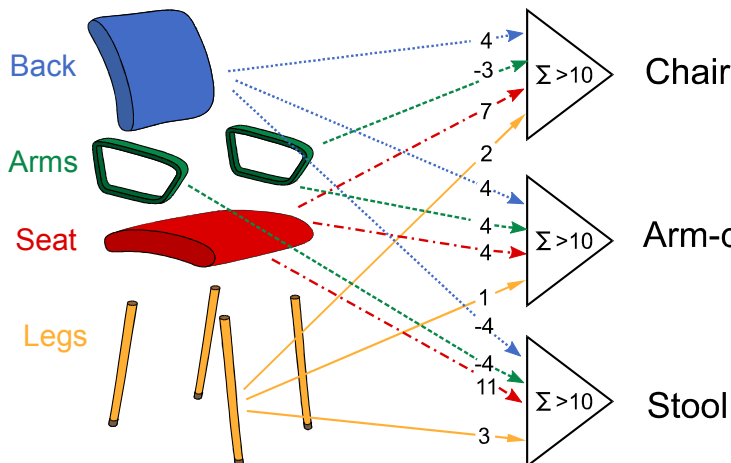


2015-RU-01-EN A chair or an armchair?

0 ----	I: ----	II: ----	III: ----	IV: ----
<input type="checkbox"/> ALG	<input type="checkbox"/> INF	<input type="checkbox"/> STRUC	<input type="checkbox"/> PUZ	<input type="checkbox"/> SOC
				<input type="checkbox"/> USE

Answer Type: Multiple Choice Mandatory for: none

Body



The Beaver Research Center for Artificial Indolence has devised a recognition system for resting furniture based on 3 "neurons", which consider the parts the object has, by summing up points (accordingly to the numbers shown in the left picture) if it has a back, arms, a seat, or legs. Neurons recognizes *chairs*, *arm-chairs*, or *stools* when for one of the neurons the sum exceeded



10, and for others it is less or equal than 10.

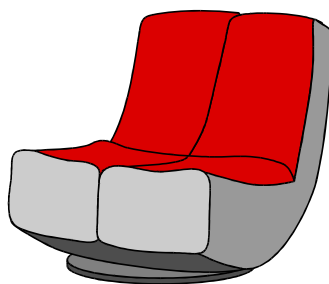
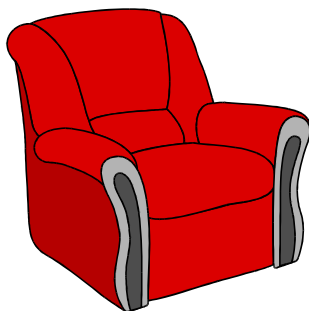
For example, the object on the right has a back, no arms, a seat and legs and gives 13 points on first neuron, 9 on the second and 10 on the third. Therefore it will be recognized as a "chair".

Question

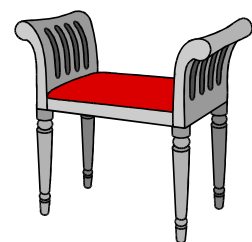
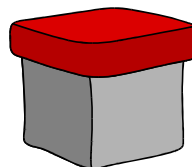
(back,arms,seat)

(back,seat)

(arms, seat, legs)



(seat)



Which of the following object will NOT be recognized by the recognition system?

Answer

Explanation

Correct answer: the last object on the right.

The first object has the following attributes: back, arms, seat and no legs.

Weights for different types of species will be:

chair $\rightarrow 4-3+7=8$, **arm-chair** $\rightarrow 4+4+4=12$, stool $\rightarrow -4-4+11=3$
therefore it will be recognized as arm-chair.

The last object has attributes: arms, seat and legs.

Weights for different types of chairs will be:

chair $\rightarrow -3+7+2=6$, arm-chair $\rightarrow 4+4+1=9$, stool $\rightarrow -4+11+3=10$
therefore no one of alternatives is appropriate for such types of chair.

For other two species weights will be:

chair $\rightarrow 4+7=11$, arm-chair $\rightarrow 4+4=8$, stool $\rightarrow -4+11=7$

chair $\rightarrow 2$, arm-chair $\rightarrow 4$, **stool** $\rightarrow 11$

It's informatics

The recognition of objects as members of a class of items is not an easy task. What is a “rose” after all? The *features* relevant to tell a rose from a pig are not necessarily the same useful to distinguish roses and tulips: the recognition is much simpler if the set of objects to recognize is fixed in advance. This simplified problem is called *classification*. In the task the system is designed to classify any object in one of four categories: chairs, arm-chairs, stools, or others. The *neurons* are simple components that compute a sum and *activate* themselves if the result is greater than a threshold (and indeed this trivial model is surprisingly similar on what biologists actually know about brain neurons!): the numbers they sum are sometimes called the *weights* of the inputs since they establish how important is each single feature in the classification task. For example, having a seat is a very important feature in stools, and legs are almost irrelevant for arm-chairs. All in all, a neuron is a compact way to state an otherwise complex rule: since all the inputs are just binary (true/false) properties, you can see that by writing a table with all the possibilities. For the “Chair” neuron:

	<i>Back</i>	<i>Arms</i>	<i>Seat</i>	<i>Legs</i>	<i>Sum</i>	<i>Classification</i>
weights		4	-3	7	2	
	0	0	0	0	0	0 Other
	0	0	0	0	1	2 Other
	0	0	1	1	0	7 Other
	0	0	1	1	1	9 Other
	0	1	0	0	0	-3 Other
	0	1	0	0	1	-1 Other
	0	1	1	1	0	4 Other
	0	1	1	1	1	6 Other
	1	0	0	0	0	4 Other
	1	0	0	0	1	6 Other
	1	0	1	1	0	11 Chair
	1	0	1	1	1	13 Chair
	1	1	0	0	0	1 Other
	1	1	0	0	1	3 Other
	1	1	1	1	0	8 Other
	1	1	1	1	1	10 Other

Thus, the “Chair” neuron recognizes objects as chairs only if they have Back, Seat, no Arms, and, optionally, legs.

Keywords

Classification, neural networks, perceptrons.

Websites

http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html

Internal Use

Wording

List of word used to name important things in the task body (concepts, definitions, objects, names, etc.) *This is to ensure the consequent use of terms in the task body and facilitates translation.*

Comments

Ilya Posov, iposov@gmail.com, 2015-05-25, changed almost all graphics to self-drawn
Mattia Monga, monga@di.unimi.it, 2015-05-26, changed text and graphics. It'informatics and keywords.

Graphics

All graphics is self-drawn (by painter Anya Vasilkova), except the small black chair at the bottom right of the statement, it is from openclipart.org

Files

All additional files for this task (graphics, scripts, etc.)
2015-RU-01-EN.odt (this file)
2015-RU-01-EN.svg (inkscape sources)
2015-RU-01-EN-Black-and-White.svg (the black and white variant of images)
2015-RU-01-EN-wooden-chair-viyana.svg (the wooden chair to the bottom right of the statement)

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