‹ Previous   ☑ ✔   ☑ ✔   ☑ ✔   ☑ ✔   Next ›

4. Word Embeddings

🔖 Bookmark this page

Word Embeddings

1/1 point (graded)

Training a neural network using back-propagation and SGD moves the network weights in a direction that minimizes the loss function. If the network contains a *bottleneck*, a layer in which many inputs are reduced to only a few outputs, training will adjust the weights to maximize the useful information contained in the layer's output. In this way, a sparse input representation can be embedded in a lower-dimensional space to become a dense, *distributed* representation. Embeddings often have interesting properties like transforming semantic or visual similarity into geometric proximity.

For example, imagine you have the words "cat", "lion", "car", "bridge". You could have a possible dense representation like: "cat" : [0.9, 0.2], "lion" : [0.9, 0.5], "car" : [0.01, 0.8], "bridge" : [0.01, 1.0]. In this representation, the first component give (not exactly) a measure of "animalness" and the second, size. In addition, the vectors for similar or related words may be close together in space. In this question, we will examine the utility of (the highly popular) word embeddings.

Consider two neural networks for classifying sequences of words that differ only in their input representation:

- The first of which uses a sparse *one-hot* encoding of each word in which word i is identified by a vector that contains a 1 in position i and 0s elsewhere. For instance, a dictionary containing the words *word* and *embedding* might be represented as $[0\ 1]$ and $[1\ 0]$, respectively. You may assume that the dictionary used contains all words in both the training and testing sets.

- The second neural network, instead, uses a pre-trained embedding of the dictionary that you may assume represents every word in the dictionary.

Assuming that both networks use $\tanh$ activations and have randomly initialized weights, and they are trained using the same training set, but different input representation.

Now, at test time, each network is presented with a sequence of words not seen during training. Which of the following statement(s) is/are true about the output of the network for this sequence?

- ☑ The first network cannot classify the sequence correctly

- ☐ The second network cannot classify the sequence correctly

- ☑ The second network has a fighting chance at classifying the sequence

- ☐ The first network has a fighting chance at classifying the sequence

✔

Solution:

The first network cannot classify the sequence correctly. As a result of the words not being seen during training, the corresponding input units always had an output of zero, which means that no gradient was backpropagated into the weights and the randomly-initialized weights remain unchanged.

The second network, however, has a fighting chance at classifying the sequence. Since the embedding process causes words that appear in similar contexts to have similar locations in vector space, the unseen words will likely fall into a region that contains words that the network **has** seen and knows how to correctly classify.

Submit   You have used 1 of 2 attempts

ℹ   Answers are displayed within the problem

Discussion

Hide Discussion

Topic: Unit 3 Neural networks (2.5 weeks):Homework 3 / 4. Word Embeddings

Add a Post

Show all posts ⌄	by recent activity ⌄

💬 **I'm sure that the TA's doing the edition of the material and HW is having fun frustrating and irritating the class...**
Dear MIT, is this logic writing? This question and the previous (#3 and #4) are clear examples of how you can edit material to be obscure... — 10

💬 **Great Homework!**
Only when you finish the homework, you start realizing how wisely the material is laid out - it makes you go many times through certain ... — 1

💬 **Grading is Wrong**
I have completed 22/26 but its showing just 16. I hope @staff will be looking at this technical glitch as it would affect our scores. — 2

💬 **My ever expending search for more info on topics...**
So I just recently stumbled on these two websites and I had to share them. I've had such a eureka moment reading through them. This ... — 3

❓ **@Staff Please provide a detailed answer for this question after the deadline.**
@Staff Please provide a detailed answer for this question after the deadline. — 1

☑ **[STAFF] Unclear problem description**
Dear Staff, Please confirm the following statements. If some of the statements are incorrect, please, provide clarification. - Two text clas... — 12

💬 **Another Approach - Word Embeddings**
Hello, Some pointers. 1) Don't over-complicate. 2) 2nd neural network uses pre-trained embedded input. You want to classify (or catego...
👤 Community TA — 3

💬 **Good homework, except for the last question (in this page)**
I liked this homework, except for the "word embeddings" question. It could have been better crafted. — 1

〈 Previous   Next 〉

© All Rights Reserved

---

edX

edX

About
Affiliates
edX for Business
Open edX
Careers
News

Legal

Terms of Service & Honor Code
Privacy Policy
Accessibility Policy
Trademark Policy
Sitemap

Connect

[Blog](#)
[Contact Us](#)
[Help Center](#)
[Media Kit](#)
[Donate](#)

深圳市恒宇博科技有限公司 [粤ICP备17044299号-2](#)