Q1:

After implementing the cossim\_sparse () function for the file nytcounts.university\_cat\_dog, the following results are obtained:

file nytcounts.university\_cat\_dog has contexts for 3 words  
Cosine similarity between cat and dog 0.966891672715  
Cosine similarity between cat and university 0.660442421144  
Cosine similarity between university and dog 0.659230248969

The similarity of the pair (cat, dog) is higher than the pairs (dog, university) and (cat, university).

The reason why pair (cat, dog) has a high cosine similarity as 0.966891672715 is that both “cat” and “dog” appear in similar position in contexts. What is more, “cat” and “dog” have similar vectors values due to their meaning in same dimensions. For example, “dog” and “cat” both are pets and appear in contexts like “the pet dog/cat”.

The cosine similarity of other pairs (cat, university) and (university, dog) is low due the two concepts do not have similar meanings and these pairs of words do not appear in similar contexts. Theses pairs’ vectors do not have high values in same dimensions and different a lot, hence their cosine similarity is quite low.