

Aula Prática 9

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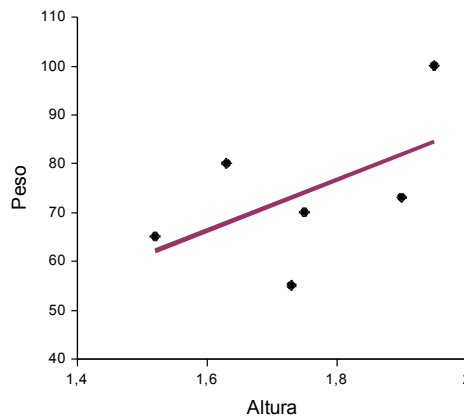
Data: 02/12/2011

1. Knowledge representation

- a. Consider the following table. Using a spreadsheet, create a 2D plot with these values.

Individual	1	2	3	4	5	6
Height (m)	1,75	1,90	1,52	1,63	1,95	1,73
Weight (kg)	70	73	65	80	100	55

- b. By observing the plot, can you identify which people can be considered fat? Or thin?



- c. Formalize this ‘pattern recognition’ by creating a *Rule* (pair *condition-action*) for each of these two situations.
- d. Apply your new rule to the previous individuals, by filling out the following table. (*Rule A: Fat / Not fat; Rule B: Thin/ Not thin*)

Individual	1	2	3	4	5	6
Rule A						
Rule B						

- e. Consider this new table. Mentally classify each individual as either *fat*, *thin* or *normal*. Apply the rules created in question c). Are results similar?

Individual	7	8	9	10
Height (m)	1,72	2,05	1,67	1,82
Weight (kg)	85	95	65	61
Manual classification				
Automatic classification				

2. **Statistical Pattern Recognition**

- a. Consider that you have created an algorithm that segments circular objects from a black and white image. Your goal is to identify if these circles correspond to dark or light balls. By manually classifying the various images you have obtained the following results:

Dark balls	1	2	3	4	5	6	7	8	9	10
Average luminosity	10	55	152	34	175	101	77	163	44	95

Light balls	1	2	3	4	5	6	7	8	9	10
Average luminosity	230	243	180	134	244	153	180	175	220	215

- b. Calculate the mean and standard deviation of the luminosity distribution for each class.

Class	Mean	Standard-deviation
A: Dark balls		
B: Light balls		

- c. Assume that each class has a Gaussian distribution. Use the *probability density function* to decide if: “the ball is dark” or “the ball is light” for the new set of balls described in the table below.

$$Gauss_{pdf} = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(x - \mu)^2}{2\sigma^2}\right)$$

Balls	1	2	3	4	5	6	7	8	9	10
Average luminosity	90	145	133	132	146	223	252	204	78	195
Decision										

- d. The correct result is described on the table below. (*L-Light, D-Dark*). Compare this to the results of your automatic classifier and estimate the *accuracy* of the results.

Balls	1	2	3	4	5	6	7	8	9	10
Result	D	D	L	D	L	L	L	L	D	D

$$Accuracy = \frac{Nr. Correct Classifications}{Nr. Total Classifications}$$

3. **Machine learning**

- a. In order to learn more about some of these methods, read the excellent tutorials from this repository: <http://www.autonlab.org/tutorials/>