CS6601 - Fall 2017
Project 2

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For this project, the goal is to see if a dot product between two vectors is greater than or equal to some threshold. The vectors and thresholds are specified in *config.json*. To accomplish bit multiplication, we implemented [1]. The basic principle is thus: for each bit in A (the first number), multiply that bit by B (the second number) and store it in C_i where i starts at 0. Bit shift each C_i left by i. Finally, add each number together using bit addition. This will generate the final product. To do a dot product, add up each multiplication result. This will yield D, the dot product. To finish the circuit, we compare D to the threshold value specified in the configuration file. If D is greater than the set threshold, then a value of 1 will be outputted, 0 otherwise.

For the threshold value, it is assumed that the number of bits will be no greater than the max number of bits plus 1 that the dot product can take. The formula used to calculate the max number of bits for the dot product is shown in Equation 1.

$$2 * \text{bits of largest number} + \mathit{ciel}(\mathit{lg}(\text{Vector Size - 1})) \tag{1}$$

All inputs are assumed to be unsigned integers as required by the project description.

References

[1] Binary multiplier. `https://en.wikipedia.org/wiki/Binary_multiplier`, Sep 2017.