

# Hamming Distance

## Information Theory Exercises

1. For the following error control code, do the following:
  - a. compute the minimum Hamming distance and indicate how many errors it can detect and how many errors it can correct, with the nearest neighbor decoding algorithm;
  - b. considering two received codewords,  $\mathbf{r}_1 = 11100$  and  $\mathbf{r}_2 = 00011$ , perform decoding and say if there are errors, and if so then correct the errors (find the correct codeword and indicate where the errors are located);
  - c. Give an example of errors the code cannot detect, and another example of errors it can detect but it cannot correct, using the nearest neighbor decoding algorithm.

Message	Codeword
$s_1$	$c_1 = 00000$
$s_2$	$c_2 = 10011$
$s_3$	$c_3 = 11100$
$s_4$	$c_4 = 00111$

2. Design a block code consisting of 4 codewords, with minimum codeword length, which is able to detect 3 errors in a codeword.
3. Design a block code consisting of 4 codewords, with minimum codeword length, which is able to correct 2 errors in a codeword.