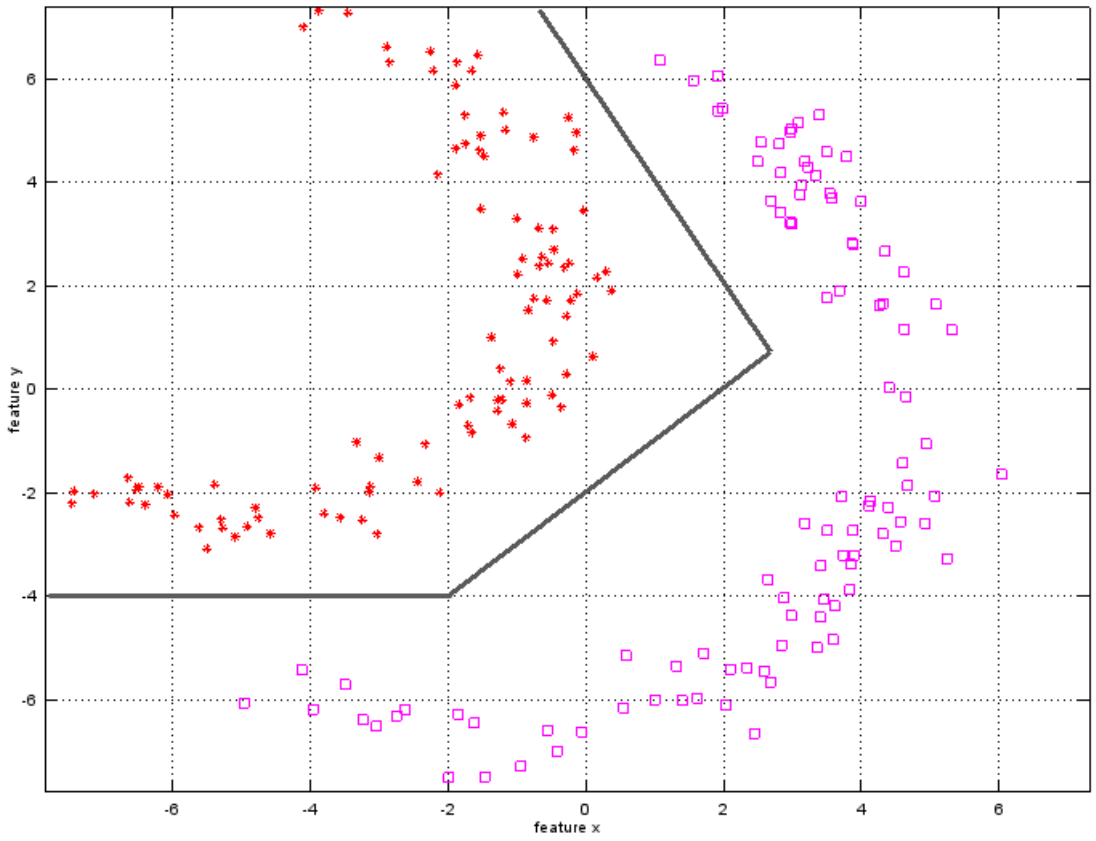
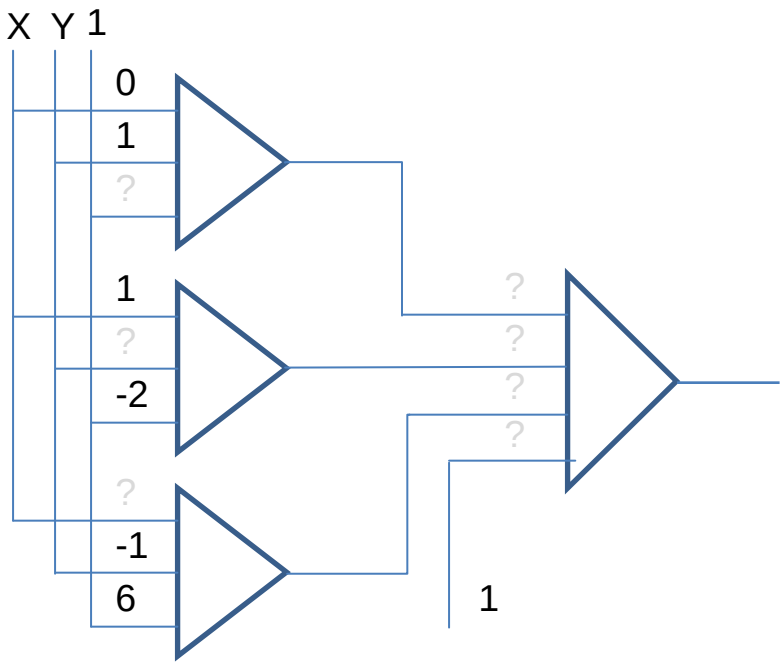
1	2	3	4	5	6	Σ

EPART winter 2017/2018 16.01.2018
Test #2 (max. = 33)

.....

1. (6 pts) The neural network is supposed to give boundary decision between classes depicted in the diagram below. Please fill in missing neuron's weights in the net schema at the bottom of the page. The network should produce 1 for '*' class. Neurons have binary unipolar activation function (i.e. their output is 0 or 1).

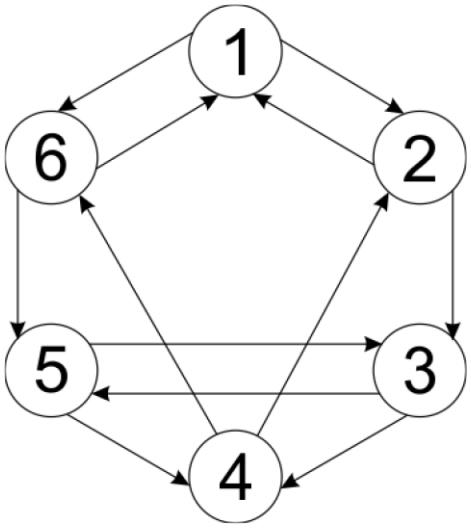




2. (3 pts) How many weights has a standard (fully connected) network, which in the only hidden layer has H=50 neurons, classifies C=7 objects' classes represented by F=40 features?

$$W_{cnt} = \ldots\ldots\ldots\ldots\ldots\ldots$$

3. (8 pts) The diagram below shows possible transitions between states in a Markov process. Initial state probability vector is known: π = [0.3 0.1 0.1 0.3 0.1 0.1].



$$A = \begin{bmatrix} - & - & - & - & - & - \\ - & - & - & - & - & - \\ - & - & - & - & - & - \\ - & - & - & - & - & - \\ - & - & - & - & - & - \\ - & - & - & - & - & - \end{bmatrix}$$

$$P_{cnt} = \ldots\ldots\ldots\ldots\ldots\ldots$$

(a – 3 pts) Fill in the matrix above known values of state transition probabilities. Let's assume that A(*row*, *col*) contains probability of the transition from the state *row* to the state *col*.

(b – 2 pts) How many parameters P_{cnt} of such a process (model) must be computed assuming $N = 6$ states and $K = 5$ different observations?

(c – 3 pts) What improvements can be implemented in *forward* procedure for such a state transition matrix?

4. (3 pts) Please fill in good suffix array of Boyer-Moore algorithm for **ALLELLE** pattern.

0	1	2	3	4	5	6	7

……

5. (7 pts) Below you can see text buffer which should be indexed for memory efficient and quick searching:

S	E	H	E	N	S	W	U	R	D	I	G	K	E	I	T
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

(a – 3 pts) Fill in suffix array for such a text buffer; in the array cell index of the beginning of the suffix in the text buffer should be entered.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

(b – 4 pts) Propose an algorithm for exact pattern search using suffix array.

6. (4 pts) Sketch the decision tree optimizing average number of test performed during classification of 6 classes A..F which have known *a priori* probabilities: $P_A = 0.4$, $P_B = 0.15$, $P_C = 0.15$, $P_D = 0.15$, $P_E = 0.1$, $P_F = 0.05$. We are happy because there exist tests separating any subset of classes from the rest of the training set.

   (2 pts) What is the average number of tests performed during the classification with the above tree?.

$T_{avg} =$……..