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Week 2

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Assignment: Linear Regression

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ex1 tutorial for featureNormalize()

Tom Mosher Mentor · a year ago · Edited

This tutorial discusses how to implement the featureNormalize() function using vectorization.

There are a couple of methods to accomplish this. The method here is one I use that doesn't rely on automatic broadcasting or the bsxfun() or repmat() functions.

- You can use the mean() and sigma() functions to get the mean and std deviation for each column of X. These are returned as row vectors (1 x n)
- Now you want to apply those values to each element in every row of the X matrix. One way to do this is to duplicate these vectors for each row in X, so they're the same size.

One method to do this is to create a column vector of all-ones - size (m x 1) - and multiply it by the mu or sigma row vector (1 x n). Dimensionally, (m x 1) * (1 x n) gives you a (m x n) matrix, and every row of the resulting matrix will be identical.

• Now that X, mu, and sigma are all the same size, you can use element-wise operators to compute X_normalized.

Try these commands in your workspace:

Now you can subtract the mu matrix from X, and divide element-wise by the sigma matrix, and arrive at X_normalized.

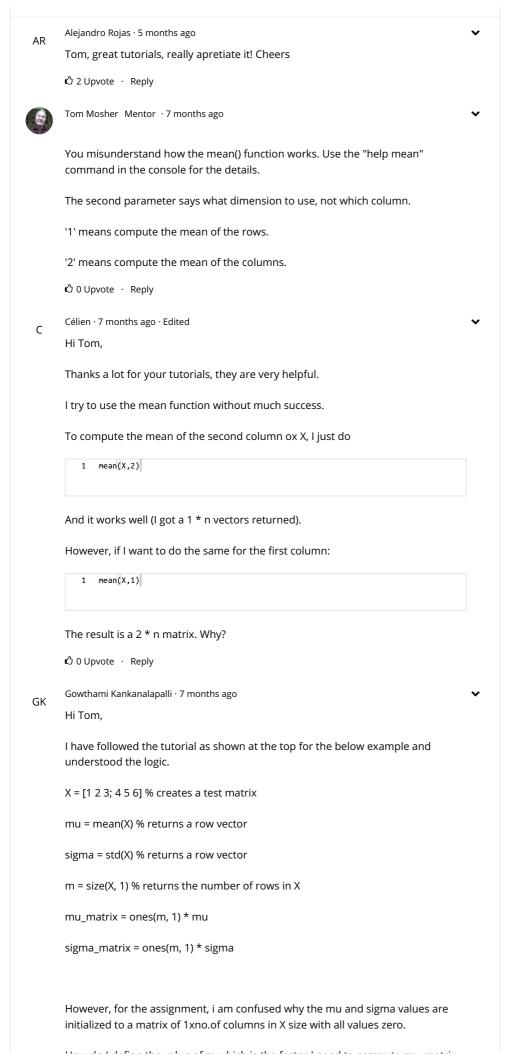
You can do this even easier if you're using a Matlab or Octave version that supports automatic broadcasting - then you can skip the "multiply by a column of 1's" part.

You can also use the bsxfun() or repmat() functions. Be advised the bsxfun() has a non-obvious syntax that I can never remember, and repmat() runs rather slowly.

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Machine Learning - Discussions | Coursera How do I define the value of m which is the factor I need to compute mu_matrix and sigma_matrix? Thanks! ô 0 Upvote · Reply Rohan Marwaha · 8 months ago Hi Tom, I followed the tutorials, But I'm still getting an error. Not enough input arguments. Error in featureNormalize (line 9) $X_norm = X;$ How can I rectify this? 🖒 0 Upvote · Hide 3 Replies Tom Mosher Mentor · 8 months ago Please read the "FAQ for Week 2 and programming exercise 1" in the Week 2 forum area. 🖒 0 Upvote Rohan Marwaha · 8 months ago What I mean is, how can $X_norm = X;$ create an error. This part of the code isn't even written by the student and we aren't supposed to edit it. 🖒 0 Upvote Tom Mosher Mentor · 8 months ago Did you read Q10 of the FAQ? Please post a screen caputure of the command you entered that generated this error. 🖒 0 Upvote Edwin ismail · 8 months ago ΕI I still can't find the normalized Pawel Tyszka · 8 months ago Thanks for the tutorial Tom. I did the same as you suggested so I multiplied mu by ones(47,1) and got submission error. Only after changing it to ones(size(X,1), 1) my submission was accepted. Why was I getting the error when hard-coding 47 if it's the correct dimension? 🖒 0 Upvote · Hide 2 Replies Tom Mosher Mentor · 8 months ago

RW

Machine Learning - Discussions | Coursera 47 is only the correct value if every data set in the entire world had exactly 47 training examples. Your code must work with any size of data set. The submit grader's test case is different than the one in the exercise script. 🖒 0 Upvote Pawel Tyszka · 8 months ago That's very useful! Thanks! 🖒 0 Upvote Rayed Bin Wahed \cdot 8 months ago Why is it necessary to compute mu_matrix and sigma_matrix?? Works just fine with mu and sigma. 🖒 0 Upvote · Hide 1 Reply Tom Mosher Mentor · 8 months ago If you are just using mu and sigma, they are both vectors. Mathematically, you cannot use a vector to modify a matrix. Octave allows you to do this by an evil trick called "automatic broadcasting". But relying on it is risky, and your code will not be portable to MATLAB. 🖒 0 Upvote Haseeb Javed · 9 months ago Hi Tom, I've been playing around with Alpha and num_iterations a lot but keep on getting \$293665.543943 when using Gradient Descent. My price answer when using the Normal Equation is correct: \$293081.464335. Any advice? It's really frustrating to be this close. Do you think my featureNormalize(X) function is not implemented well? I've used Alphas of 0.01, 0.03, 0.1, 0.3, etc. and num_iterations of 1000, 5000, etc.

I've used Alphas of 0.01, 0.03, 0.1, 0.3, etc. and num_iterations of 1000, 5000, etc. and all of their combinations together but I can't move the needle from \$293665.xxxx. Only the tenth or hundredth cent values change.

Thank you,

Haseeb

HJ

🖒 0 Upvote · Hide 3 Replies

HJ Haseeb Javed · 9 months ago

FYI - I calculated the normalized value for the house size of 1650 and it came out to be -0.44117 if done manually on a calculator but -0.43584 when using featureNormalize().

Thanks!

🖒 0 Upvote

Haseeb Javed · 9 months ago

My bad. I figured it out. I was incorrectly adding the test data [1650 3] to the matrix X and then normalizing all of it. I was doing this so that I could easily extract the normalized test data once featureNormalize() was complete.

However this was giving me incorrect normalized data for [1650 3] because this additional row vector skewed the mean and std.

The normalization of X happens as part of ex1_multi.m to compute theta.

And then I'm normalizing the test data [1650 3] by performing the normalization in manual steps and then calculating price.

Is this manual way the correct and most efficient way to calculate the price? Are we supposed to normalize manually first and then apply the theta * [normalized test data] calculation when trying to determine price? Feels like there should be a quicker way to do so.

🖒 0 Upvote



Tom Mosher Mentor ⋅ 9 months ago

•

Yes, that is the correct method.

🖒 1 Upvote

AS

Aniket Prakash Srivastava · 9 months ago

I quote the text from exercise 1 , page 11: "You will do this for all the features and your code should work with datasets of all sizes (any number of features / examples)."

Now for this last bit, I am trying to make the code a generic one feeding in "1: size(data,2)-1" to initiate X and size(data,2) to initiate y. Is this a correct working (my code works fine) from a coding point of view.

🖒 0 Upvote · Hide 1 Reply



Tom Mosher Mentor · 9 months ago

You don't have to do that. The ex1.m script does that for you.

Your code just operates on the values that are passed to it.

🖒 0 Upvote



Tom Mosher Mentor · 9 months ago

Check you're using the right variable names. Inside featureNormalize(), you're operating on X and saving it in the local variable X_norm. X_norm is what gets returned.

In the template code, X_n orm is initialized as a copy of X. So if you still have unnormalized values after calling featureNormalize(), it could be that your code isn't updating X_n orm inside the function.

🖒 0 Upvote · Hide 2 Replies



João Paulo Caldeira \cdot 6 months ago

Hi Tom.

After normalization shouldn't the first column of X still be equal to 1?

I only get "Nice work" after normalization returns NaN in first column.

🖒 0 Upvote



Tom Mosher Mentor · 6 months ago

Normalize first, then add the bias unit.

A 111111111

U u upvote



Nicolas Kokel \cdot 9 months ago \cdot Edited

Nevertheless I kept stuck.

I have typed all lines of codes to normalize X:

- lines 38 to 40 from ex1_multi.m
- 'my own lines of codes' to modify featureNormalize.m
- line 55 from ex1_multi.m

and the result is the correct normalized 47x3 dimensional X vector with the first column made of ones and normalized surface and room number values.

When however I type the EXACT SAME 'my own lines of codes' in featureNormalize.m file, save it, clear and and redo command >> ex1_multi in Octave, and after that type X at the prompt, I get a 47x3 dimensional X vector with non-normalized values for surface and room number in column 2 and 3.

'my own lines of codes' are:

- · calculating mu
- calculating sigma
- defining m
- building the mu matrix by making ones(m,1) times mu
- building the sigma matrix by making ones(m,1) times sigma
- Defining M as X minus mu matrix
- Defining N as M element-wise divided by sigma matrix
- Renaming N into X (simple equal equation); it does not change anything as well if I rename N into X_norm, neither if I directly rename M element-wise divided by sigma matrix to be equal to X or to X_norm.

This is a complete puzzle to me.

🖒 0 Upvote · Reply

ΥW

Yiming Wang \cdot a year ago

Hi Tom,

I have got to the step to derive the X_normalized vector. Please see the partial screen below. When I try to submit, I did not get "nice work" feedback. I wonder where could I have made a mistake in the featureNormalize. m?

```
Program paused. Press enter to continue.

Normalizing Features ...

Running gradient descent ...

Theta computed from gradient descent:
0.000000
0.000000
0.000000

Predicted price of a 1650 sq-ft, 3 br house (using gradient descent):
$0.000000

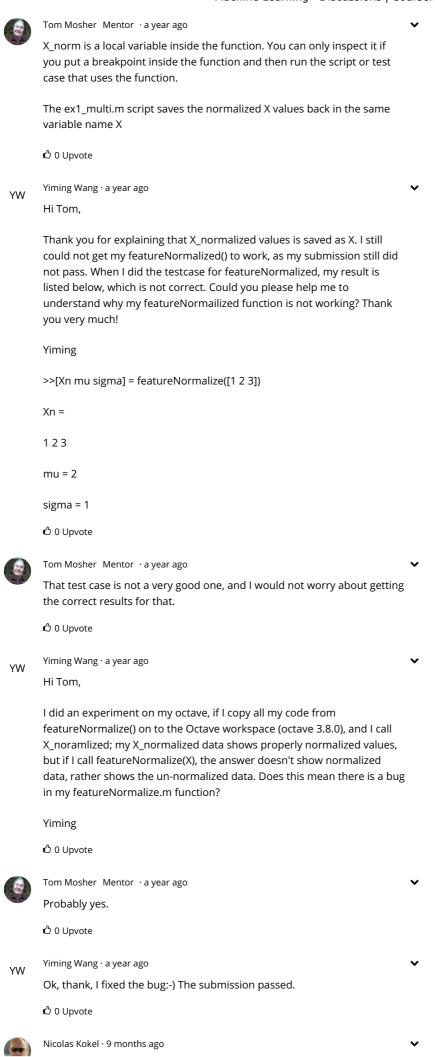
Program paused. Press enter to continue.
```

Also, when I want to look at the dimension of X_normalized, the Octave workspace doesn't respond to my request and returns nothing.

Thank you very much for your help in advance! This discussion page has been super helpful thus far. I have tried to see if I have other problems raised by other folks in this discussions, but it seems not where my problem is.

Yiming

🖒 0 Upvote · Hide 9 Replies





I did as suggested here below:

```
1 X = [1 2 3; 4 5 6] % creates a test matrix
2 mu = mean(X) % returns a row vector
3 sigma = std(X) % returns a row vector
4 m = size(X, 1) % returns the number of rows in X
5 mu_matrix = ones(m, 1) * mu
6 sigma_matrix = ones(m, 1) * sigma
```

'Now you can subtract the mu matrix from X, and divide element-wise by the sigma matrix, and arrive at X_normalized.'

but the issue I am facing is that:

- the first colum of the mu_matrix is made of ones
- the first column of the sigma_matrix is made of zeros.
- by normalizing X for mean values and the first column is made of zeros since 1-1 = 0
- by normalizing X for mean values and then for sigma and the first colum is made of infinite values since it the result of 0 / 0.

Should the first colum of normalized X be made of zeros or of ones?

Does it means no normalization, or normalization only for mean values?

The way for doing so is by selectively normalizing columns 2 and 3 only?

🖒 0 Upvote



Tom Mosher Mentor · 9 months ago

Normalize the features before you add the bias units. ex1 does this for us.

🖒 0 Upvote



Nicolas Kokel · 9 months ago

Oh! I found my mistake.

I was typing code in Octave AFTER runing ex1_multi, so that ones had already been added as the first of three columns to X.

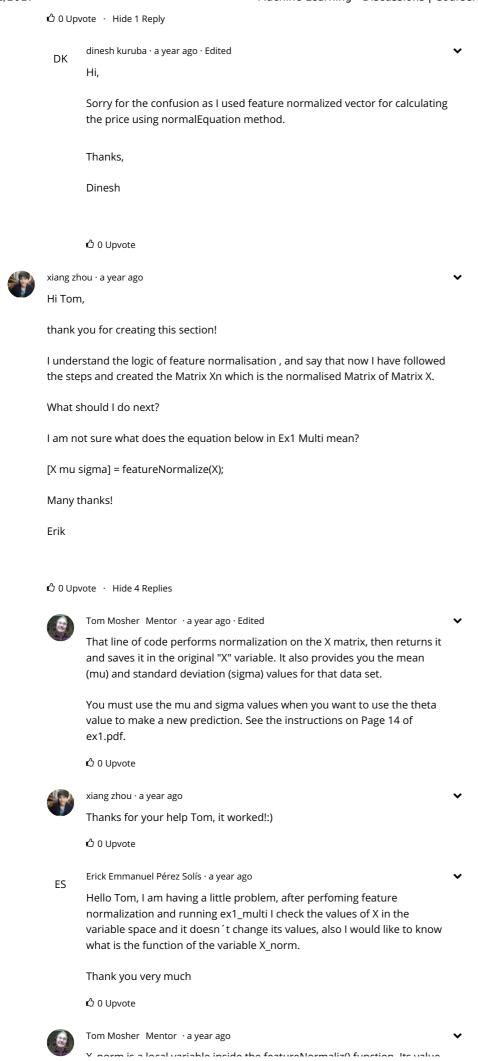
When back to modify featureNormalized.m with MathLab first.

🖒 0 Upvote

DK

dinesh kuruba \cdot a year ago \cdot Edited

Can someone post test cases for NormalEqn() function? and should we nomalize the parameters before calculating price? Price calculated using gradient descent method and normalize equation does not match.



A_HOTHI IS a local variable inside the reacureryormaliz() function. Its value is returned to the script that called the function.

ex1_multi.m saves this value back into the original "X" variable name.

🖒 0 Upvote

1 2 >