Week 4

SUBFORUMS

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Assignment: Multi-class Classification and Neural Networks

← Week 4

ex3 tutorial for predict()

Tom Mosher Mentor Week 4 · 3 years ago · Edited

Here is an outline for forward propagation using the vectorized method. This is an implementation of the formula in Figure 2 on Page 11 of ex3.pdf.

1. Add a column of 1's to X (the first column), and it becomes 'a1'.
2. Multiply by Theta1 and you have 'z2'.
3. Compute the sigmoid() of 'z2', then add a column of 1's, and it becomes 'a2'
4. Multiply by Theta2, compute the sigmoid() and it becomes 'a3'.
5. Now use the max(a3, [], 2) function to return two vectors - one of the highest value for each row, and one with its index. Ignore the highest values. Keep the vector of the indexes where the highest values were found. These are your predictions.

Note: When you multiply by the Theta matrices, you'll have to use transposition to get a result that is the correct size.

Note: The predictions must be returned as a column vector - size (m x 1). If you return a row vector, the script will not compute the accuracy correctly.

Note: Not getting the correct results? In the hidden layer, be sure you use sigmoid() first, then add the bias unit.

------ dimensions of the variables ---------

a1 is (m x n), where 'n' is the number of features including the bias unit

Theta1 is (h x n) where 'h' is the number of hidden units

a2 is (m x (h + 1))

Theta2 is (c x (h + 1)), where 'c' is the number of labels.

a3 is (m x c)

p is a vector of size (m x 1)

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Krishnang Dalal · 2 years ago

I get test case oneVSall correct. I get 94.62% prediction accuracy for predictoneVSall. But when I am submitting the entire assignment it does not calculate scores for the regularized Logistic Regression and One-vs-All Classifier Training. It even doesn't give wrong feedback. What could be the issue?

1 Upvote Hide 1 Reply

Tom Mosher Mentor · 2 years ago

The issue is that your code does not work correctly for the test case that the submit grader uses. Your code must work correctly for any data set.

I recommend you read the Tutorials and use the additional test cases in the Resources menu.

0 Upvotes

H

Harpreet · 2 years ago

How do I calculate Theta1 and Theta2, if it was not provided to us.

1 Upvote Hide 3 Replies

Tom Mosher Mentor · 2 years ago

That is what we learn in Week 5.

2 Upvotes

L L.L. · 2 years ago · Edited by moderator

Thanks for your reply,but I has a little question,you said that a1 is m x n,and Theta1 is (h x n),so I think they can not be mutiplied,because maybe n≠h or m≠n,so it should be **{mentor edit: code removed}**

1 Upvote

Tom Mosher Mentor · 2 years ago

Perhaps you overlooked this line in the turorial:

Note: When you multiply by the Theta matrices, you'll have to use transposition to get a result that is the correct size.

The tutorial leaves a few things for the student to figure out . Otherwise, it would be merely a cookbook.

7 Upvotes

A Alexandr · 2 years ago

Hi Tom,

Thanks for helpful tutorials. I finished assignment but did not understand why we use indices instead of max values of a3.

Thanks,

0 Upvotes Hide 6 Replies

Tom Mosher Mentor · 2 years ago

We don't really care what the maximum value is.

We want to find which classifier gives us the maximum value.

6 Upvotes

JJ Julius Jacobson · 2 years ago

My result for this test is off by one value. My vector returns the correct values save for the last number of my vector p. I get a '1' instead of a '2'. Any ideas as to what could be causing this miscalculation?

0 Upvotes

JJ Julius Jacobson · 2 years ago

Here is the offending row of a3:

0.633861 0.582628 0.522118 0.458987

0 Upvotes

Tom Mosher Mentor · 2 years ago

Here are my results for that test case:

```
>> p = predict(Theta1, Theta2, X)
stopped in C:\Users\Tom\ml-od\machine-learning
    -ex3\ex3\predict.m at line 29
29: [v p] = max(a3, [], 2);
m =  8
debug> a3
a3 =

    0.53036   0.54588   0.55725   0.56352
    0.54459   0.54298   0.53754   0.52875
    0.49979   0.49616   0.49288   0.49024
    0.41357   0.42199   0.43736   0.45844
    0.37321   0.40368   0.44349   0.48911
    0.42073   0.45935   0.50210   0.54464
    0.50962   0.53216   0.55173   0.56659
    0.54882   0.55033   0.54738   0.54021
```

3 Upvotes

JJ Julius Jacobson · 2 years ago

Thanks again for the reply! I figured out what was wrong with my code. I am sure there is a place in Machine Learning heaven reserved for you!

2 Upvotes

Tom Mosher Mentor · 2 years ago

Good news!

2 Upvotes

XL Xinghou Liu · 2 years ago

Hi Tom,

I am working on the predict.m, following you steps, I got the correct output:

'Training Set Accuracy: 97.520000'

I couldn't find any errors from the codes and I am pretty sure they are logically correct with your tips.

But after I submit the codes, they don't passed the assignment.

Any ideas on how can this happen?

0 Upvotes Hide 1 Reply

Tom Mosher Mentor · 2 years ago

There is an error in your code. It does not work correctly with the test case that the submit grader uses.

Try the additional test case, in this thread:

https://www.coursera.org/learn/machine-learning/discussions/iyd75Nz_EeWBhgpcuSIffw

0 Upvotes

LL lennie leong · 2 years ago

HI Tom / mentors,

I am working on predict.m currently.

Using Tom's tutorial as a guide for the assignment, In Tom's tutorial guide, it mentions " Add a column of 1's to X (the first column), and it becomes 'a1'."

Currently, I have X that's a 16x2 matrix. By adding a column of 1's to X, does this mean that it still remains as 16x2 matrix with the first column filled with 1's.

Or, is it a matrix with 16x3 with the first column filled with 1's?

Thank you mentors for help in advanced!

0 Upvotes Hide 1 Reply

Tom Mosher Mentor · 2 years ago

Add a column of 1's. Don't overwrite an existing feature with 1's.

1 Upvote

IC Irena Chanis · 3 years ago

Hi Tom,

i don't understand exactly how the size of the hidden layer (h) is determined (25 in the example). it seems it's arbitrary & not connected to input or output data. Couldn't understand it through the course videos also...

Another question: is it OK that i get the all history cost details of each iteration (attached Pic) for both NN and Multi class classification sections? (was able to submit all the tasks).

thanks,

```
Iteration     5 | Cost: 3.611087e-01
Iteration     6 | Cost: 3.598573e-01
Iteration     7 | Cost: 3.598359e-01
Iteration     8 | Cost: 3.598130e-01
Iteration     9 | Cost: 3.598122e-01
Iteration    10 | Cost: 3.598119e-01
Iteration    11 | Cost: 3.598119e-01
```

Irena.

0 Upvotes Hide 1 Reply

Tom Mosher Mentor · 3 years ago

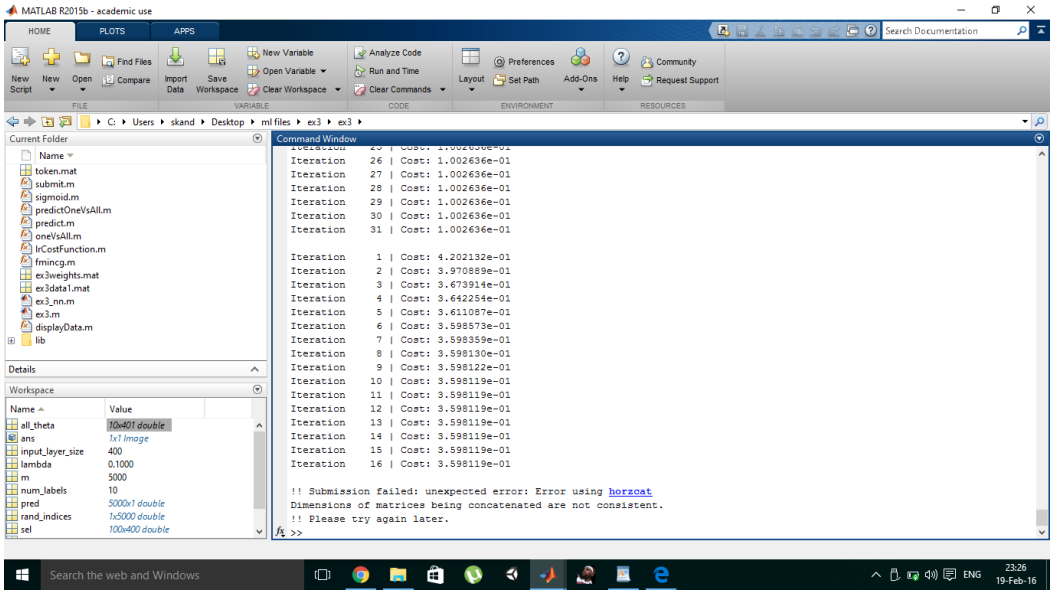
The course doesn't discuss how to set the number of hidden layer units. It is more art than science. There are lots of rules-of-thumb and no general agreement, other than it is typically a value between the number of input features and the number of output classifications. Experimentation is a good idea.

The iteration and cost values from fmincg() are supposed to all be printed on one line. It doesn't matter if they are on separate lines, but perhaps it is being caused by a missing semicolon somewhere in your cost function.

Just guessing, but it might also be due to how your command console is configured. You didn't mention whether you were using MATLAB or Octave, or what version, or if you're using the GUI or the CLI interface. You may be able to adjust some configuration setting.

4 Upvotes

Sunil Skanda · 3 years ago



This is what I got when I tried to submit my code

0 Upvotes Hide 6 Replies

Tom Mosher Mentor · 3 years ago

Don't add bias to the Theta matrices - just to the input and hidden layer features.

The horzcat() error means you are not adding the columns of 1's correctly - it means "horizontal concatenation".

0 Upvotes

Tom Mosher Mentor · 3 years ago · Edited

I recommend you study the tutorial. It tells you exactly what to do.

All you need to figure out is the order of operands and where to use transposition.

1 Upvote

Tom Mosher Mentor · 3 years ago

Also try testing your code using the test cases in this thread:

0 Upvotes

Sunil Skanda · 3 years ago

Thanks. So, z2 equals a1 multiplied by Theta1 right ?

0 Upvotes

Tom Mosher Mentor · 3 years ago

Yes. You will need to use the correct order of the operands and add a transposition.

0 Upvotes

Sunil Skanda · 3 years ago

1.Thanks. All I had was a minor error in using parantheses. Thanks for the help Tom!.

2. The pdf suggested that some interaction session will launch the images. I didn't find any.

3. We wrote a code similar to the predictOnevsAll function. But, I didn't get the prediction result(Training Set Accuracy) as expected.

Again Thanks for the help.

0 Upvotes

Sunil Skanda · 3 years ago

Do we need to add bias unit to theta and theta as well?

0 Upvotes Reply

Sunil Skanda · 3 years ago

How man hidden units are there ?

Tom Mosher Mentor · 3 years ago · Edited

Everything you need to know is provided via the Theta matrices.

0 Upvotes

Sunil Skanda · 3 years ago

Ok. I wrote the code for predict.m as instructed and ran it in Matlab. But, It just stops after the prediction results for the previous function.

0 Upvotes

Tom Mosher Mentor · 3 years ago

Per the tutorial, we're just doing a couple of matrix multiplications and running the sigmoid function. There's nothing there that should cause execution to stop.

If you're using for-loops, all sorts of havoc can occur.

1 Upvote

Sunil Skanda · 3 years ago

Yea, That's what I thought. I think I must have made a mistake in adding ones to the matrix X and the others. Can you tell me how to do that?

0 Upvotes

Tom Mosher Mentor · 3 years ago

Add a column of 1's to a matrix:

```
1  Q = magic(3)
2  m = size(Q,1)
3  Q = [ones(m,1) Q]
```

1 Upvote

Remi Bernadberoy · 3 years ago

I think there is a small error at point 2. Should be:

2. Multiply by Theta1and it becomes 'z2'. Take the sigmoid and it becomes 'a2'.

3. Add a column of 1's to 'a2'

0 Upvotes Hide 5 Replies

Tom Mosher Mentor · 3 years ago · Edited

I disagree. It is not a2 until you add the bias units, just as X becomes a1 after you add its bias unit.

1 Upvote

Remi Bernadberoy · 3 years ago

Ok but z2= theta1 * a1 without sigmoid. We take the sigmoid afterward, don't we?

0 Upvotes

Tom Mosher Mentor · 3 years ago

Add the bias unit after computing the sigmoid. Otherwise, sigmoid(1) would turn it into 0.73106.

2 Upvotes

jeevesh sharma · 2 years ago

Thnx this comment got me out of my agony, i was adding the bias before calculating sigmoid.

2 Upvotes

AG

Atul Kumar Gupta · 2 years ago

Your comment helped me too . Thanks

0 Upvotes

Hyatt Baker · 3 years ago

Well that was very helpful, thanks!

0 Upvotes Reply

CJ Carsten Just · 3 years ago

Hi Tom a matlab technical question that i have had trouble with: when i, in the EX3 assignment, perform the predictOneVsAll function, from where do i get the all_theta input? when i run the OneVsAll funtion, the output is not stored anywhere.... Can you helP?

Best

Carsten

0 Upvotes Hide 2 Replies

Tom Mosher Mentor · 3 years ago

Read the ex3.m script. It calls your oneVsAll() function, saves the return value, and passes it to the prediction function.

2 Upvotes

CJ Carsten Just · 3 years ago

Oki thanks. Tried to just run the function itself... thanks!

0 Upvotes