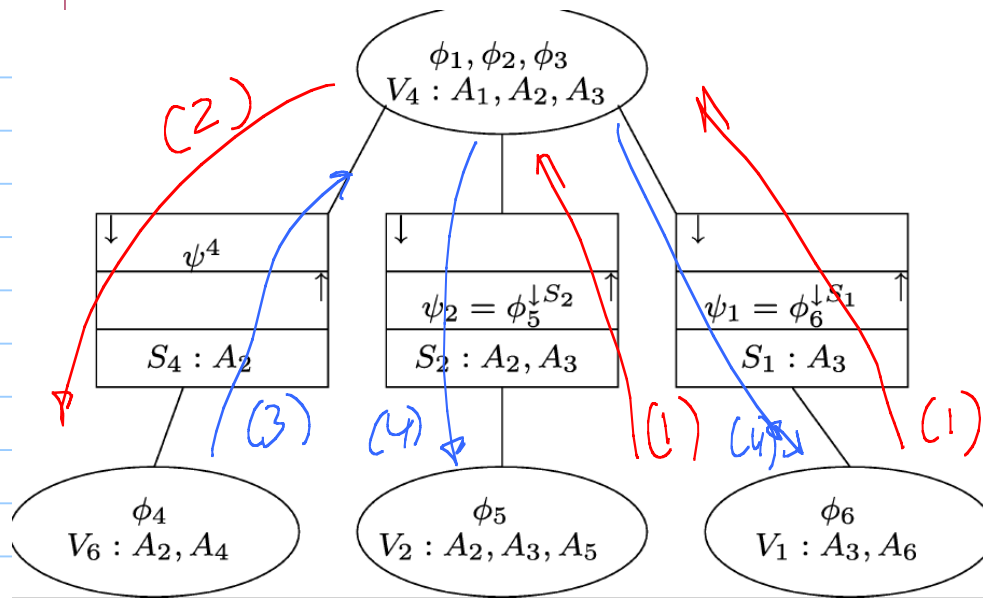


The due date for HW6 is Wednesday, April 1.
(This is a change. You should have received an email about this.)

HW6: please solve Exercise 3.16 by building a BN.



Collect Evidence
(to the virtual root V_6)

$$\varphi_1 = P(A_1)$$

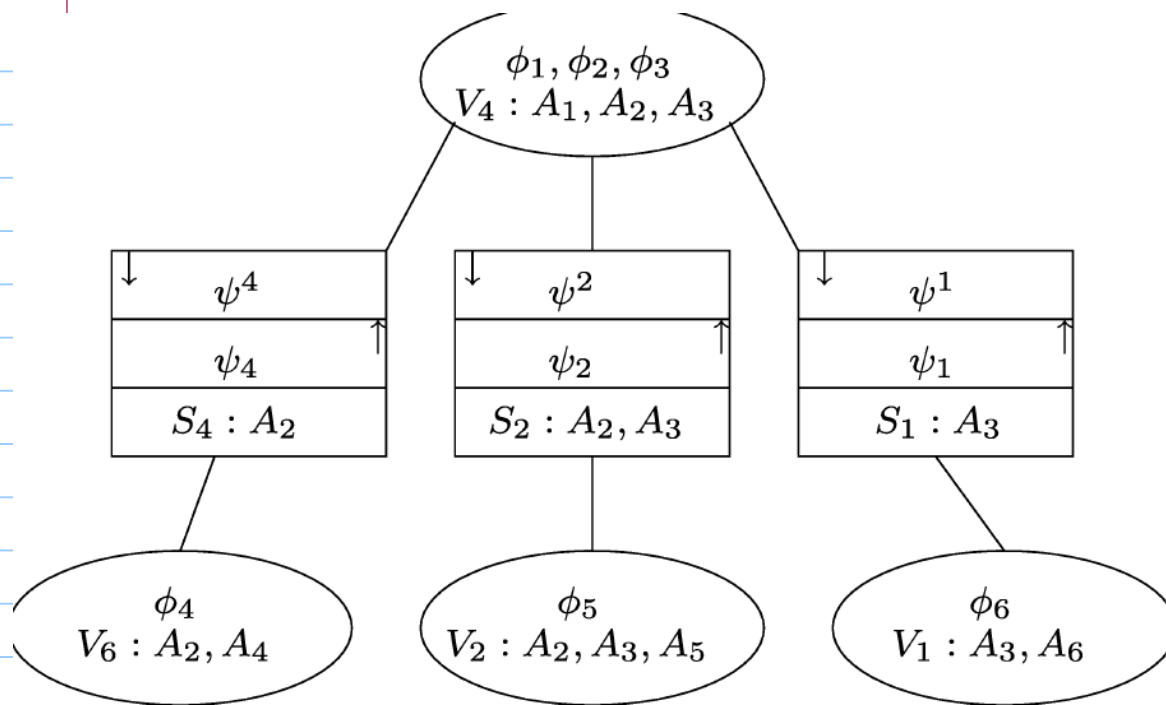
$$\varphi_2 = P(A_2 | A_1)$$

$$\varphi_3 = P(A_3 | A_1)$$

V_4 has sent ψ^4 to V_6 .

$$\psi^4 = \sum_{\substack{A_1, A_3 \\ V_4 \setminus S_4}} \phi_1 \phi_2 \phi_3 \psi_2 \psi_1 =$$

$$= \sum_{A_1} \varphi_1 \varphi_2 \sum_{A_3} \varphi_3 \psi_2 \psi_1$$



comes from V_6

$$\psi_2 = \left\{ \psi_4, \psi_1, \sum_{V_4 \setminus S_2} \varphi_1 \varphi_2 \varphi_3 \right\}$$

comes from $V_1 \{A_1\}$

$$\psi_1 = \left\{ \psi_4, \psi_2, \sum_{A_4 \setminus S_1} \varphi_1 \varphi_2 \varphi_3 \right\}$$

$\{A_1, A_2\}$

$$P(V_2) = \psi_4 \cdot \psi_1 \cdot \left(\sum_{V_4 \setminus S_2} \varphi_1 \varphi_2 \varphi_3 \right) \cdot \varphi_5$$

$$P(A_2) = \sum_{A_3, A_5} P(V_2)$$

Lazy propagation:
 delay the
 multiplications:
 messages are sets of
 functions instead of
 functions obtained
 by multiplication

One can use the separators to compute marginal probabilities. To do so, "multiply" the ^{two} messages in the separator mailboxes.
 Ex. (p. 127): S_3 (which contains A_3 alone)

$$\psi' \psi_1 = \left(\sum_{A_2} \psi_2 \psi_4 \sum_{A_1} \varphi_1 \varphi_2 \varphi_3 \right) \left(\sum_{A_6} \varphi_6 \right) =$$

$\underbrace{\hspace{15em}}_{\psi'}$
 $\underbrace{\hspace{10em}}_{\psi_1}$

$$= \sum_{A_2} \sum_{A_5} \varphi_5 \sum_{A_4} \varphi_4 \sum_{A_1} \varphi_1 \varphi_2 \varphi_3 \sum_{A_6} \varphi_6 =$$

$$= \left(\varphi_5 \varphi_4 \varphi_1 \varphi_2 \varphi_3 \varphi_6 \right) \downarrow^{A_3} = P(A_3)$$