CS383

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1 Theory

a. y0 = $\begin{bmatrix}1\\1\\1\end{bmatrix}$ **, y1 =** $\begin{bmatrix}1\\1\\0\\0\\0\end{bmatrix}$ **, y2 =** $\begin{bmatrix}0\\0\end{bmatrix}$

$$H_0 = 0, H_1 = -\frac{3}{5}log_2\frac{3}{5} - \frac{2}{5}log_2\frac{2}{5}, H_2 = 0$$

E = 3/10(0) + 5/10(0.97)+2/10(0)
E = 0.485

b. y0 = $\begin{bmatrix}1\\1\\0\\0\\0\end{bmatrix}$ **, y1 =** $\begin{bmatrix}1\\1\\1\\0\\0\end{bmatrix}$

$$H_0 = -\frac{3}{5}log_2\frac{3}{5} - \frac{2}{5}log_2\frac{2}{5}, H_1 = -\frac{2}{5}log_2\frac{2}{5} - \frac{3}{5}log_2\frac{3}{5}$$

E = 5/10(.97) + 5/10(0.97)
E = 0.97

c. The first feature is more discriminatory because it has a lower entropy and offers better separation.

d. The principal components are:

$$\begin{bmatrix}0.98 & -0.19\\0.19 & 0.98\end{bmatrix}$$

e. It looks like the horizontal axis has been tilted 20 degrees down.

f. $\mathbf{x} = \begin{bmatrix} -7.84e^{-}1 \\ -9.80e^{-}1 \\ 1.96e^{-}1 \\ -9.80e^{-}1 \\ 1.96e^{-}1 \\ -2.17e^{-}17 \\ -2.17e^{-}17 \\ 1.96e^{-}1 \\ 9.80e^{-}1 \\ 1.176 \end{bmatrix}$

2 Part 2