

# Error Detection and Correction Using Hamming Codes

**Hamming codes** are a family of error-correcting codes that can detect up to two-bit errors and correct single-bit errors in transmitted data. They use the Hamming distance concept to determine where errors may have occurred.

If we have  $m$  number of data bits then let's attach  $r$  number of redundant parity bits to it, so the whole bit length will be:

$$n = m + r$$

If two code-words are given, for example : **0101110** and **001111110** and the only difference between them is 1 bit, then the 'Hamming distance' of these code-words will be 1. This is an interesting measure for distance because it does not matter which bit in the row is different or whether it belongs to a binary or decimal system. So for example : **45635263** and **45615263** have the Hamming distance of 1 too. It does not matter that 10 different digits could be in the place of the wrong digit.

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