Computer Architecture – Cache Optimization MatMul

You should create two tables of the execution times, cache references, and cache misses. Complete the following tables:

Original Code	**-O0**	**-O1**	**-O2**	**-O3**
Runtime	212.87s	177.55s	177.97s	177.84s
Cache Misses	1,084,261,005	1,080,744,412	1,080,823,260	1,080,618,449
Cache References	22,648,606,445	3,263,560,463	3,261,410,324	3,260,284,505

With best compiler optimization level	**Original**	**Column-major**	**Tiled 16x16**	**Tiled 32x32**
Runtime	177.84s	12.95s	16.74s	14.84s
Cache Misses	1,080,618,449	4,055,541	155,143,982	122,665,924
Cache References	3,260,284,505	3,260,343,331	3,466,374,255	3,360,280,477

Less cache misses tends to correlate with faster performance. The same can be said with less cache references. However, caches misses hurt performance much more than references, as can be observed in the Original Code -O0 vs -O1, where cache references are reduced by about 85% but performance is only improved by 15%. Then cache references are unaffected in comparing Original to Column-Major implementation and caches misses are reduced by 99.5% resulting in a performance improvement of 93%.