CS146 - Preclass 9.2

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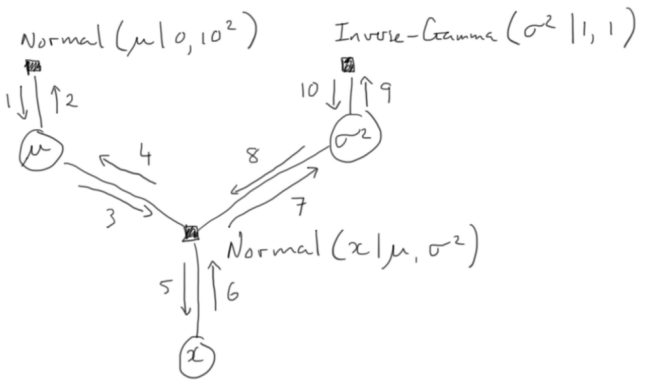
Compute the 10 messages (as numbered on the image) for the sumproduct algorithm in this factor graph, representing the joint distribution



$$\mathrm{p}\left(\mathrm{x},\mu,\sigma^2\right)=\mathrm{Normal}\left(\mathrm{x}|\mu,\sigma^2\right)Normal\left(\mu|0,10^2\right)Inverse-Gamma(\sigma^2|1,1)$$

Tips:

1. Every message is a function of the variable to which or from which it is traveling and only that variable — all other variables get summed or integrated out.
2. Before a message can be calculated and sent out from a node (variable or factor), all other messages must have arrived at that node already.
3. The exceptions are leaf nodes — that is nodes with only 1 edge leaving them — since there are no other messages that need to arrive.
4. You should not compute the messages in the numerical order that you see on the graph. Refer to Tip 2 above.

5. The message along an edge from a variable node to a factor node is the product of all other messages arriving at that variable node from all other factor nodes connected to it.
6. The message along an edge from a factor node to a variable node is the product of the factor node and all other messages arriving at that factor node from all other variable nodes connected to it, and with all other variables summed or integrated out.

Messages:

0.1

$$m_1(\mu) = Normal(\mu|0, 10)$$

0.2

$$m_2(\mu) = m_4(\mu)$$

0.3

$$m_3(\mu) = m_1(\mu)$$

0.4

$$m_4(\mu) = \sum_{\sigma^2} \sum_{x} f(x, \mu, \sigma^2) m_6(x) m_8(\sigma^2)$$

0.5

$$m_5(\mu) = \sum_{\sigma^2} \sum_{\mu} f(x, \mu, \sigma^2) m_3(\mu) m_8(\sigma^2)$$

0.6

$$m_6(x) = Normal(x|\sigma^2, \mu)$$

0.7

$$m_7(\sigma^2) = \sum_{x} \sum_{\mu} f(x, \mu, \sigma^2) m_3(\mu) m_6(x)$$

0.8

$$m_8(\mu) = m_{10}(\mu)$$

0.9

$$m_9(\mu) = m_7(\sigma^2)$$

0.10

$$m_{10}(\mu) = Inverse - Gamma(\sigma^2|1, 1)$$