Bias in Number Representation

We have values that are negative and positive, signed integers.

Now we want to encode them using only unsigned binary. We can shift the numbers so they center on zero.

In order to do that, bias is stated as -> 2^(n-1) - 1

To interpret stored binary - actual value = stored(unsigned integer) + bias

To store a data value - stored = actual value - bias

Example Lets assume that we have a bias of -127 with an 8 bit number, 0b0000 1001.

If we want to interpret the binary 0b0000 10001 = 9, we mean

-> actual value = 9 + (-127) = -118

If we want to store the binary 0b0000 1001 = 9, we mean

-> stored = 9 -(-127) = 136

136 to binary 128 64 32 16 8 4 2 1 = 0b1000 1000

So, 9 is stored as unsigned binary 0b1000 1000

Example 2

Store -9 as unsigned binary representation using 8 bits.

First Find the bias using the n bits. -> 2^(n-1) - 1 = 2^(8-1) - 1 = 2^7 - 1 = 127

Second Find the stored value -> stored = -9 + 127 = 118

118 to binary 128,64,32,16,8,4,2,1 = 0b0111 0110

So -9 is stored as an unsigned binary 0b0111 0110