First question - Vector Add

1. How many floating-point operations are being performed in your vector add kernel in terms of N, the size of the vector?

In the CUDA kernel vecAdd, each thread performs one addition operation for each element of the vectors. Since there are N elements in each vector, and each element is added to the corresponding element in the other vector, the number of floating-point operations is directly proportional to the size of the vector N

Thus, N-floating-point addition operations are performed in total, one for each element of the vector.

2. How many global memory reads are being performed by your kernel in terms of N the size of the vector?

For each element of the output vector, the kernel reads two elements from global memory: one from the first input vector (in1) and one from the second input vector (in2). Therefore, the total number of global memory reads is:

Number of reads = 2 * N

So, 2N global memory reads are being performed, with one read from each of the input vectors.

3. How many global memory writes are being performed by your kernel in terms of N , the size of the vector?

For each element of the result vector, the kernel writes one element to global memory. Since there are N elements in the output vector (out), the number of global memory writes is simply N .

Thus, N global memory writes are performed.

4. Name three applications of vector addition.

1. Image Processing: In image blending or compositing, vector addition can be used to combine pixel values of two images. Each pixel can be represented as a vector (RGB channels), and addition can blend or mix the pixel colors.

2. Physics Simulations: In physical simulations, vector addition is used to compute the resultant force, velocity, or position of an object by adding forces, velocities, or displacements, respectively.

3. Machine Learning: In the training of neural networks, vector addition is used during backpropagation to update weights by adding gradients to the current weights. It's also used to sum weighted inputs at the nodes of the network.