

Probabilistic Graphical Models

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Winter 2011-2012

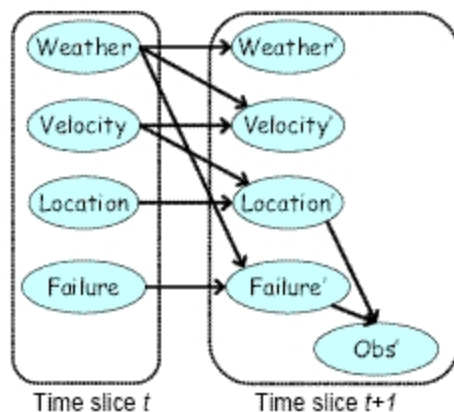
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Feedback — Inference in Temporal Models

You achieved a score of 3.00 out of 3.00

Question 1

Unrolling DBNs. Which independencies hold in the unrolled network for the following 2-TBN for all t ?




(Hint: it may be helpful to draw the unrolled DBN for several slices)

Your Answer	Score	Explanation
<input type="checkbox"/> $(Weather^t \perp Location^t \mid Velocity^t, Obs^{1...t})$	<input checked="" type="checkbox"/> 0.17	One can trace an active path between $Weather^t$ and $Location^t$ in the unrolled DBN.
<input type="checkbox"/> $(Failure^t \perp Location^t \mid Obs^{1...t})$	<input checked="" type="checkbox"/> 0.17	One can trace an active path

			between $Failure^t$ and $Location^t$ due to the active v-structure given by Obs^t
<input type="radio"/> $(Failure^t \perp Velocity^t \mid Obs^{1...t})$		0.17	One can trace an active path between $Failure^t$ and $Velocity^t$ in the unrolled DBN.
<input checked="" type="checkbox"/> $(Weather^t \perp Velocity^t \mid Weather^{(t-1)}, Obs^{1...t})$		0.17	$Weather^t$ is blocked by $Weather^{t-1}$ for all t .
<input type="radio"/> None of these		0.17	Some of the independencies do hold. Perhaps you could try to draw the unrolled DBN and see whether active paths exist between the variables in question.
<input type="radio"/> $(Weather^t \perp Velocity^t \mid Obs^{1...t})$		0.17	One can trace an active path between $Weather^t$ and $Velocity^t$ in the unrolled DBN.
Total		1.00	

Question 2

***Limitations of Inference in DBNs.** What makes inference in DBNs difficult?


Your Answer	Score	Explanation
<input type="radio"/> As t grows large, we generally lose all independencies in the ground network	 0.25	We do indeed lose some independencies, but do we lose all independencies? For instance, consider whether variables in time step $t + 1$ are independent of variables in time step $t - 1$ given those in time step t .

<input type="checkbox"/> Standard clique tree inference cannot be applied to a DBN	✓	0.25	We can apply clique tree inference to a DBN; it just might be slow and undesirable in certain cases.
<input checked="" type="checkbox"/> In many networks, maintaining an exact belief state over the variables requires a full joint distribution over all variables in each time slice	✓	0.25	This is true because we generally lose independencies relating variables in the belief state due to entanglement. Hence, the only way to maintain an exact belief state often requires a full joint distribution.
<input checked="" type="checkbox"/> As t grows large, we generally lose independencies of the form $(X^{(t)} \perp Y^{(t)} \mid Z^{(t)})$	✓	0.25	This is true, and this phenomenon is known as entanglement.
Total		1.00	

Question 3

Entanglement in DBNs. Which of the following are consequences of entanglement in Dynamic Bayesian Networks over discrete variables?

Your Answer	Score	Explanation
<input type="checkbox"/> The belief state <i>never</i> factorizes.	✓ 0.25	This is not a consequence of entanglement; there are some DBNs for which the belief state still factorizes.
<input checked="" type="checkbox"/> The size of an exact representation of the belief state is exponentially large in the number of variables.	✓ 0.25	This is true, since the only way to represent the belief state exactly is to maintain a full joint distribution.
<input type="checkbox"/> The belief state factorizes in the unrolled DBN if the belief state	✓ 0.25	This is not a consequence of entanglement. In fact, even if the belief state factorizes in the 2-

factorizes in the 2-TBN for the DBN.			TBN for the DBN, it is unlikely to factorize in the unrolled network due to entanglement.
<input type="radio"/> All variables in the unrolled DBN become correlated.		0.25	This is not true; only variables in the belief state become correlated.
Total		1.00	