



Bookmarks

- ▶ Introduction
- ▶ Part 1: Probability and Inference
- ▼ **Part 2: Inference in Graphical Models**

Week 5: Introduction to Part 2 on Inference in Graphical Models

Week 5: Efficiency in Computer Programs

Exercises due Oct 20, 2016 at 02:30 IST



Week 5: Graphical Models

Exercises due Oct 20, 2016 at 02:30 IST



Week 5: Homework 4

Homework due Oct 20, 2016 at 02:30 IST



Week 6: Inference in Graphical Models - Marginalization

Part 2: Inference in Graphical Models > Week 5: Graphical Models > Trees

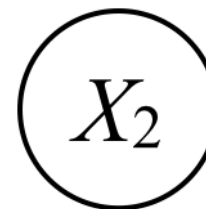
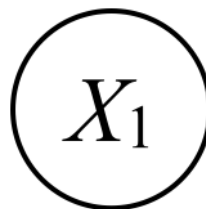
Trees

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TREES

A *tree* is a graph for which there are no loops, and we can reach from any node to any other node (moving along edges in the graph). We'll be seeing trees quite a bit so here are some basics of trees.

Example:



This graph is not a tree since there is no path from X_1 to X_2 .

Example:

Exercises due Oct 27, 2016 at 02:30 IST



Week 6: Special Case: Marginalization in Hidden Markov Models

Exercises due Oct 27, 2016 at 02:30 IST

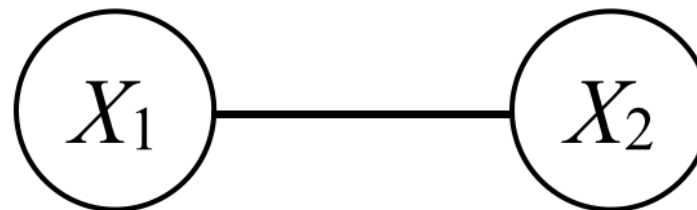


Week 6: Homework 5

Homework due Oct 27, 2016 at 02:30 IST

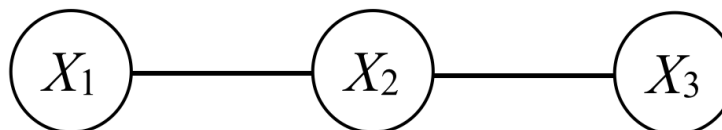


Weeks 6 and 7: Mini-project on Robot Localization (to be posted)



This graph is a tree since there are no loops and we can reach from any node to any other node.

Example:



This graph is a tree since there are no loops and we can reach from any node to any other node.

Theorem: For any graph that has n nodes, if the graph is a tree, then it will always have exactly $n - 1$ edges.

Proof: We use induction.

Base case $n = 1$: There is only 1 node so there are no edges, so the claim clearly holds.

Inductive step: Suppose the claim holds for every tree of size (i.e., number of nodes) up to k . Thus, every tree of size k nodes has $k - 1$ edges. Now consider a tree T with $k + 1$ nodes. Take a leaf node v from T and note that the tree T with v removed is a tree T' of size k , which by the inductive hypothesis has $k - 1$ edges. Since v is a leaf node though, it has exactly 1 neighbor, which means that the tree T has 1 more edge than the tree T' , i.e., T has k edges. This finishes the inductive step. \square



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