

# Machine Learning Exercise 3

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## Features

Just by looking at the pictures one can see that most of the positive examples have more red pixels than the negative examples — except for negative sample n06.png which is red as well. I tried to predict n06.png correctly so I choose 7 features:  $R_{\min}$ ,  $G_{\min}$ ,  $B_{\min}$ ,  $R_{\text{avg}}$ ,  $G_{\text{avg}}$ ,  $B_{\text{avg}}$  and an edge score  $E$ .

I calculated  $E$  by applying a  $3 \times 3$  convolution matrix  $C$  to the greyscale image and then counting the resulting pixels having a value above 0.5

$$C = \begin{pmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{pmatrix}$$

## Resulting model

$$\phi = 0.5$$

$$\mu_0 = \begin{pmatrix} 0.4180392156862745 \\ 0.17856209150326796 \\ 0.3354248366013072 \\ 0.5568282498184458 \\ 0.5423443173565721 \\ 0.6827700617283943 \\ 7.533333333333333 \end{pmatrix} \quad \mu_1 = \begin{pmatrix} 0.39686274509803915 \\ 0.4033986928104575 \\ 0.5458823529411764 \\ 0.4891503267973856 \\ 0.4861347131445169 \\ 0.6305274146695714 \\ 0.0 \end{pmatrix}$$

$$\sigma = \begin{pmatrix} 0.0023857490708701777 & 0.0021892092784826355 & 0.0014766628219915418 & 0.0016981595397781448 & 0.0021892092784826355 & 0.002948336110043146 & 0.0024201631850997484 & 0.001870831672053956 & 0.0014766628219915418 & 0.0024201631850997484 & 0.0034951343500363107 & 0.0016663501336143258 & 0.001711843423413563 & 0.002101304341634972 & 0.0025702620312225474 & 0.0024509522097388796 & 0.002148138337967923 & 0.0016273495236874703 & 0.0018607307374656529 & 0.0020225360853612824 & 0.0017946104856509553 & -0.024418300653594772 & -0.029054466230936826 & 0.02532461873638345 & -0.00966196138949426 \end{pmatrix}$$