Parallel Metropolis-Hastings Algorithms

Boyan Bejanov
bbejanov@bankofcanada.ca

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1 Title slide

- Parallel Metropolis-Hasting Algorithms
- author info
- course info
- date of presentation

2 Motivation (1 or 2 slides)

- Examples of applications of MCMC and M-H

3 Agenda for today

- Background on Markov chains and M-H
- Parallelization approaches
- Prefetching

4 Markov Chains, definition

- Markovian property
- transition kernels

5 Markov Chains, properties

- ergodicity
- limiting distributions

6 Metropolis-Hastings (2 slides)

- Description of the algorithm

7 Assumptions / Goals

- target distribution is high-dimensional
- computation of target density is the most expensive operation
- chain has long burn-in period
- algorithm is not specific to a narrow class of chains

8 Parallel M-H approaches

- Caveats of multiple independent chains
- Within-draw vs. between-draw parallelization of single chain
- references

9 Parallel M-H approaches (cont'd)

- Independence Metropolis-Hastings
- description
- difficulties: ergodicity problems, feasibility problem
- adaptation
- references

10 Parallel M-H approaches (cont'd)

- Independent tours
- regeneration times: definition, advantages, difficulties
- references

11 Parallel M-H approaches (cont'd)

- Prefetching
- description (general, hand-waiving)
- benefits, caveats
- references

12 The Method of Choice

- Parallel prefetching is the method of choice: explain why?

13 Prefetching

- proper description
- variants: Brockwell 2006, Byrd et. al. 2008, Strid 2010

14 Analysis

- complexity math

15 Analysis (cont'd)

- P-completeness (1-2 slides max)

16 Implementation details

- General remarks (2-3 slides max)

17 Implementation details

- Multicore: Cilk

18 Implementation details

- Multicore: OpenMP

19 Implementation details

- Coarse grained cluster: MPI