T-61.3050 PROBLEMS 3/2007

In T1 on 28 September 2007 at 10 o'clock.

You should solve the problems before the problem session and give the solved problems to the assistant. Please write clearly and leave a wide (left or right) margin. The solutions should be stapled together **with a cover sheet** containing your name, student number and the numbers of problems you have solved.

For the problems where a "correct" solution exists (math and algorithm questions) the assistant will present one possible solution during the session. In some cases the questions do not have a single correct answer, but the idea is that you think about the problem and are prepared to discuss it with the assistant and other students during the session.

See `http://www.cis.hut.fi/Opinnot/T-61.3050/2007/problems` for up-to-date information of the problem session.

This problem sheet has two pages.

1. (Alpaydin (2004) Ch 3, Exercise 3) In a two-class, two-action problem, if the loss function is $\lambda_{11} = \lambda_{22} = 0$, $\lambda_{12} = 10$ and $\lambda_{21} = 1$, write the optimal decision rule.

2. (Alpaydin (2004) Ch 3, Exercise 5) In figure 3.4, calculate $P(C \mid W)$. (Hint: The images of Alpaydin (2004) are also available from the book's web site at `http://www.cmpe.boun.edu.tr/~ethem/i2ml/`)

3. Download the SHUTTLE and discretized ADULT data sets from the course web site at
   `http://www.cis.hut.fi/Opinnot/T-61.3050/2007/problems#3`
   and study their descriptions. Create Bayesian networks from the data sets using *Bene* (Silander et al. 2006) at
   `http://b-course.hiit.fi/bene`

   (a) Try different prior parameters ("ESS"). What changes?

   (b) Write down joint probability distributions that correspond to (one of) the resulting Bayesian networks. How could you learn the probabilities, given the data sets?

   (c) When should shuttle autolander be used?

   (d) Describe some interesting fact with the help of the Bayesian network from the ADULT data set.

Reference for Problem 3: Silander T, Myllymäki P (2006) A Simple Optimal Approach for Finding the Globally Optimal Bayesian Network Structure. In Proc 22nd Annual Conference on Uncertainty in Artificial Intelligence (UAI'06).
`http://cosco.hiit.fi/Articles/uai06.pdf`