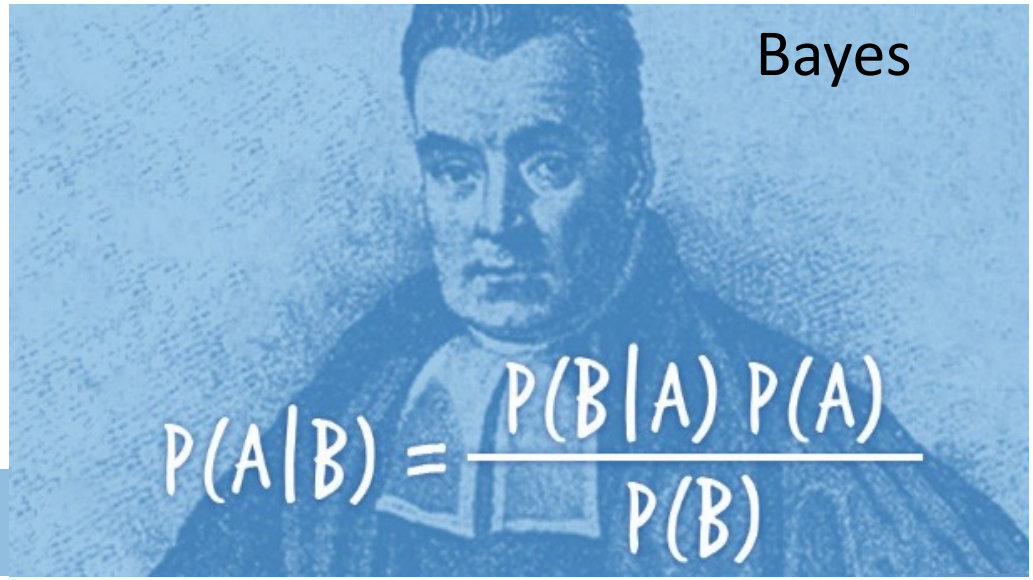
Salmon live in vast, diverse, and dynamic environments. They are difficult to detect. The solution to the "forecasting problem" may not be better forecast math, but better means of coping with uncertainty.

Decision-making

Table 1. Marginal probabilities of three levels of abundance and uncertainty in the forecast of abundance.

		Marginal Probability	Forecast		
			Low	Medium	High
Abundance	Low	0.3	0.6	0.3	0.1
	Medium	0.4	0.2	0.6	0.2
	High	0.3	0.1	0.3	0.6

This year's forecast is *High*. What is the probability that the abundance is actually *Low?*



$$\boldsymbol{P(Abundance = L|Forecast = H) = \frac{P\,(Forecast{=}H|Abundance{=}L)P(Abundnace{=}L)}{P(Forecast{=}H)}}$$

$$\boldsymbol{= \frac{0.1*0.3}{0.1*0.3+0.2*0.4+0.6*0.3} = 0.103}$$

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	High	0.3	0.1	0.3	0.6

This year's forecast is *High*. What harvest rate should be implemented?

Table 2. Utilities reaped by a decision maker under all possible combinations of abundance and harvest decisions.

		Abundance: Low	Abundance: Medium	Abundance: High
Harvest	Low	80	40	10
	Medium	30	80	80
	High	0	30	100

Expected utility low harvest= $p(low) * 80 + p(med) * 40 + high(10)$

Expected utility med harvest= $p(low) * 30 + p(med) * 80 + high(80)$

Expected utility high harvest= $p(low) * 0 \ + p(med) * 30 + high(100)$

} Choose max

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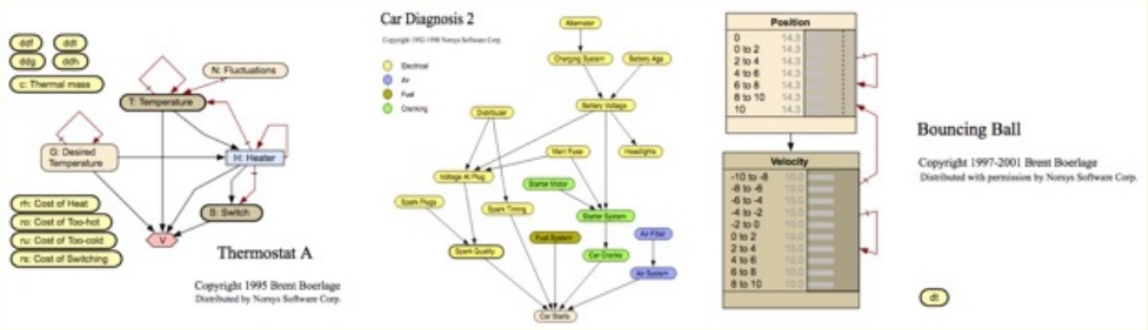

Netica is a powerful, easy-to-use, complete program for working with **belief networks** and influence diagrams. It has an intuitive and smooth user interface for drawing the networks, and the relationships between variables may be entered as individual probabilities, in the form of equations, or learned from data files (which may be in ordinary tab-delimited form and have "missing data").

Once a network is created, the knowledge it contains can be transferred to other networks by cutting and pasting, or saved in modular form by creating a library of nodes with disconnected links. Of course, the networks and libraries may be saved in files or printed out.