MCA Assignment 3

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Part 1

The algorithm comes in two flavours - CBOW and Skip Grams which are closely intertwined with each other. I followed Skip Gram.

Skip Gram works on trying to associate the relations between words occurring within a specific distance(called window size) of each other.

Let's say the sentence is A1,A2,A3,A4,A5... A10
Let's say we're interested in A4, for a context window of 2, we have A2 and A3 at its left hand side and A5 and A6 at its right hand side. Our primary task is to make a neural network which learns this association between a 'center' word(in this case A4) and it's context words (in this case A2/A3/A5/A6).

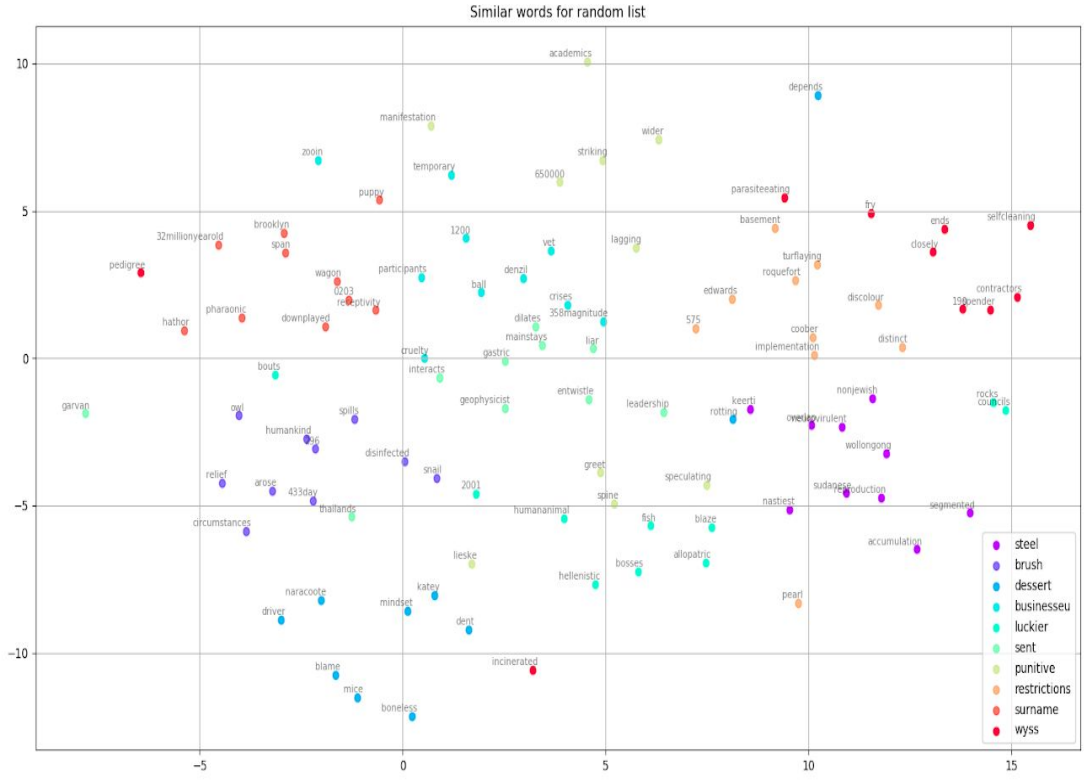
We train our model to predict the context words for a given center word. Now this can happen in a couple of 'sub-flavours' . We can use a softmax layer to predict the

most probably layer or we can use a log-sigmoid layer to predict a ‘yes’ or ‘no’ whether a given context and center word are associated with each other or not. I follow the latter.

I have a hidden embedding layer of size [vocabulary_size,embedding_size] . My choice of embedding size is 60. For every pair on input - both of them are passed through the embedding layer and then their dot products are calculated using the torch.matmul function. This result is passed through a sigmoid layer to determine whether they are associated or not.

I trained 5 epochs due to computational difficulties and the plots are as follows.

The results are for 10 random words and their closest respective words(using Cosine Similarity logic).


Similar words for random list
academics
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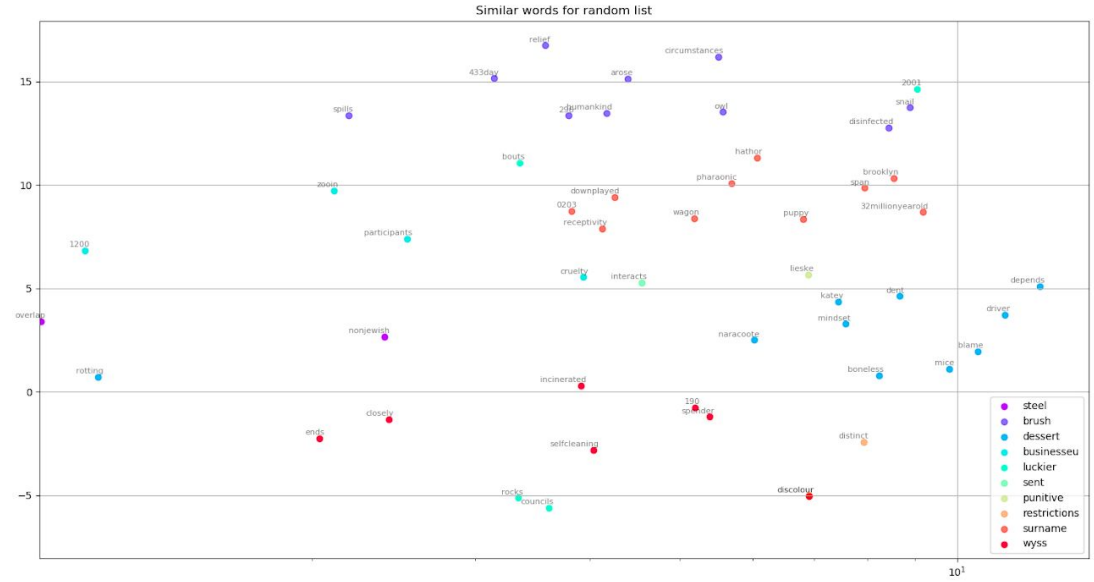
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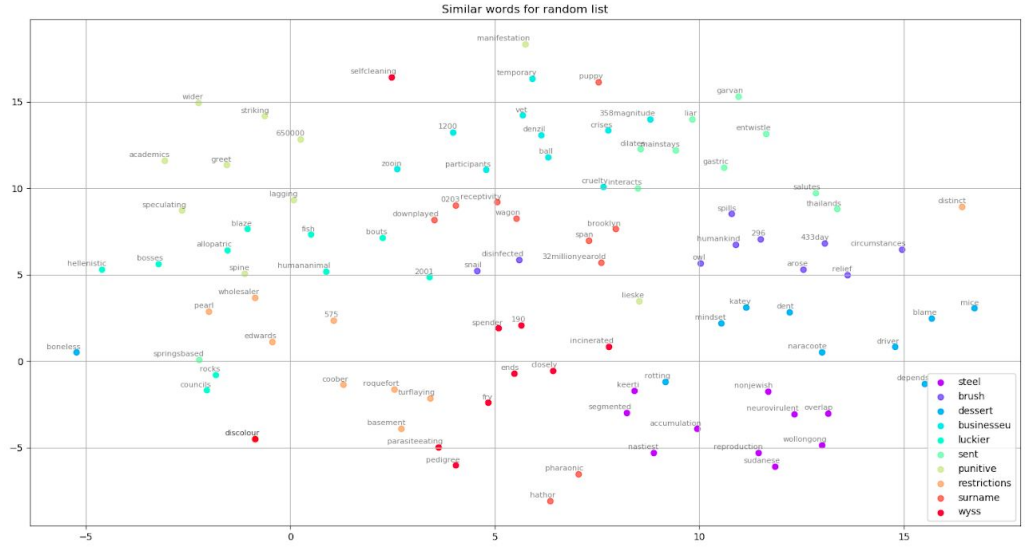
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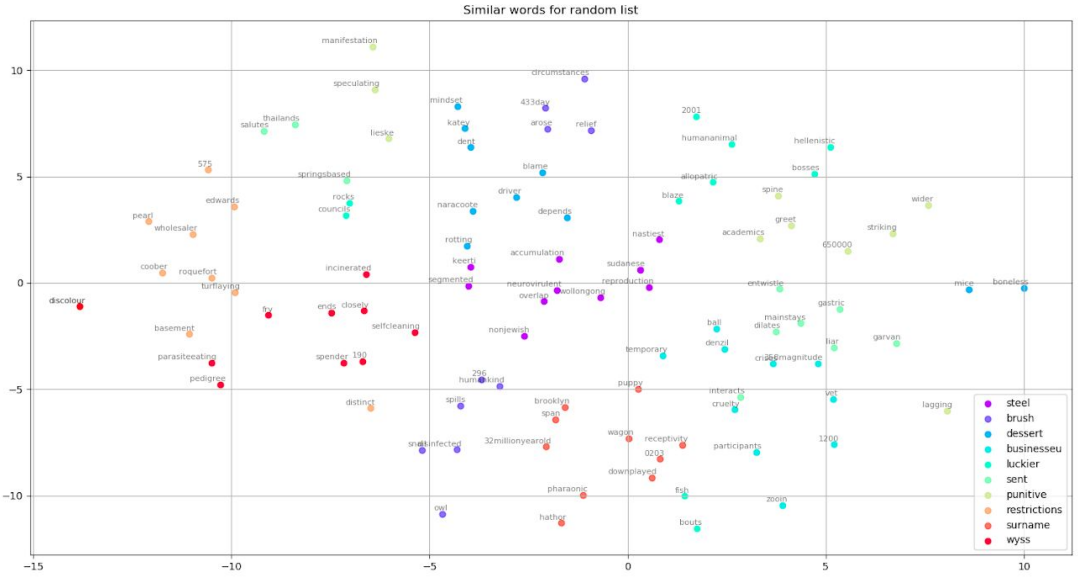
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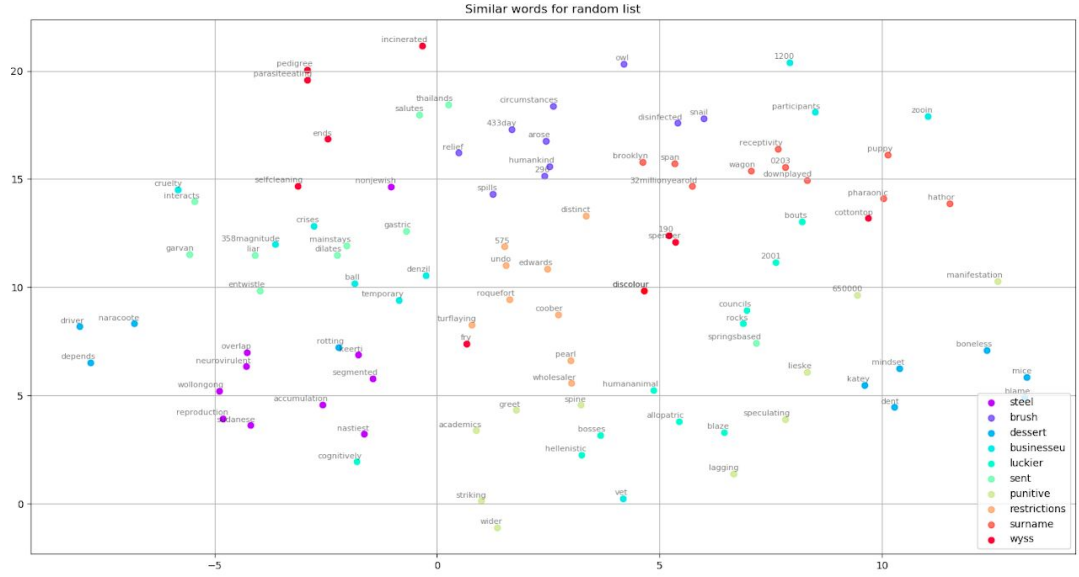
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Due to poor visibility here images are being added to the repository. They are in order of epochs.

I have referred to the following resources -
https://www.kdnuggets.com/2018/04/implementing-deep-learning-methods-feature-engineering-text-data-skip-gram.html
http://mccormickml.com/2016/04/19/word2vec-tutorial-the-skip-gram-model/
https://github.com/jojonki/word2vec-pytorch
https://towardsdatascience.com/word2vec-skip-gram-model-part-1-intuition-78614e4d6e0b
https://medium.com/datadriveninvestor/word2vec-skip-gram-model-explained-383fa6ddc4ae

Part 2

I got the following results in Part 2
Retrieval with Relevance Feedback
MAP: 0.6349721389266573

Retrieval with Relevance Feedback and query expansion
MAP: 0.5996370763003258

In the code itself I used multiple iterations - 1 and 3 and got a result of 0.61 and 0.634 . The increase was expected along with more iterations as we see.

In the second part of the second question query expansion surprisingly did not increase. A reason for this might be that when words similar to the most important words of each query messes up the inferred meaning of the query and hence results decrease.

Resources referred -

https://nlp.stanford.edu/IR-book/pdf/09expand.pdf