

Q1) Would you expect the following pairs of random variables to be uncorrelated, positively correlated, or negatively correlated?

- (a) The weight of a new car and its price.
- (b) The weight of a car and the number of seats in it.
- (c) The age in years of a second-hand car and its current market value.

Q2) Roughly sketch the shapes of the following Gaussians $N(\mu; \Sigma)$. For each, you only need to show a representative contour line which is qualitatively accurate (has approximately the right orientation, for instance).

a) $\mu = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ and $\Sigma = \begin{pmatrix} 9 & 0 \\ 0 & 1 \end{pmatrix}$

b) $\mu = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$ and $\Sigma = \begin{pmatrix} 1 & -0.75 \\ -0.75 & 1 \end{pmatrix}$

Q3) Consider the linear classifier $\omega \cdot x \geq \theta$, where

$$\omega = \begin{pmatrix} -3 \\ 4 \end{pmatrix} \text{ and } \theta = 12$$

Sketch the decision boundary in \mathbb{R}^2 . Make sure to label precisely where the boundary intersects the coordinate axes, and also indicate which side of the boundary is the positive side.