Tutorial 3 in Cognitive Systems

1. Describe the **Hebbian Learning Rule**. For this, give the rule
   - in word form (*short* and *long* version),
   - as an equation, and
   - as a graphic.
2. How does a network node look like which is able to realise the Hebbian Learning Rule?
3. Explain the meaning of the **"100-Steps Rule"**.
4. We will deal with the description of structure and also with the generation of new rules.
   (a) In analogy to the lecture, create a description of the object **"stair"**!
   (b) Visualise the process of generation, too.
5. A concept-graph is a possibility to present knowledge. Rectangles represents the concepts and ellipses the corresponding relations. The $*$ is a generic marker for unspecific instances.
   Please give the corresponding conceptual graph of the following statements:
   (a) The cat sits on the tree.
   (b) Carl gave a bagel to John.
   (c) Paul fells the tree with his axe.
   (d) The dog scratches behind one's ear with his paw.
6. A calculation-tree is another possibility to represent mathematical expressions. Variables and numbers are the leaves of such a tree. The corresponding mathematical symbols are visualised in the inner nodes.
   Generate the corresponding calculation-trees of the following expressions:
   (a) $7 + 4$
   (b) $(a \cdot b) + (2 \cdot c)$
   (c) $a^2 + b^2 = c^2$
   (d) $((\neg a \wedge (\neg b \vee c)) \vee (a \wedge c \vee d \wedge b)) \wedge \neg e$