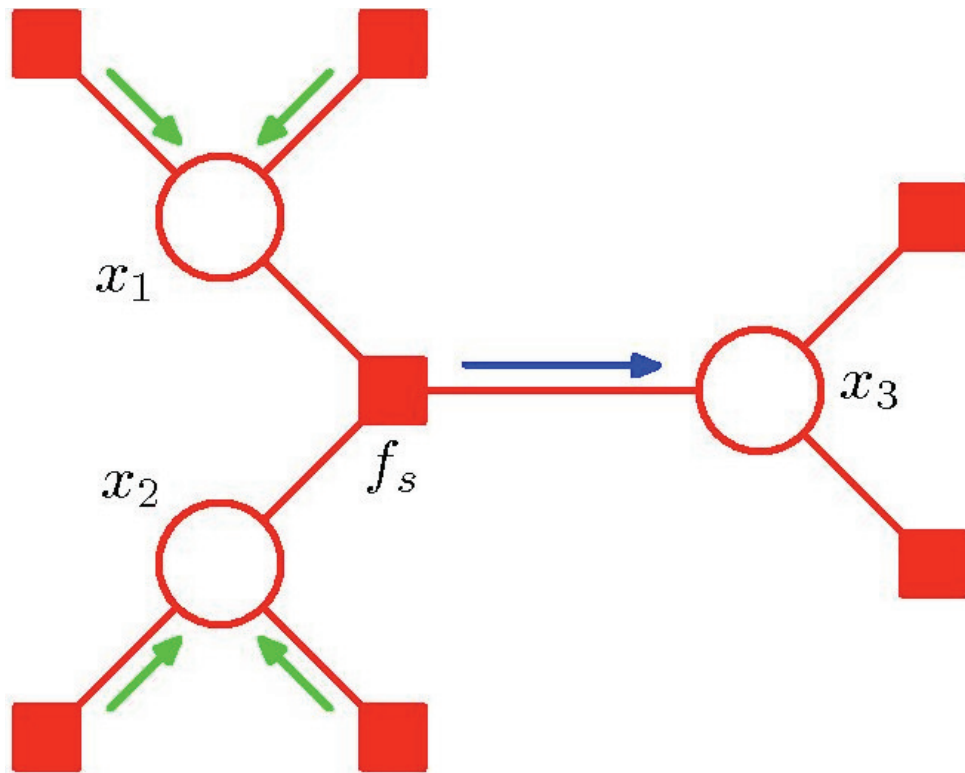• The sum-product algorithm can be viewed in terms of messages sent out by factor nodes to other factor nodes.

The outgoing message (blue) is obtained by taking the product of all the incoming messages (green), multiplying by f_s, and marginalizing other x_1 and x_2.

$$\mu_{x_m \to f_s}(x_m) = \prod_{l \in ne(x_m) \setminus f_s} \mu_{f_l \to x_m}(x_m)$$

$$\mu_{f_s \to x}(x) = \sum_{x_1} ... \sum_{x_M} f_s(x, x_1, ... x_m) \prod_{m \in ne(f_s) \setminus x} \mu_{x_m \to f_s}(x_m)$$