OULUN YLIOPISTO
Tietotekniikan osasto
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1. *Structure of Pattern Recognition Systems*

   In general, a pattern recognition system can be partitioned into several components. Describe what kinds of components there usually are and what the tasks of these components are! (6p)

2. *Evaluation of Classifiers*

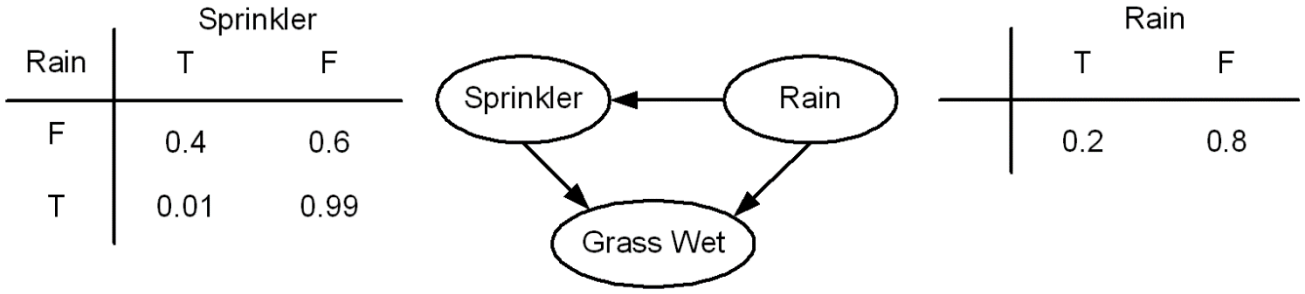
   Explain in detail what kinds of methods are typically used to evaluate the performance of a classifier! (6p)

3. *Bayes nets*

   Figure 1 below shows a Bayes net and the corresponding conditional and a priori probabilities. The net is a simplified model describing the causal relations between the wetness of the grass, the sprinkler irrigation and the rain.

   a) Derive/simplify the joint probability mass function of the net! (1p)

   b) Calculate the probability that it rains (Rain = True) when it is known that the grass is wet (Grass Wet = True)! (5p)



Rain	Sprinkler T	Sprinkler F
F	0.4	0.6
T	0.01	0.99

Rain T	Rain F
0.2	0.8

Sprinkler	Rain	Grass Wet T	Grass Wet F
F	F	0.0	1.0
F	T	0.8	0.2
T	F	0.9	0.1
T	T	0.99	0.01

Figure 1. Bayes net for question 3.

4. *Nearest-neighbor-classifier*

Figure 2 below shows a data set with 14 samples from two different classes (+ and –). Each sample is described by two real valued features (x_1 and x_2) that attain values in range from zero to ten. You are using a nearest-neighbor classifier with Euclidean distance metric and the given learning data set.

a) Sketch the decision boundary on the image! (4p)

b) What is the accuracy of the classifier on this data? (1p)

c) What is the answer to question b) if you use leave-one-out cross validation? (1p)

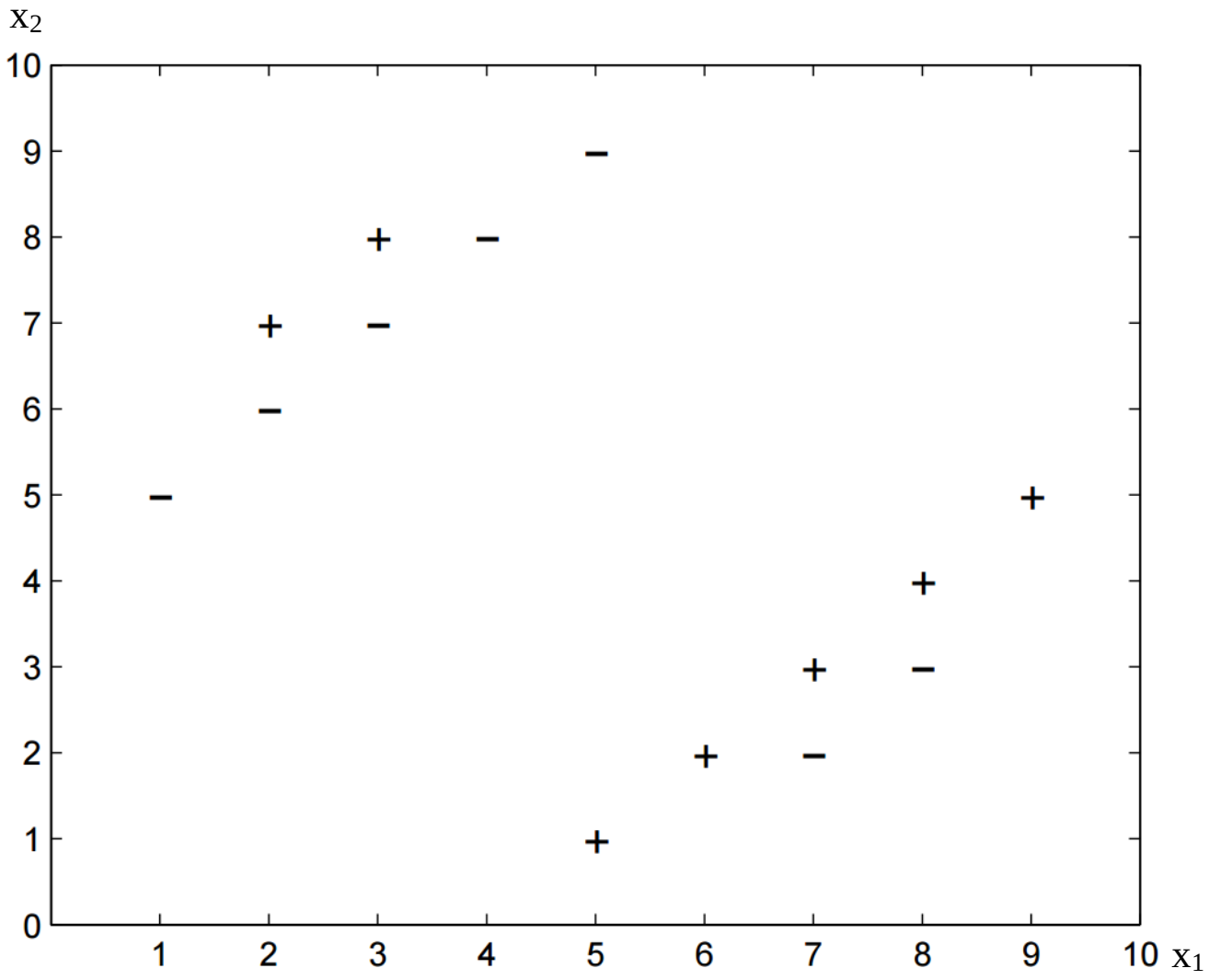


Figure 2. Data set for question 4.