

SNAPP

SNAPP



MCMC
Prior distributions

MCMC

Markov-chain Monte Carlo

Monte Carlo methods



Monte Carlo methods

Stanisław Ulam

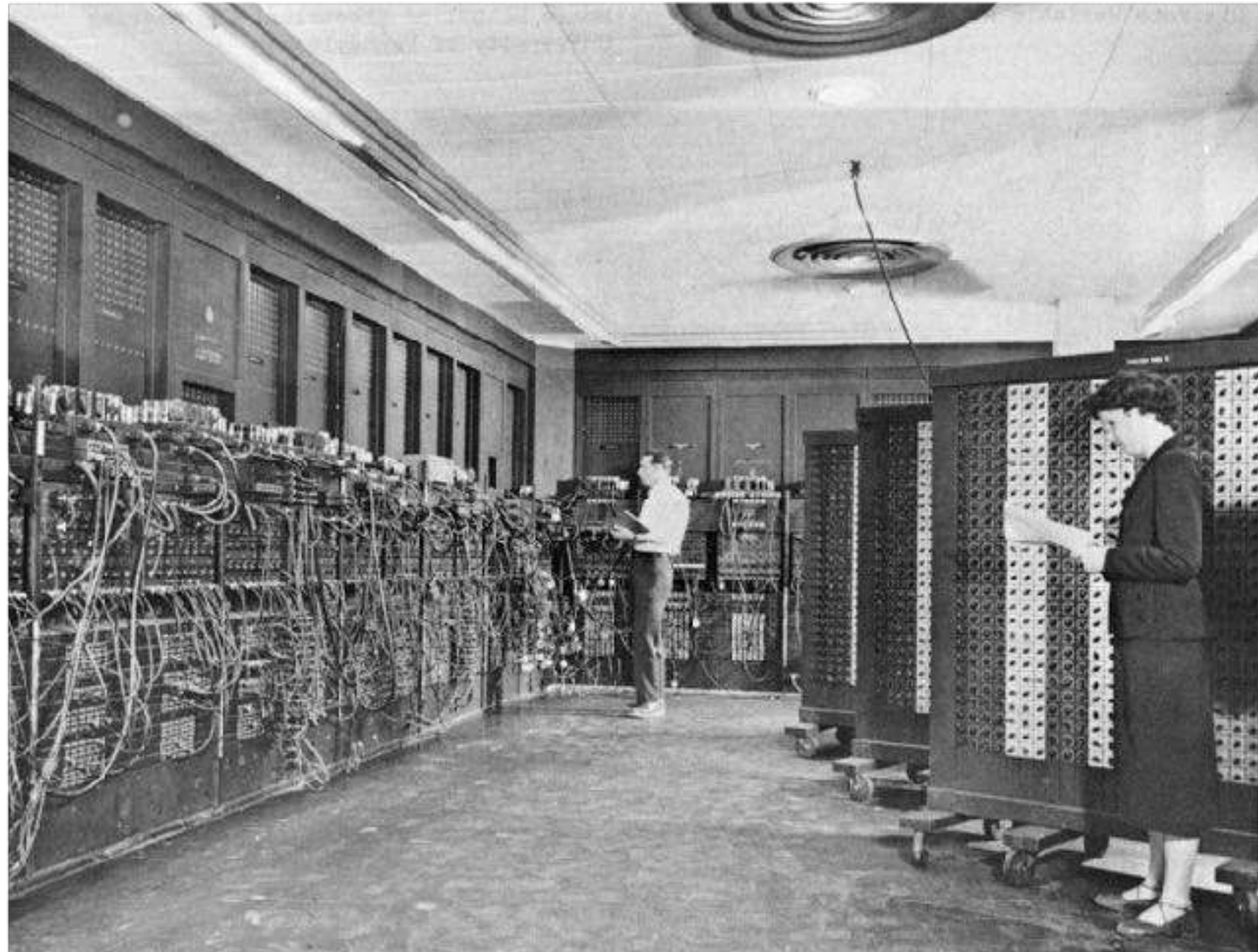


***“What are the chances
that a Canfield solitaire
laid out with 52 cards will
come out successfully?”***

Stanisław Ulam, 1946

Monte Carlo methods

ENIAC
1946



Monte Carlo methods

Stanisław Ulam

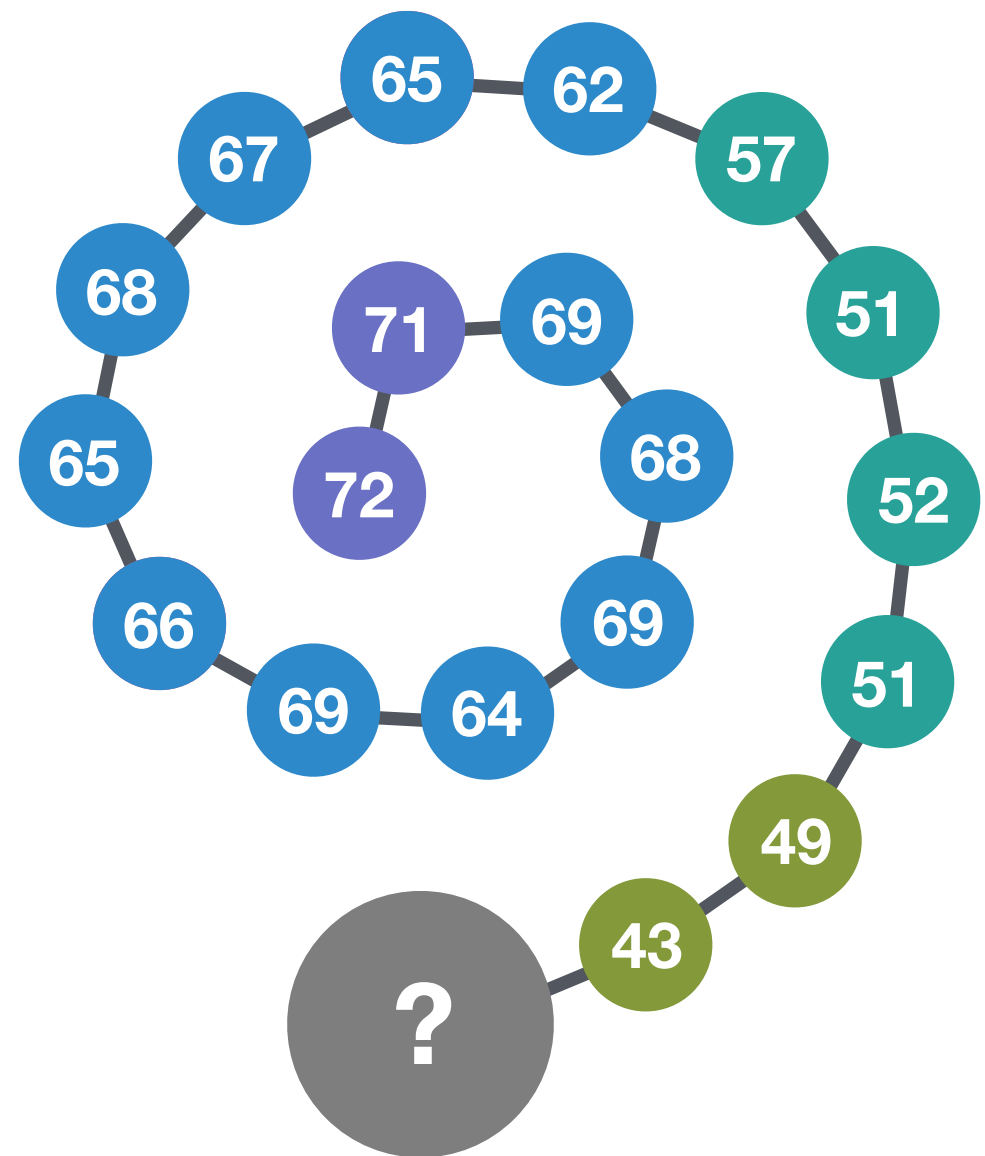


“Stan had an uncle who would borrow money from relatives because he ‘just had to go to Monte Carlo’.”

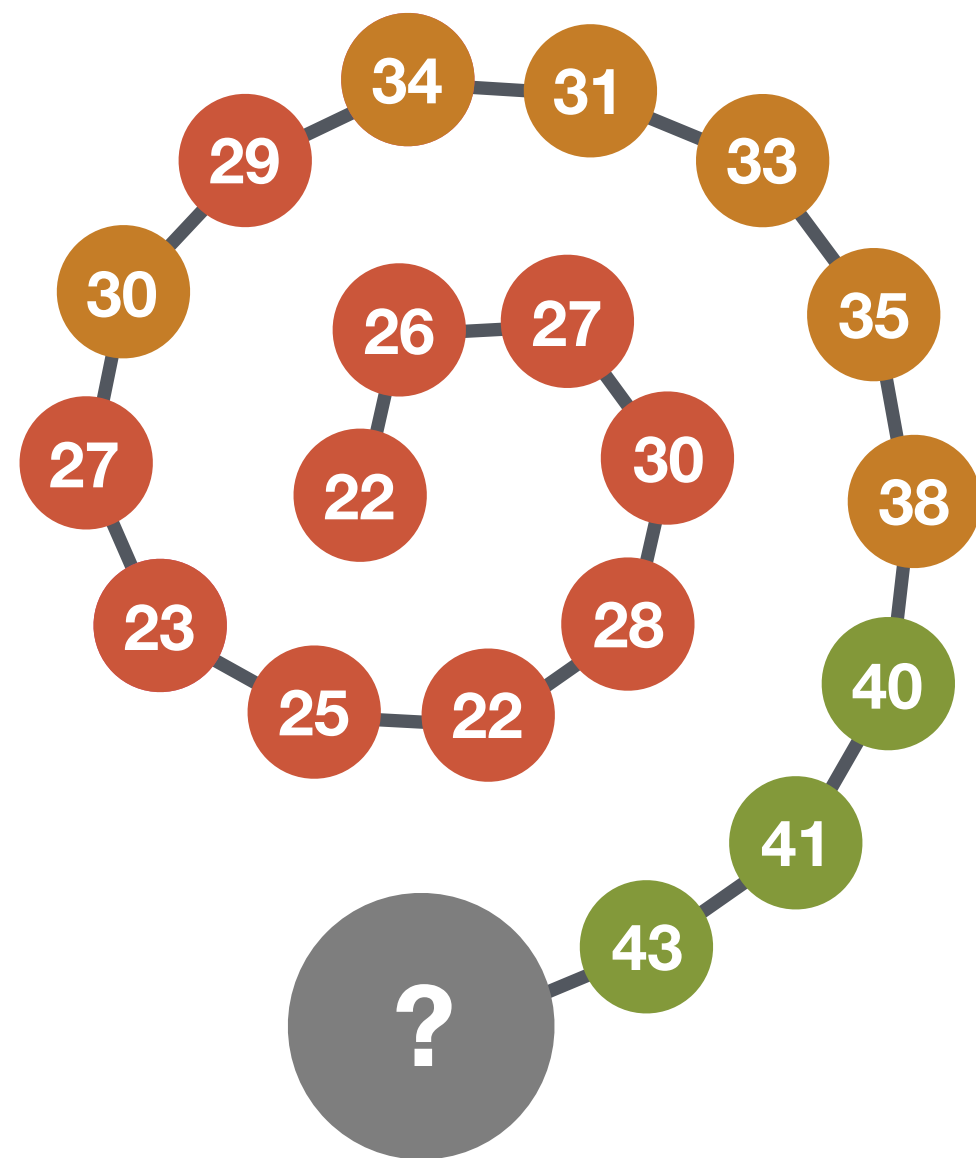
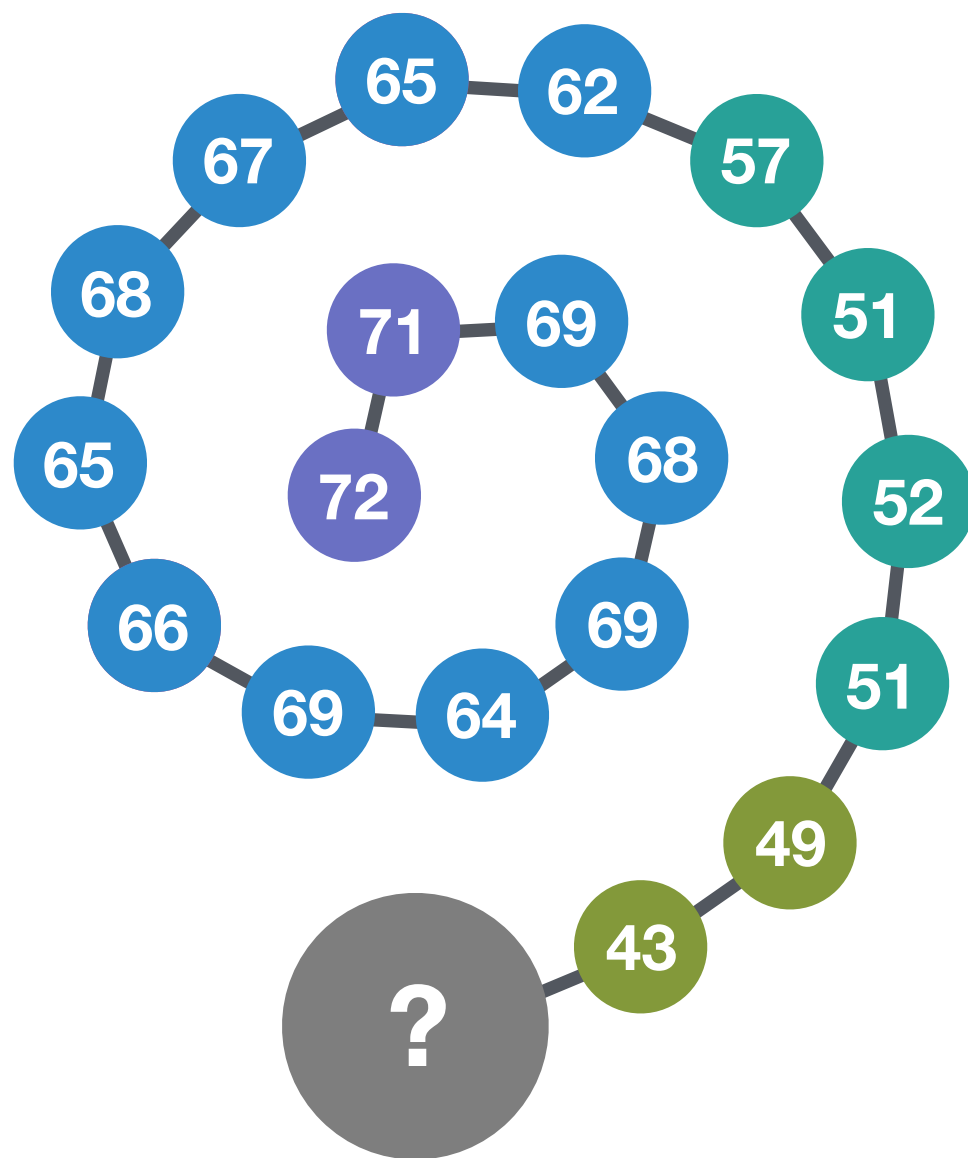
Nicholas Metropolis

Markov chains

Andrey Markov

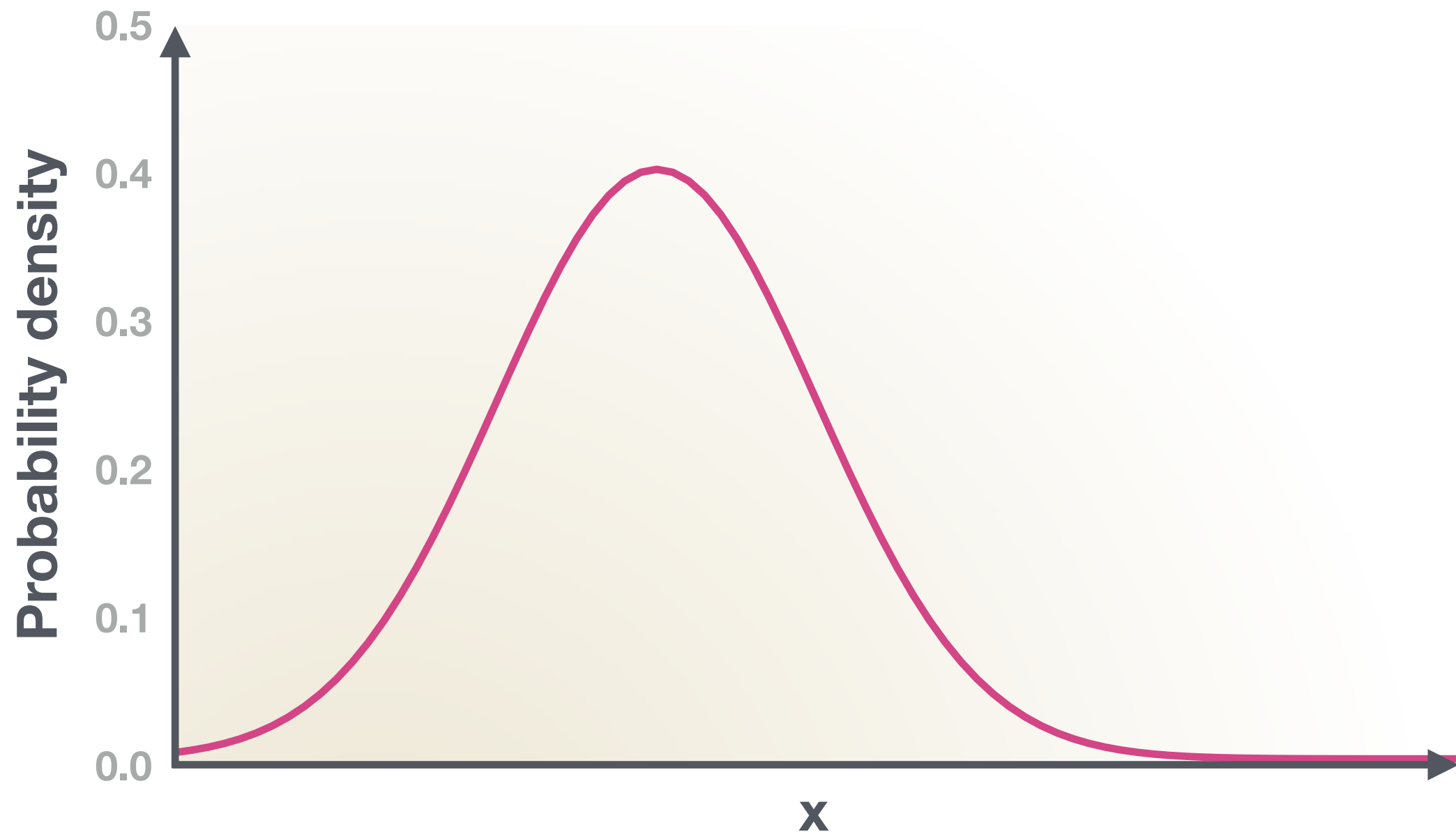


Markov chains



MCMC

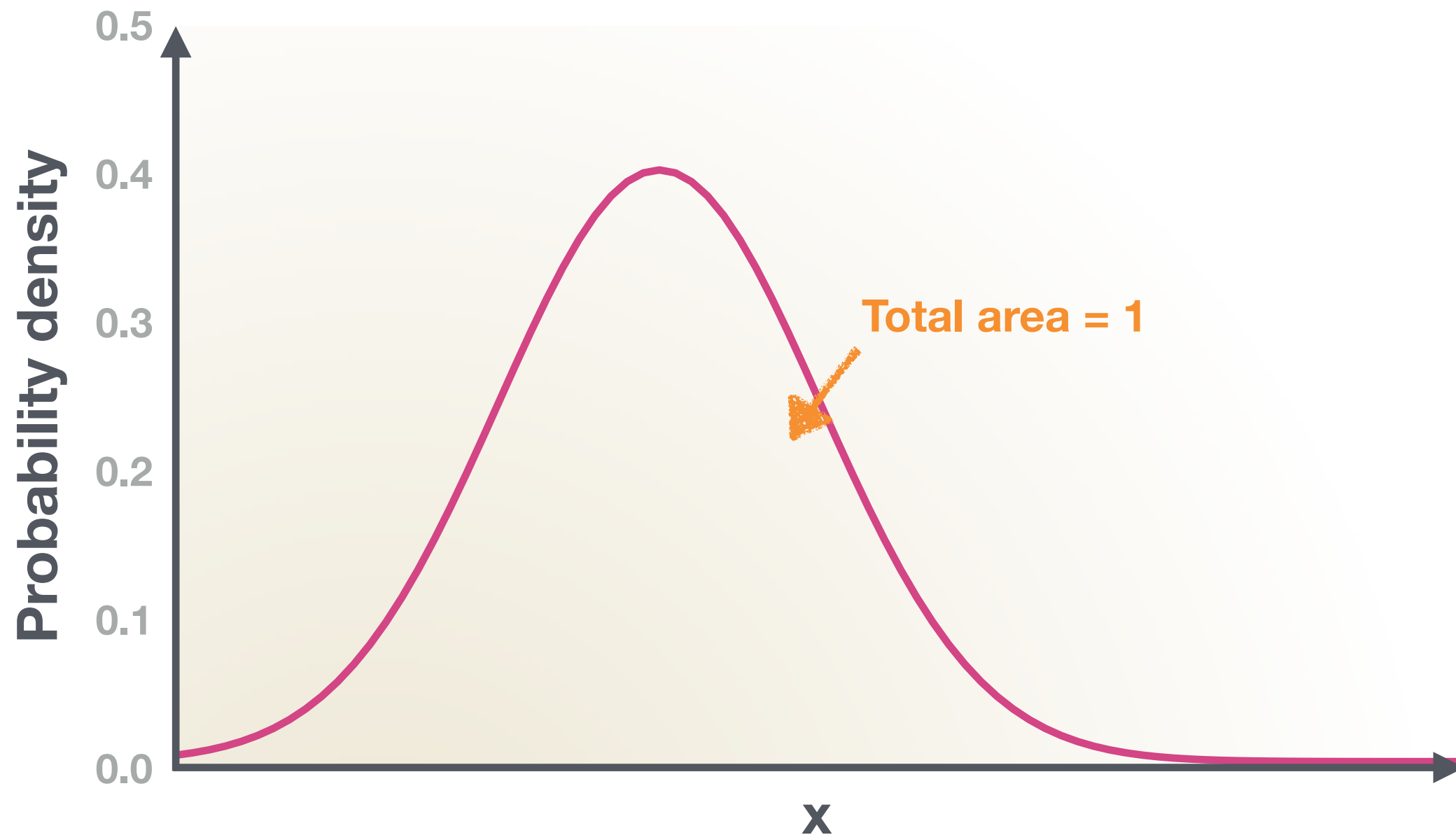
Markov-chain Monte Carlo



(Hastings 1970 Biometrika, Metropolis et al. 1953 J Chem Phys)

MCMC

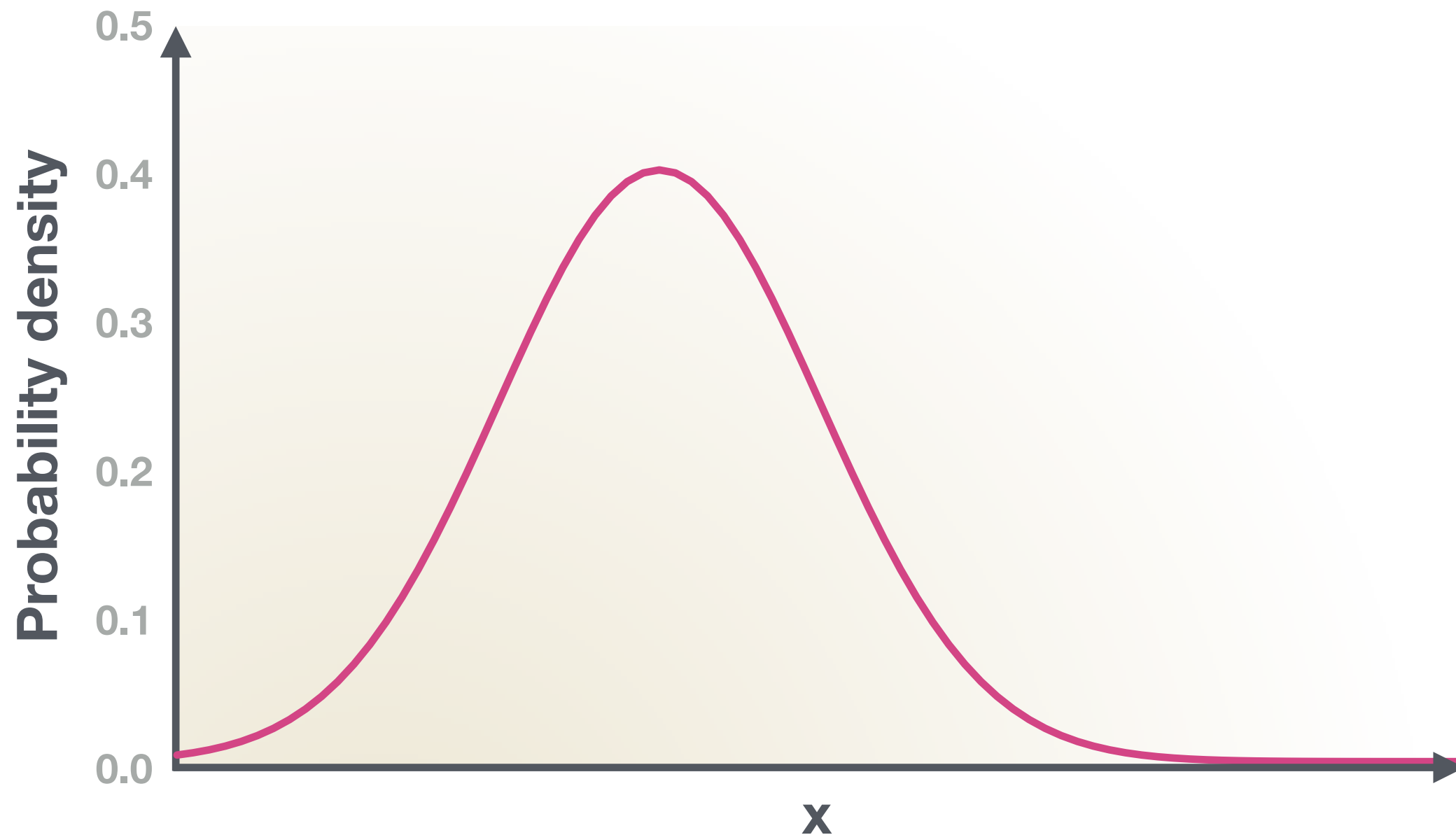
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MCMC

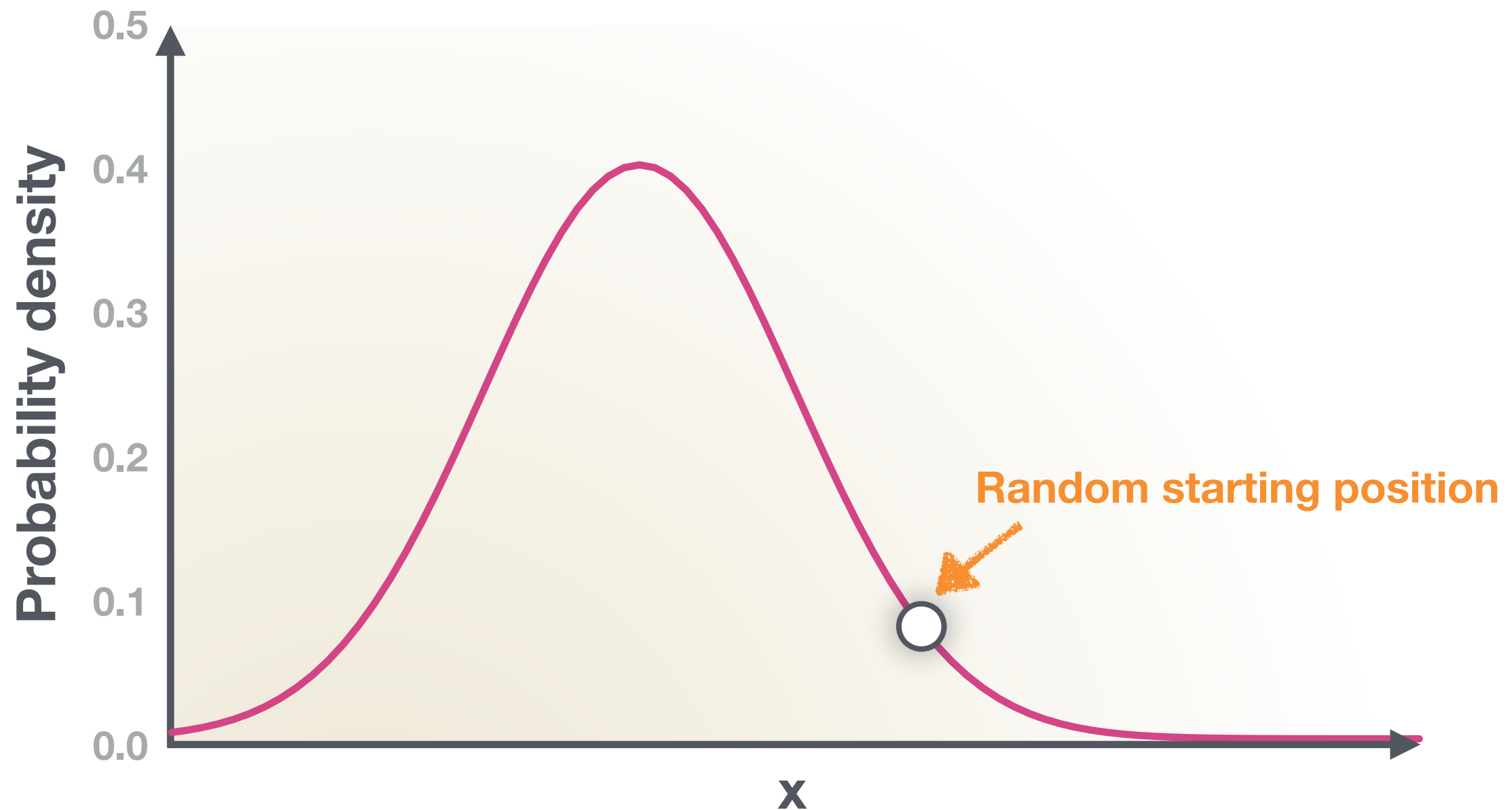
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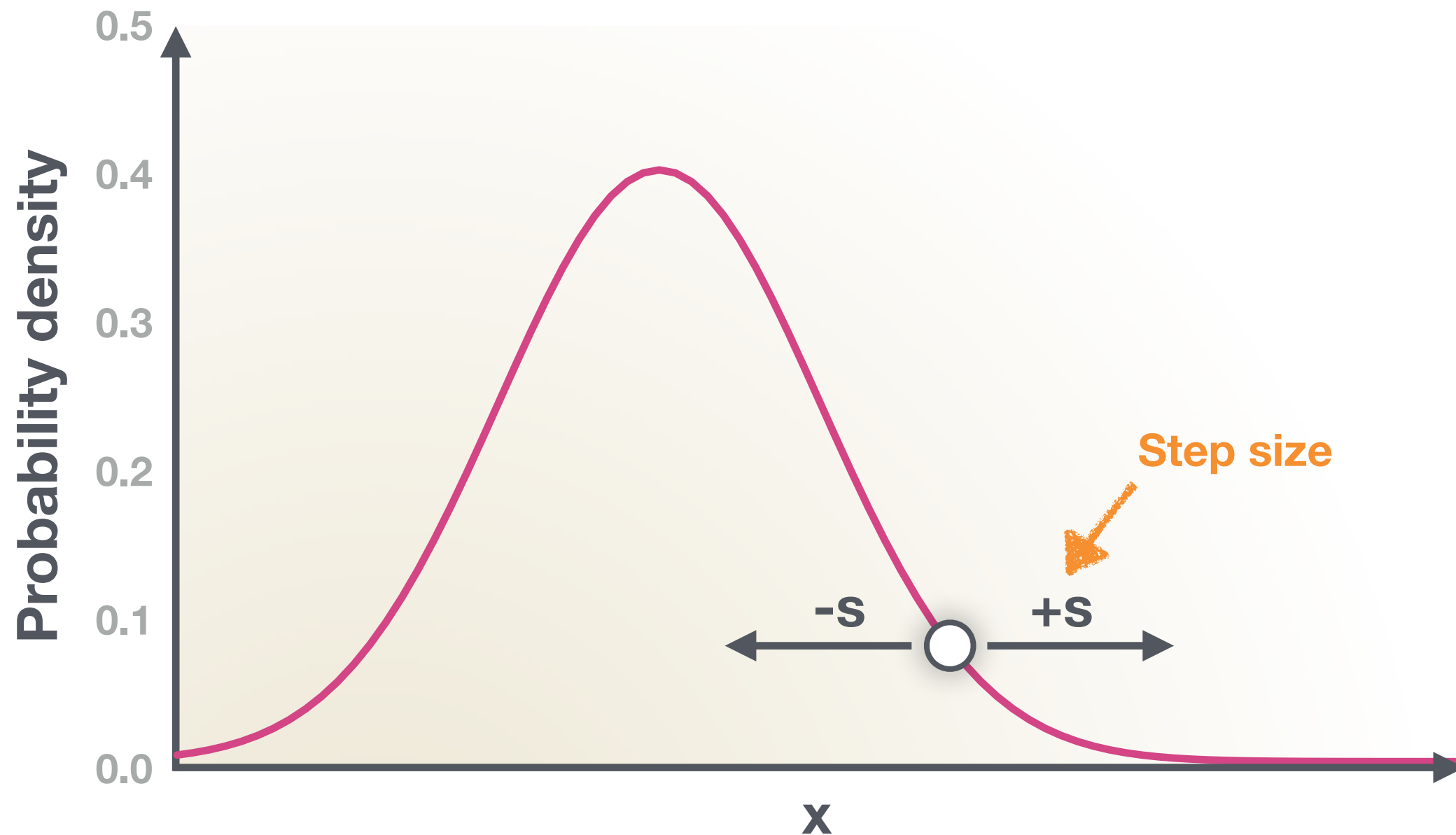
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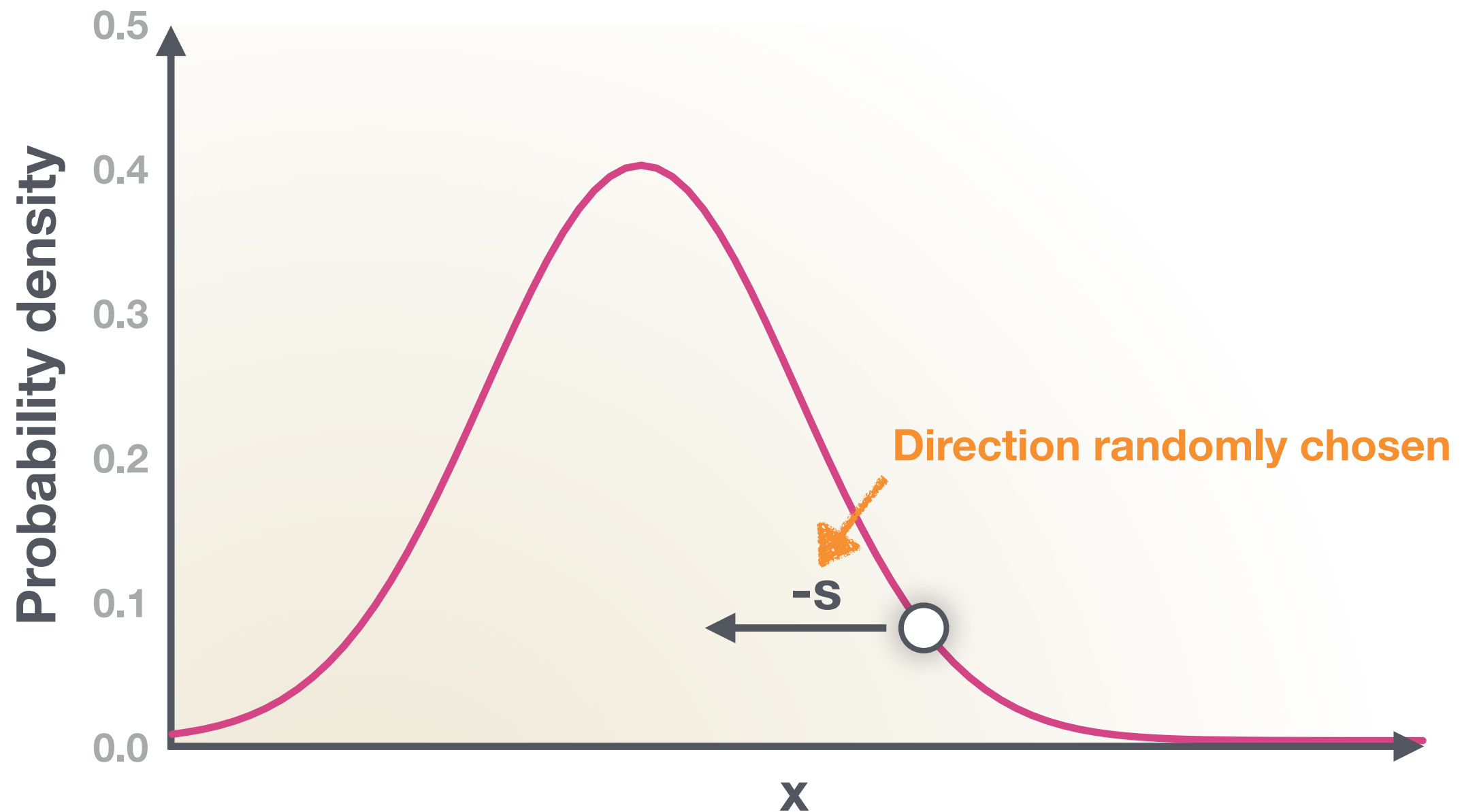
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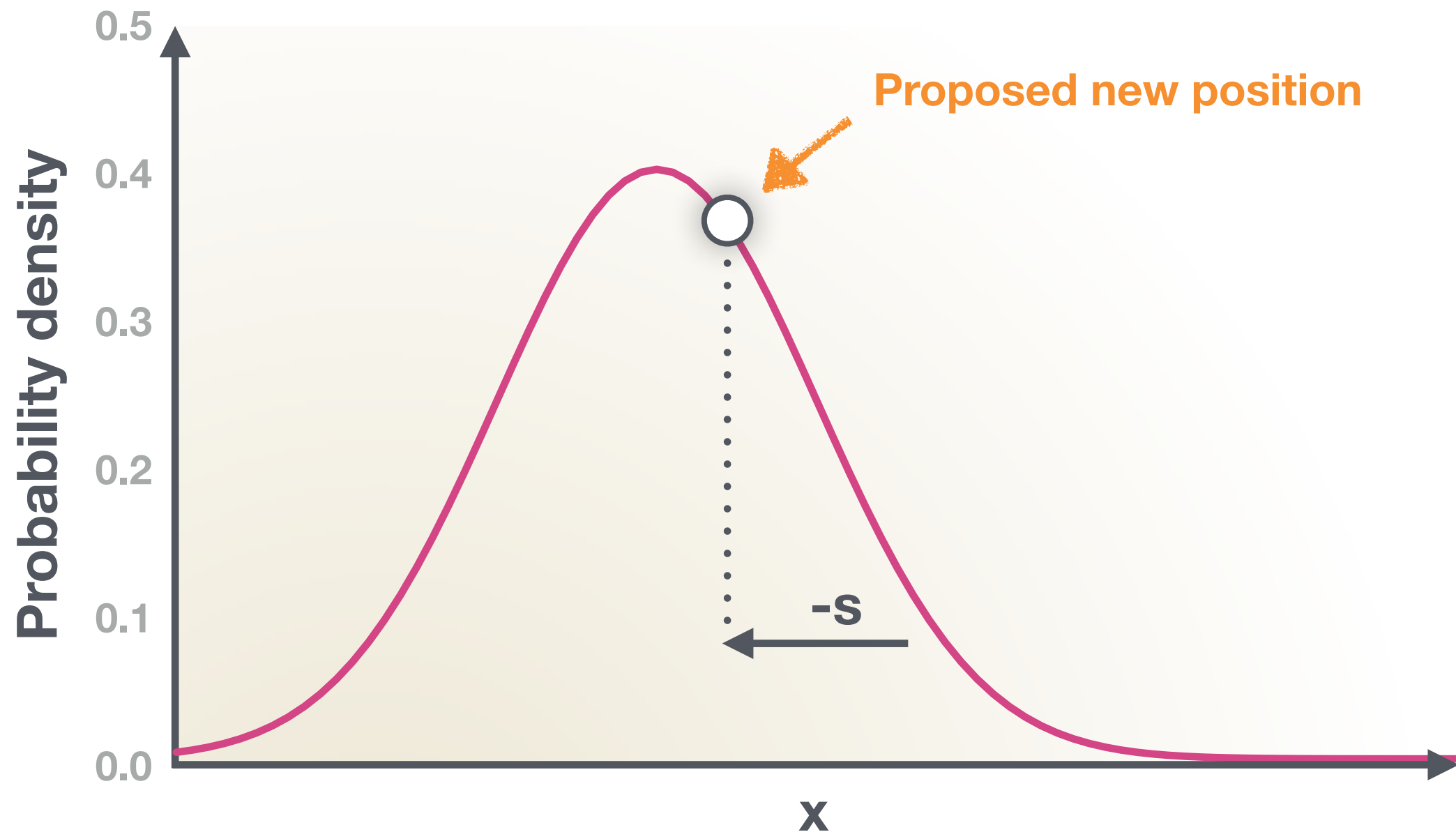
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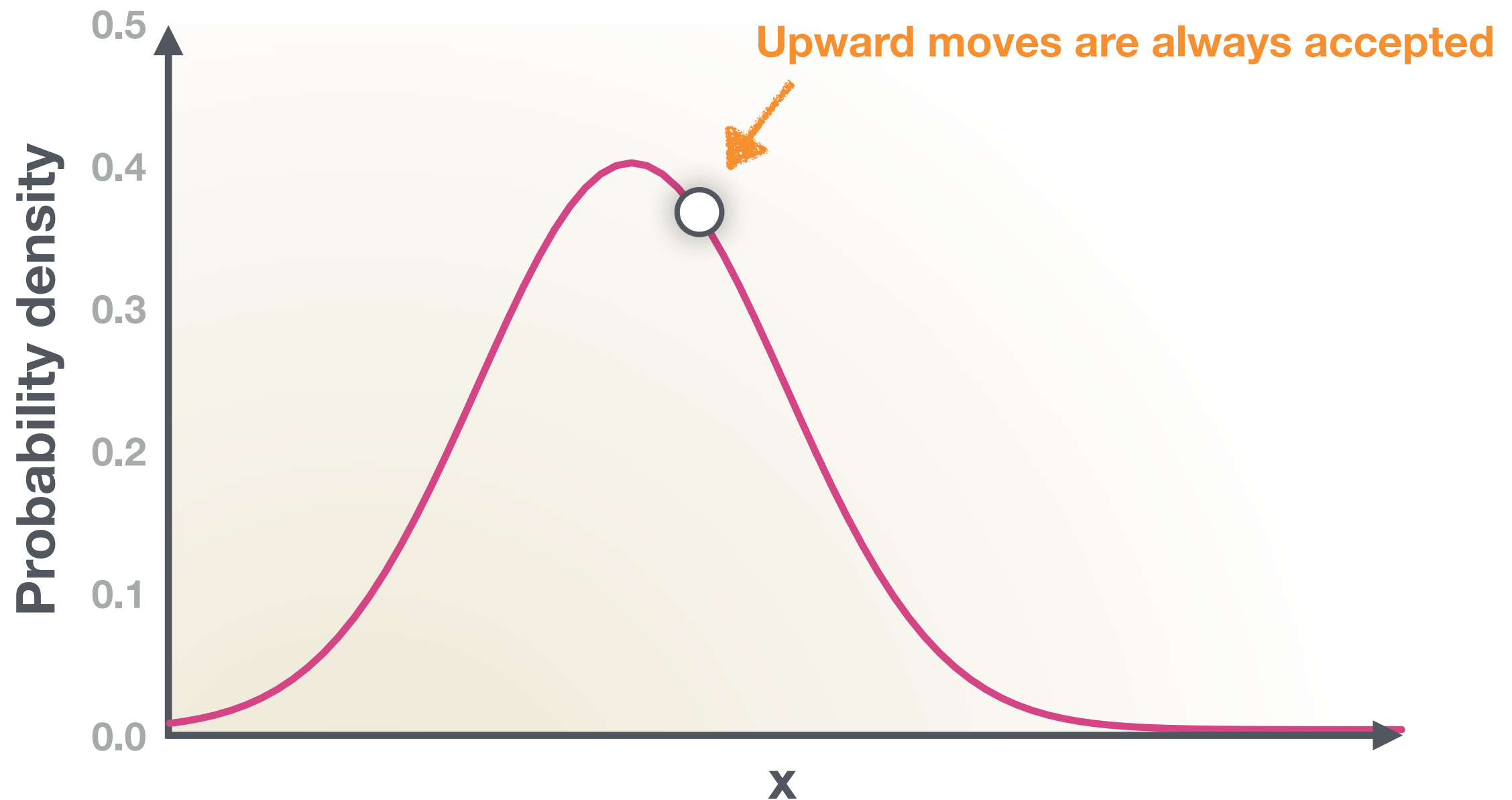
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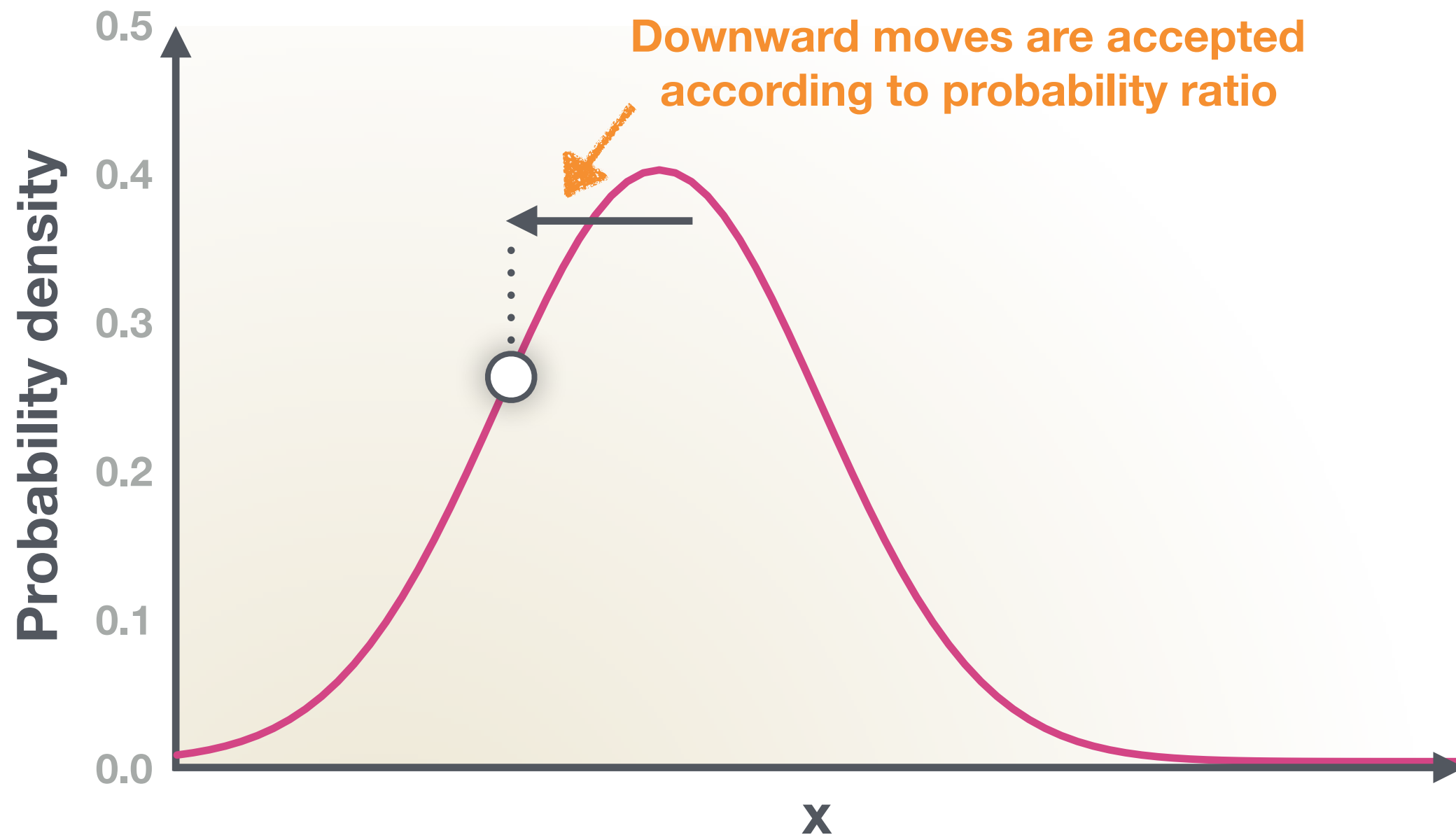
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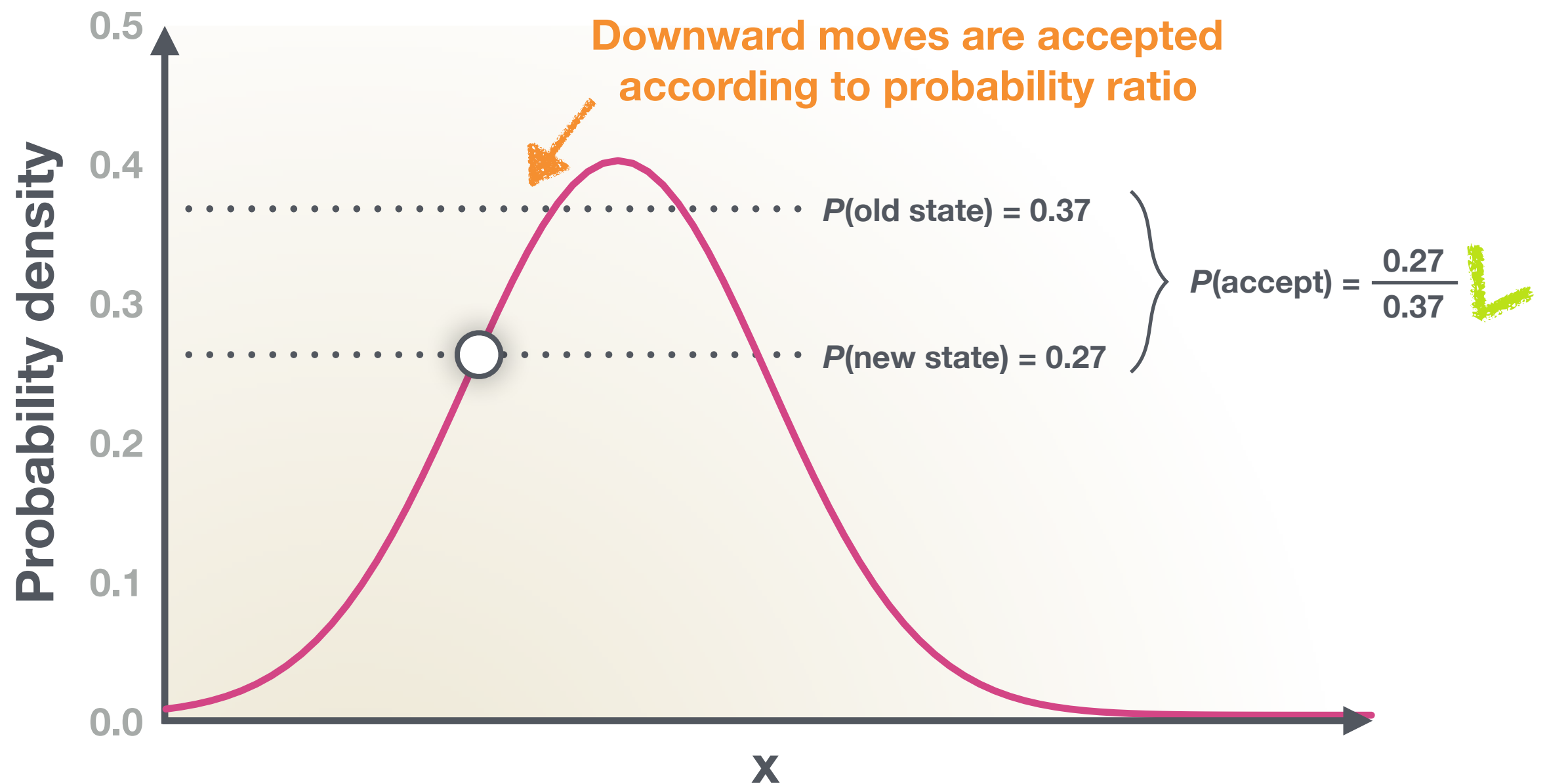
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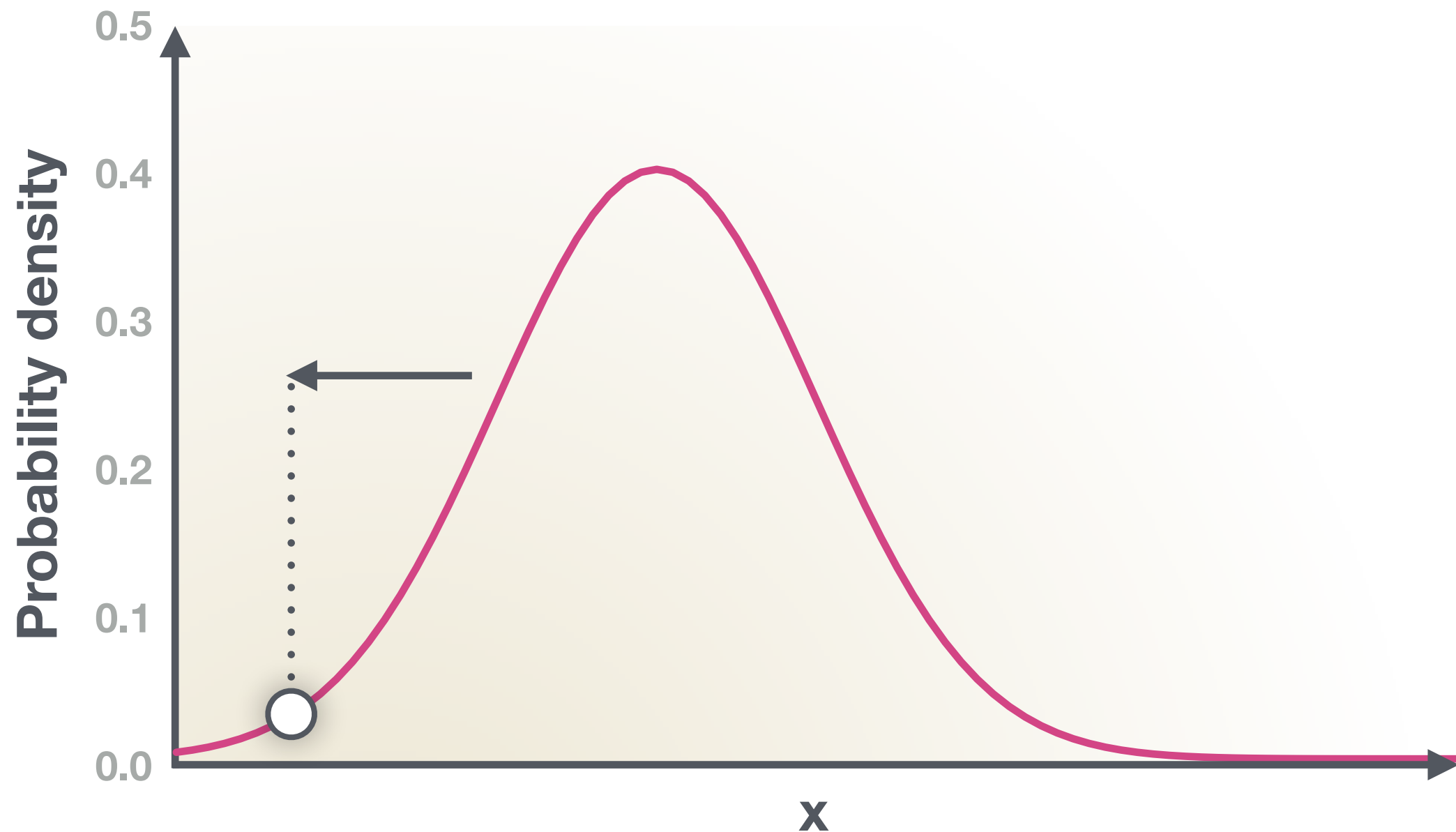
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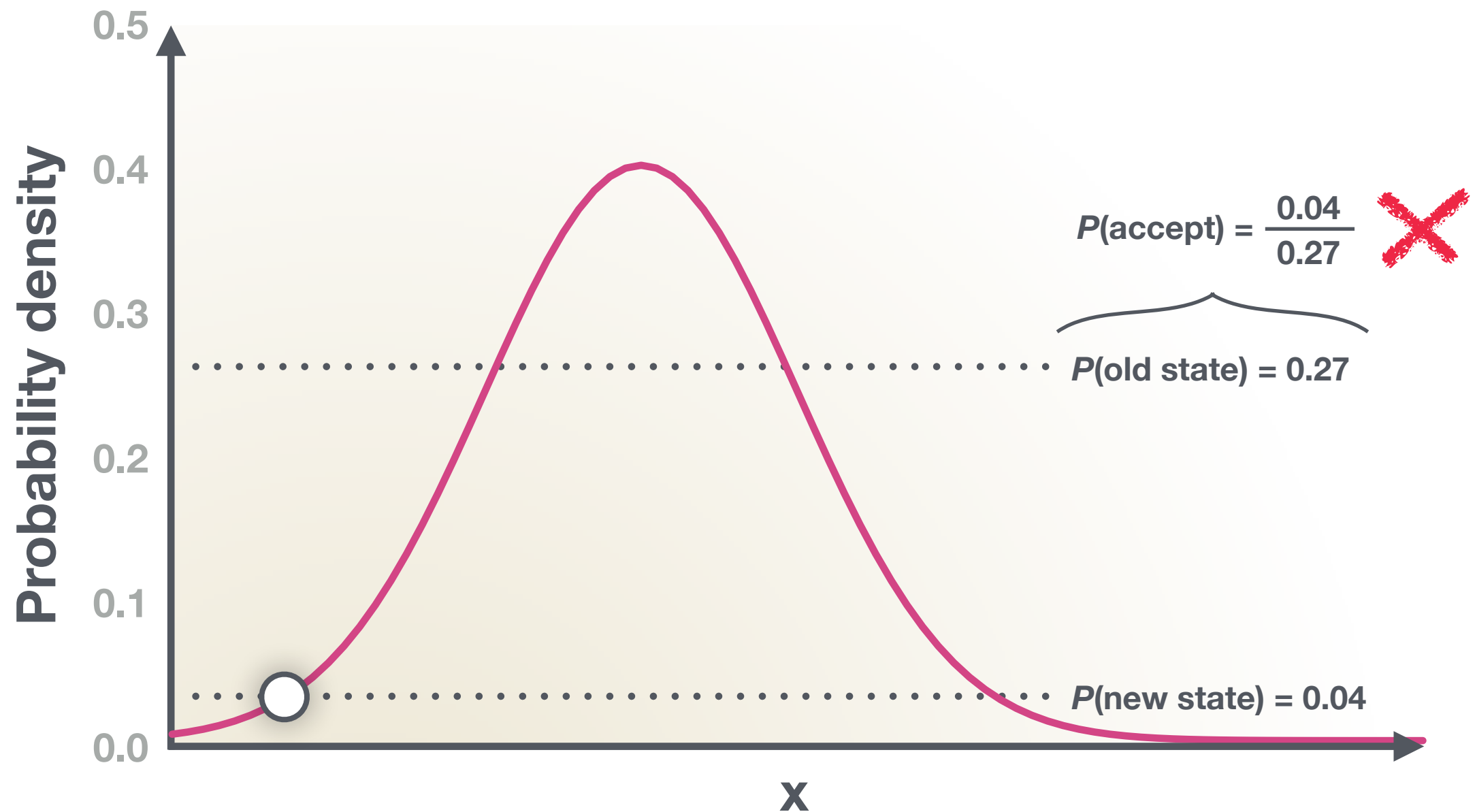
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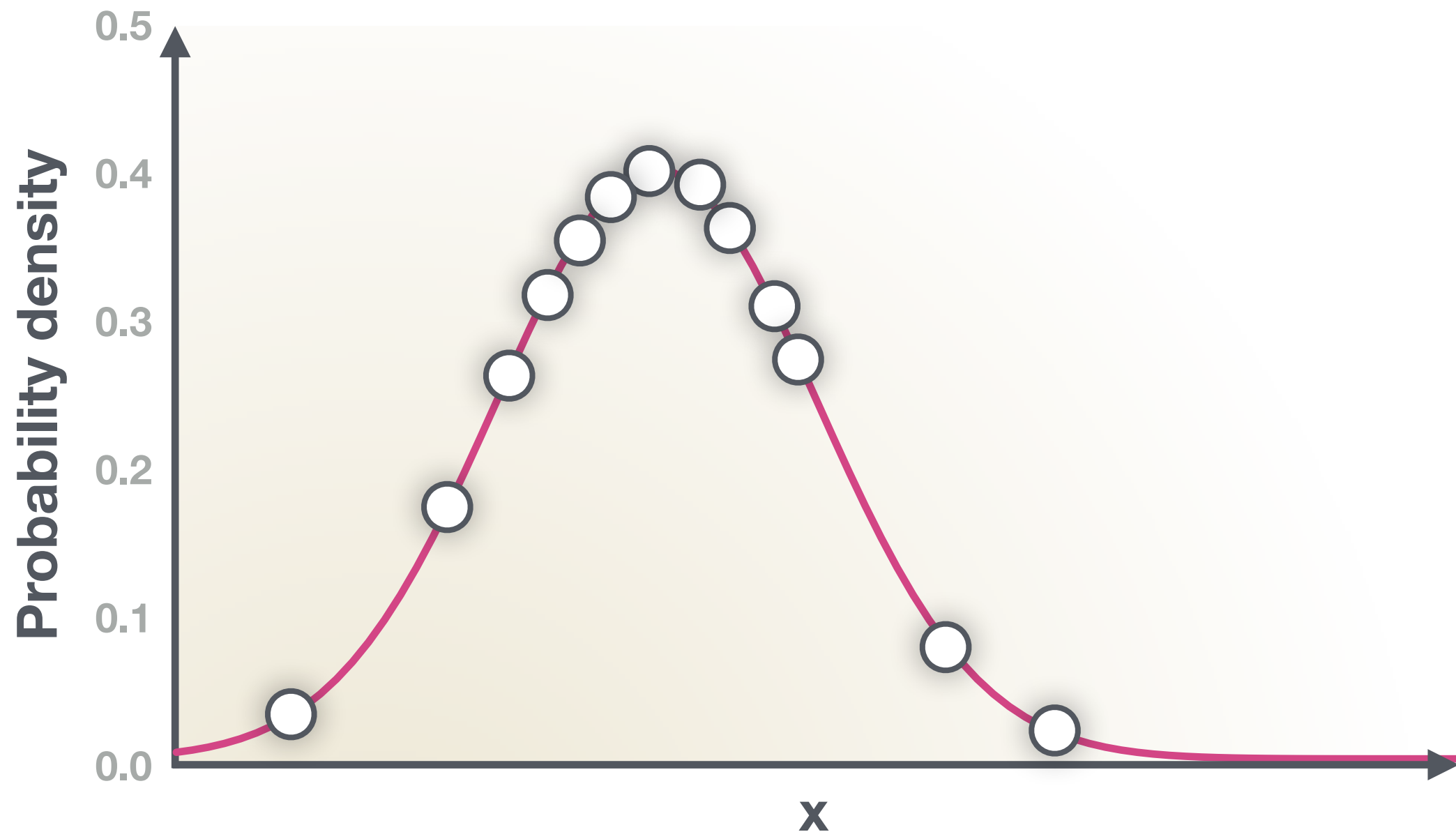
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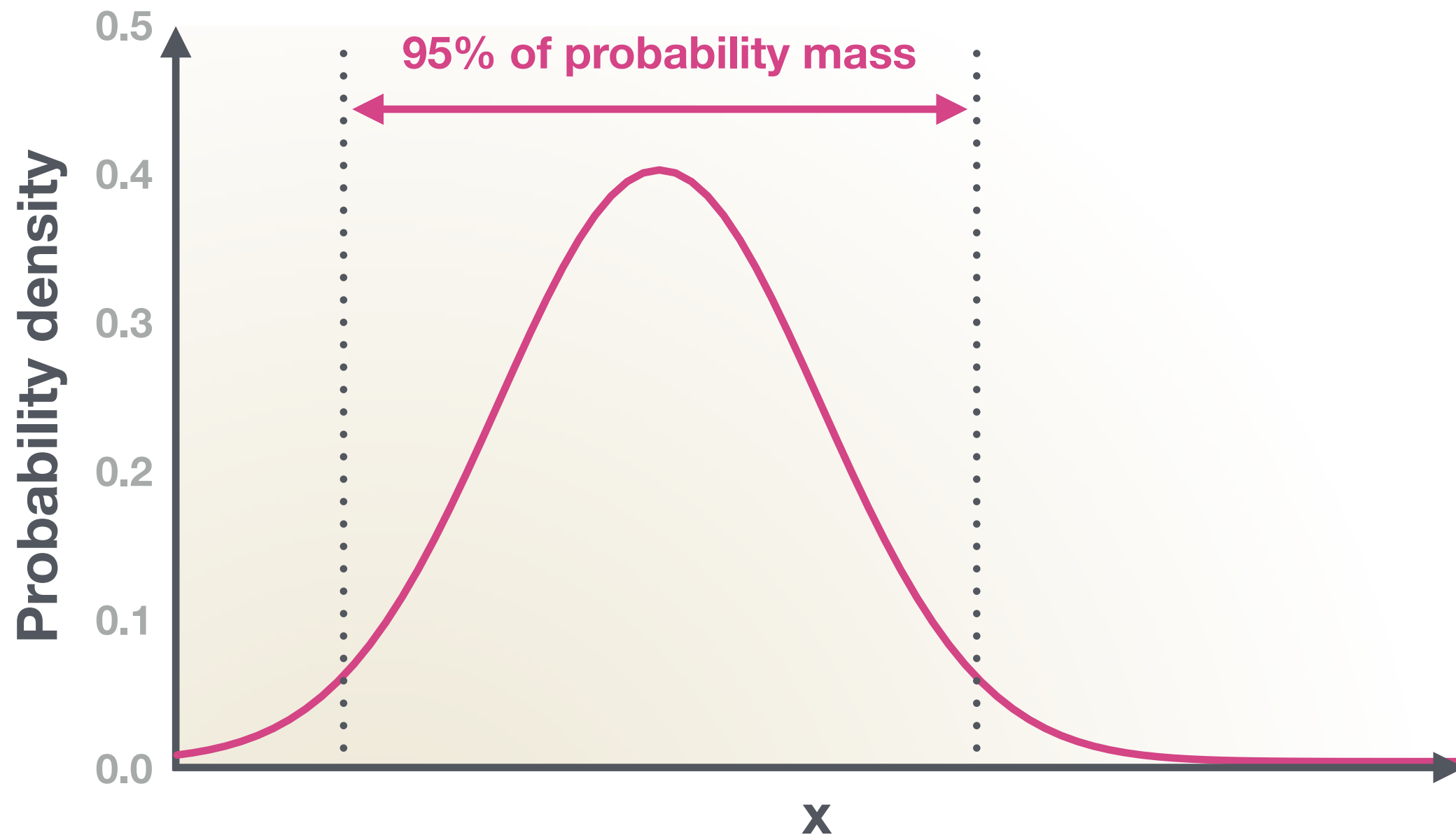
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MCMC

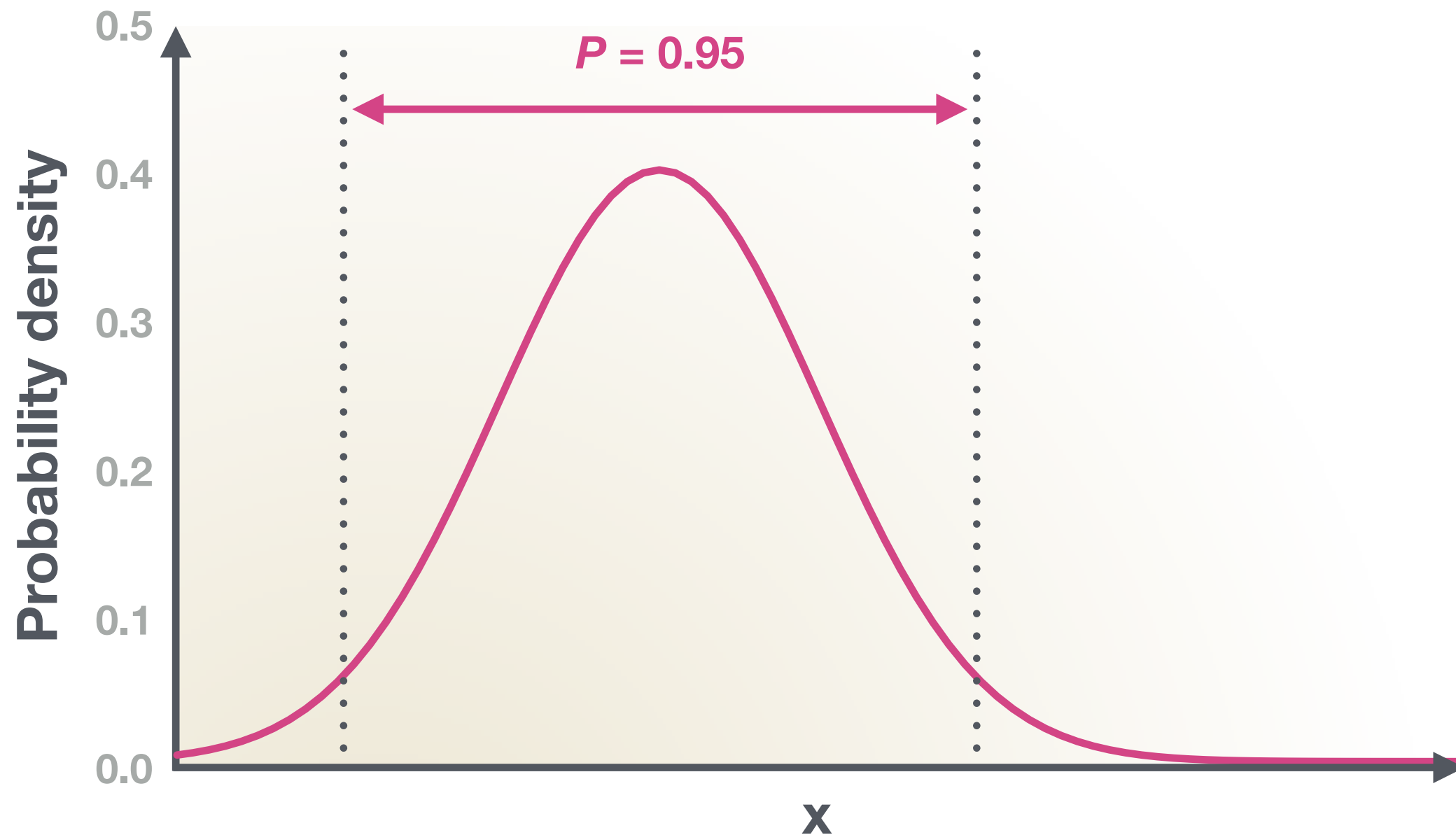
Markov-chain Monte Carlo



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MCMC

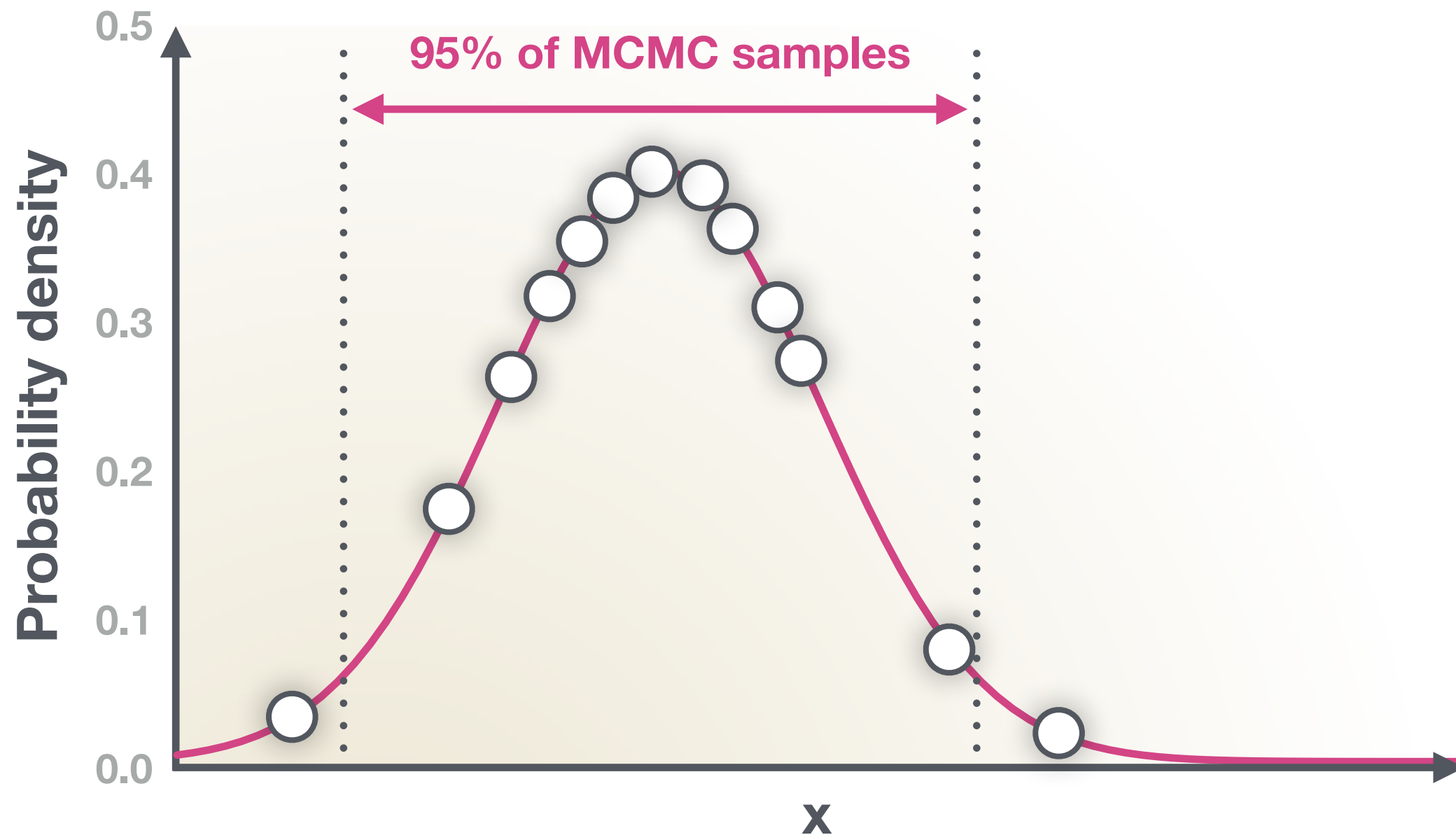
Markov-chain Monte Carlo



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MCMC

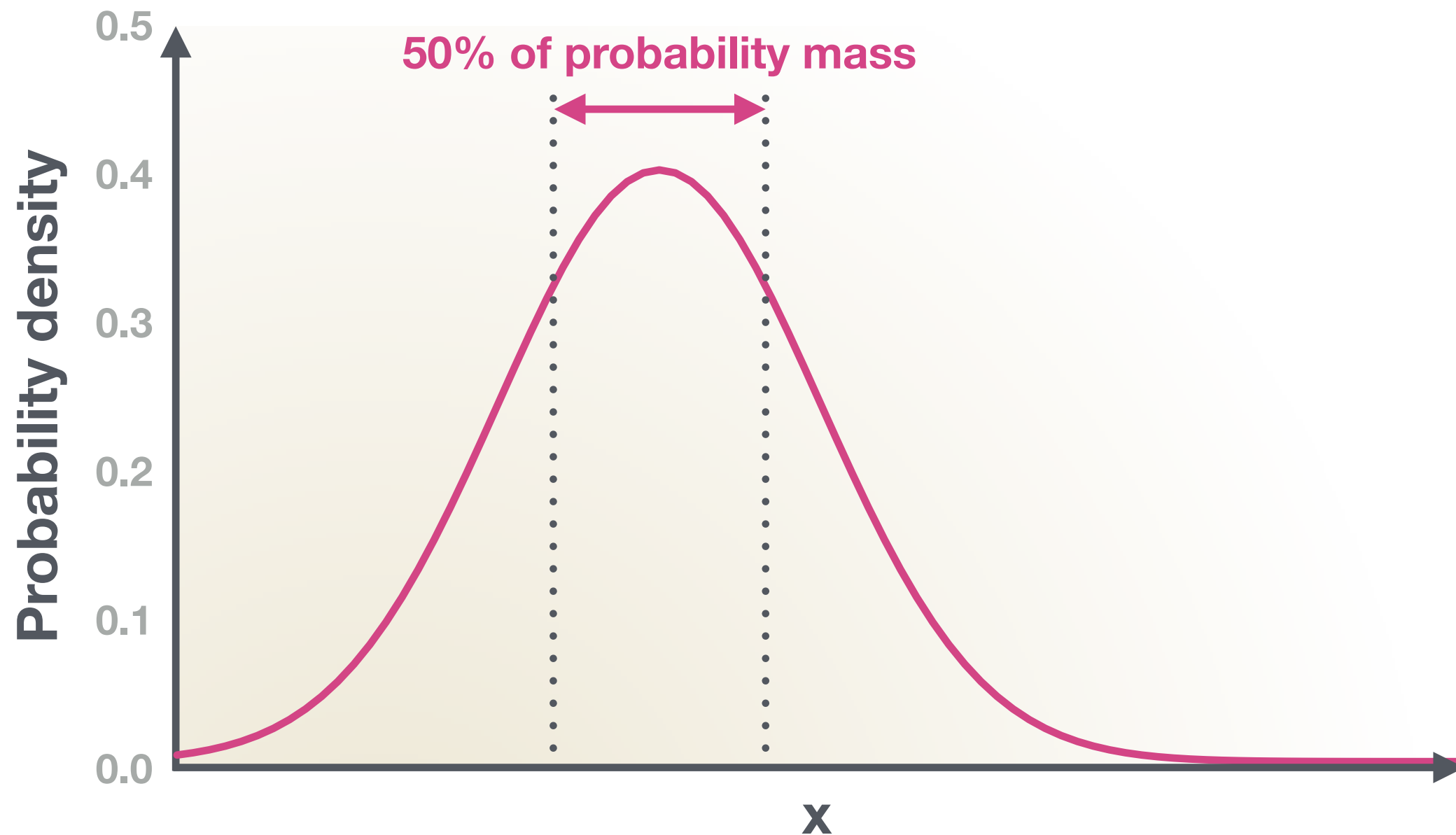
Markov-chain Monte Carlo



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MCMC

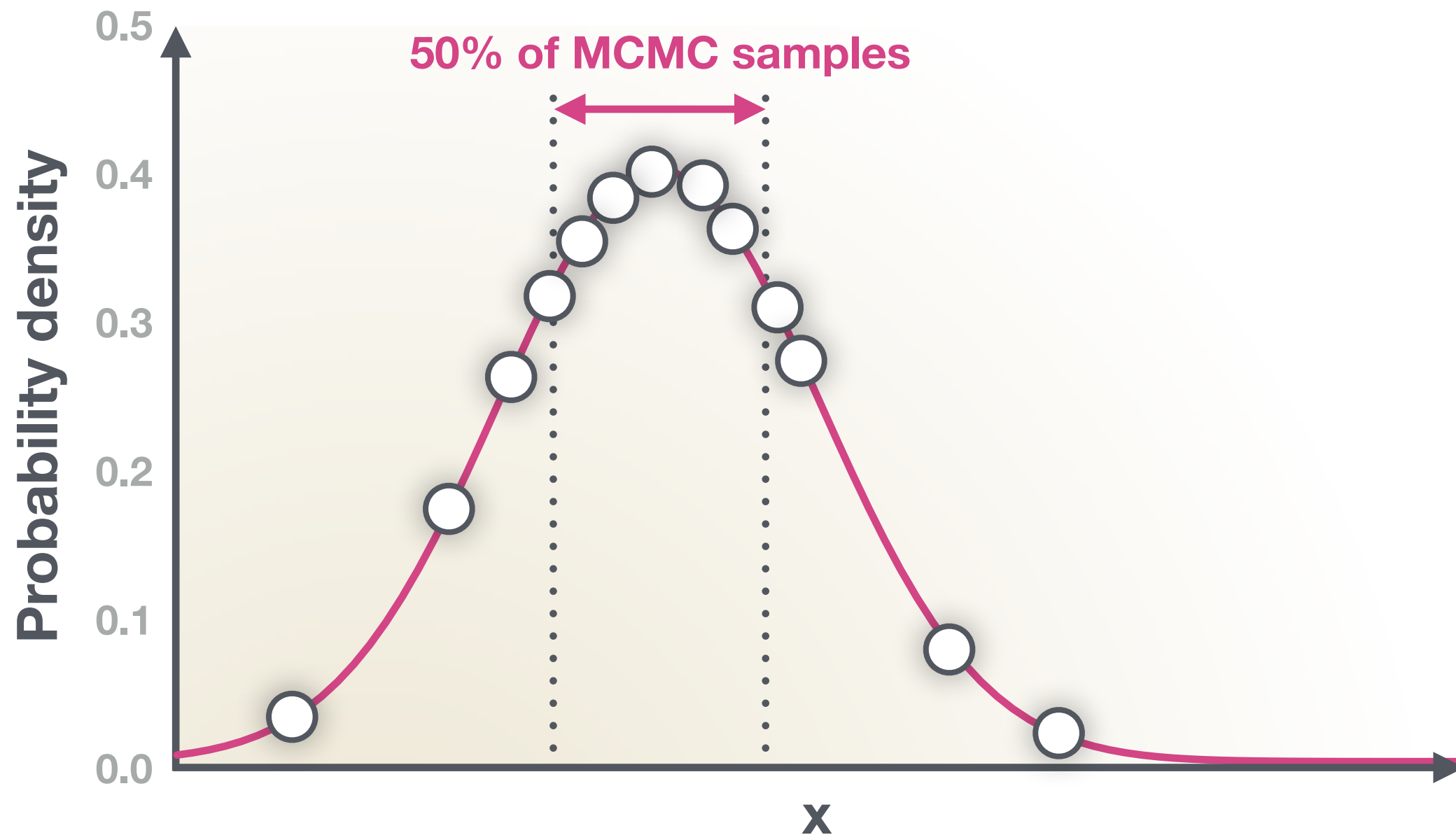
Markov-chain Monte Carlo



(Hastings 1970 Biometrika, Metropolis et al. 1953 J Chem Phys)

MCMC

Markov-chain Monte Carlo



(Hastings 1970 Biometrika, Metropolis et al. 1953 J Chem Phys)

BEAST 2

Bayesian Evolutionary Analysis by Sampling Trees



BEAST 2



BEAUti

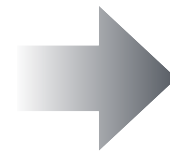
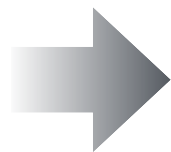


BEAST

BEAST 2



BEAUti



BEAST

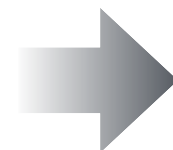
BEAST 2



BEAST



.log



TreeAnnotator

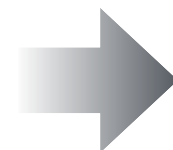
BEAST 2



BEAST



.log

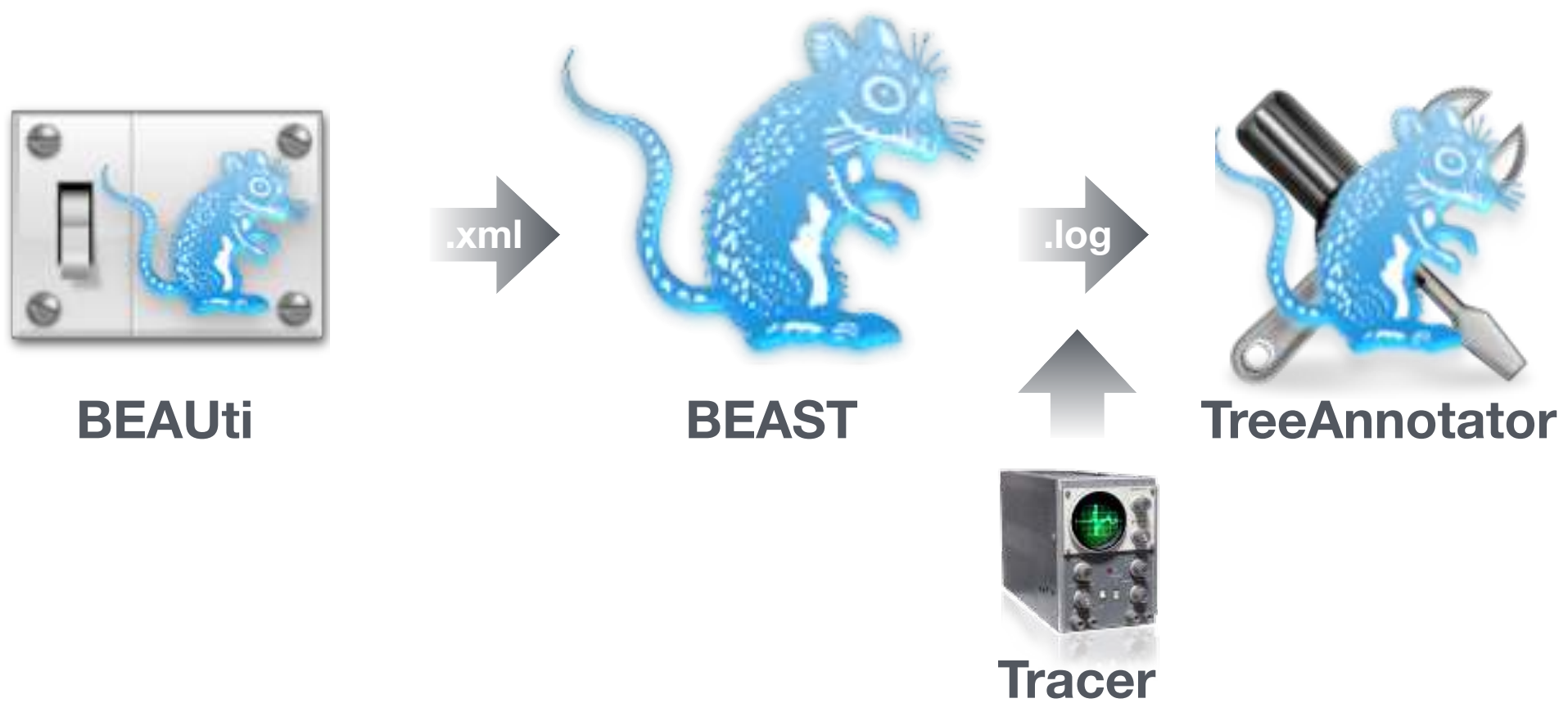


TreeAnnotator

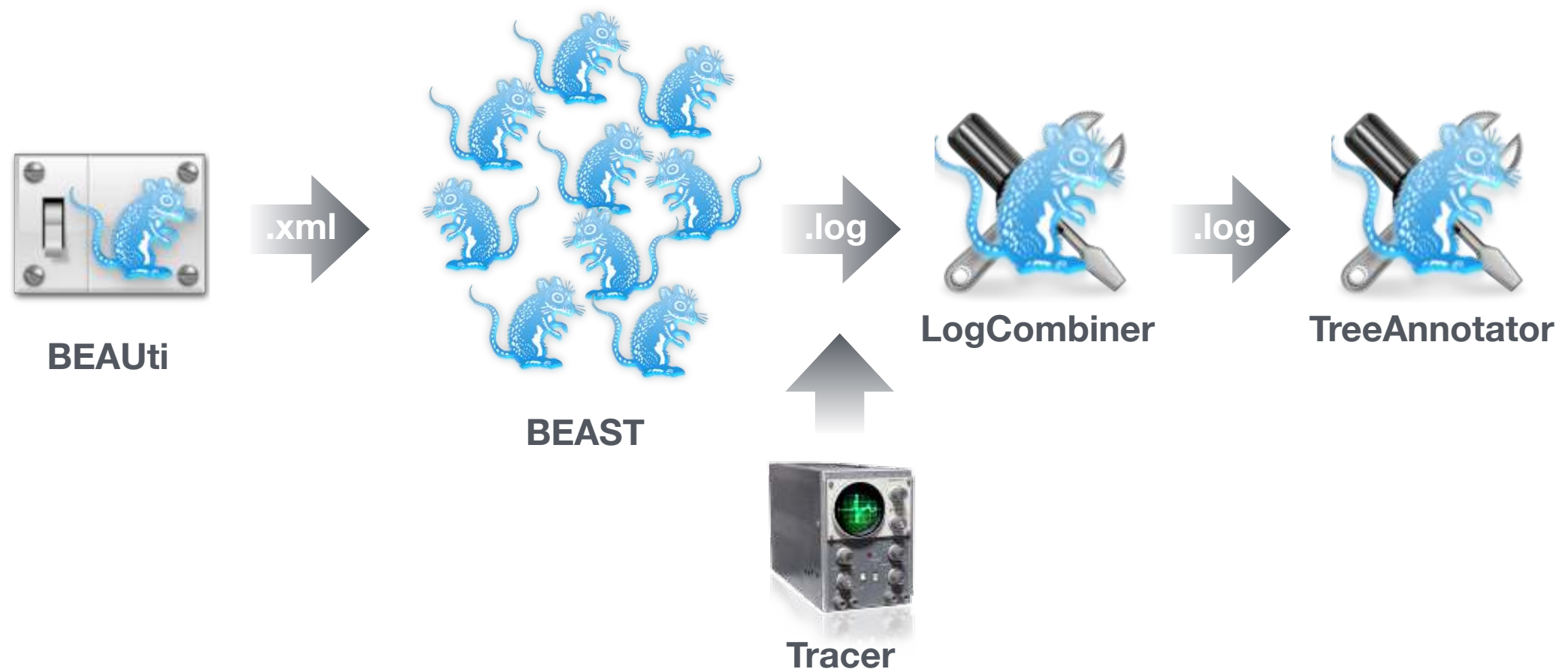


Tracer

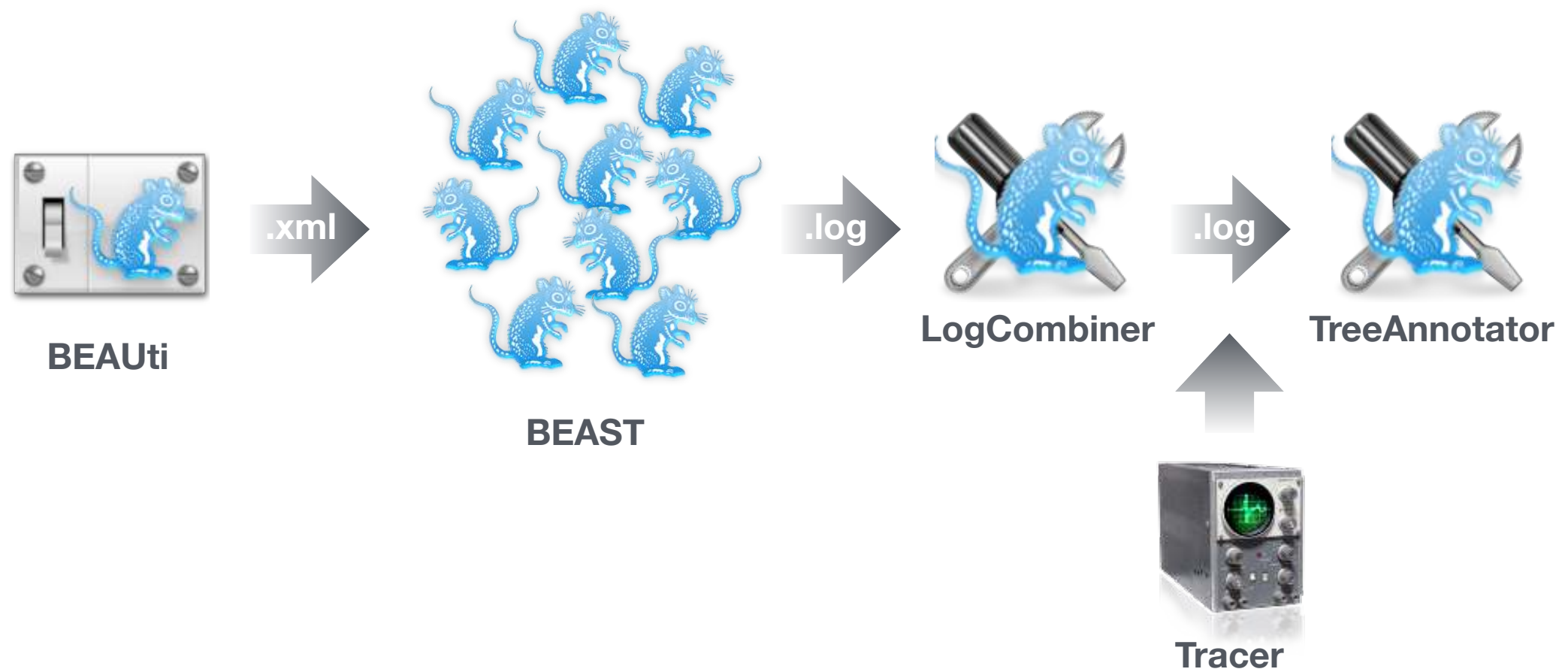
BEAST 2



BEAST 2

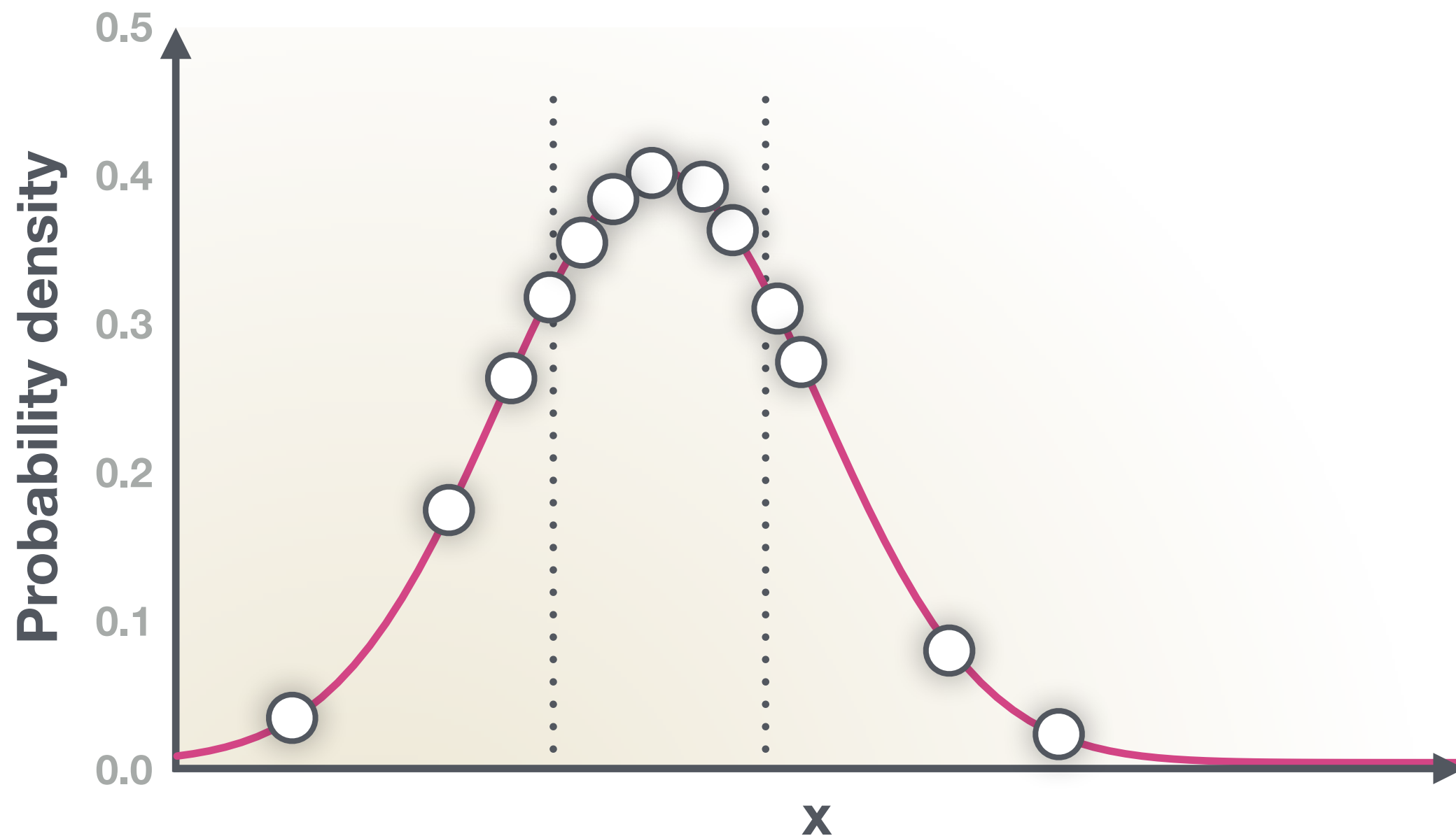


BEAST 2

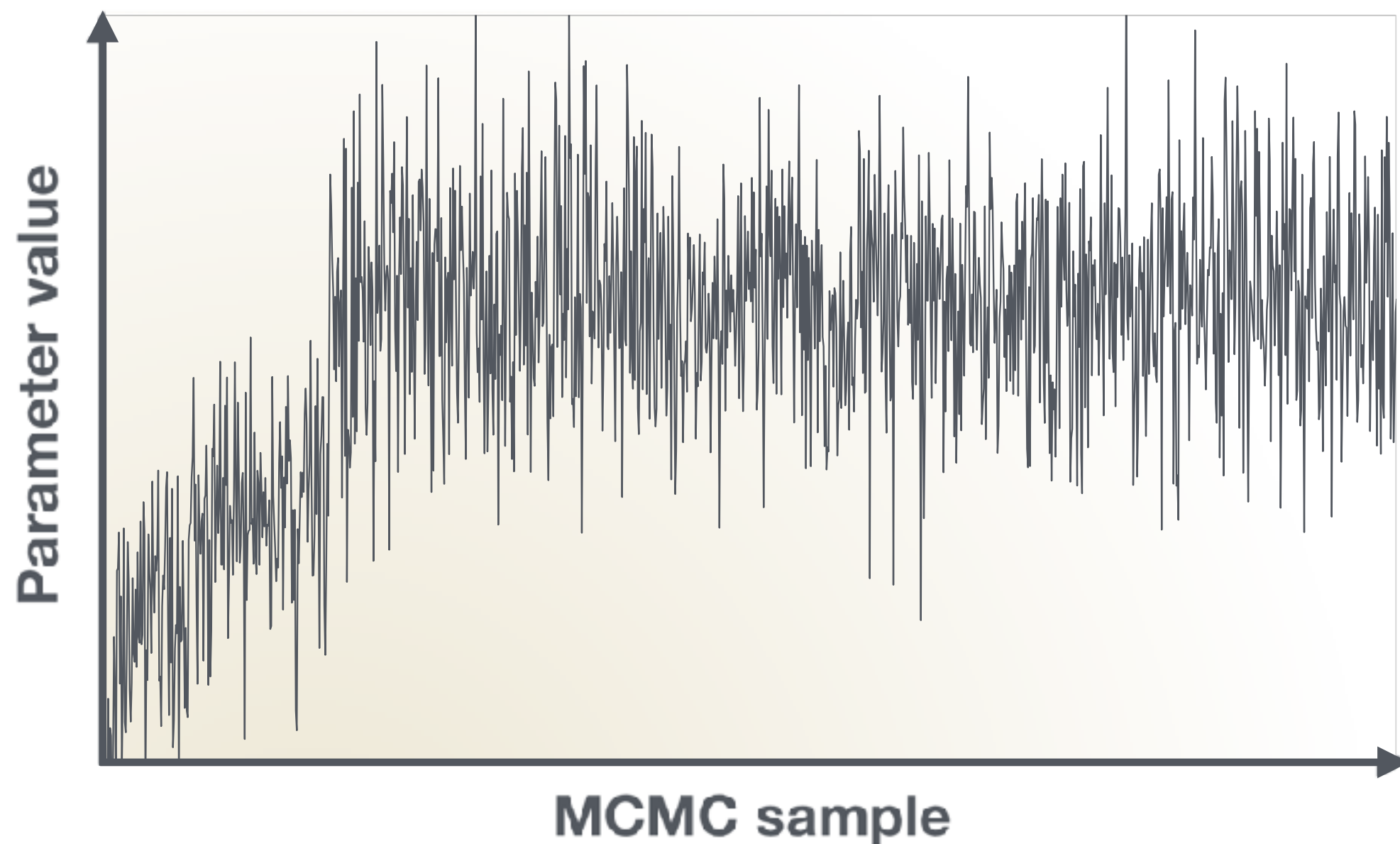


MCMC

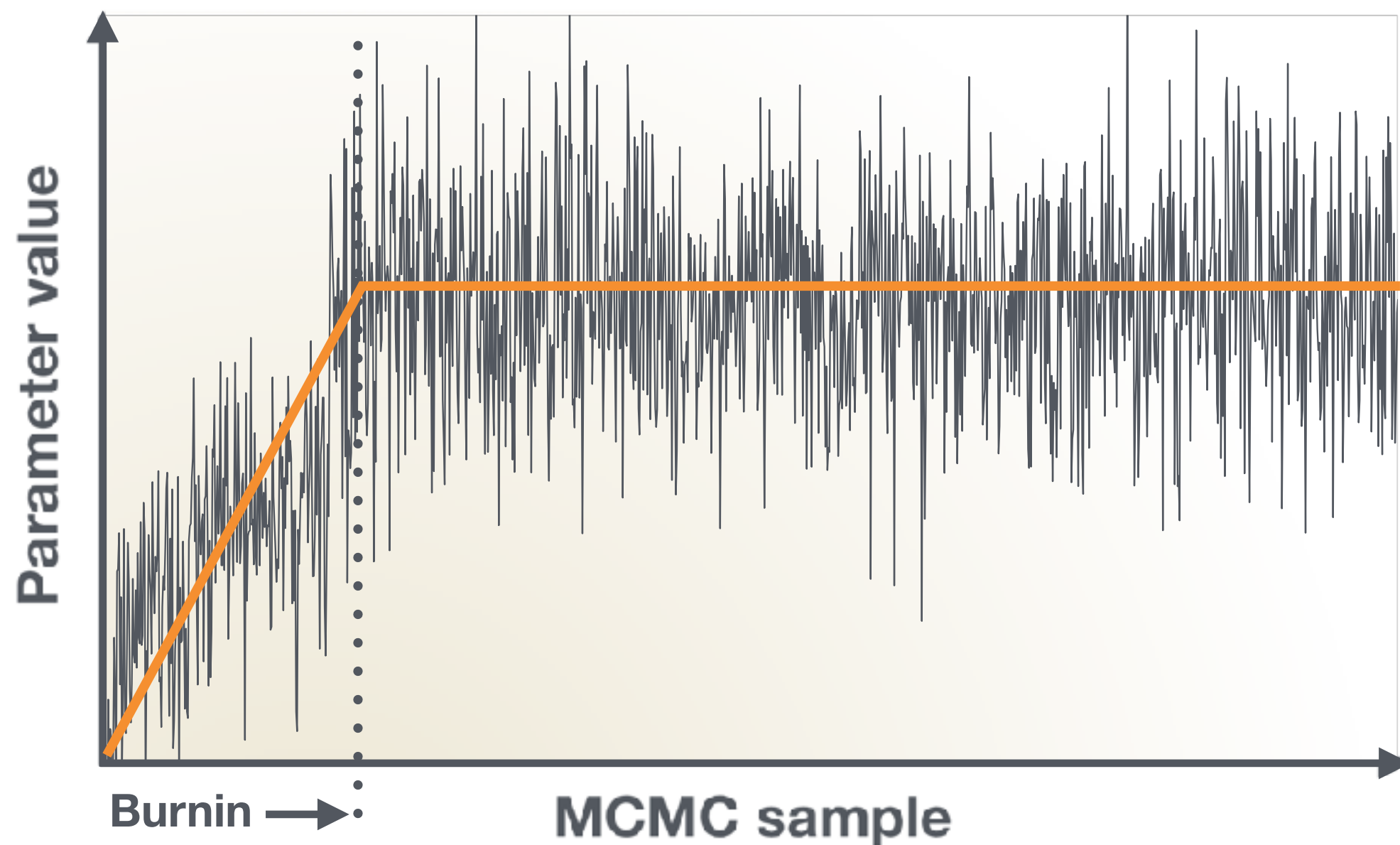
Markov-chain Monte Carlo



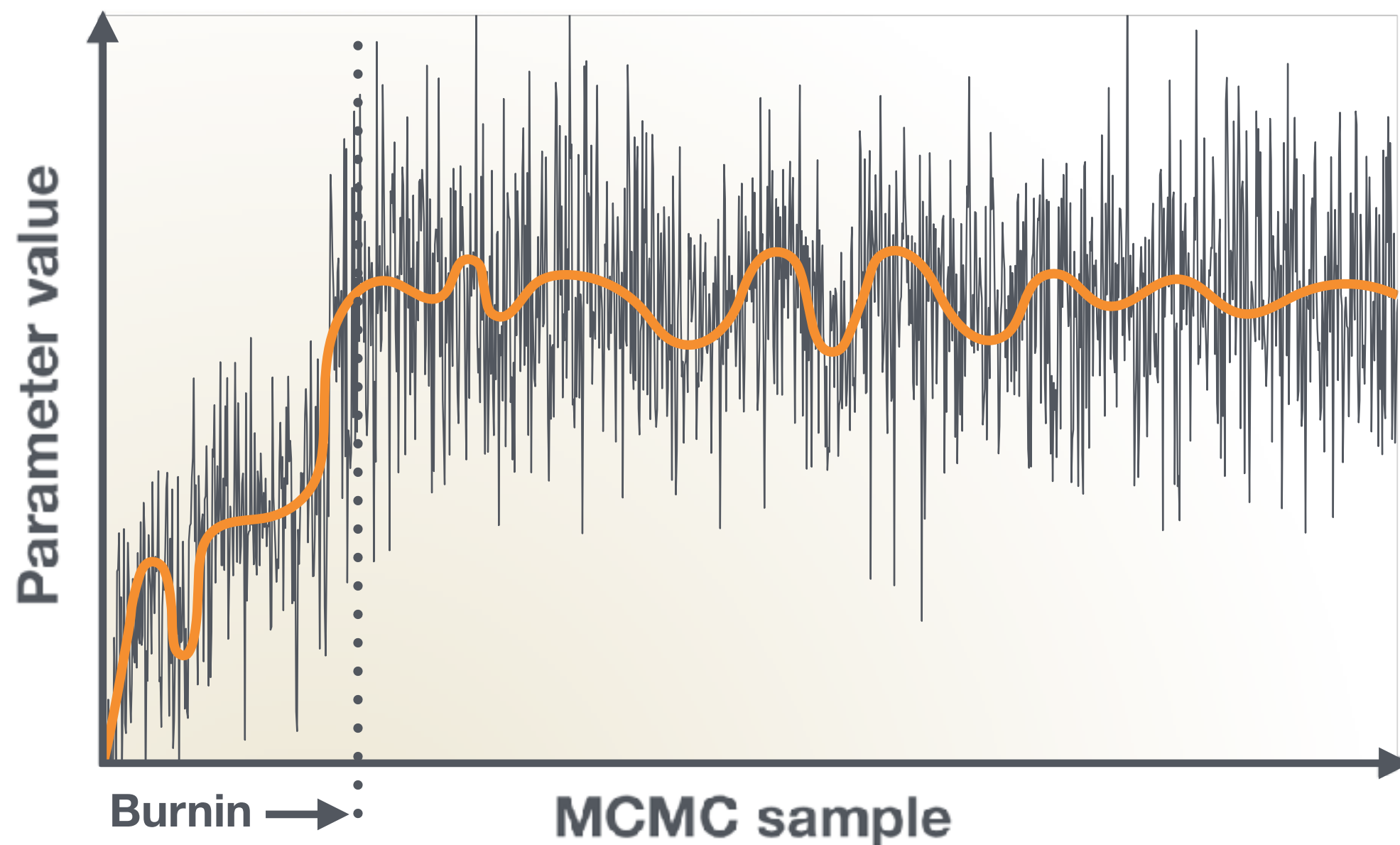
MCMC stationarity



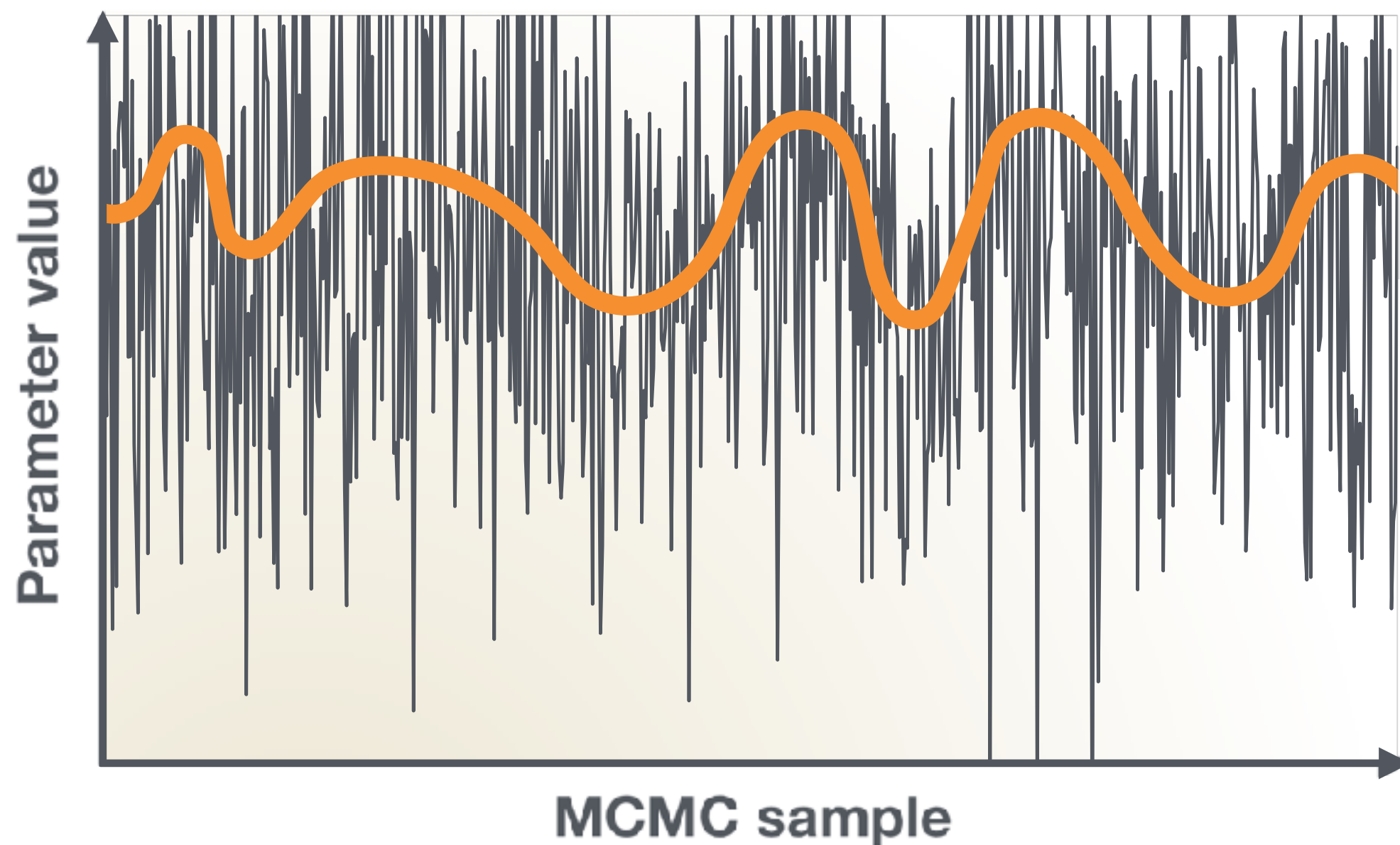
MCMC stationarity



MCMC stationarity



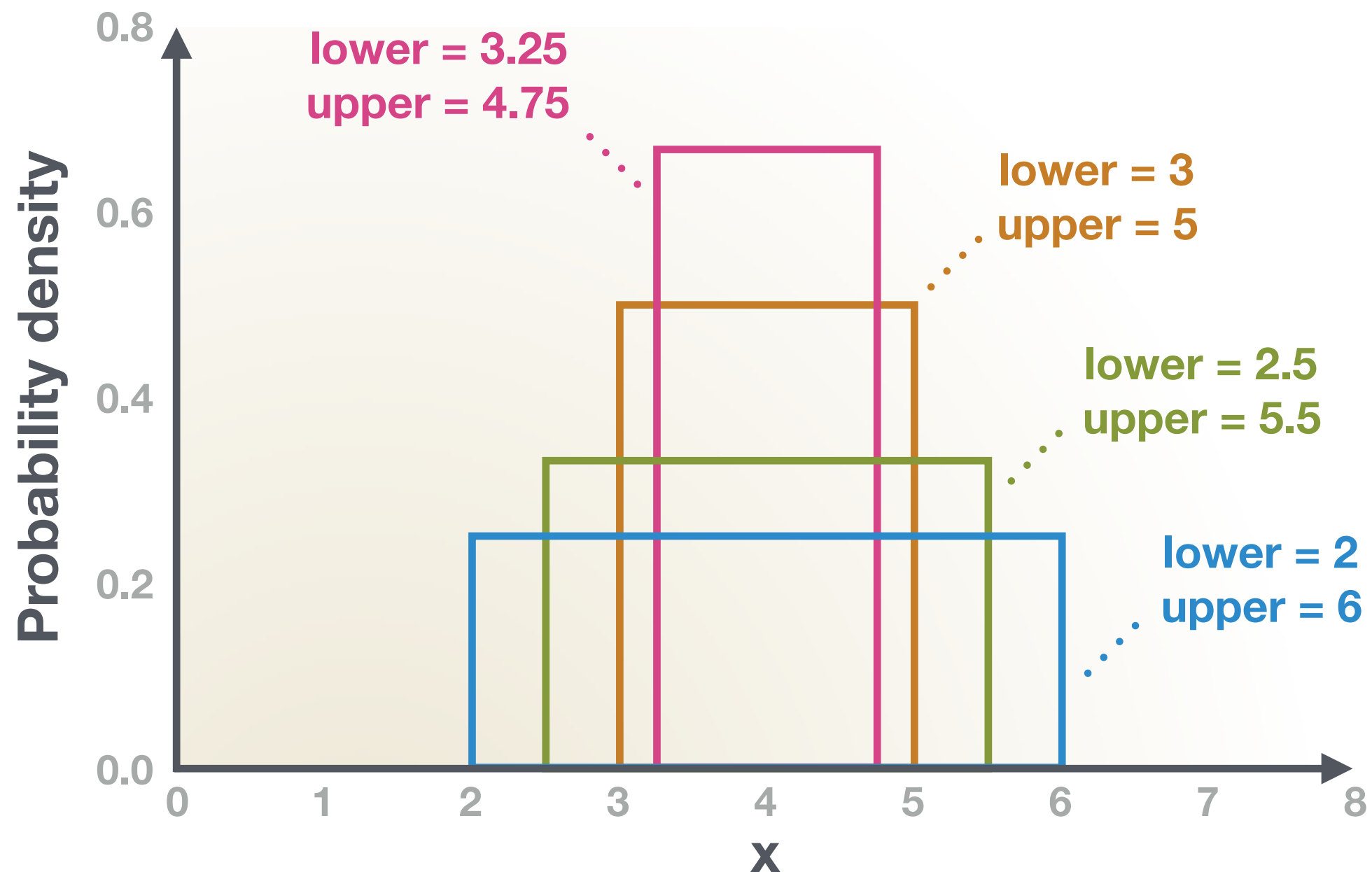
MCMC stationarity



Prior distributions

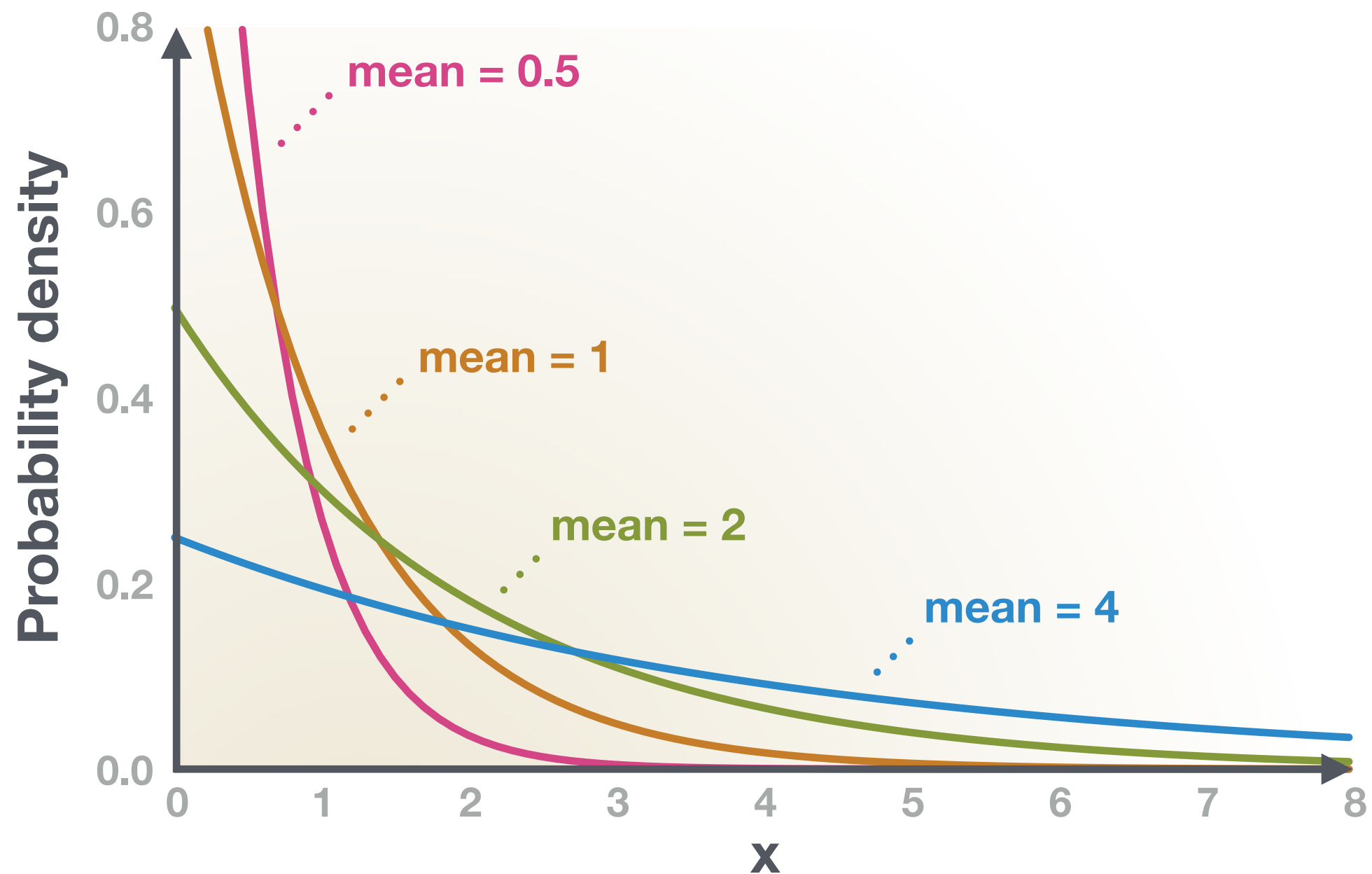
Probability distributions

Uniform distribution



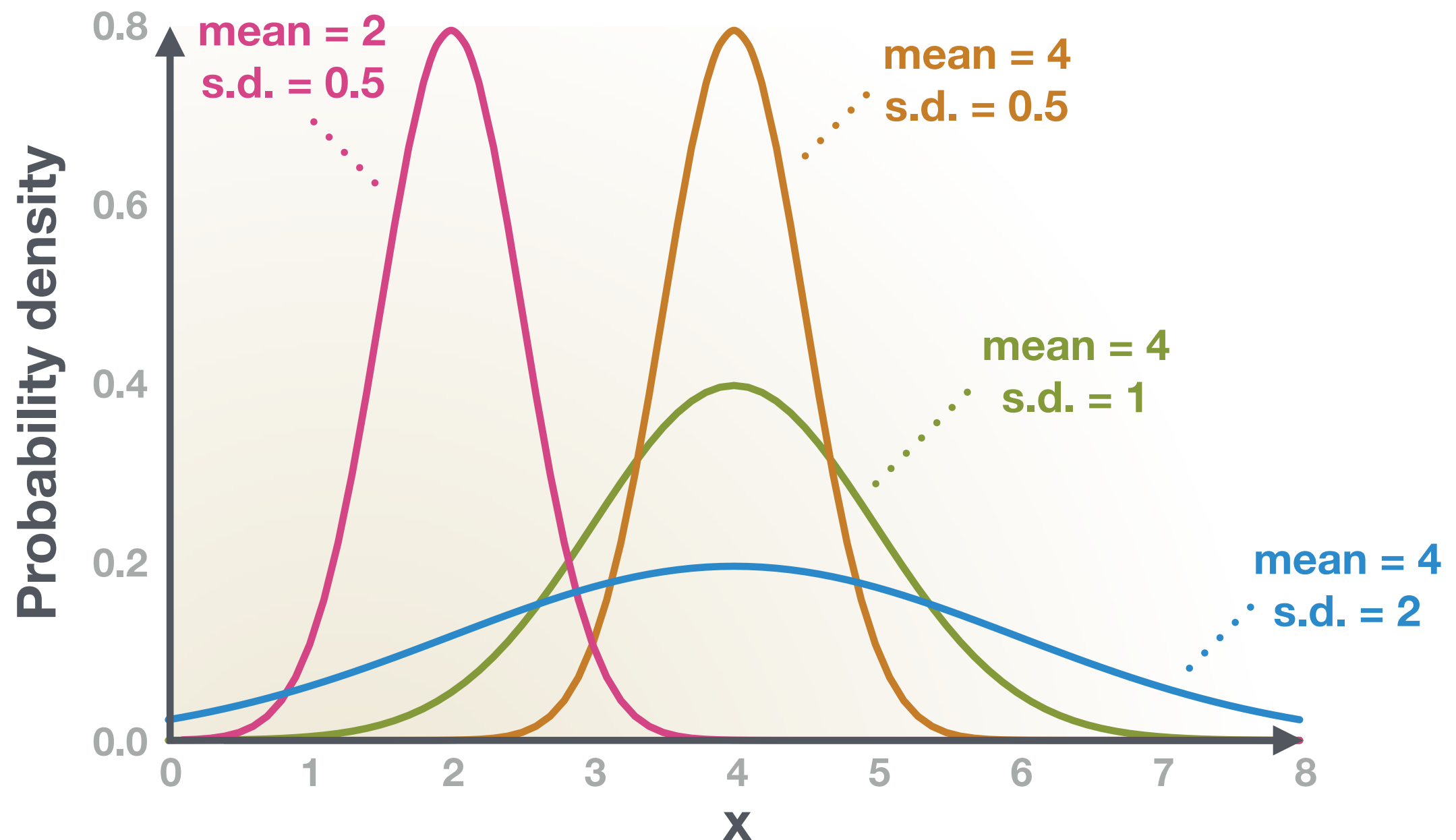
Probability distributions

Exponential distribution



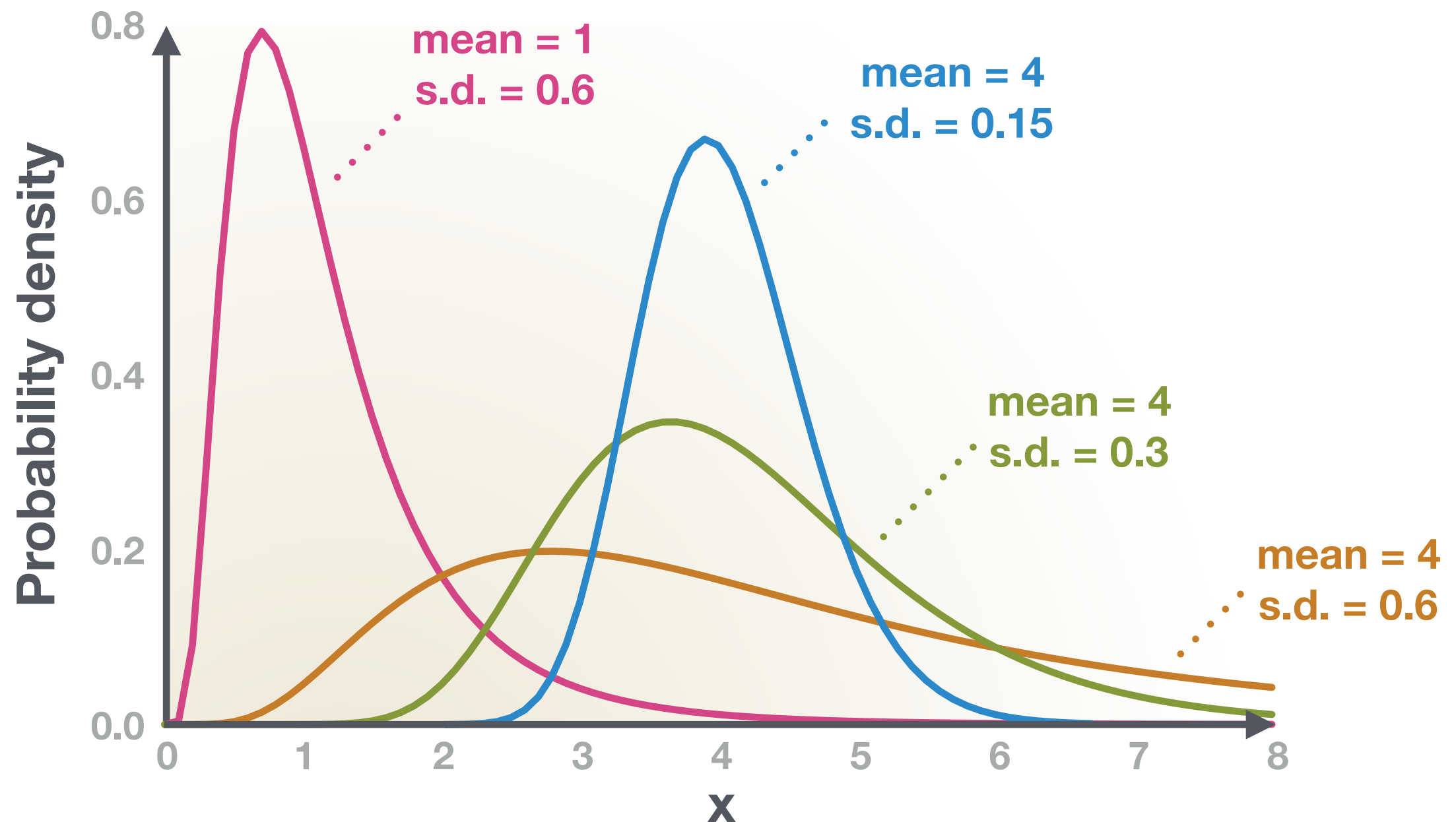
Probability distributions

Normal distribution



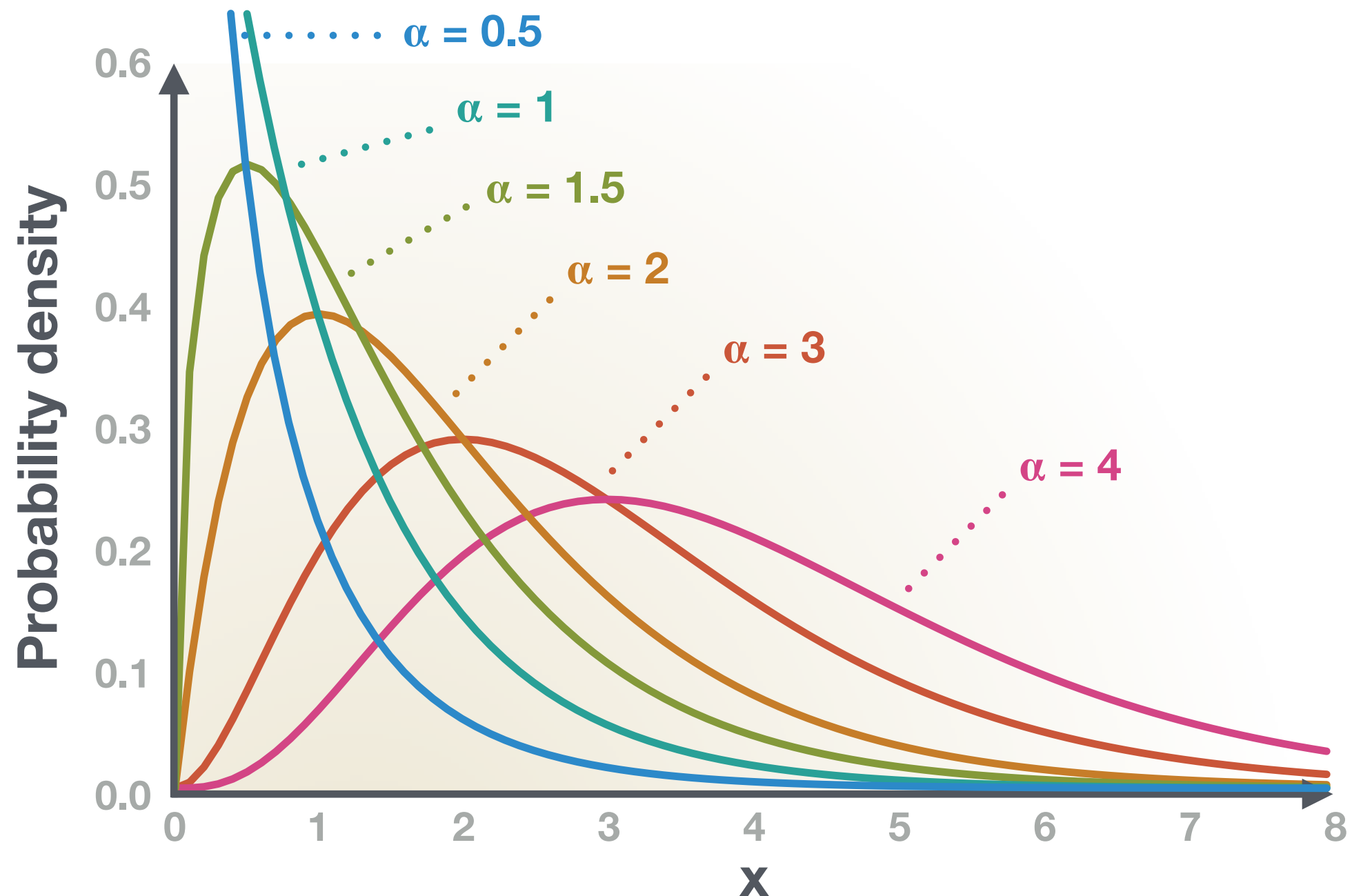
Probability distributions

Lognormal distribution



Probability distributions

Gamma distribution



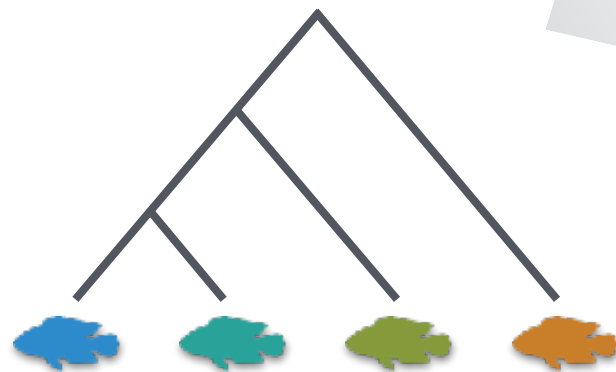
Species-tree inference

Gene-tree variation

Species tree



“Gene” trees



AGCCTGTCAGTCAG
AGCCTGTCAGTCAG
AGCCTATCAGTCAG
AGCGTATCAGTCAG

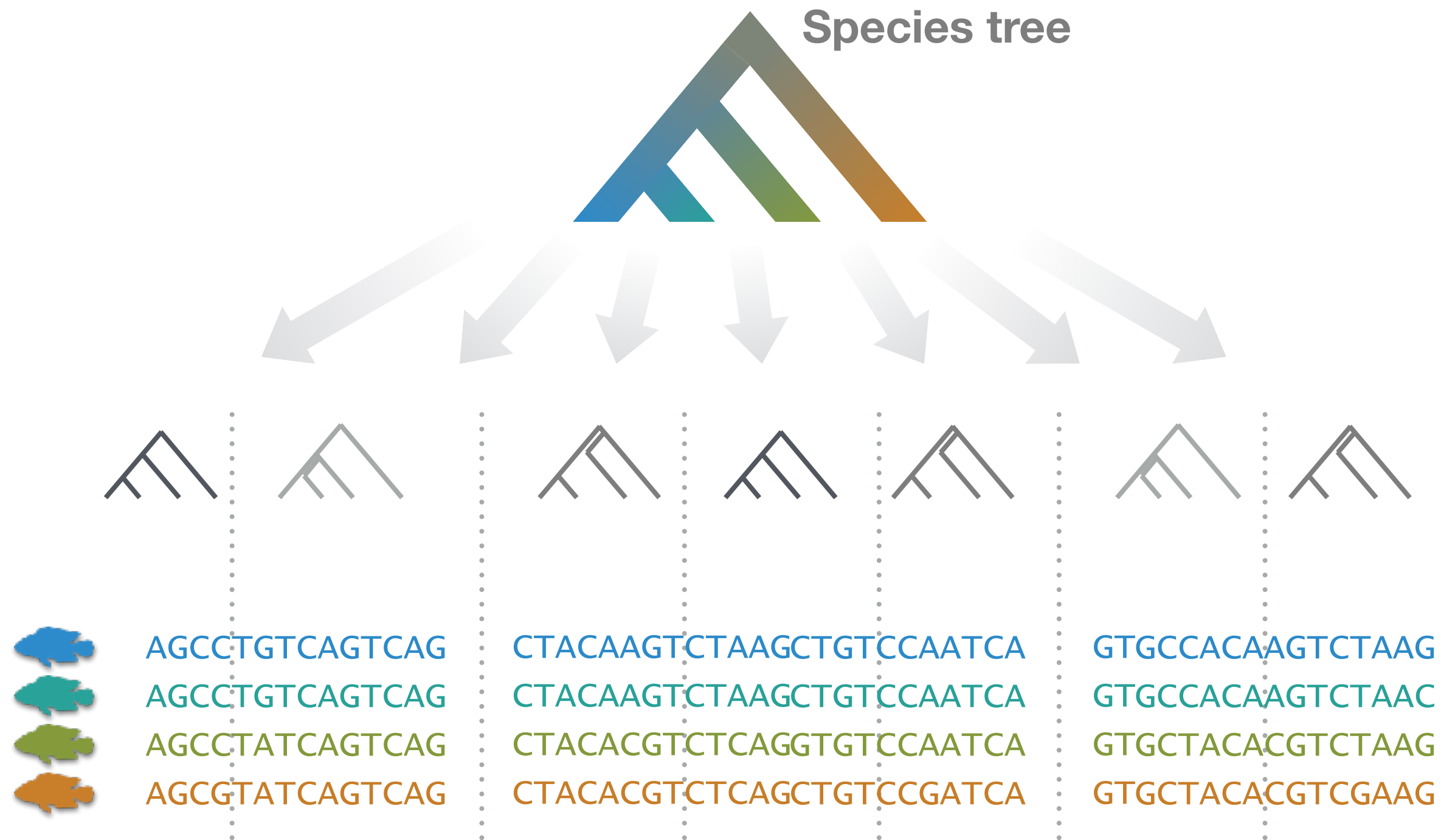


CTACAAGTCTAAGCTGTCCAATCA
CTACAAGTCTAAGCTGTCCAATCA
CTACACGTCTCAGGTGTCCAATCA
CTACACGTCTCAGCTGTCCGATCA

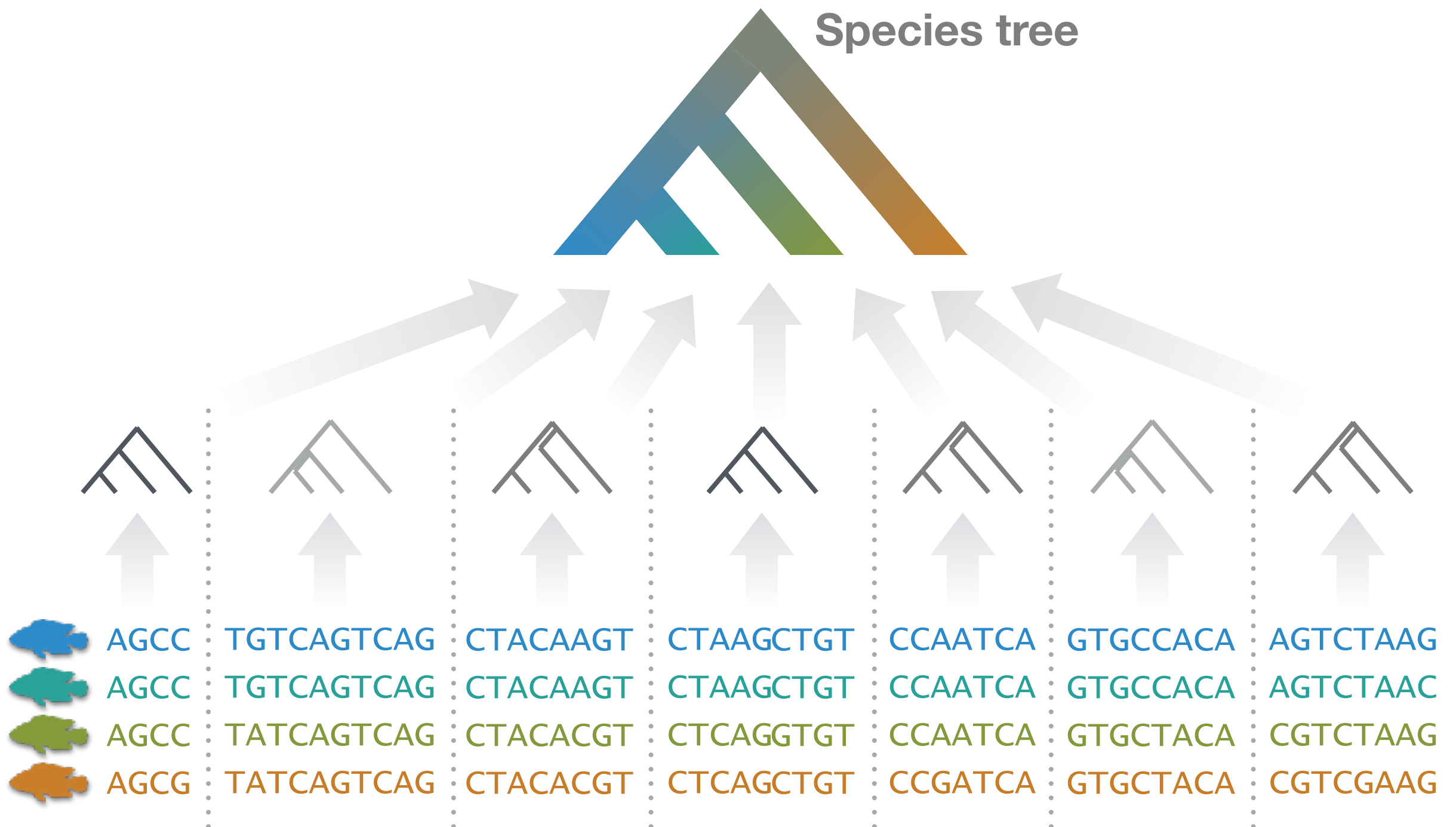


GTGCCACAAGTCTAAG
GTGCCACAAGTCTAAC
GTGCTACACGTCTAAG
GTGCTACACGTCTGAAG

Gene-tree variation



Species-tree inference



Species-tree inference



AGCCTGTCAGTCAGCTACAAGTCTAAGCTGTCCAATCAGTGCCACAAGTCTAAG

AGCCTGTCAGTCAGCTACAAGTCTAAGCTGTCCAATCAGTGCCACAAGTCTAAC

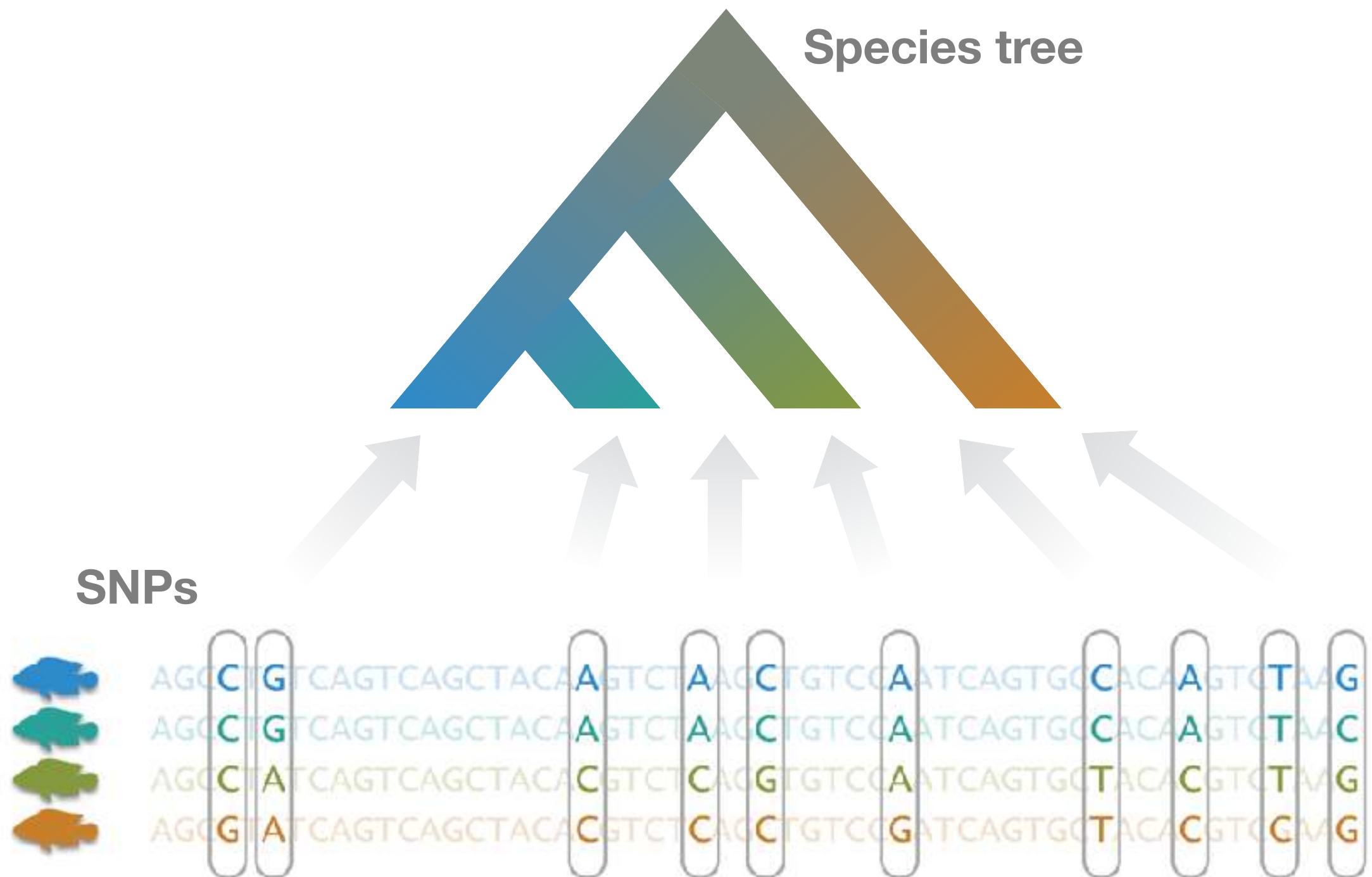
AGCCTATCAGTCAGCTACACGTCTCAGGTGTCCAATCAGTGCTACACGTCTAAG

AGCGTATCAGTCAGCTACACGTCTCAGCTGTCCGATCAGTGCTACACGTCTGAAG

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