

Programming Assignment 2: Learning Word Representations.

28/31 points
(90%)

Quiz, 13 questions

✓ **Congratulations! You passed!**

Next Item

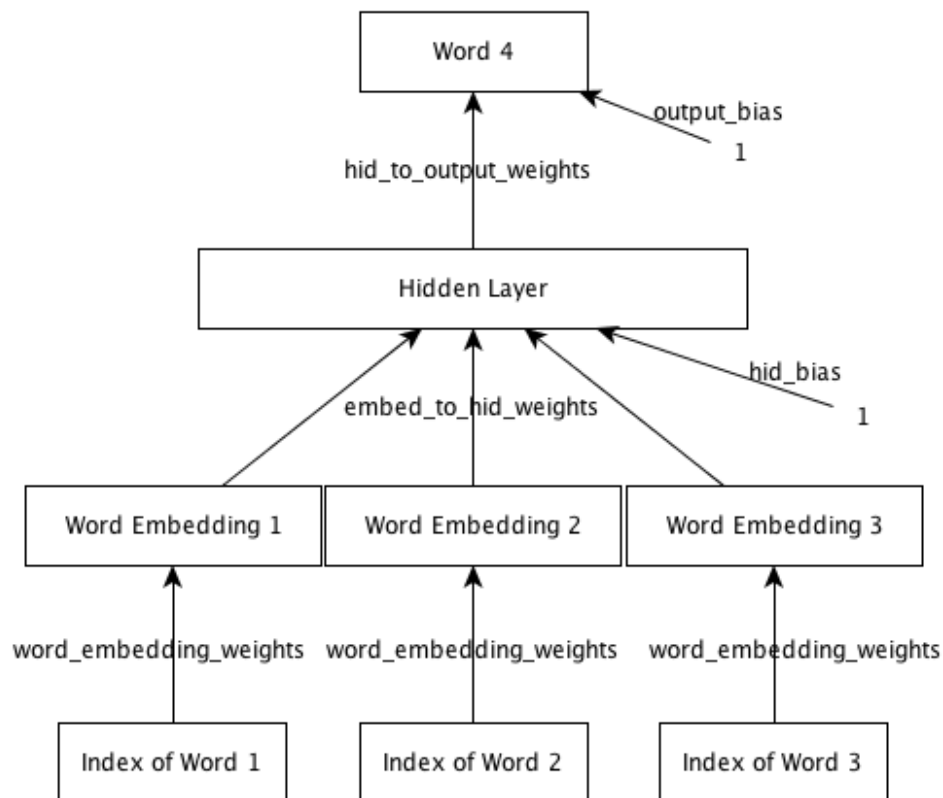


1 / 1
points

1.

We are now ready to start using neural nets for solving real problems!

In this assignment we will design a neural net language model. The model will learn to predict the next word given the previous three words. The network looks like this:



To get started, download any one of the following archives.

[assignment2.tar.gz](#)

Or

Programming Assignment 2: Learning Word Representations.

28/31 points
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Quiz, 13 questions

Or each file individually:

- README.txt
- train.m
- raw_sentences.txt
- fprop.m
- word_distance.m
- display_nearest_words.m
- predict_next_word.m
- load_data.m
- data.mat

The starter code implements a basic framework for training neural nets with mini-batch gradient descent. Your job is to write code to complete the implementation of forward and back propagation. See the README file for a description of the dataset, starter code and how to run it.

This sample_output shows you what output to expect once everything is implemented correctly.

Once you have implemented the required code and have the model running, answer the following questions.

Ready to start? (Please select a response. This is a reflective question and choosing one answer over the other will not count against this quizzes' grade.)



Yes



No



4 / 4
points

Programming Assignment 2: Learning Word Representations

Quiz, 13 questions

2.

Train a model with 50 dimensional embedding space, 200 dimensional hidden layer and default setting of all other hyperparameters. What is the training set cross entropy as reported by the training program after 10 epochs ? Please provide a numeric answer (three decimal places). [4 points]

28/31 points
(90%)

2.534

Correct Response



0 / 3
points

3.

Train a model for 10 epochs with a 50 dimensional embedding space, 200 dimensional hidden layer, a learning rate of 100.0 and default setting of all other hyperparameters. What do you observe ? [3 points]



Cross Entropy on the validation set fluctuates around a large value.

This should be selected



Cross Entropy on the training set fluctuates around a large value.

This should be selected



Cross Entropy on the training set decreases smoothly but fluctuates around a large value on the validation set.

This should not be selected



Cross Entropy on the training set fluctuates wildly and eventually diverges.

This should not be selected

Programming Assignment 2: Learning Word Representations.

28/31 points
(90%)

Quiz, 13 questions

4.

If all weights and biases in this network were set to zero and no training was performed, what will be the average cross entropy on the validation set ? Please provide a numeric answer (three decimal places). [3 points]

5.521

Correct Response

If all weights and biases are zero, the output distribution will be uniform for all inputs. The entropy will then be $\log_e(n)$ where n is the number of words in the vocabulary. In this case it will $\log_e(250)$



1 / 1
points

5.

Train three models each with 50 dimensional embedding space, 200 dimensional hidden layer.

- Model A: Learning rate = 0.001,
- Model B: Learning rate = 0.1
- Model C: Learning rate = 10.0.

Use the default settings for all other hyperparameters. Which model gives the lowest training set cross entropy after 1 epoch ? [3 points]

☐ Model C

☒ Model B



Correct

☐ Model A



2 / 2
points

Programming Assignment 2: Learning Word Representations.

28/31 points
(90%)

Quiz, 13 questions

In the models trained in Question 5, which one gives the lowest training set cross entropy after 10 epochs ? [2 points]



Model B



Correct



Model A



Model C



3 / 3
points

7.

Train each of following models:

- Model A: 5 dimensional embedding, 100 dimensional hidden layer
- Model B: 50 dimensional embedding, 10 dimensional hidden layer
- Model C: 50 dimensional embedding, 200 dimensional hidden layer
- Model D: 100 dimensional embedding, 5 dimensional hidden layer

Use default values for all other hyperparameters.

Which model gives the best training set cross entropy after 10 epochs of training ? [3 points]



Model A



Model C



Correct



Model D



Model B

Programming Assignment 2: Learning Word Representations.

2 / 2
points

28/31 points
(90%)

Quiz, 13 questions

In the models trained in Question 7, which one gives the best validation set cross entropy after 10 epochs of training ? [2 points]

- ☐ Model B
- ☐ Model A
- ☐ Model D
- ☒ Model C

Correct



3 / 3
points

9.

Train three models each with 50 dimensional embedding space, 200 dimensional hidden layer.

- Model A: Momentum = 0.0
- Model B: Momentum = 0.5
- Model C: Momentum = 0.9

Use the default settings for all other hyperparameters. Which model gives the lowest training set cross entropy after 5 epochs ? [3 points]

- ☒ Model C

Correct

- ☐ Model B
- ☐ Model A



2 / 2
points

Programming Assignment 2: Learning Word Representations.

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Quiz, 13 questions

Train a model with 50 dimensional embedding layer and 200 dimensional hidden layer for 10 epochs. Use default values for all other hyperparameters.

Which words are among the 10 closest words to the word 'day'. [2 points]



'week'



Correct



'today'



Un-selected is correct



'night'



Correct



'during'



Un-selected is correct



2 / 2
points

11.

In the model trained in Question 10, why is the word 'percent' close to 'dr.' even though they have very different contexts and are not expected to be close in word embedding space? [2 points]



We trained the model with too large a learning rate.



Both words occur too frequently.



Both words occur very rarely, so their embedding weights get updated very few times and remain close to their initialization.



Correct

Programming Assignment 2: Learning Word Representations.

28/31 points
(90%)

Quiz, 13 questions



The model is not capable of separating them in embedding space, even if it got a much larger training set.



2 / 2
points

12.

In the model trained in Question 10, why is 'he' close to 'she' even though they refer to completely different genders? [2 points]



The model does not care about gender. It puts them close because if 'he' occurs in a 4-gram, it is very likely that substituting it by 'she' will also make a sensible 4-gram.



Correct



They often occur close by in sentences.



Both words occur very rarely, so their embedding weights get updated very few times and remain close to their initialization.



They differ by only one letter.



3 / 3
points

13.

In conclusion, what kind of words does the model put close to each other in embedding space. Choose the **most** appropriate answer. [3 points]



Words that can be substituted for one another and still make up a sensible 4-gram.



Correct



Words that occur close to each other (within three words to the left or right) in many sentences.

Words that occur close in an alphabetical sort.

Programming Assignment 2: Learning Word Representations.

Words that belong to similar topics. A topic is a semantic categorization (like 'sports', 'art', 'business', 'computers' etc).

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Quiz, 13 questions

