UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Probabilistic Models For Decision Making

2122-1-F1801Q127

Aims

The course will provide the main concepts and operative tools, based on computational methods, for representing the learning process and the reasoning techniques in uncertain domains. Students will gain the ability of using the concepts and methods learned for solving practical operational decision problems. In particular, they will acquire the following abilities: to identify relations between parameters by using probabilistic models, to build models for decision making, to evaluate and find the problem solutions.

Contents

Representing uncertainty in decision problems

Knowledge representation in uncertain domains

Bayesian Networks

Pseudo-number generation for sampling

Inference on BN

Probabilistic Reasoning over time

Markov Chains

Hidden Markov Models

Inference in dynamic models

Detailed program

1. "Representing uncertainty in decision problems Basic notions of probability theory Bayes rule and its application". Chapter 13.

   2.1 "Knowledge representation in an uncertain domain Bayesian network semantics; Efficient representation of conditional probabilities". Chapter 14 (14.1, 14.2, 14.3).

   2.2 D-separation (papers & slides)

   2.3 Pseudo-number generation for sampling (papers & slides)

   3. "Exact and approximate inference in Bayesian Networks". Chapter 14 (14.4, 14.5)

   4. "Markov Chains" (papers & slides)

   5. Hidden Markov Models; Forecasting, Filtering and Smoothing ". Chapter 15 (15.1, 15.2 15.3).

Prerequisites

Basic notions of: probability, statistics, linear algebra

The course is in Italian.

Teaching form

Lectures, classroom exercises, lab exercises

Textbook and teaching resource

S. Russel, P. Norvig. “Artificial Intelligence: A Modern Approach", Prentice Hall, III Edizione

papers & slides

Semester

Second Semester

Assessment method

Two exam modalities are possible:

1) Recommended modality for those students attending the course:

Assignments + Written exam + optional oral (4 questions, each with a rating -1 or +1)

Assignments must be delivered no later than the deadline given during the course and will be valid until July 2022.

2) Written Exam + oral (optional)

For more details refer to the document in the introductory section of the course.

Office hours

By appointment

For quick questions, you can send an email to both the instructor and assistant with object : Question MPD - 2122.