

CS310 Natural Language Processing - Assignment 2: Word2vec Implementation

Total points: 50

Task: Train a word2vec model using the skip-gram architecture and negative sampling.

- The corpus data being trained on is the full text of 《论语》.
- Use the Lab 4 content to help you.

Submit:

- The modified notebook file `A2_w2v.ipynb`
- A zipped file containing all resulted `word embeddings` (.txt format)
- Any dependent Python files.
- Write up the results for the following requirement 3 and 5 in a `Word/PDF document`.

Requirements:

- 1) (10 points) Implement the data loading and processing pipeline. You should re-use and augment the code for `generate_data` and `batchify` functions.
- 2) (15 points) Implement the `SkipGram` class. The key is to implement the computation for `loss` in `forward` function. Make sure the inputs to this function are tensors in correct dimensions.
- 3) (10 points) Implement the `train` function that runs correctly.
 - a) Print the loss every few intervals (determine the number by your observation). Include a screenshot of loss change in your write-up.
 - b) Determine the training epochs needed by observing when the loss stops decreasing significantly.
- 4) (10 points) Run training with different hyper-parameters; save the embedding results.
 - a) Train with `emb_size = 50, 100`, respectively
 - b) Train with negative sample number `k = 5, 10, 15`, respectively
 - c) Train with `window_size = 1, 3, 5`, respectivelyTherefore, there are in total $2 \times 3 \times 3 = 18$ experiment groups, that is, 18 embedding files need be submitted.
- 4) (5 points) Plot and compare the embeddings with LSA ones.
 - a) Use Truncated SVD to reduce the dimension of embeddings from the target words provided (`['学', '习', '曰', '子', '人', '仁']`). Plot all of the 18 embedding results. You may also use the words that you find interesting instead.
 - b) Compare your favorite embedding plot with the one we obtained from the LSA Lab. Briefly describe the difference in your write-up