

PROBABILISTIC GRAPHICAL MODELS

Paper Code: ETIT-429

Paper: Probabilistic Graphical Models

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INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student probabilistic graphical models, parameter learning, convexity and Bayesian networks.

UNIT-I

Bayesian network, Examples (HMM, diagnostic system, etc.), Separation and independence, Markov properties and minimalism, Markov network, Examples (Boltzmann machine, Markov random field, etc.), Cliques and potentials, Markov properties

[T1, T2, R1][No. of Hrs. 11]

UNIT-II

Exact inference, Complexity, Bucket elimination, Junction tree, Belief propagation (message passing), Application to HMM, Sum- and Max-product algorithms.

[T1, R1][No. of Hrs. 11]

UNIT-III

Parameter learning, Exponential family, Bayesian learning, Expectation-Maximization (EM)

[T1, T2][No. of Hrs. 10]

UNIT-IV

Approximate inference, Convexity, Mean field approach, Structured variational method, Loopy belief propagation, Characterization of solution spaces, Sampling methods.

[T1, T2, R2][No. of Hrs. 10]

Text Books:

- [T1] Bayesian Networks and Beyond by Daphne Koller and Nir Friedman
- [T2] An Introduction to Probabilistic Graphical Models by Michael I. Jordan

Reference Books:

- [R1] Probabilistic Networks and Expert Systems by Cowell, Dawid, Lauritzen, and Spiegelhalter, Springer 1999.
- [R2] Learning in Graphical Models by M. Jordan (editor), MIT Press, 1999.