

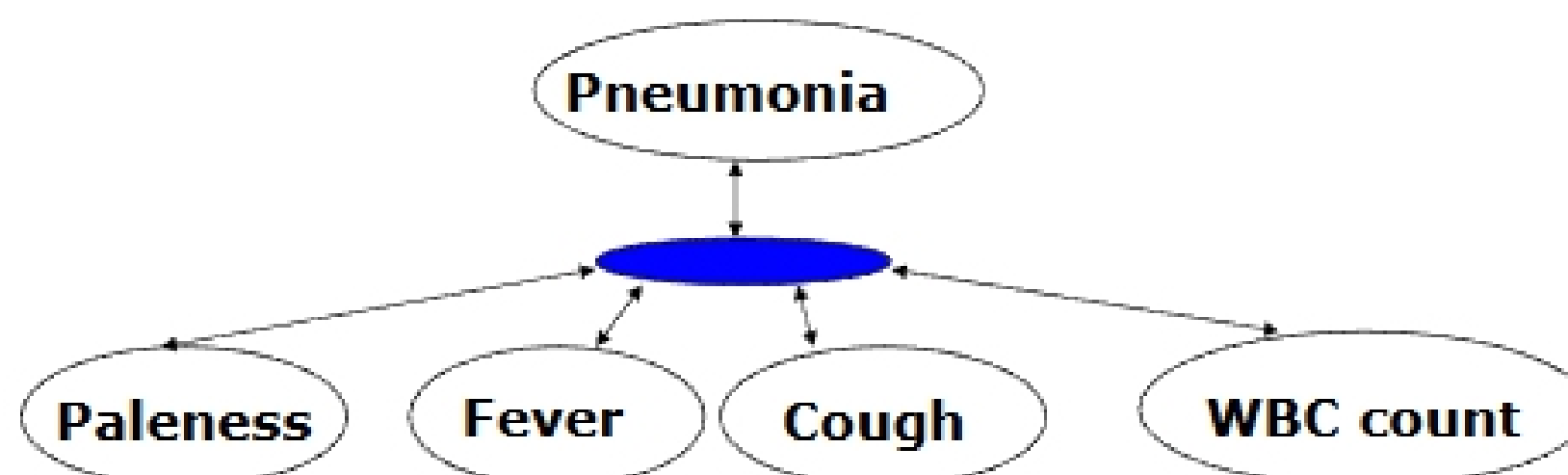
CS 2710 Foundations of AI
Lecture 16

Bayesian belief networks

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Uncertainty

To make diagnostic inference possible we need to represent knowledge (axioms) that relate symptoms and diagnosis

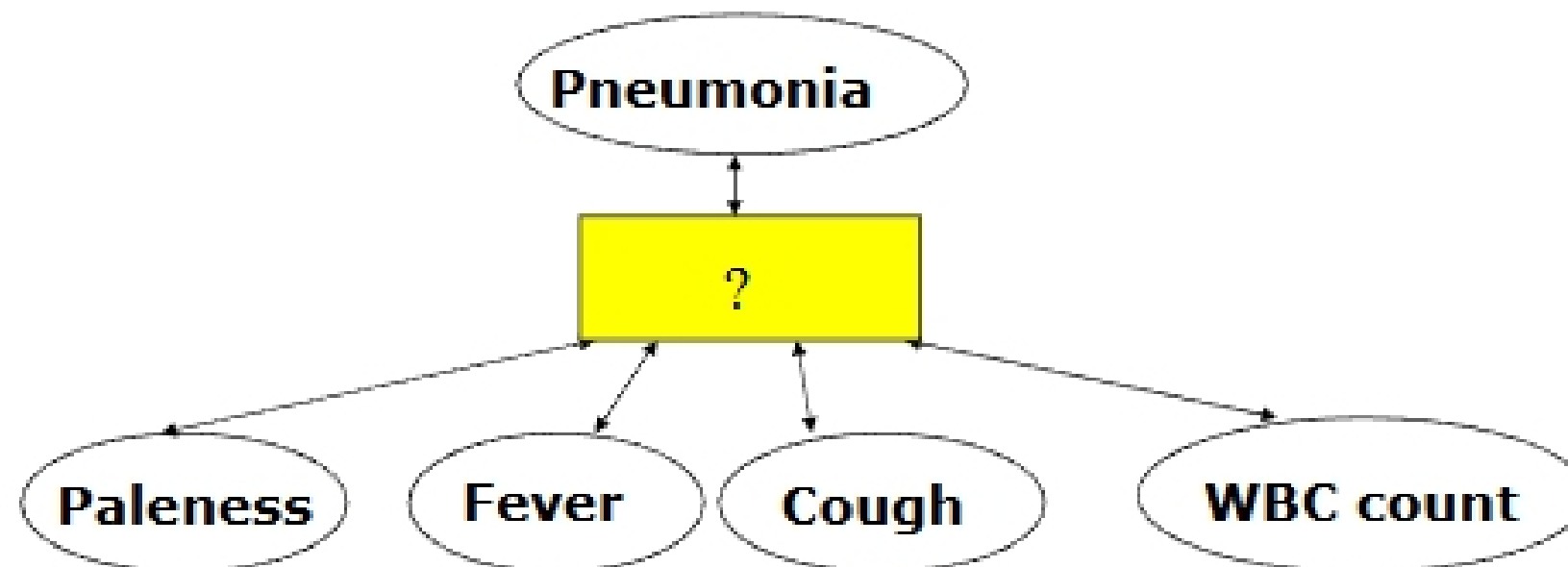


Problem: disease/symptoms relations are not deterministic
– **They are uncertain (or stochastic) and vary from patient to patient**

Modeling the uncertainty.

Key challenges:

- How to represent the relations in the presence of uncertainty?
- How to manipulate such knowledge to make inferences?
 - **Humans can reason with uncertainty.**



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Methods for representing uncertainty

Probability theory

- A well defined theory for modeling and reasoning in the presence of uncertainty
- A natural choice to replace certainty factors

Facts (propositional statements)

- Are represented via **random variables** with two or more values

Example: *Pneumonia* is a random variable

values: *True* and *False*

- Each value can be achieved **with some probability:**

$$P(\text{Pneumonia} = \text{True}) = 0.001$$

$$P(\text{WBCcount} = \text{high}) = 0.005$$

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