Carnegie Mellon University

Improving API Knowledge Discovery with ML

A Case Study of Comparable API Methods

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S3D
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Motivation

Python code to capitalize all the words in a sentence?

Input

```
hello, world! hello, ICSE!
```

Output

```
Hello, World! Hello, ICSE!
```

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Python code to capitalize all the words in a sentence?

```
output = “ “.join([w.capitalize() for w in input.split(“ “)])
```

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```
output = “ “.join([w.capitalize() for w in input.split(“ “)])
```

V.S.

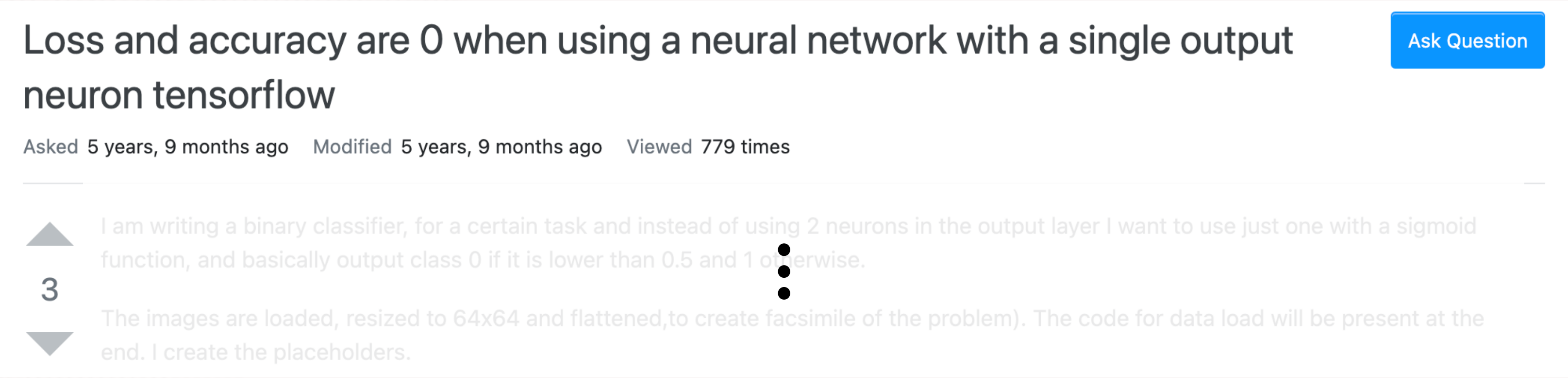
```
output = input.title()
```

Simpler, but not everyone knows this!

Discoverability Issue!

Motivation

Developers face difficulties in finding appropriate methods!



Loss and accuracy are 0 when using a neural network with a single output neuron tensorflow

Asked 5 years, 9 months ago Modified 5 years, 9 months ago Viewed 779 times

I am writing a binary classifier, for a certain task and instead of using 2 neurons in the output layer I want to use just one with a sigmoid function, and basically output class 0 if it is lower than 0.5 and 1 otherwise.

⋮

The images are loaded, resized to 64x64 and flattened,to create facsimile of the problem). The code for data load will be present at the end. I create the placeholders.

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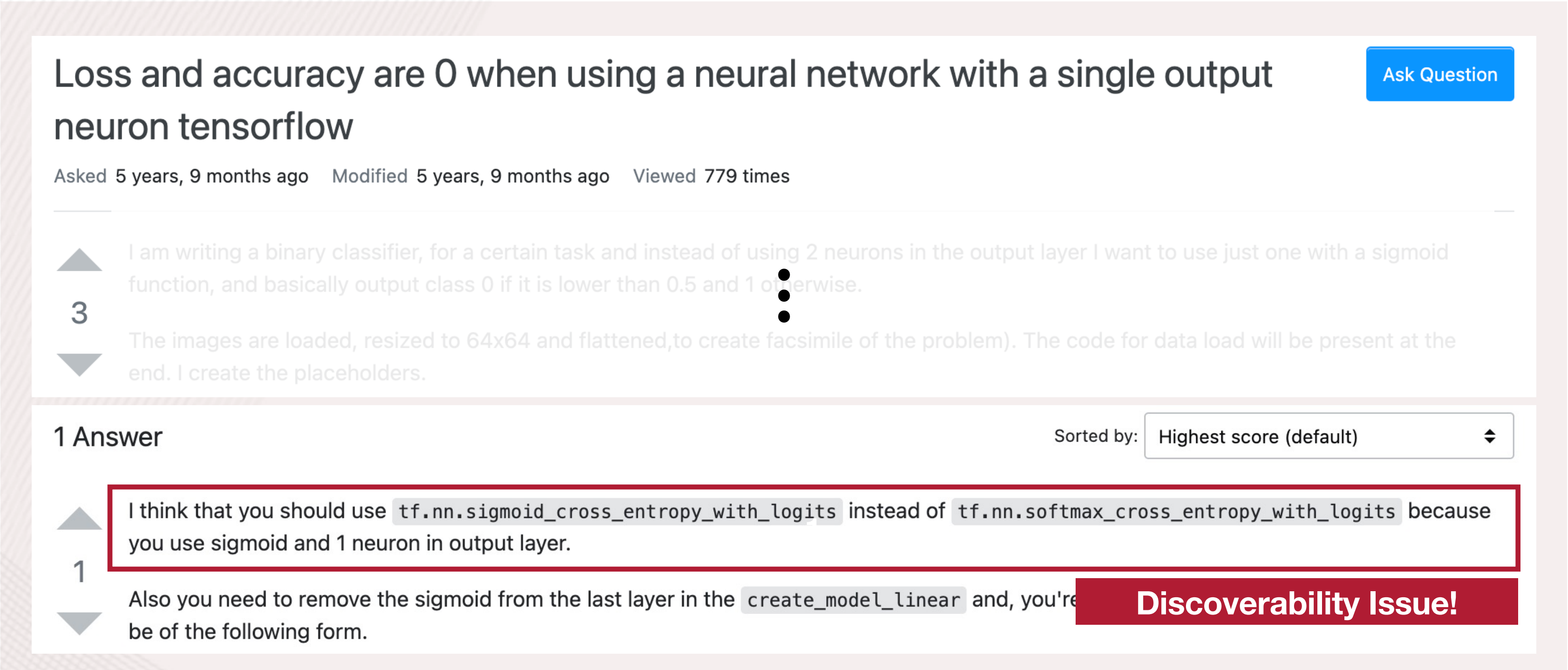

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1 Answer

I think that you should use `tf.nn.sigmoid_cross_entropy_with_logits` instead of `tf.nn.softmax_cross_entropy_with_logits` because you use sigmoid and 1 neuron in output layer.

Also you need to remove the sigmoid from the last layer in the `create_model_linear` and, you'r

be of the following form.

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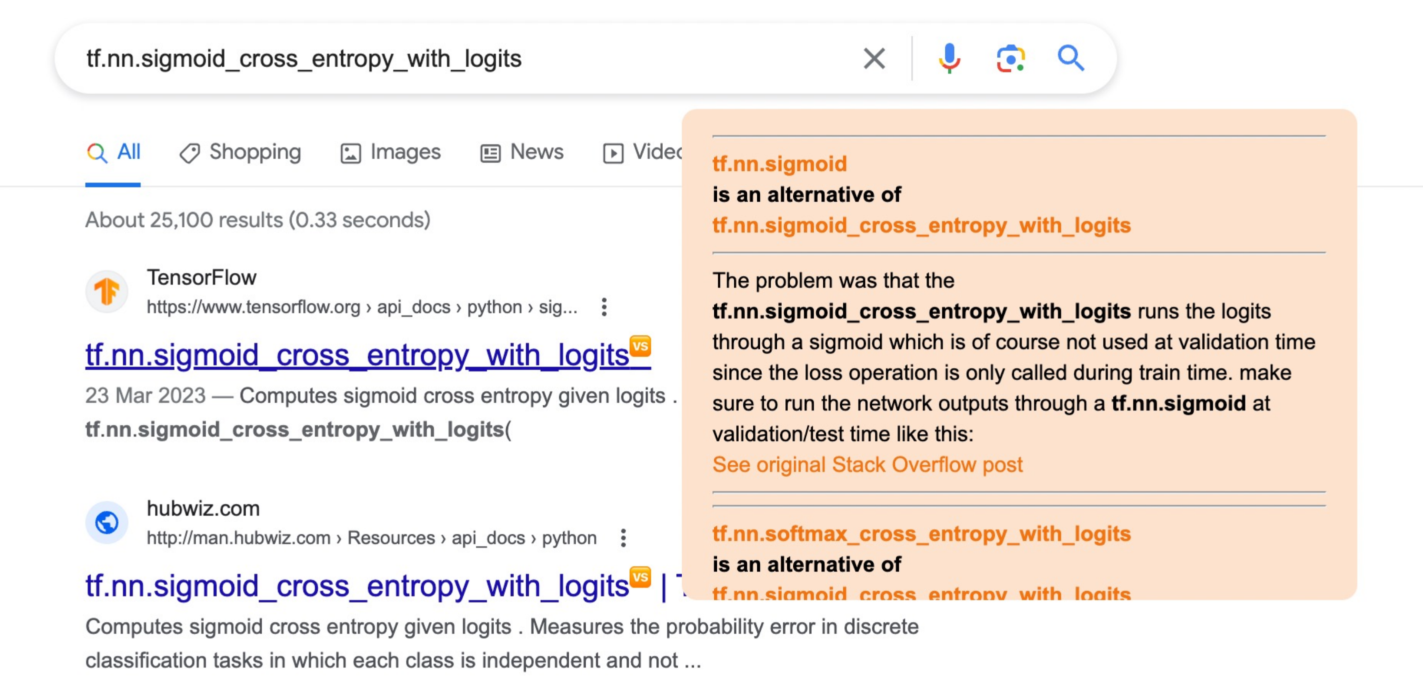
Providing comparable API methods will help developers understand the design space of APIs


tf.nn.sigmoid_cross_entropy_with_logits

About 25,100 results (0.33 seconds)

TensorFlow
https://www.tensorflow.org › api_docs › python › sig...

tf.nn.sigmoid_cross_entropy_with_logits

23 Mar 2023 — Computes sigmoid cross entropy given logits .
tf.nn.sigmoid_cross_entropy_with_logits(

hubwiz.com
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tf.nn.sigmoid_cross_entropy_with_logits |

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tf.nn.sigmoid
is an alternative of
tf.nn.sigmoid_cross_entropy_with_logits

The problem was that the **tf.nn.sigmoid_cross_entropy_with_logits** runs the logits through a sigmoid which is of course not used at validation time since the loss operation is only called during train time. make sure to run the network outputs through a **tf.nn.sigmoid** at validation/test time like this:
See original Stack Overflow post

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A Case Study of Comparable API Methods

Dataset

Annotation protocol &
266 pairs of comparable
Tensorflow API methods

Hypothesis Testing

Prototype tool &
human subjects study
with 16 participants

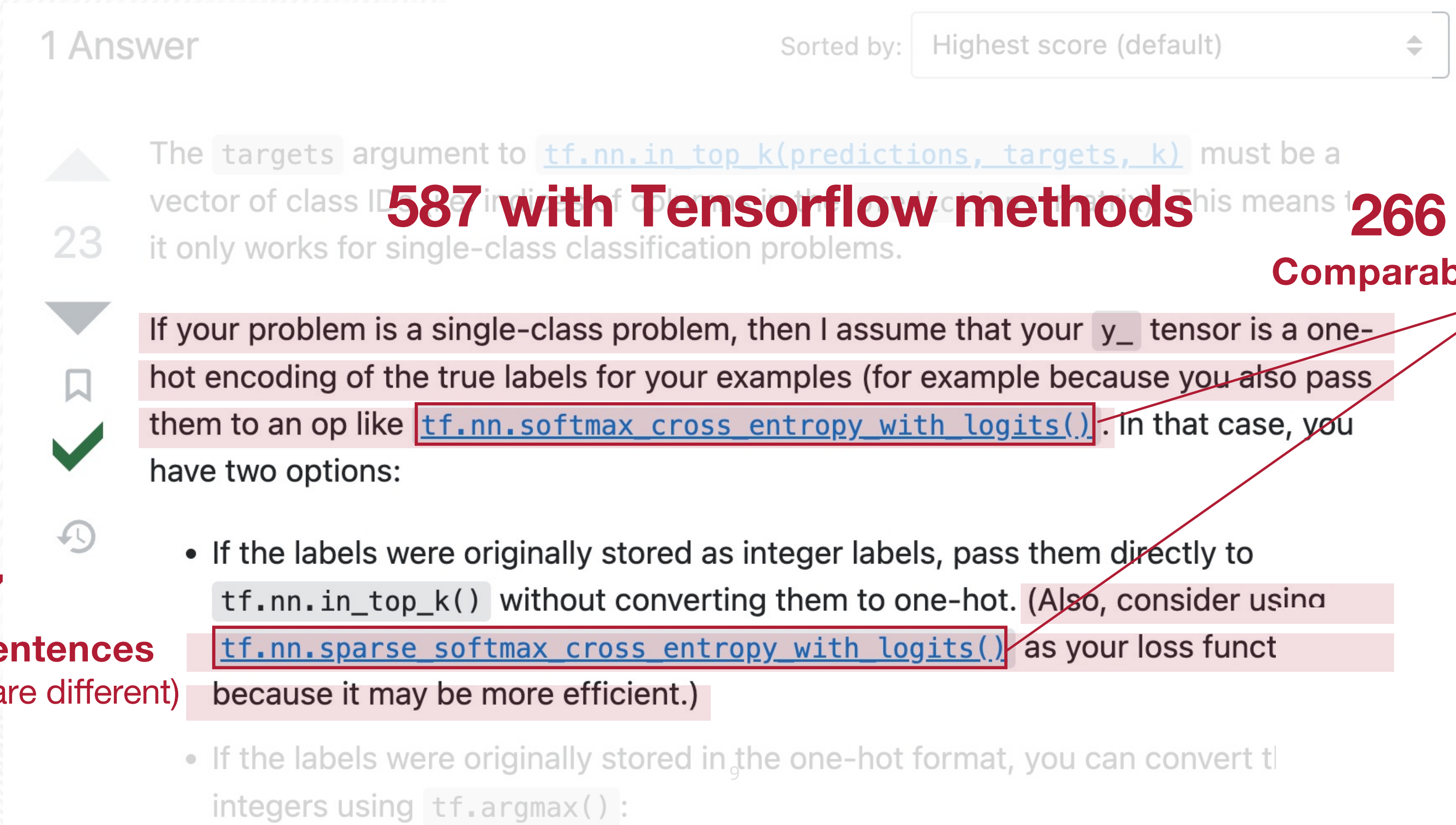
Automation

SOREL:
A deep-learning-based
knowledge extraction engine

Dataset

Dataset

Manual Annotation of Stack Overflow Answers



The `targets` argument to `tf.nn.in_top_k(predictions, targets, k)` must be a vector of class IDs (i.e. indices of columns in the `predictions` matrix). This means t it only works for single-class classification problems.

If your problem is a single-class problem, then I assume that your `y_` tensor is a one-hot encoding of the true labels for your examples (for example because you also pass them to an op like `tf.nn.softmax_cross_entropy_with_logits()`. In that case, you have two options:

- If the labels were originally stored as integer labels, pass them directly to `tf.nn.in_top_k()` without converting them to one-hot. (Also, consider using `tf.nn.sparse_softmax_cross_entropy_with_logits()` as your loss funct because it may be more efficient.)
- If the labels were originally stored in the one-hot format, you can convert t integers using `tf.argmax()`:

587 with Tensorflow methods

266 Pairs of
Comparable API Methods

737
Summary sentences
(i.e., how they are different)

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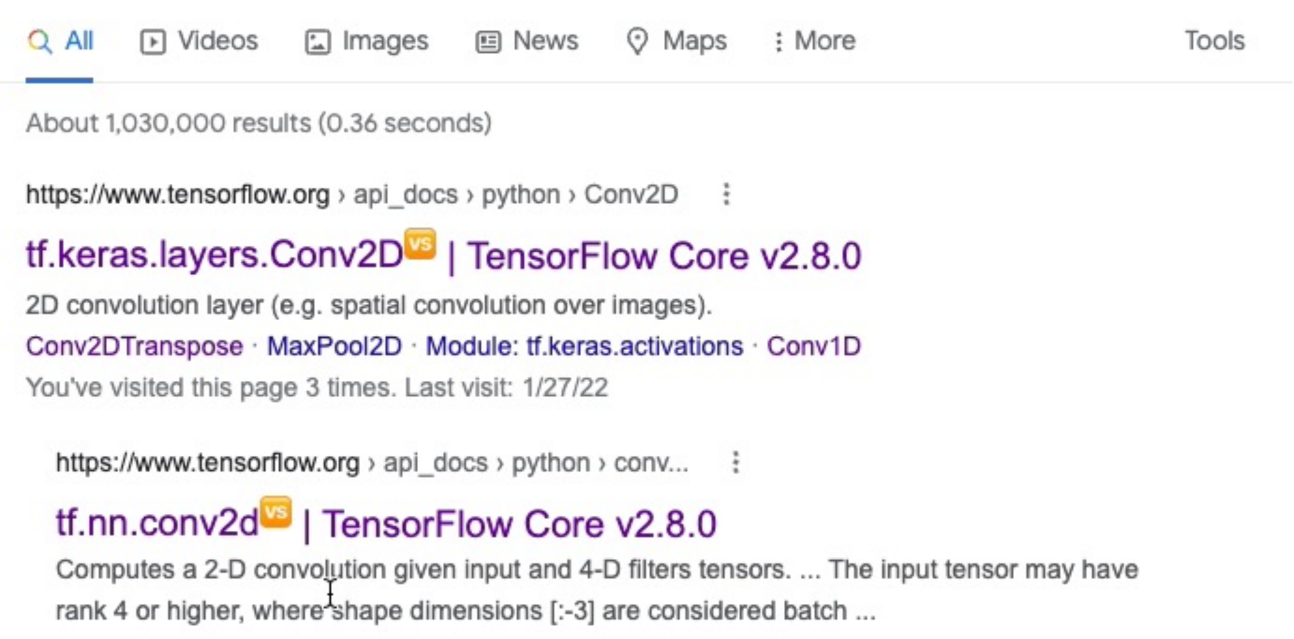
Prototype

Show comparable API methods in Chrome



About 1,030,000 results (0.36 seconds)

https://www.tensorflow.org › api_docs › python › Conv2D

tf.keras.layers.Conv2D VS | TensorFlow Core v2.8.0

2D convolution layer (e.g. spatial convolution over images).

Conv2DTranspose · MaxPool2D · Module: tf.keras.activations · Conv1D

You've visited this page 3 times. Last visit: 1/27/22

https://www.tensorflow.org › api_docs › python › conv...

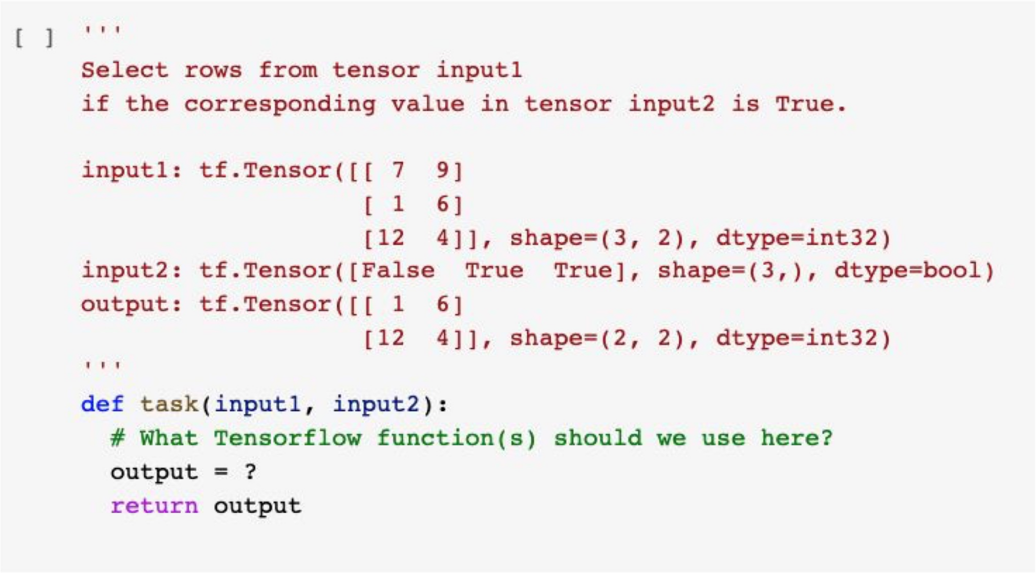
tf.nn.conv2d VS | TensorFlow Core v2.8.0

Computes a 2-D convolution given input and 4-D filters tensors. ... The input tensor may have rank 4 or higher, where shape dimensions [:-3] are considered batch ...

Study Design

Participants & Tasks

- Recruited 16 participants who know ML, but not TF
- 8 tasks (e.g., image processing)
- Participants used web search, with and without the prototype, to find appropriate TF methods
- Collected both quantitative and qualitative data

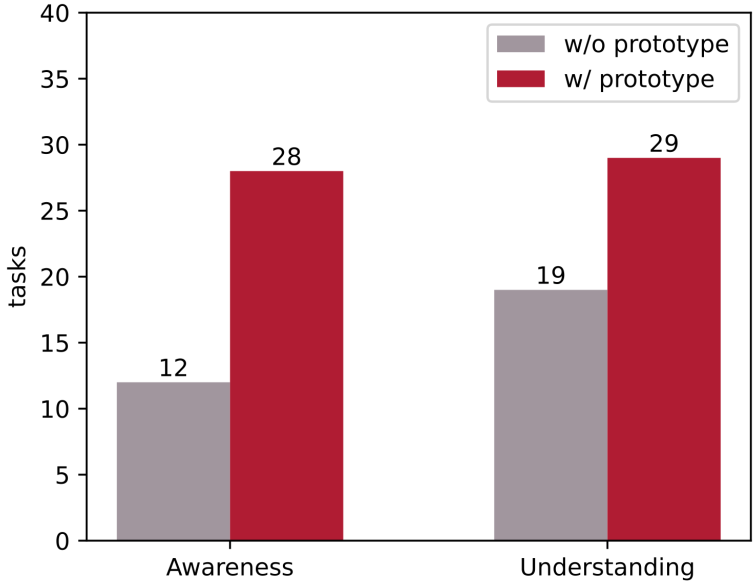


```
'''
Select rows from tensor input1
if the corresponding value in tensor input2 is True.

input1: tf.Tensor([[ 7  9]
                   [ 1  6]
                   [12  4]], shape=(3, 2), dtype=int32)
input2: tf.Tensor([False  True  True], shape=(3,), dtype=bool)
output: tf.Tensor([[ 1  6]
                   [12  4]], shape=(2, 2), dtype=int32)
'''
def task(input1, input2):
  # What Tensorflow function(s) should we use here?
  output = ?
  return output
```

Study Results

When using the prototype,
participants were more aware of comparable API methods (p=0.0015)
and had a better understanding of the differences (p=0.0056).



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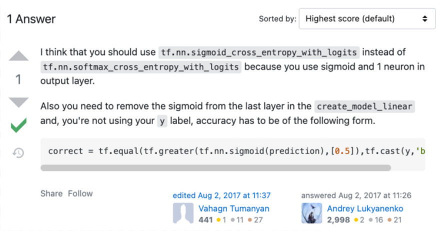
Model Architecture



1 Answer

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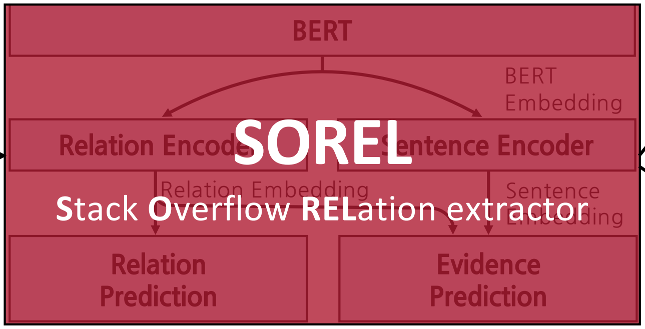
Also you need to remove the sigmoid from the last layer in the `create_model_linear` and, you're not using your `y` label, accuracy has to be of the following form.

```
correct = tf.equal(tf.greater(tf.nn.sigmoid(prediction),[0.5]),tf.cast(y,'b
```

edited Aug 2, 2017 at 11:37
Vahagn Tumanyan
441 ●1 ●11 ●27

answered Aug 2, 2017 at 11:26
Andrey Lukyanenko
2,998 ●2 ●16 ●21



SOREL

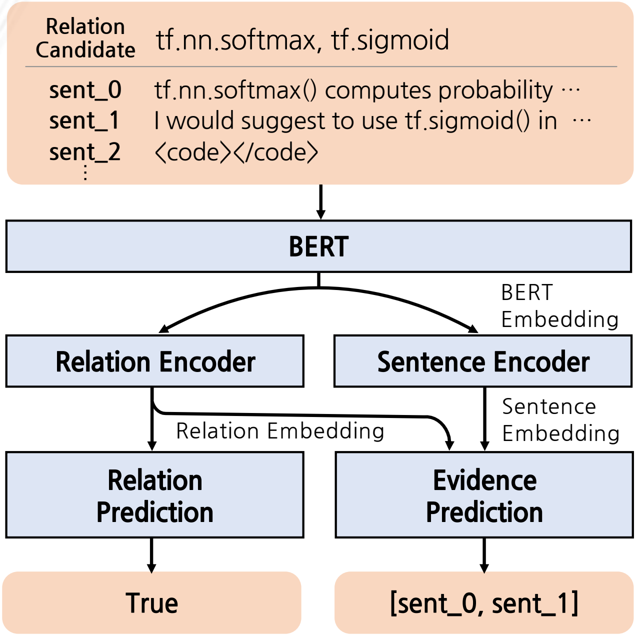
Stack Overflow **REL**ation extractor

tf.nn.softmax, tf.sigmoid

I think that you should use tf.nn.sigmoid_cross_entropy_with_logits instead of tf.nn.softmax_cross_entropy_with_logits because you use sigmoid and 1 neuron in output…

Automation

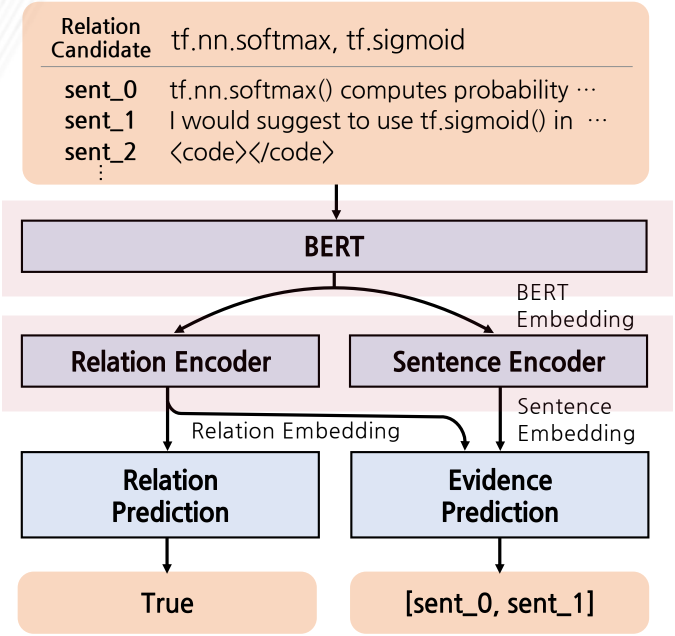
Model Architecture



Automation

Model Architecture

Implication 1:
Maximize the utility of small dataset

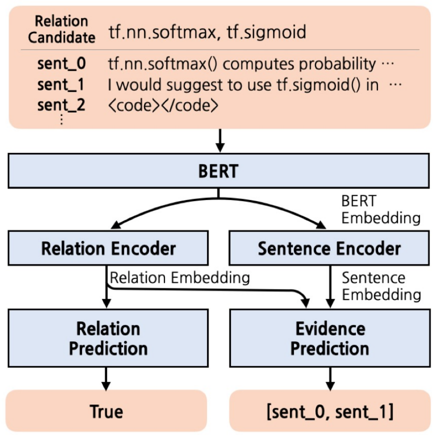


Implication 2:
Comparable pairs over summaries

Automation

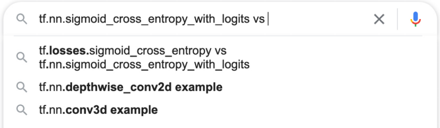
Evaluation

Comparison with existing information source and baselines



SOREL

Google



tf.nn.sigmoid_cross_entropy_with_logits vs

tf.**losses**.sigmoid_cross_entropy vs tf.nn.sigmoid_cross_entropy_with_logits

tf.nn.**depthwise_conv2d example**

tf.nn.**conv3d example**

Google Autocomplete

APIComp* (Pattern Matching)

https://www.telusinternational.com/insights/ai-data/article/the-essential-guide-to-entity-extraction

*: not designed for comparable API methods extraction; not directly comparable

Automation

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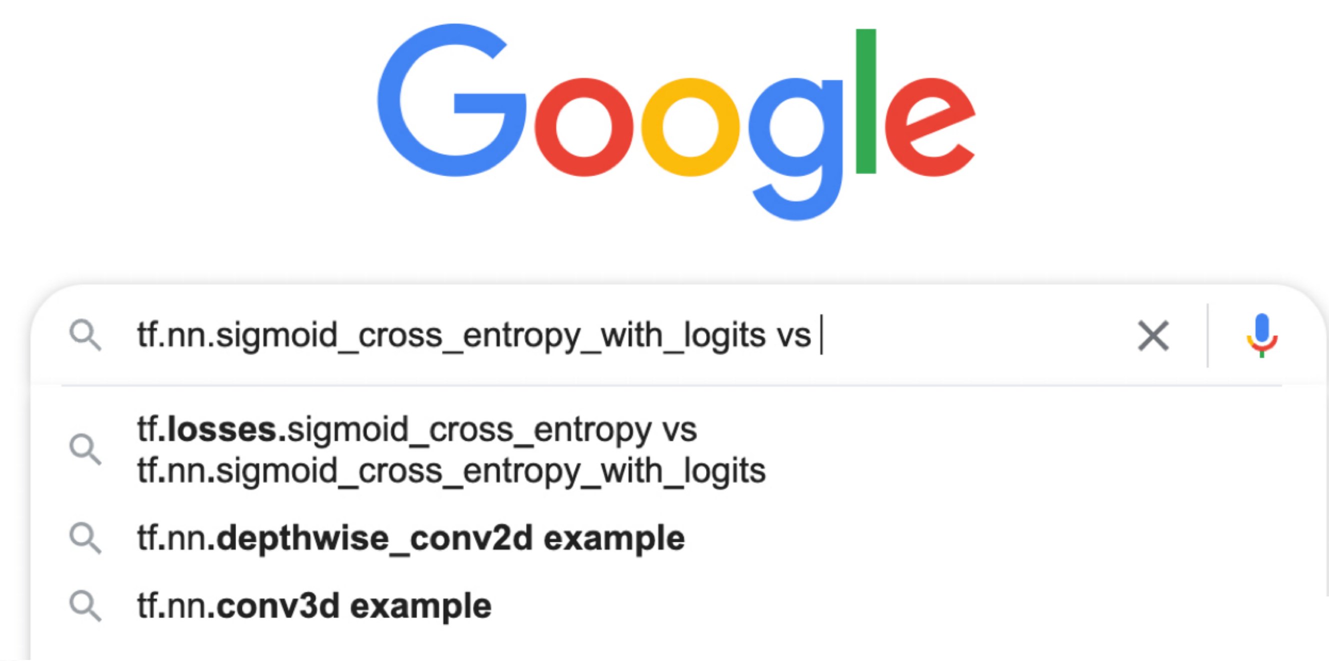

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Evaluation

Comparison with existing information source and baselines

[API_A] Is better than [API_B]
Use [API_A] instead of [API_B]
…

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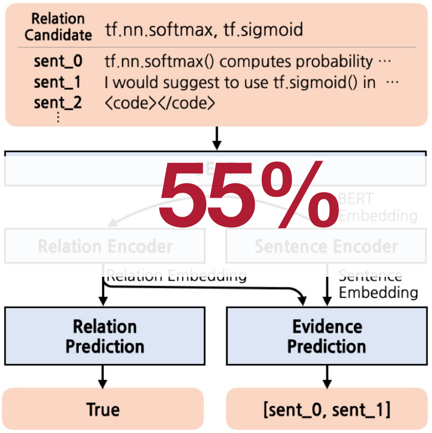
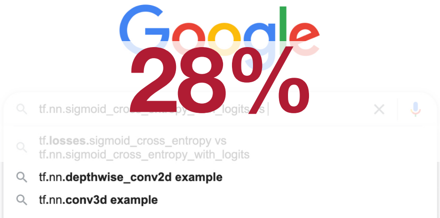
Out of 66 comparable API method pairs in test set,



55%

SOREL



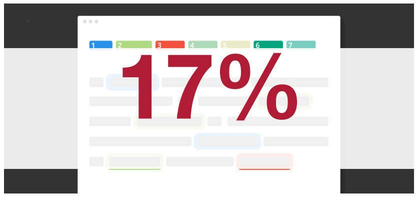
tf.losses.sigmoid_cross_entropy vs tf.nn.sigmoid_cross_entropy_with_logits

tf.nn.depthwise_conv2d example

tf.nn.conv3d example

28%

Google Autocomplete



17%

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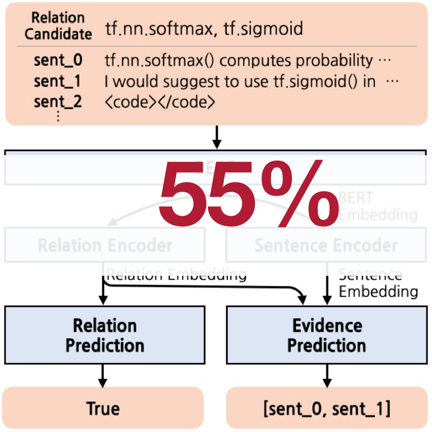
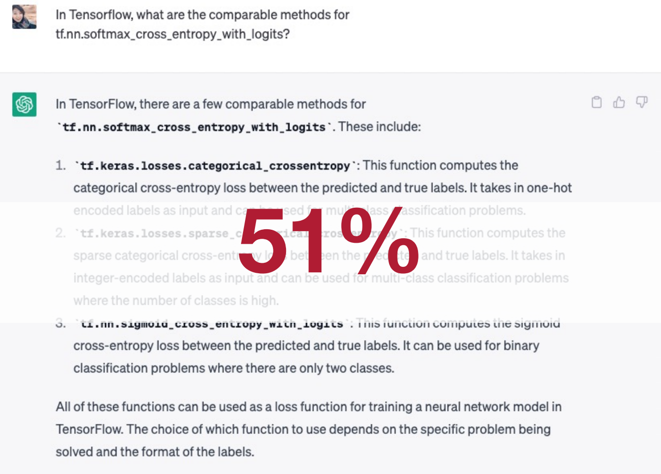


55%

SOREL



In Tensorflow, what are the comparable methods for tf.nn.softmax_cross_entropy_with_logits?

In TensorFlow, there are a few comparable methods for `tf.nn.softmax_cross_entropy_with_logits`. These include:

1. `tf.keras.losses.categorical_crossentropy`: This function computes the categorical cross-entropy loss between the predicted and true labels. It takes in one-hot encoded labels as input and can be used for multi-class classification problems.
2. `tf.keras.losses.sparse_categorical_crossentropy`: This function computes the sparse categorical cross-entropy loss between the predicted and true labels. It takes in integer-encoded labels as input and can be used for multi-class classification problems where the number of classes is high.
3. `tf.nn.sigmoid_cross_entropy_with_logits`: This function computes the sigmoid cross-entropy loss between the predicted and true labels. It can be used for binary classification problems where there are only two classes.

All of these functions can be used as a loss function for training a neural network model in TensorFlow. The choice of which function to use depends on the specific problem being solved and the format of the labels.

51%

ChatGPT

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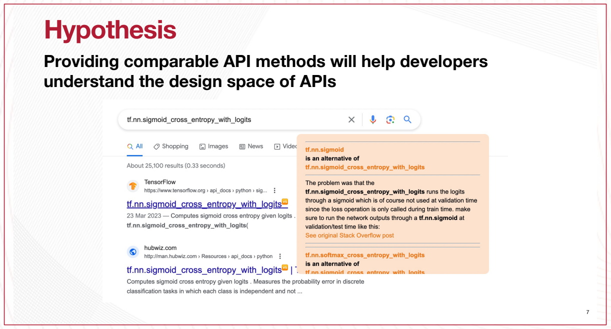

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tf.nn.sigmoid_cross_entropy_with_logits

About 25,100 results (0.33 seconds)

TensorFlow
https://www.tensorflow.org › api_docs › python › sig...

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23 Mar 2023 — Computes sigmoid cross entropy given logits . **tf.nn.sigmoid_cross_entropy_with_logits**(

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See original Stack Overflow post

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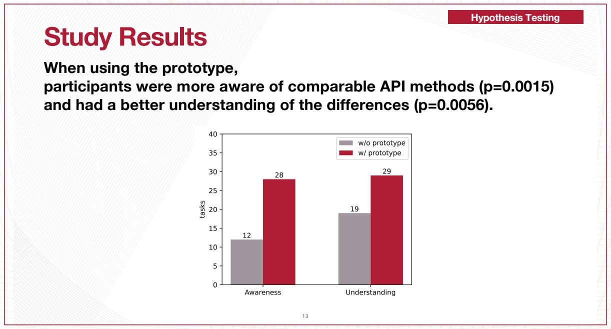

Hypothesis Testing

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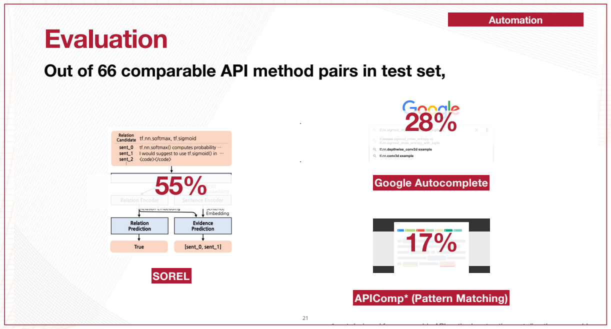

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