Quiz #7. Probabilistic reasoning over time

Describe the core probabilistic model for reasoning about time.

What is the difference between hidden and observable variables?

How is Markov assumption used in the transition model?

Assume that state variable X_t depends on two previous state variables s X_{t-1} and X_{t-2}. Can we encode this transition using dependence just between subsequent states? Hint: state may be described using more variables.

What is the difference between stationary and static process?

Look at example at slide 5. What is the probability of transition Rain = true -> Rain= false?

What are the four typical reasoning tasks solved in probabilistic reasoning over time? Describe them both in words and as formulas.

What type of task are we solving when we looking for the current location?

Assume that you want to translate speech, that you hear, to a sentence. What type of inference task is it?

Assume the model from slide 5 and observation sequence <false, true>. Is it raining today?

Does mixing time mean that after that time, the state will not change?

What is the most like explanation of observation sequence <true, true, false, true, true> at slide 10?

Assume that we do full smoothing, that is we smooth every past variable (think about an efficient method how do it), and for each past variable with select the most probable value. Will we get the most likely explanation of a sequence of observations? Why?

Look at the recursive formula to find the most likely explanation and the formula for message passing (slide 10). Is there any difference? Why can we use message passing as described there?

Explain the difference between Hidden Markov Model and Dynamic Bayesian Network.

Is the model at slide 5, HMM or DBN?

Can every DBN be translated to equivalent HMM?

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How can full joint probability distribution be obtained from a dynamic Bayesian network?

What is the problem if we apply exact inference methods for Bayesian networks to a DBN?

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