Tensors	Baseline		Tensor Train Decomposed				Tucker Decomposed			
	Similarity	Time	Similarity	Decomp time	Compare time	Total Time	Similarity	Decomp time	Compare time	Total time
T1,T2	0.9806	0.6746	0.9897	T1:23.56	0.6960	47.90	0.9907	T1:83.27	0.0	165.81
T2,T3	0.9432	0.7664	0.9546	T2:23.65	0.7476	47.56	0.9547	T2:82.53	0.0	164.54
T1,T3	0.9480	0.6777	0.9584	T3:23.17	0.7235	47.45	0.9639	T3:82.01	0.0	165.29
Average	—	0.7063	—	23.46	0.7208	47.64	—	82.61	0.0	165.21

T1: fastsmallball.gif
T2: slowbigball.gif
T3: different.gif

Analysis:

The table records the decomposition time for each tensor, the compare time for a pair of the tensors, and total time, which is the sum of compare time and each individual tensor's decomp time. We are using cosine similarity.

Tensor 1 is a small ball moving fast from left to right of the screen. Tensor 2 is a big ball moving slowly from the left to right of the screen. Tensor 3 is a rectangle expanding from top right to bottom left of the screen. Color doesn't matter too much as they are converted into grayscale, but balls are blue and the rectangle is red. Tensor 1 and 2 are similar videos.

From the result, we can see that the similarity between T1 and 2 is high, while T3 with either tensor has a lower similarity score. Comparing TT and TD to baseline, we can easily conclude from the similarity score increase, that they both lose some information. In that area, tucker decomposition in general has even higher similarity scores, which indicates that more information is lost by this method compared to tensor train.

Time-wise, the most noticeable is that either decomposition method drastically increases the total execution time with the current tensors and method of comparison. This is expected as the videos are relatively simple and very short, thus the comparison time is yet quite low. For more complex method of comparison and longer videos, I would expect a closer trade off between comparison and decomposition time.

For decomposition time, TD takes significantly longer than TT, which is expected as it has significantly more work to do to calculate the core matrix. For comparison time, TT doesn't seem

to lower the time compared to the baseline by much. The little difference observed in the table could be attributed to randomness in each execution. However, TD drastically decreases the comparison time, to almost 0 (it shows 0 because it's too low to be shown). Thus we can conclude that TD has higher cost for decomposition but way less cost for comparison, at the cost of slightly greater information loss.