EECE5640 HW3

Quinn Arbolante

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Question 2

Part A

My code is `matrix-vector-AVX.c`. In my code, `matrix-vector()` is the function that multiplies a matrix by a vector without using AVX512, and `matrix-vector-avx512f()` multiplies a matrix by a vector with AVX512. I multiply a 4096-by-4096 matrix full of 1's by a 4096-length vector full of 1's.

Regarding speedup, my implementation without AVX512 takes 40.4171565ms (averaged over 10 runs). My implementation with AVX512 takes 7.9730274ms (averaged over 10 runs). Therefore, the speedup is $\frac{40.4171565}{7.9730274} \approx 5.06923587$.

Part B

Here are three different vector instructions that I found in my assembly listing:

1. `vxorps  %xmm0, %xmm0, %xmm0`: This applies the `XOR` operation on floats. This uses the special XMM registers, which can hold arrays of data and are for AVX use..
2. `vmovaps %zmm0, 520(%rsp)`: This moves an aligned pack of floats from the top of the stack (`rsp`) to a ZMM register, which is another special register for AVX use.
3. `vmovups (%rax), %zmm0`: This moves an *unaligned* pack of floats from a ZMM register to a scratch register (`rax`).