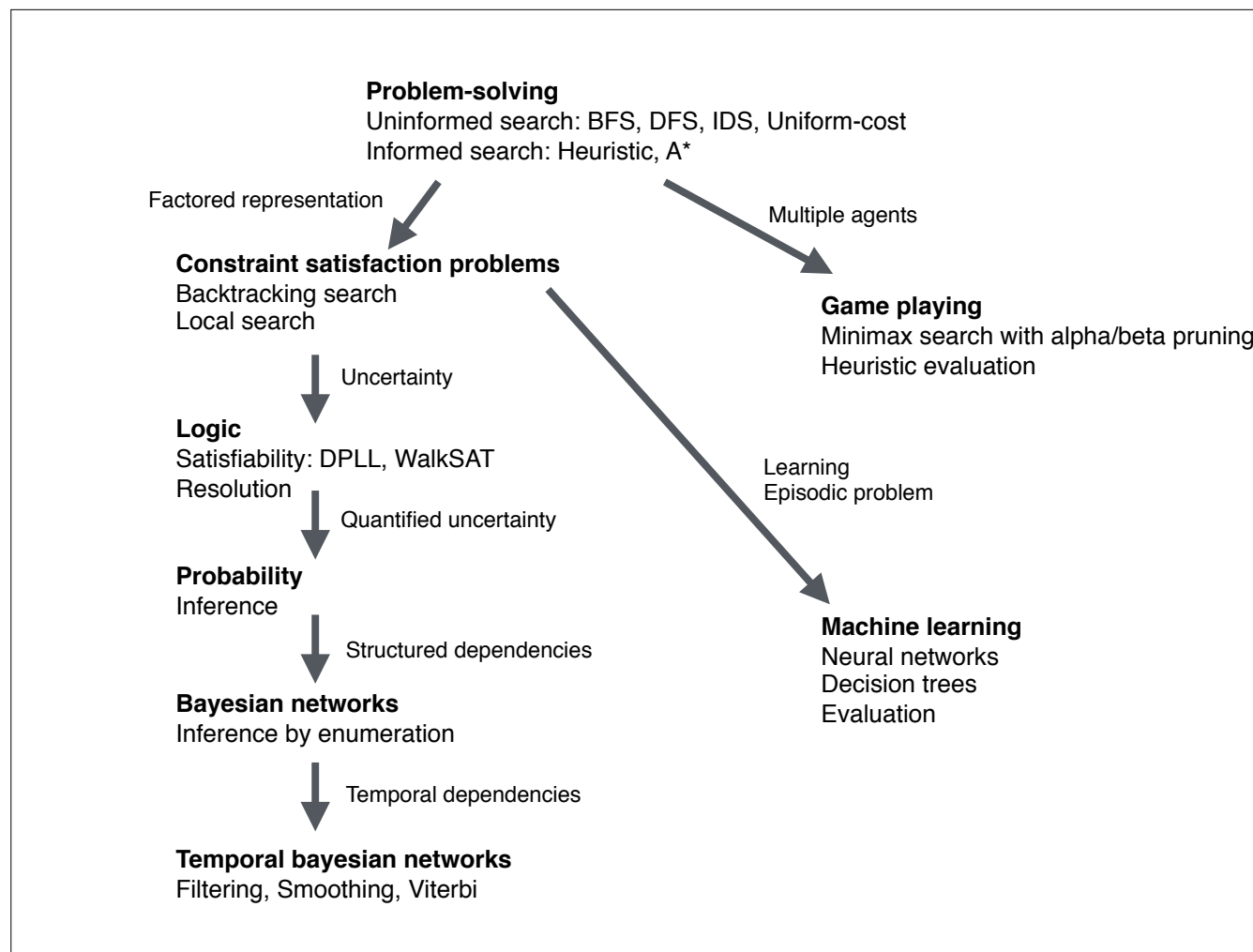




Where to learn more

Machine learning

CMPT 726: Machine learning

CMPT 727: Statistical ML

CMPT 728: Deep learning

Reinforcement learning

Optimization and planning

Convex optimization

CMPT 827: Intelligent systems

Robotics

Computational logic

Applications

CMPT 762: Vision

CMPT 825: Natural language processing

Speech processing

Health: medical imaging, diagnosis, electronic health records

Biology: genomics, chemistry,

CMPT 441: Bioinformatics algorithms

Smart cities

Smoothing

Entailment

Proof by contradiction: $KB + \alpha \models F$

Two ways to prove contradiction: (1) resolution; (2) satisfiability.

alarm $\Rightarrow$ earthquake $\vee$ burglar

-earthquake

alarm

prove: burglar

Question 1

Design a neural network that implements the XOR function. That is, define neurons, their connectivity and weights. Use threshold as your activation function (that is, the function that returns 0 or 1 if the input is negative or positive respectively).

Extra challenge: do so using the fewest number of hidden neurons.

Question 2

Imagine you have defined a neural network using the identity activation function; that is, $g(x) = x$. Suppose the network has one hidden layer with 3 neurons, which is fully connected to the input. Write the expression for a_{out} as a function of the input. Show that you can express the same network as a single-layer perceptron. What does this tell you about the expressive power of a multi-layer neural network with the identity activation function?

$$a_2 = W_{12} a_1$$

$$a_{\text{out}} = W_{23} a_2 = W_{23} * W_{12} * a_1$$

Equivalently, we could remove the hidden layer and use a perceptron with weights $(W_{23} * W_{12})$