Markov Chains: Advanced Topics

Personal Exploration - Part 2

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Mixing Times

- Measures how fast a Markov Chain converges to its stationary distribution.
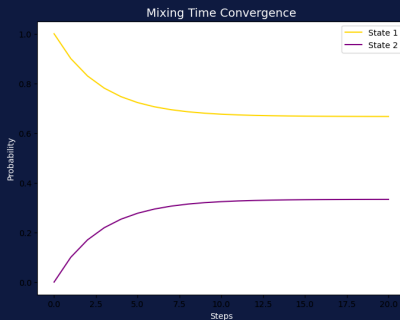- Example: After 20 steps, distribution stabilizes.

Figure: Convergence Over Time

Coupling Method

- Technique to bound mixing times by coupling two chains.
- Example: Chains couple when states align with probability.

- Statistical Physics: Modeling phase transitions.
- Network Analysis: PageRank and random walks.
- Machine Learning: MCMC for sampling.

References

- LEVIN, D. A., PERES, Y., WILMER, E. L. – *Markov Chains and Mixing Times*, American Mathematical Society, 2009.
- Additional resources to be added.