Artificial Neural Networks

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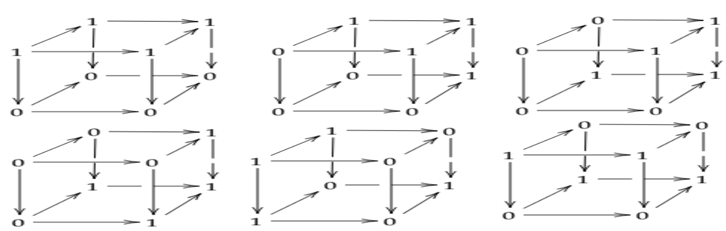
1 Number of 3-dimensional Boolean Functions

We could easily count the number of this kind of functions using The Fundamental Counting Principle to be $2^{2^3} = 256$

2 Number of Symmetries of 3-dimensional Boolean Functions with Four Ones

With total of 70 possible functions, we need to divide them into symmetries, or equivalence classes. All functions in a symmetry result from rotation(s) and/or reflection(s) on any one of them. We recognize 6 total equivalence classes.



3 Linearly Separable 3-dimensional Functions

Using the same previous method by dividing each 3-dimensional function into symmetries, and keeping a count on how many functions each symmetry have, one could count the number of linearly separable functions by examining a candidate from each symmetry and then adding the number of the function in a symmetry if the candidate *is* linearly separable; We also note that the number of linearly separable functions with 0 ones, is equivalent to that with 8 ones, and those with 1 one to that of 7 ones and so on.

$$\mathrm{L} = \Sigma_{n=0}^{n=8} \mathrm{L}_n$$

$$\mathrm{L} = 1 + 8 + 18 + 12 + 26 + 12 + 18 + 8 + 1 = 104$$