T-79.5102 **Autumn 2006**
Special Course in Computational Logic
Tutorial 11

1. Apply the CURRENT-BEST-LEARNING algorithm to the set of examples given in the restaurant example:

Example	Attributes										Goal
	Alt	*Bar*	*Fri*	*Hun*	*Pat*	*Price*	*Rain*	*Res*	*Type*	*Est*	*WillWait*
X_1	*Yes*	*No*	*No*	*Yes*	*Some*	*$$$*	*No*	*Yes*	*French*	*0–10*	*Yes*
X_2	*Yes*	*No*	*No*	*Yes*	*Full*	*$*	*No*	*No*	*Thai*	*30–60*	*No*
X_3	*No*	*Yes*	*No*	*No*	*Some*	*$*	*No*	*No*	*Burger*	*0–10*	*Yes*
X_4	*Yes*	*No*	*Yes*	*Yes*	*Full*	*$*	*No*	*No*	*Thai*	*10–30*	*Yes*
X_5	*Yes*	*No*	*Yes*	*No*	*Full*	*$$$*	*No*	*Yes*	*French*	*>60*	*No*
X_6	*No*	*Yes*	*No*	*Yes*	*Some*	*$$*	*Yes*	*Yes*	*Italian*	*0–10*	*Yes*
X_7	*No*	*Yes*	*No*	*No*	*None*	*$*	*Yes*	*No*	*Burger*	*0–10*	*No*
X_8	*No*	*No*	*No*	*Yes*	*Some*	*$$*	*Yes*	*Yes*	*Thai*	*0–10*	*Yes*
X_9	*No*	*Yes*	*Yes*	*No*	*Full*	*$*	*Yes*	*No*	*Burger*	*>60*	*No*
X_{10}	*Yes*	*Yes*	*Yes*	*Yes*	*Full*	*$$$*	*No*	*Yes*	*Italian*	*10–30*	*No*
X_{11}	*No*	*No*	*No*	*No*	*None*	*$*	*No*	*No*	*Thai*	*0–10*	*No*
X_{12}	*Yes*	*Yes*	*Yes*	*Yes*	*Full*	*$*	*No*	*No*	*Burger*	*30–60*	*Yes*

Use the following first hypotheses:

(a) $\forall x(\mathit{WillWait}(x) \leftrightarrow \mathit{Hun}(x))$

(b) $\forall x(\mathit{WillWait}(x) \leftrightarrow \mathit{Est}(x, \mathit{30–60}))$

2. Our favorite *Surprise* candy comes in two flavors, cherry and lime, but they are wrapped in an indistinguishable way. The candy is sold in large (indistinguishable) bags containing various mixtures of the two flavors:

(a) 100% cherry

(b) 75% cherry and 25% lime

(c) 50% cherry and 50% lime

(d) 25% cherry and 75% lime

(e) 100% lime

Suppose that we open a new bag of candy and unwrap 4 pieces out of which three turn out to be cherry-flavored. The mixtures above can be interpreted as hypotheses h_1–h_5 about the contents of the bag.

(a) Which one is the most likely (ML) hypothesis?

(b) Suppose that the prior distribution of the bags is

$$\langle 0.1, 0.1, 0.1, 0.6, 0.1 \rangle.$$

Find out the maximum a posteriori (MAP) hypothesis.

(c) Estimate the probability that the fifth piece of candy is lime-flavored.