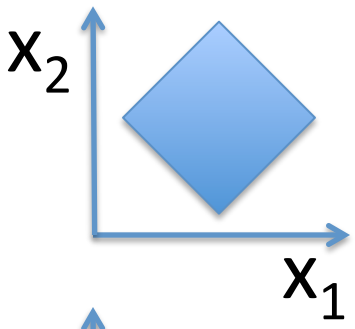
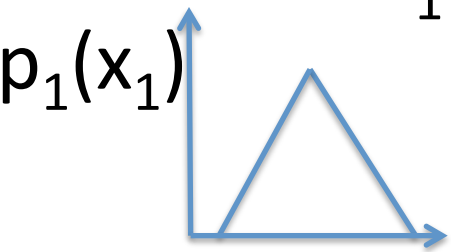
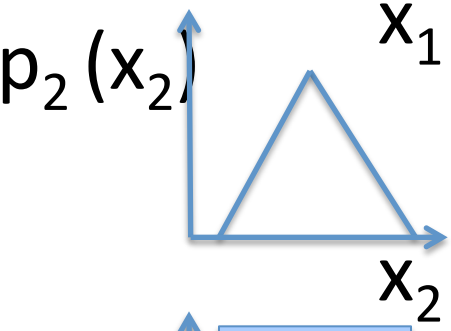
Covariance matrix and statistical independence



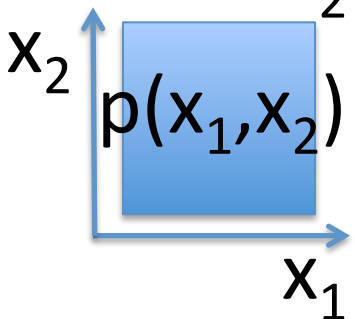
2D uniform distribution with a diagonal covariance matrix ($p(x_1,x_2)$ is symmetrical around its vertical or horizontal axis.)



Marginal probability $p_1(x_1)$ given as a plot (projection of $p(x_1,x_2)$ on the x_1-axis)



Marginal probability $p_2(x_2)$ given as a plot (projection of $p(x_1,x_2)$ on the x_2-axis)



The product $p_1(x_1)p_2(x_2)$ is not equal to $p(x_1,x_2)$ (i.e. x_1 and x_2 are not statistically independent)