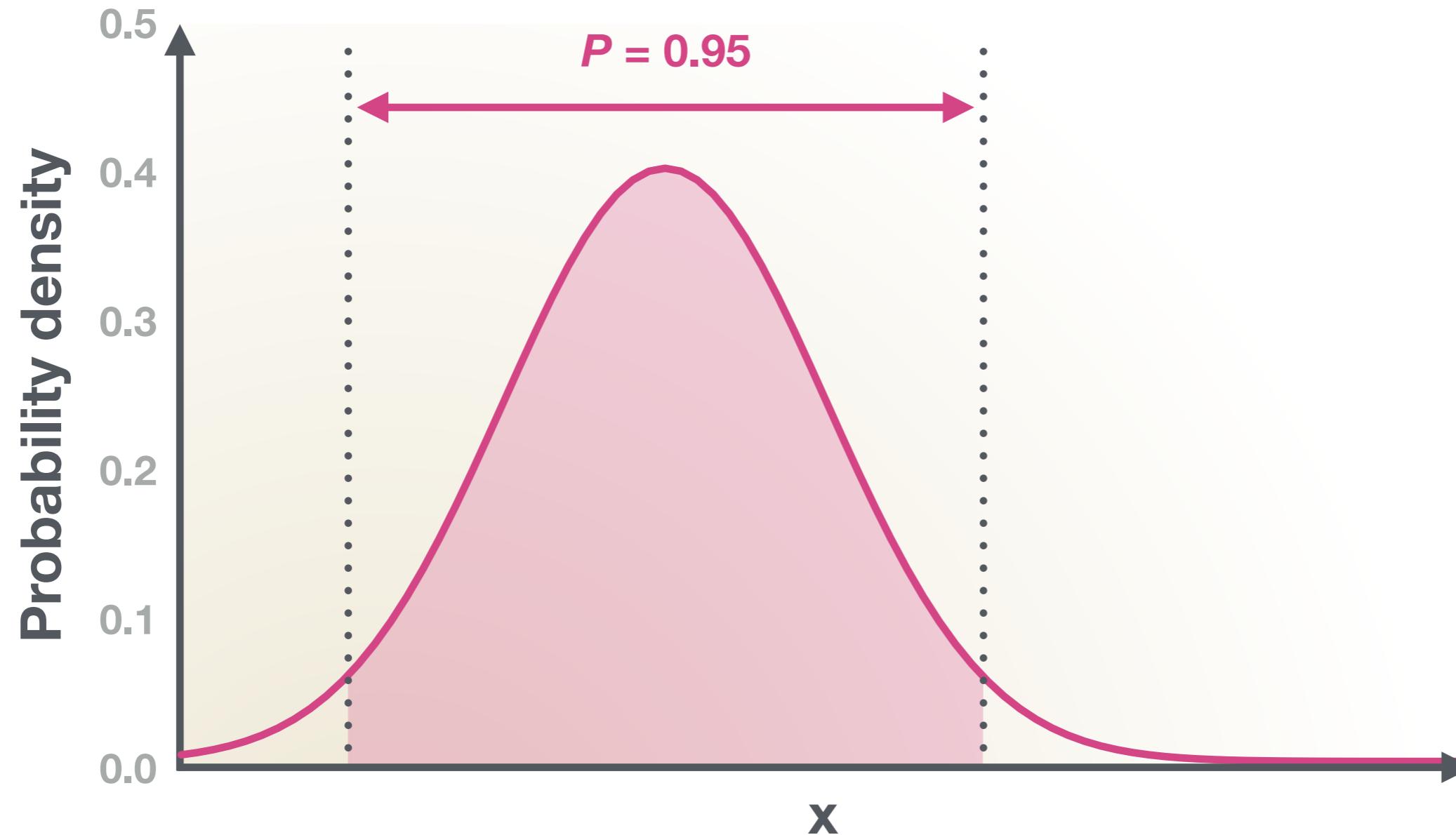
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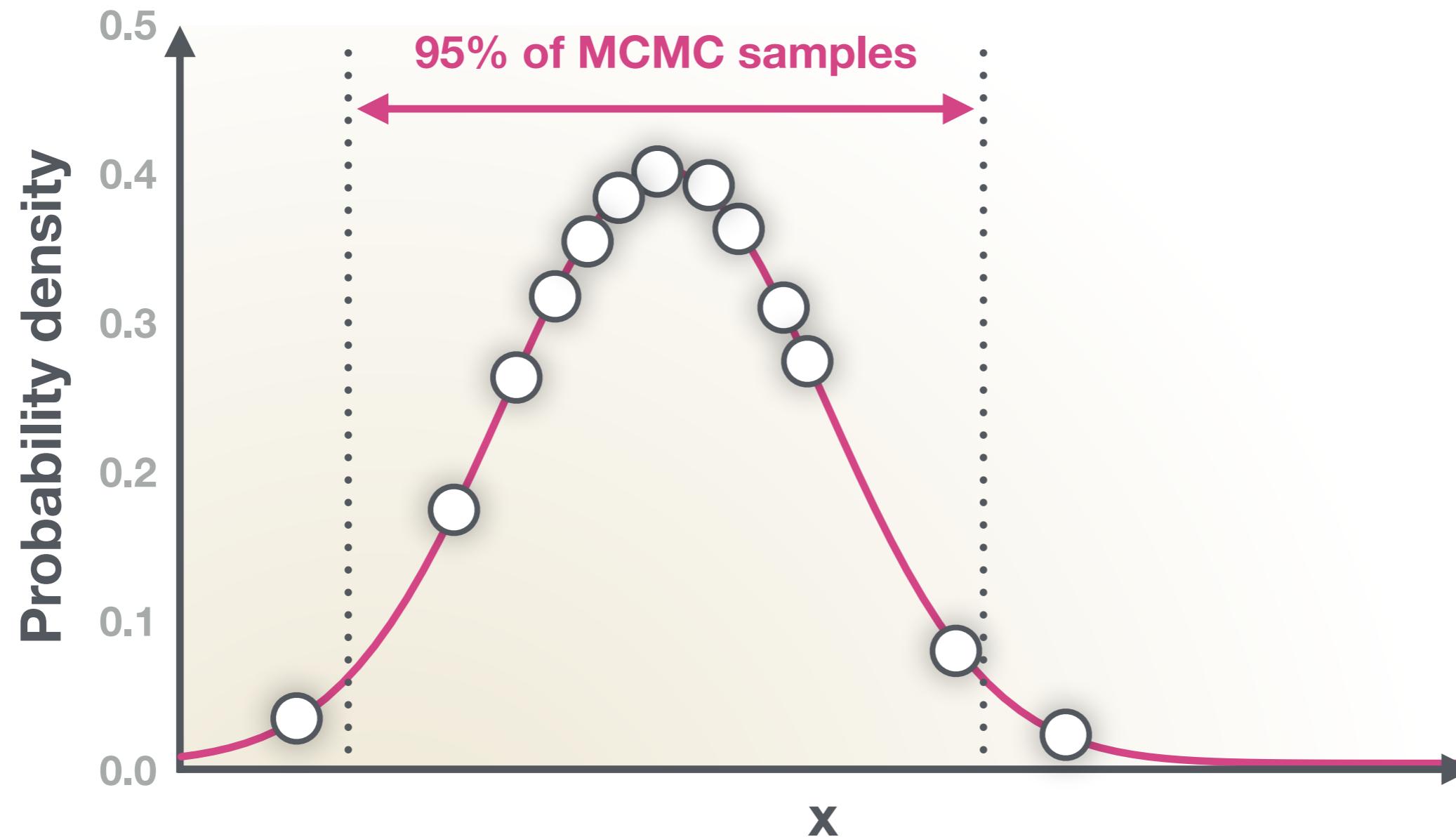
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Markov-chain Monte Carlo



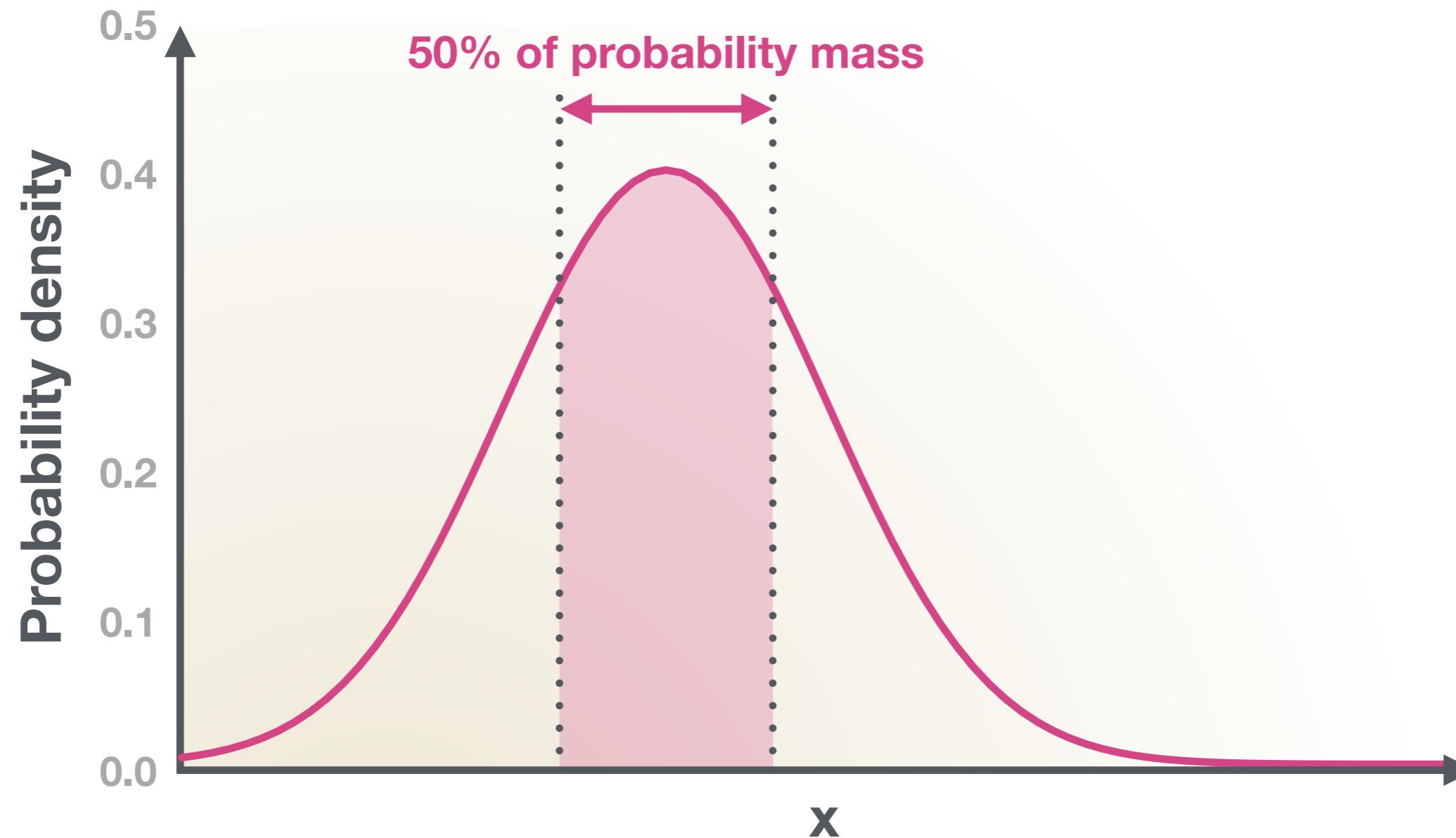
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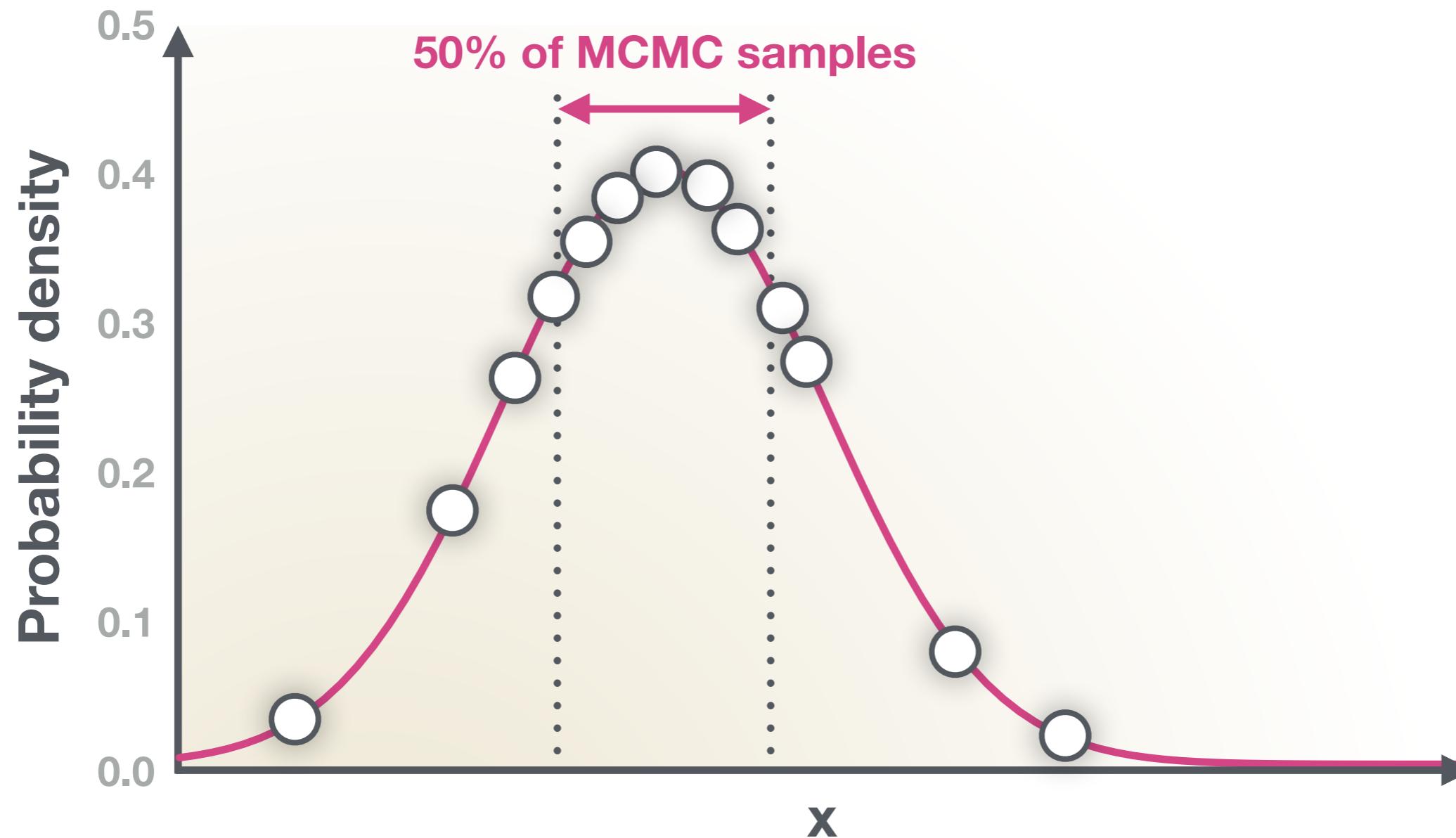
MCMC

Markov-chain Monte Carlo



MCMC

Markov-chain Monte Carlo

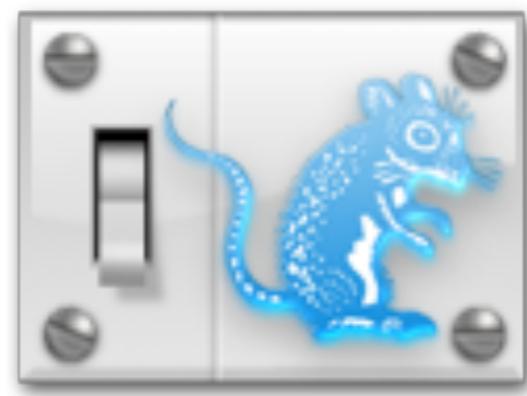


BEAST 2

Bayesian Evolutionary Analysis by Sampling Trees



BEAST 2

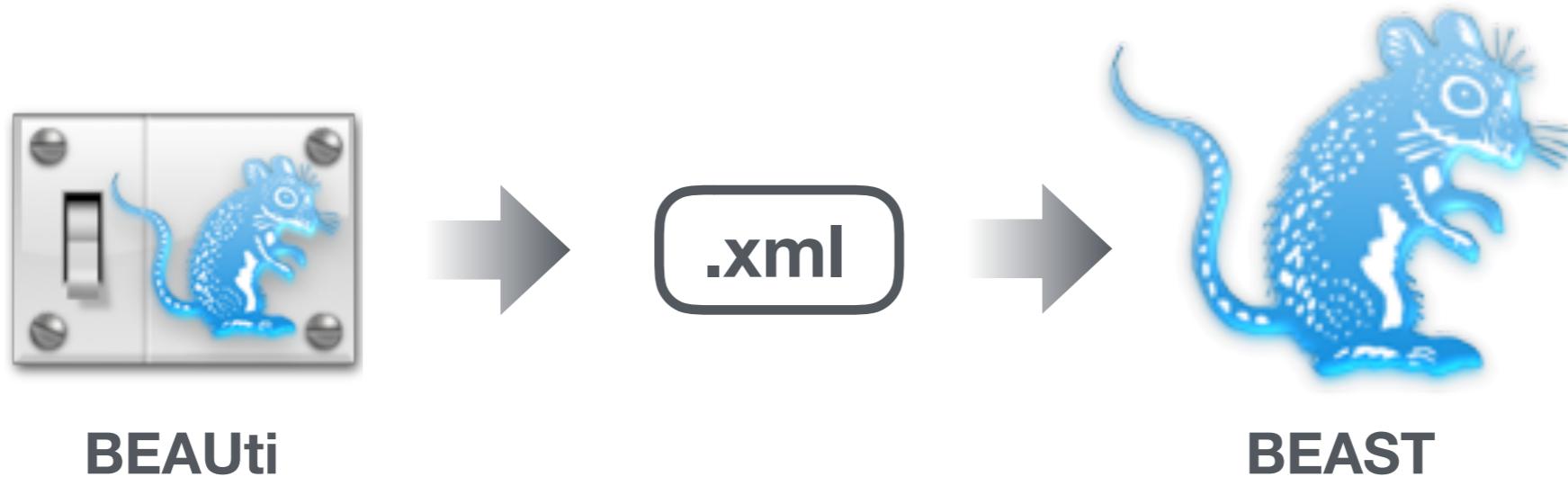


BEAUti



BEAST

BEAST 2



BEAST 2



BEAST



.log



TreeAnnotator

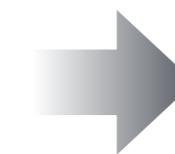
BEAST 2



BEAST



.log



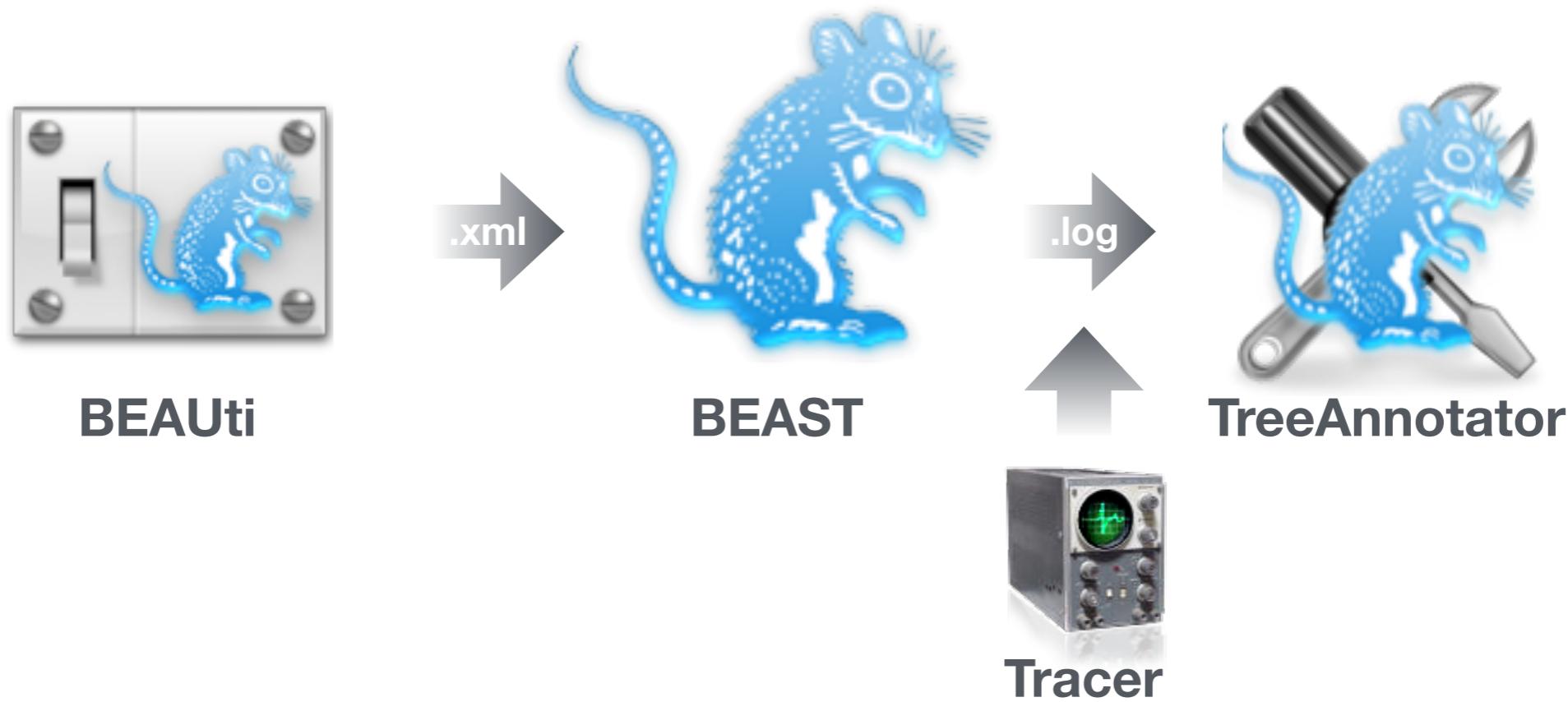
TreeAnnotator



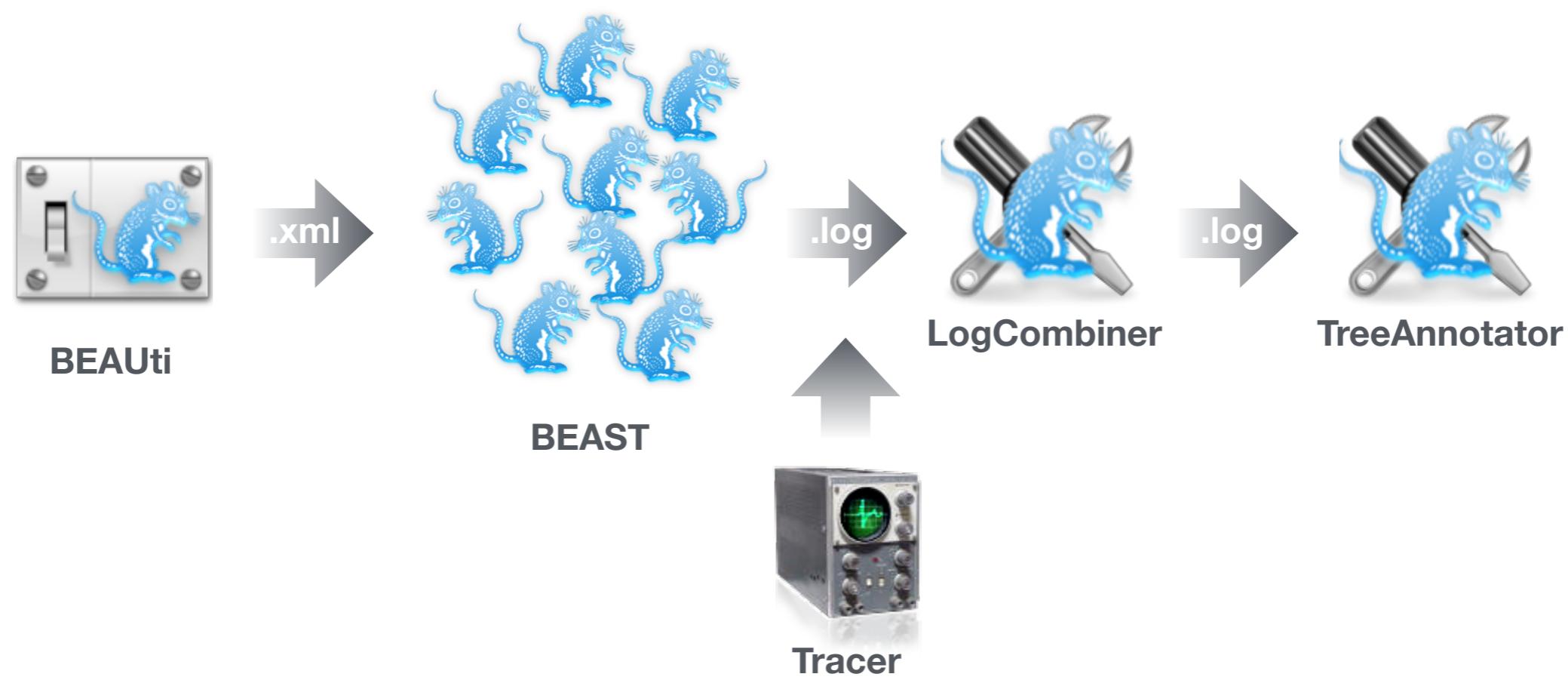
Tracer



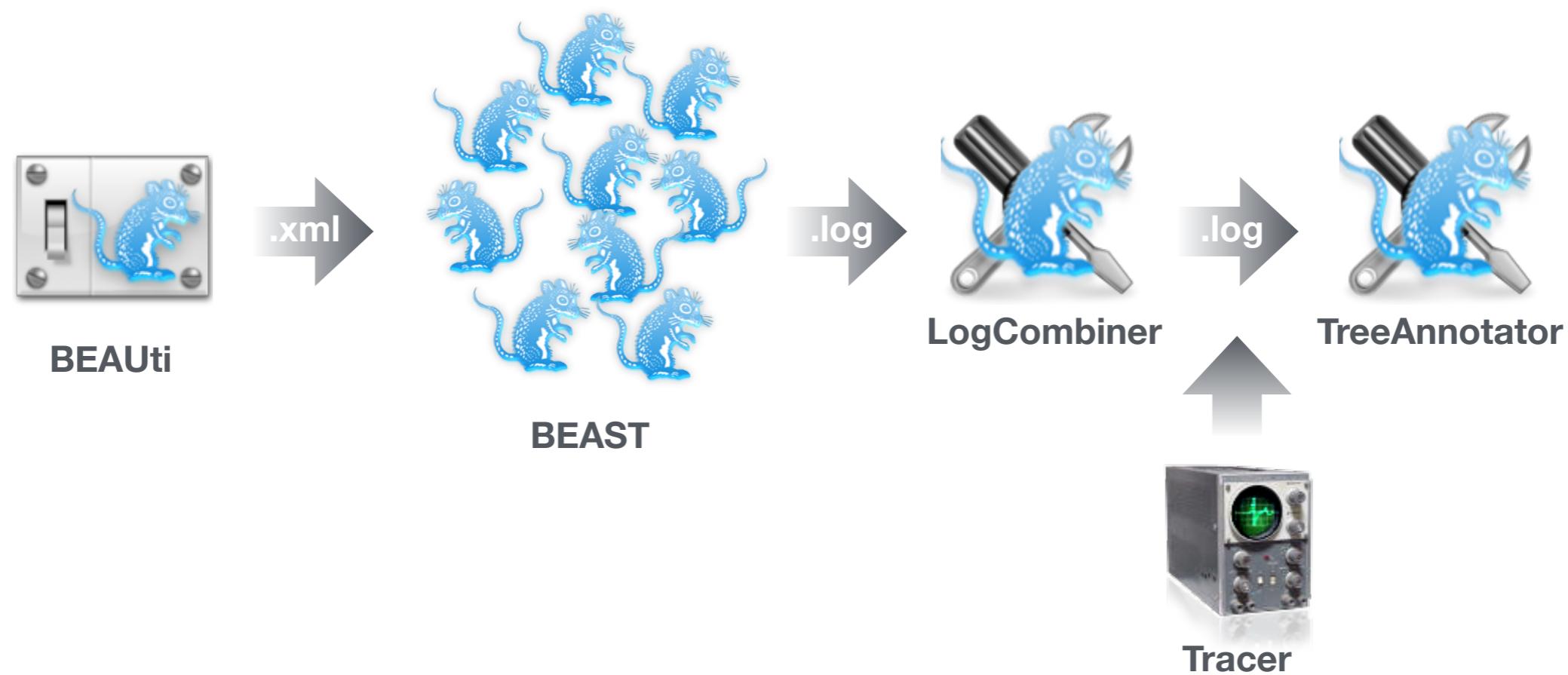
BEAST 2



BEAST 2

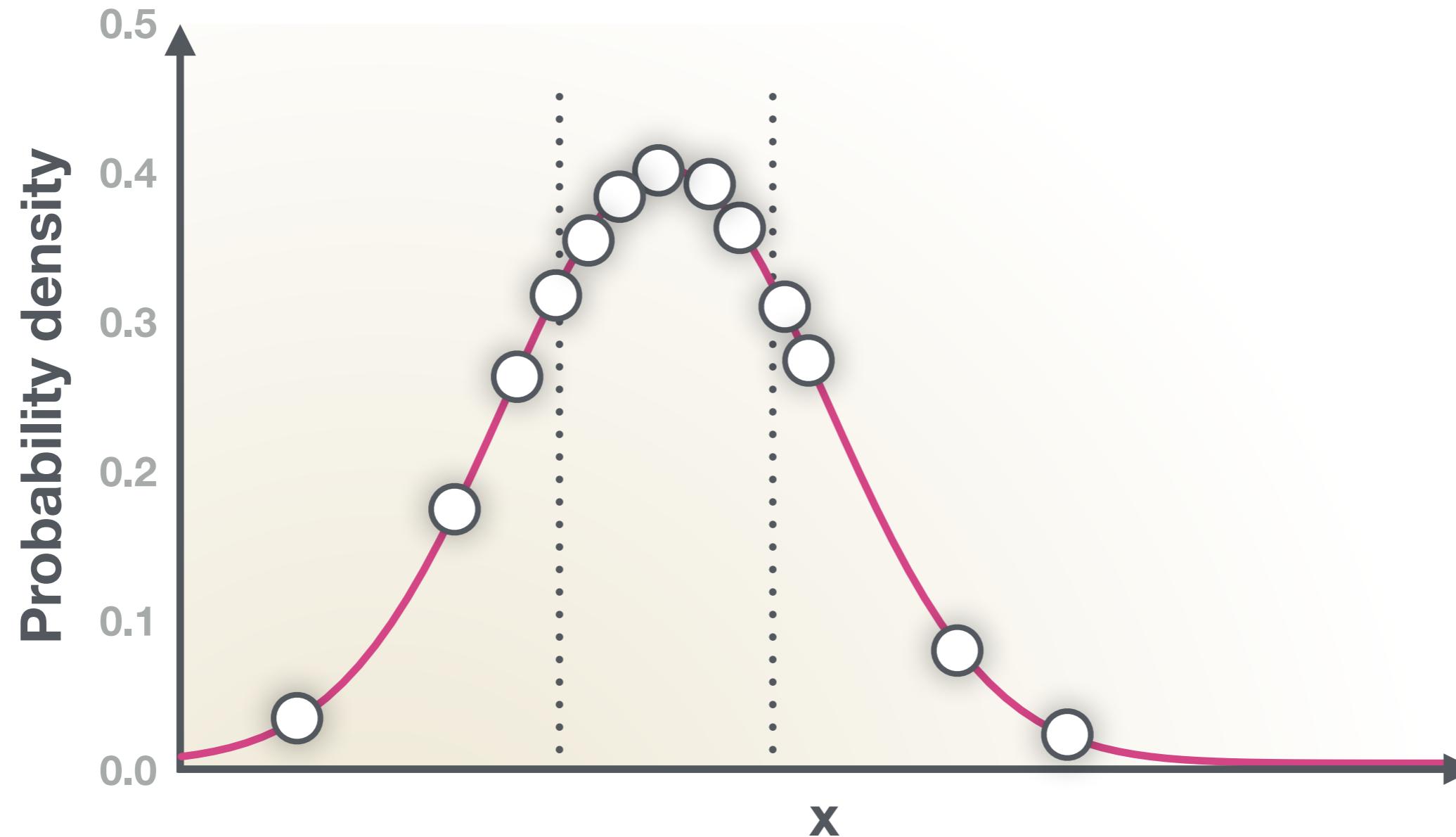


BEAST 2

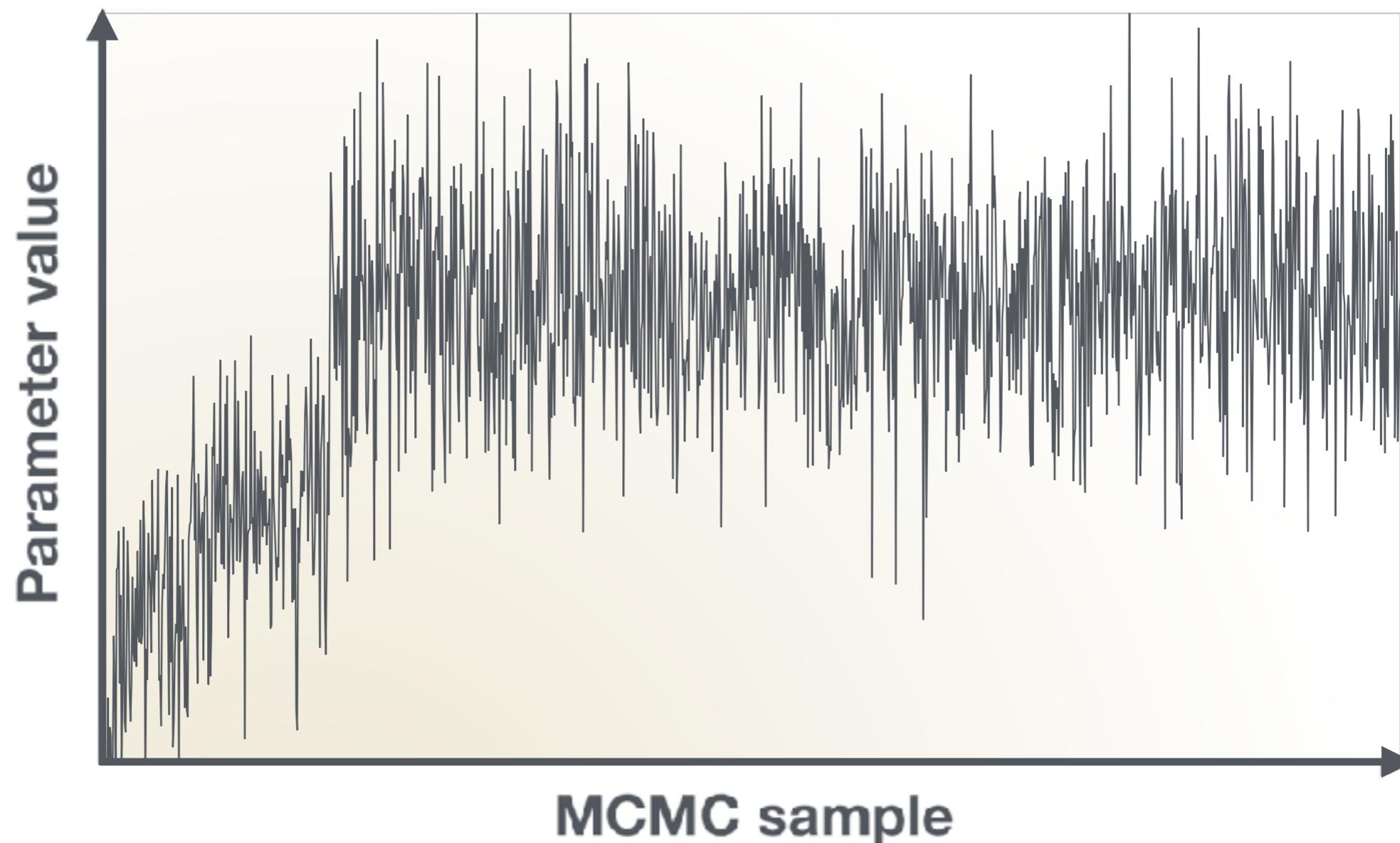


MCMC

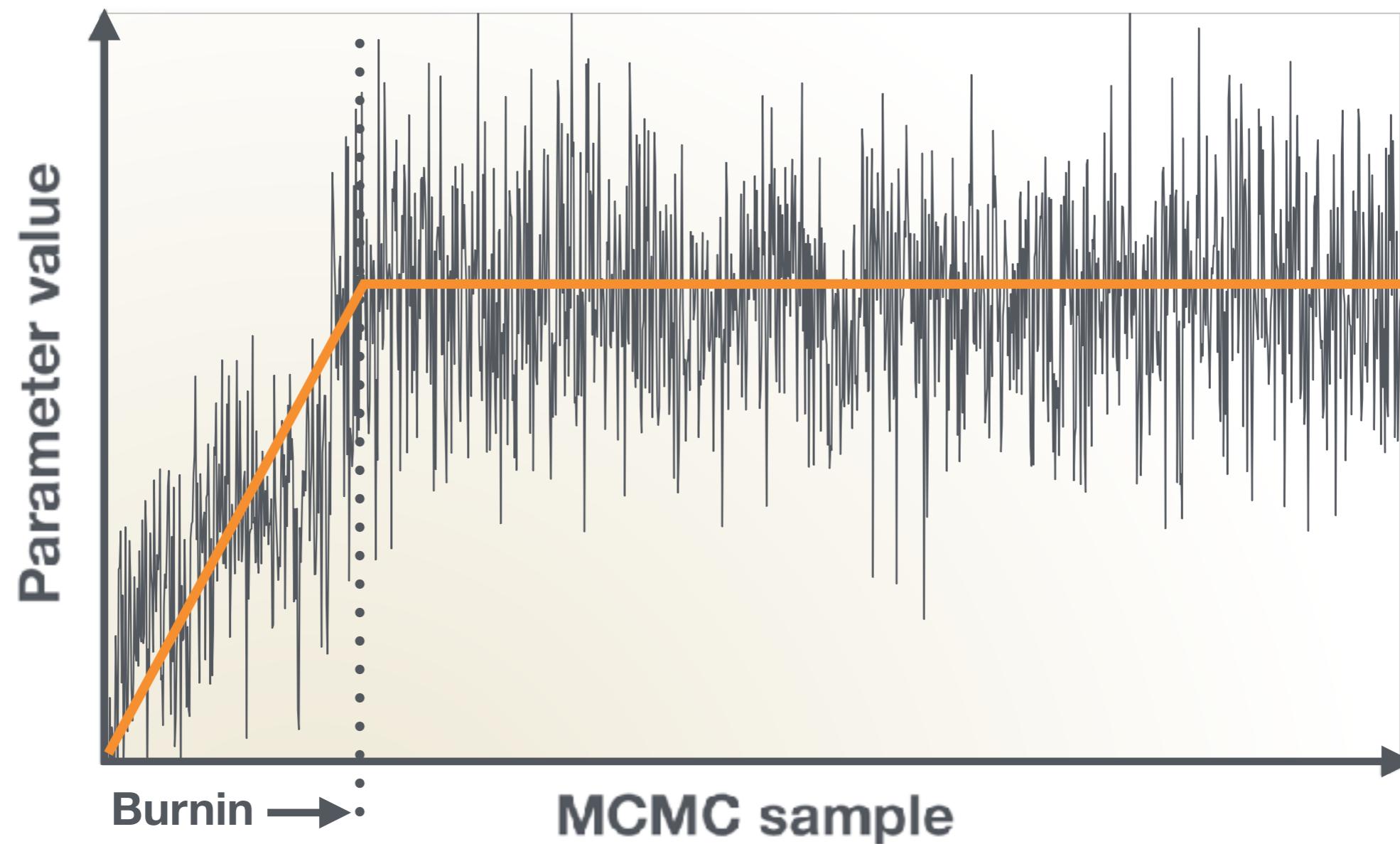
Markov-chain Monte Carlo



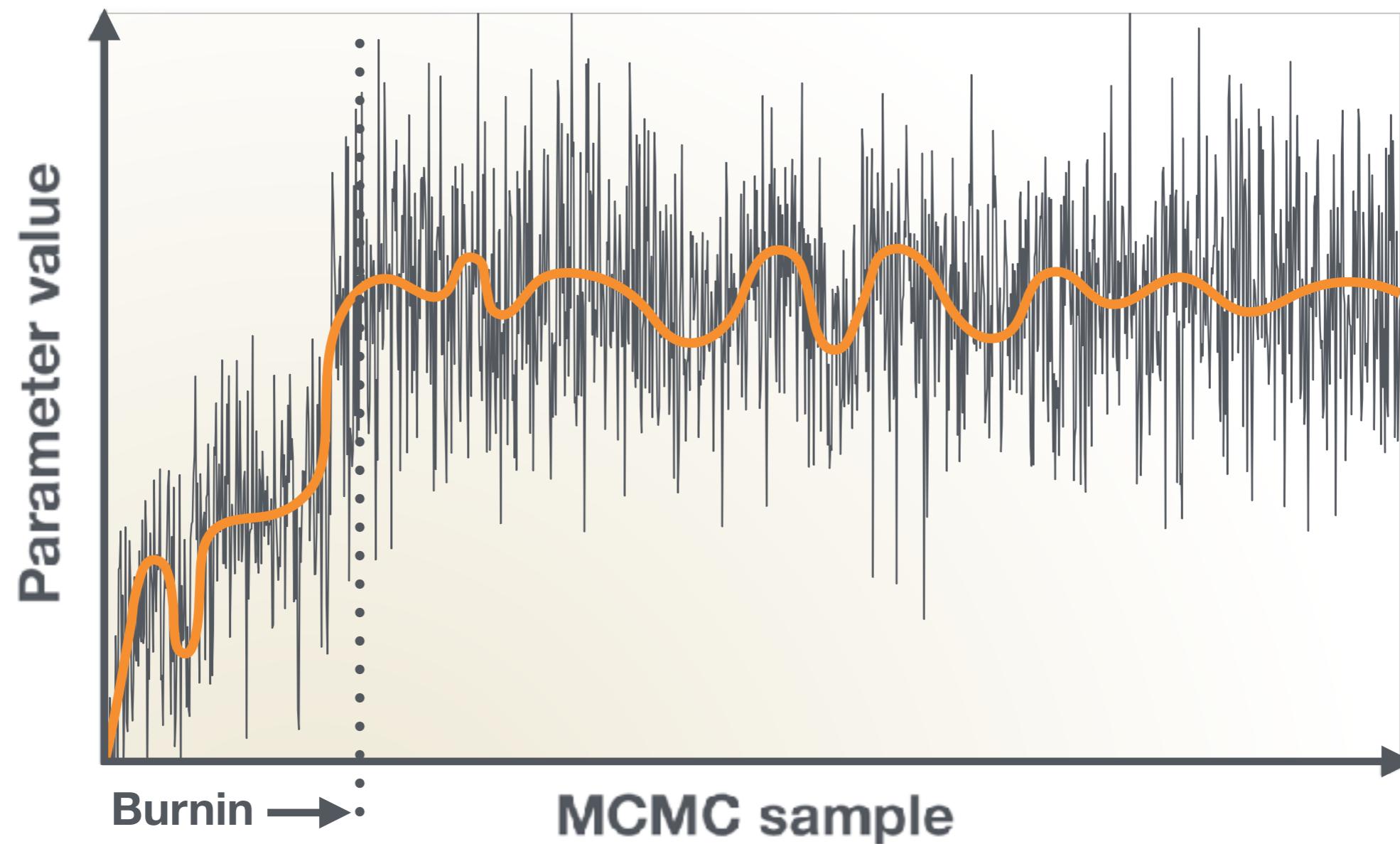
MCMC stationarity



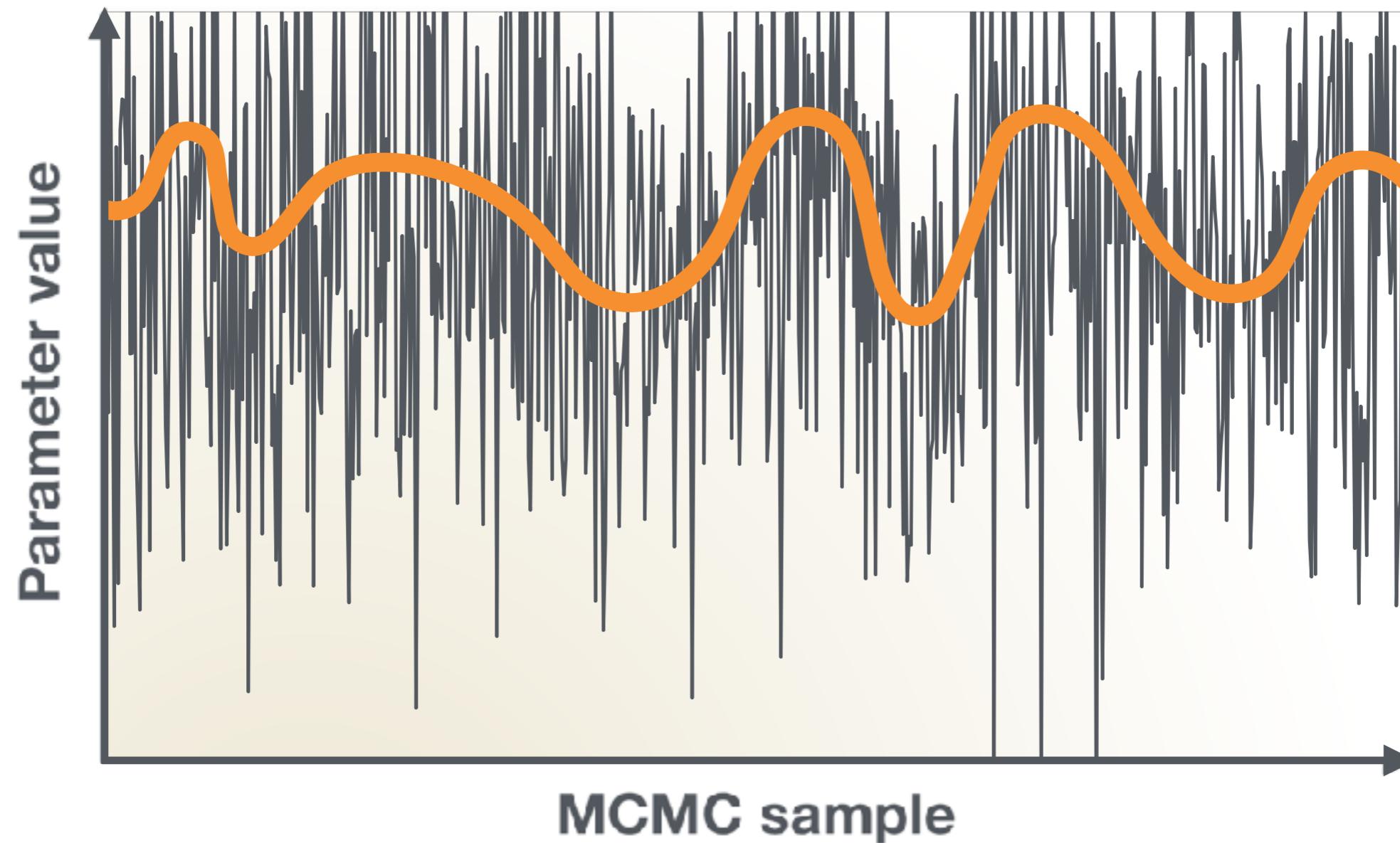
MCMC stationarity



MCMC stationarity



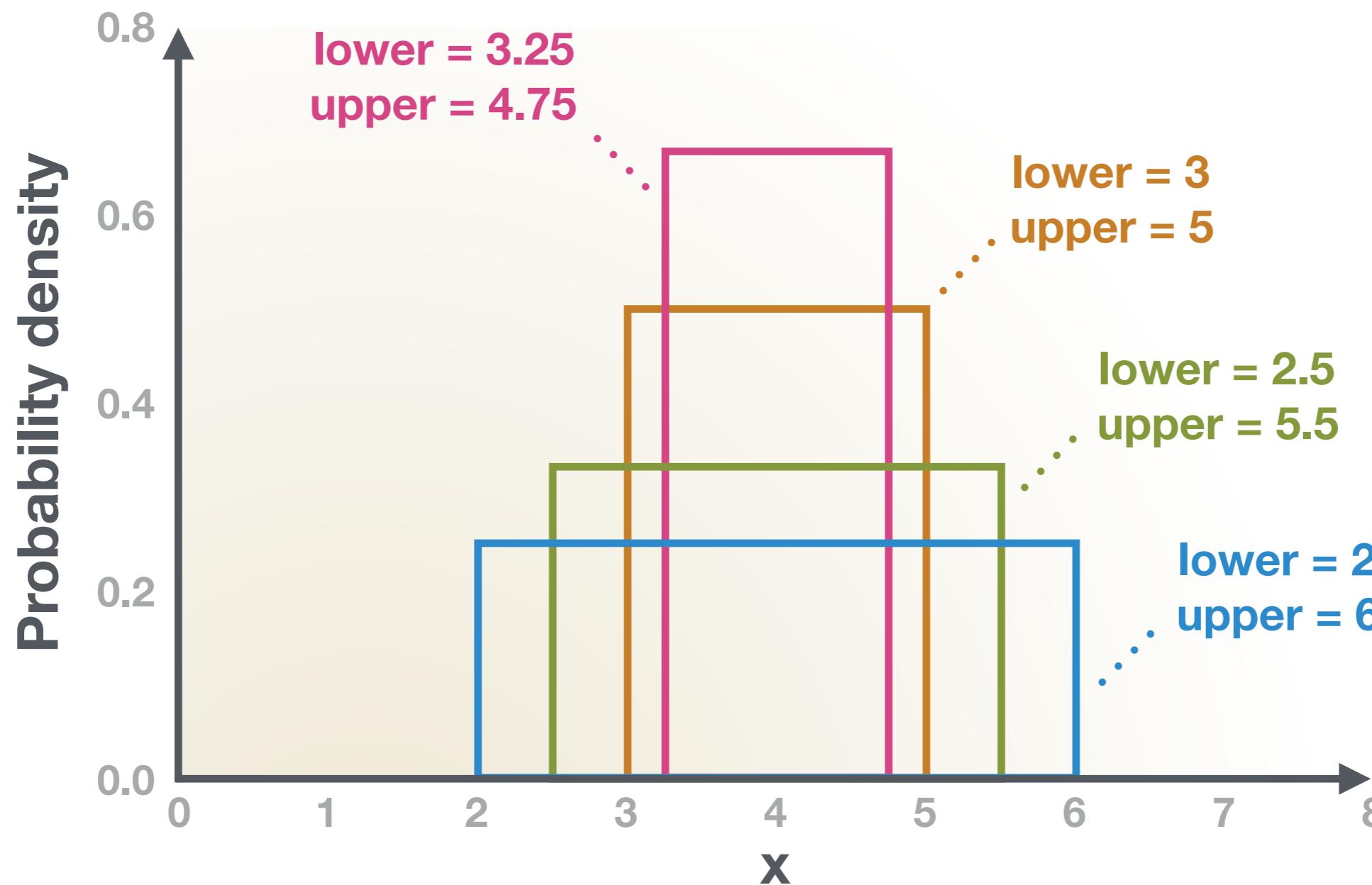
MCMC stationarity



Prior distributions

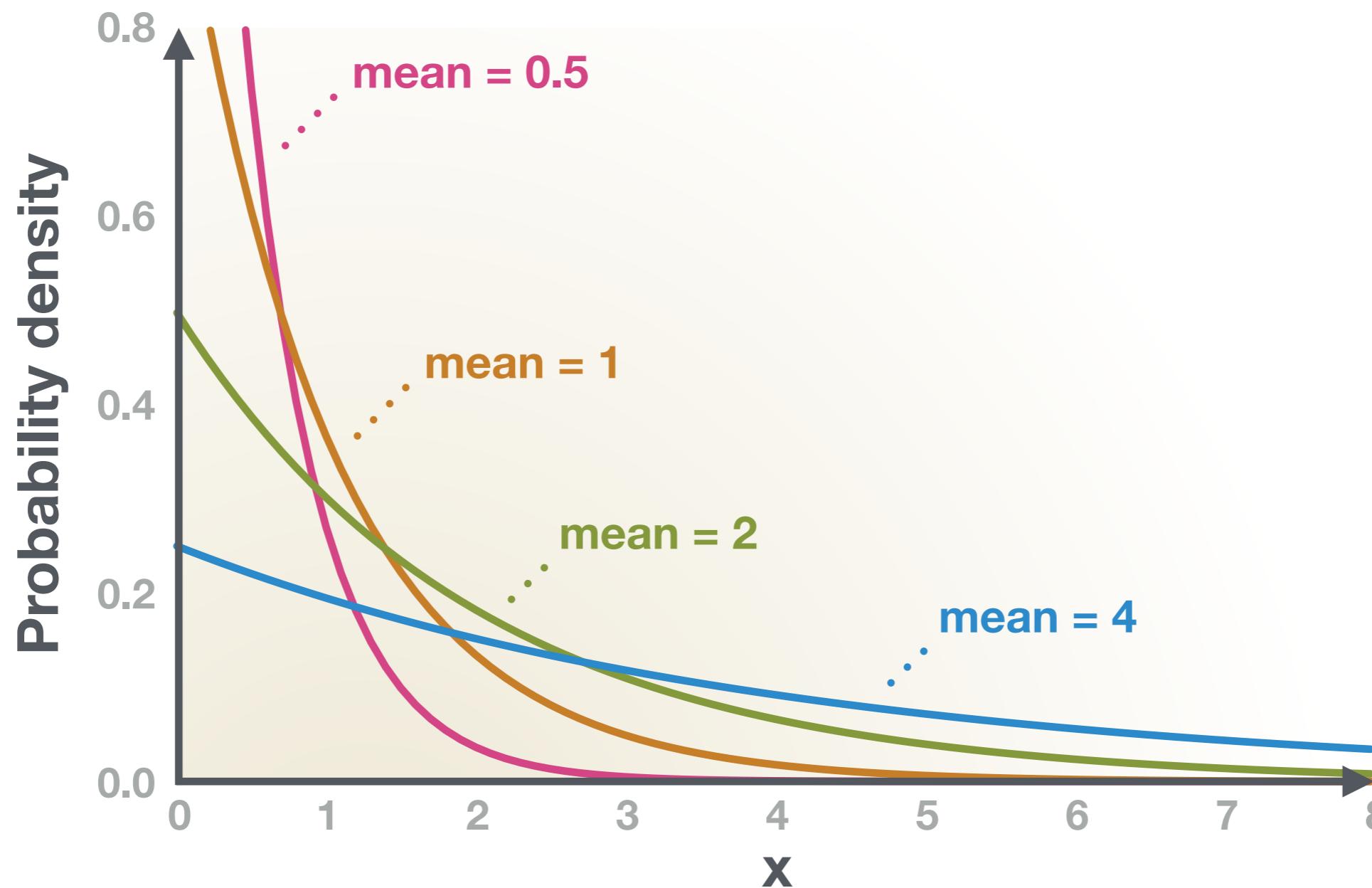
Probability distributions

Uniform distribution



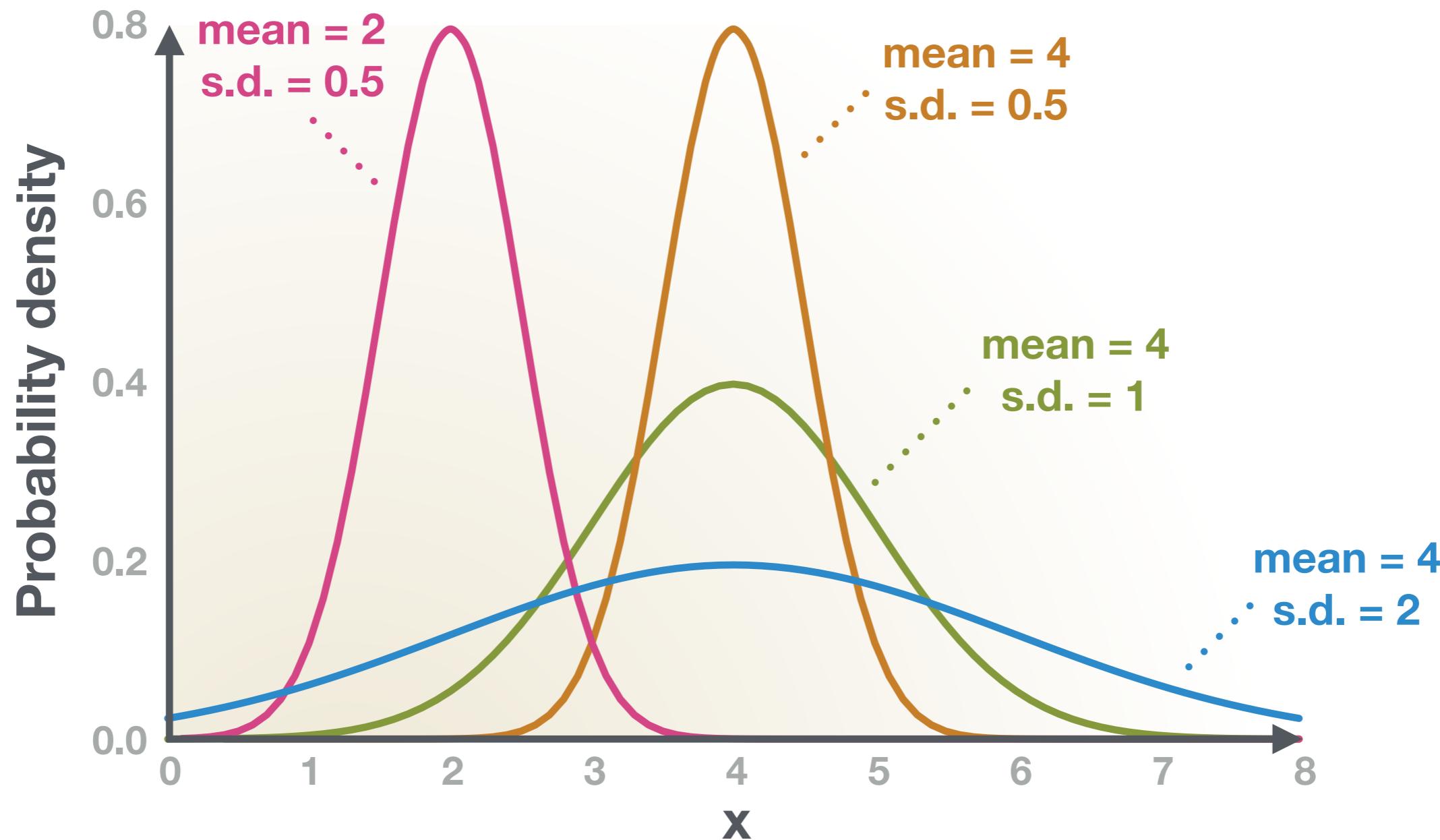
Probability distributions

Exponential distribution



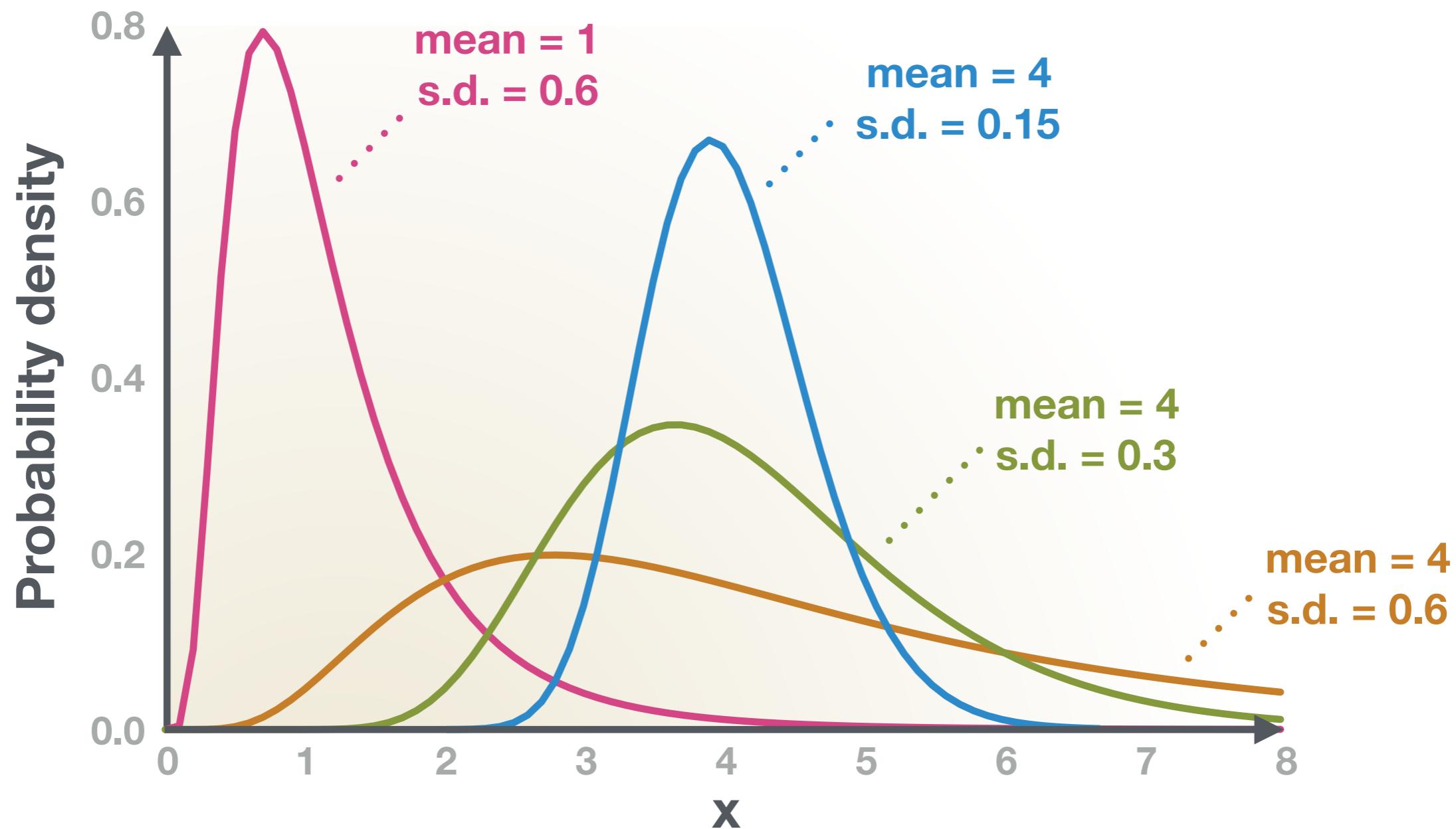
Probability distributions

Normal distribution



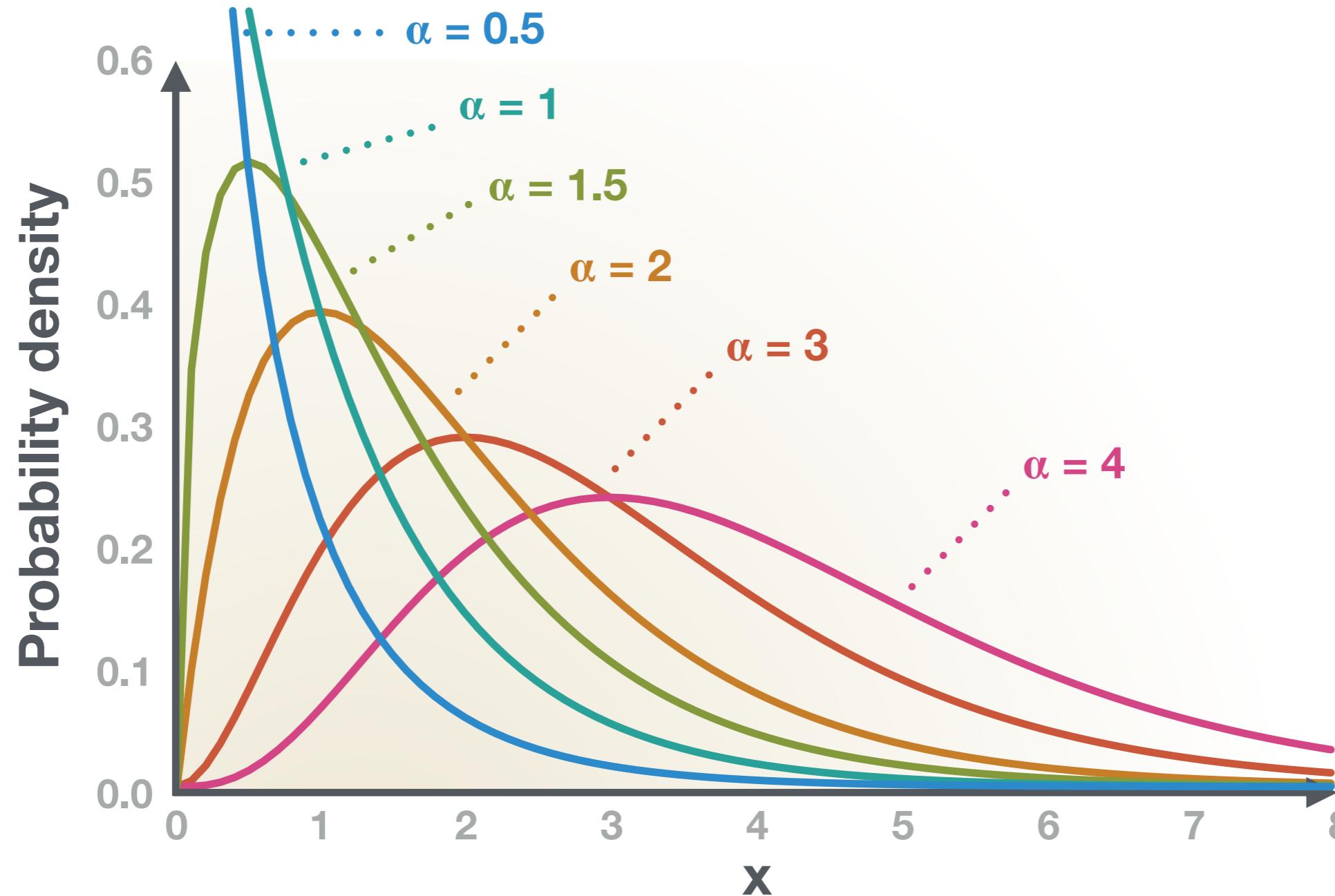
Probability distributions

Lognormal distribution



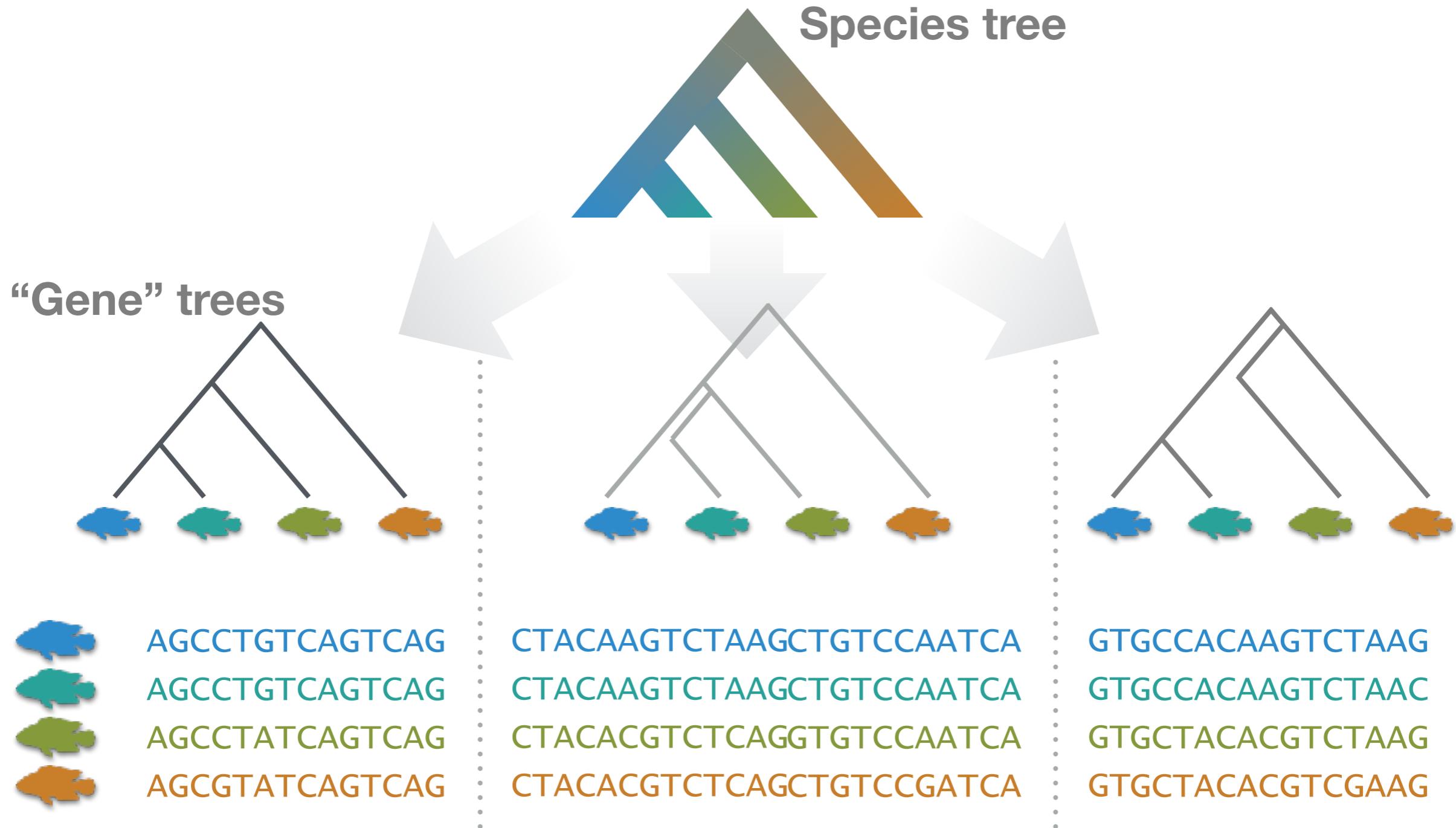
Probability distributions

Gamma distribution

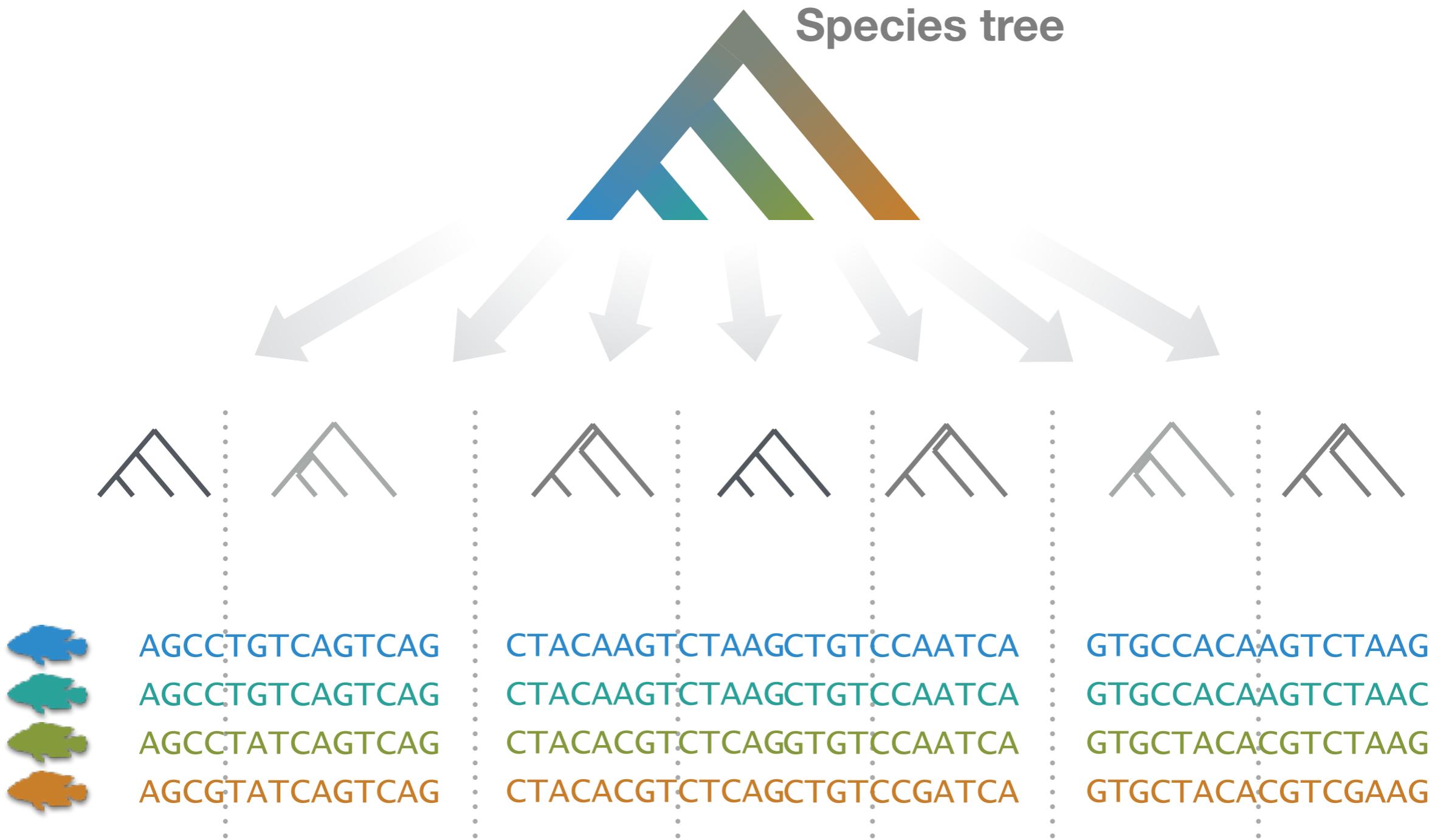


Species-tree inference

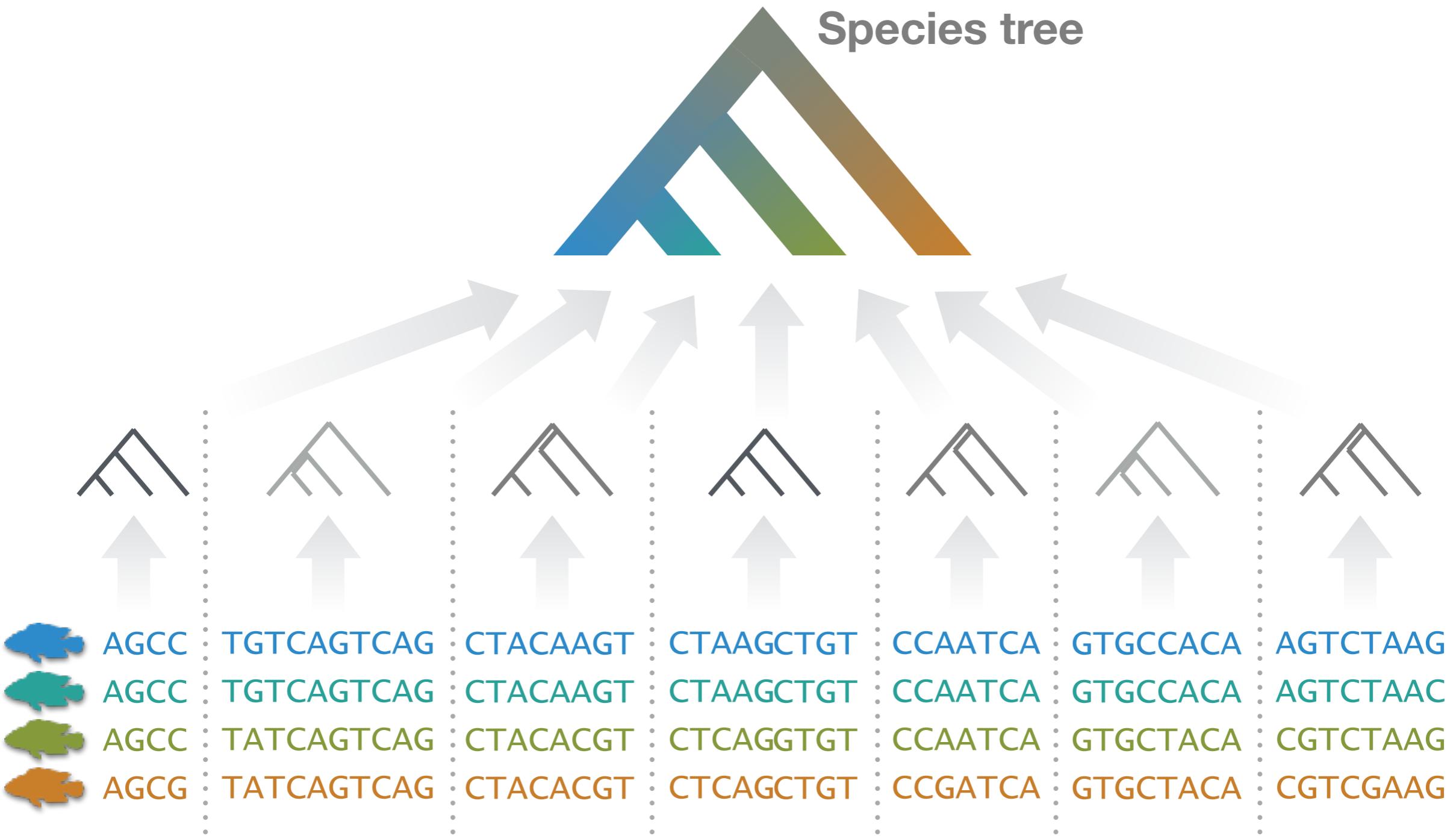
Gene-tree variation



Gene-tree variation



Species-tree inference



Species-tree inference

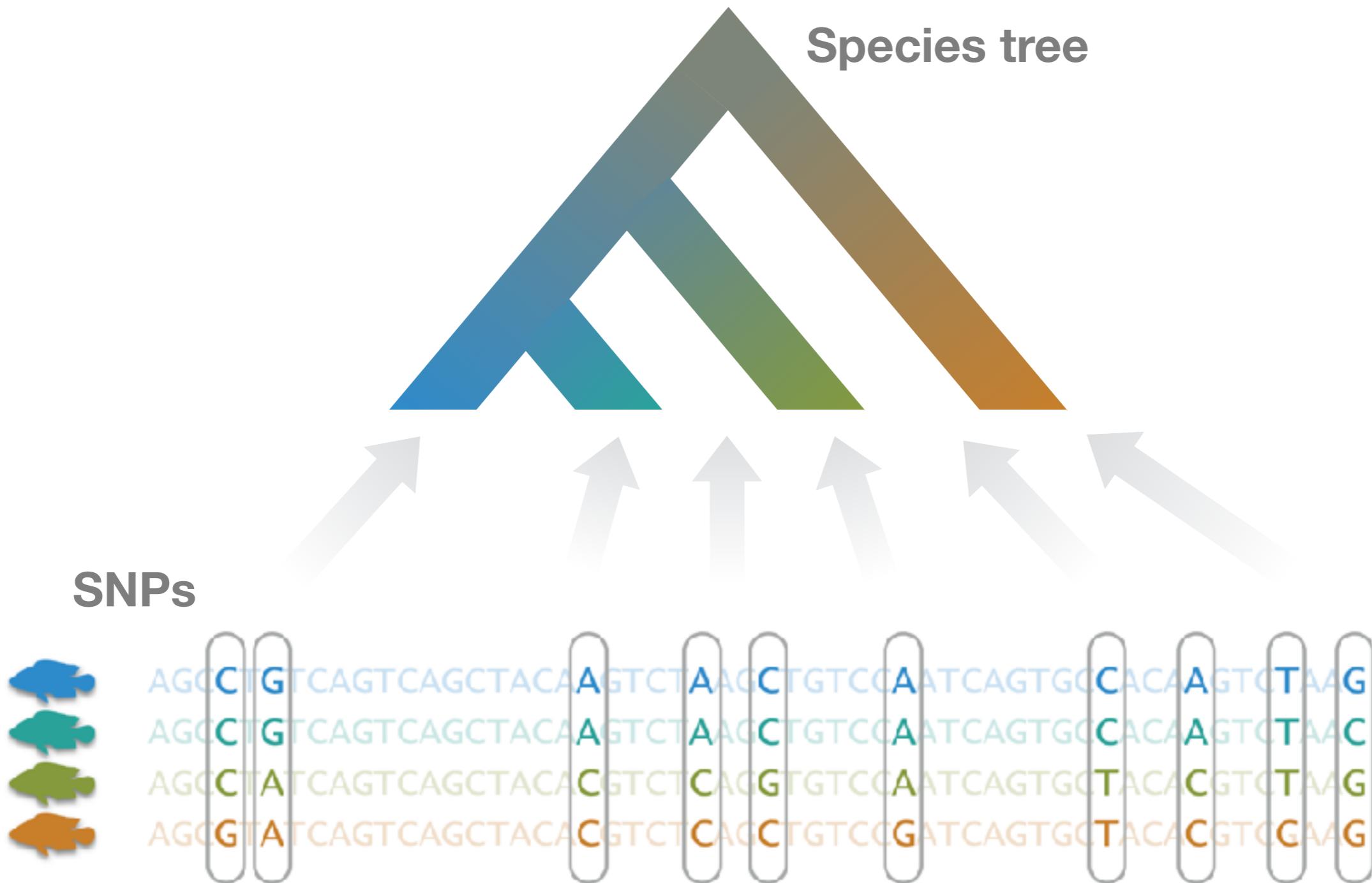


AGCCTGTCAGTCAGCTACAAGTCTAAGCTGTCCAATCAGTGCCACAAGTCTAAG
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AGCCTATCAGTCAGCTACACGTCTCAGGTGTCCAATCAGTGCTACACGTCTAAG
AGCGTATCAGTCAGCTACACGTCTCAGCTGTCCGATCAGTGCTACACGTCGAAG

SNAPP

Bryant et al. (2012) Mol Biol Evol

Species-tree inference



SNAPP limitations

- 1. SNAPP's branch lengths are not in units of time**
- 2. SNAPP runs extremely slow**

Model tweaks

Stange et al. (2018) Syst Biol

SNAPP limitations

- 1. SNAPP's branch lengths are not in units of time**
- 2. SNAPP runs extremely slow**

Model tweaks

1. Add a molecular clock model

- Fix mutation rates
- Add clock parameter
- Calibrate clock with node-age constraints

SNAPP limitations

1. SNAPP's branch lengths are not in units of time
2. SNAPP runs extremely slow

Model tweaks

2. Reduce free parameters

- Link all population sizes



Activity