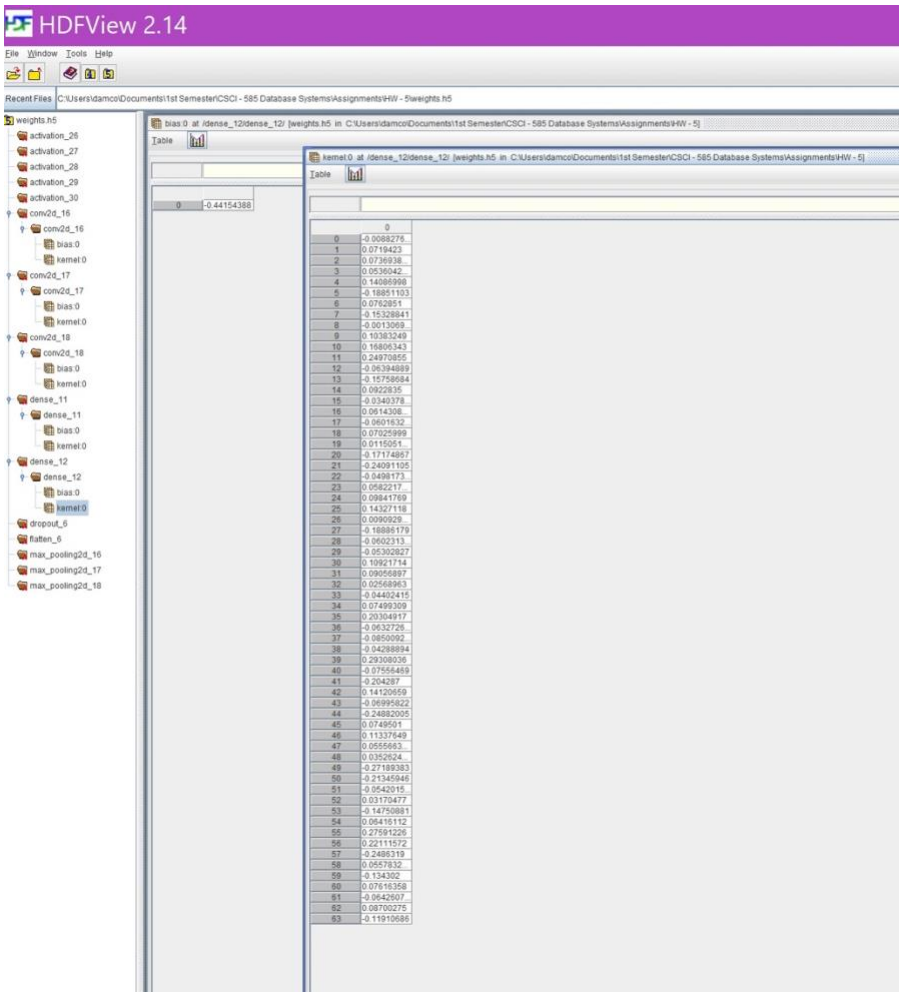
Summer 2021 - CSCI585 HW5 Rubrics

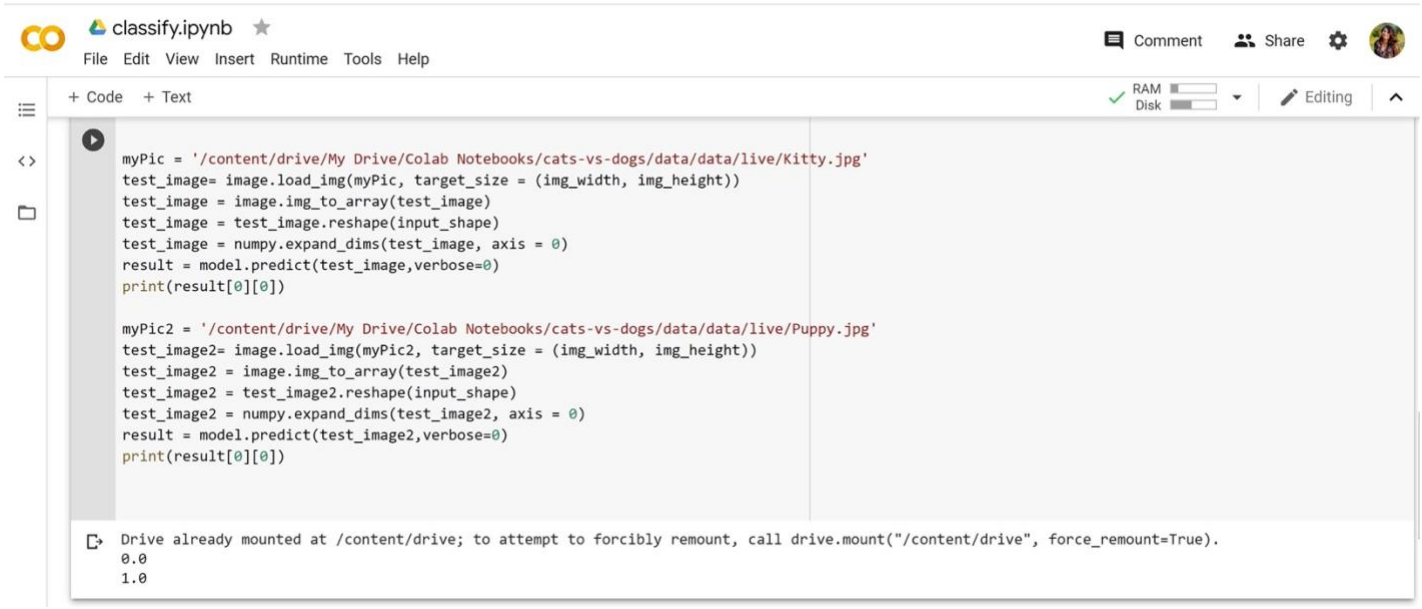
Q1) [1 point]. Submit your weights.h5 file. Also, create a submittable screengrab similar to the above [showing values for the second dense layer (e.g., dense_12)].
0.5 pt. for submitting weights.h5 file
0.5 pt. for submitting screenshot of any dense layer



Screenshot should display the expanded results of any of the dense layers below weights.h5
-0.5 pt. for not submitting weights.h5 file
-0.5 pt. if the screenshot is not submitted

Q2) [1 point]. Create a screenshot that shows the [correct] classification (you'll also be submitting your what {1,2}.jpg images with this).

Total 0.5pt (0.25pt for each) for submitting correct what {1,2}.jpg
Total 0.5pt for submitting a screenshot shows the correct classification on what {1.2}.jpg images. (The values with a 20% range are accepted. For example, for classification 1, accuracy > 0.8 should be fine.)



-0.5pt if the classification result if wrong
-0.5pt if the code is not showing in the screenshot.
-0.25pt if either of the pictures are missing

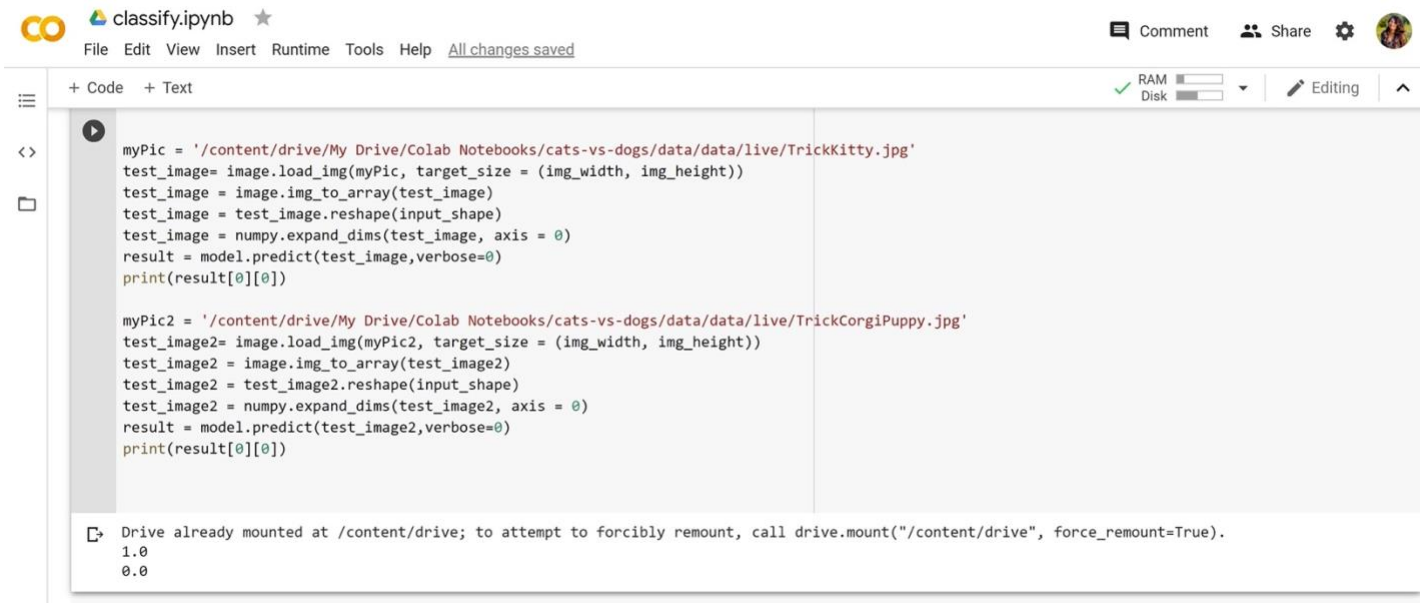
Q3 [2 points] Create a screenshot that shows the misclassification (you'll also be submitting your myPic.jpg (corgi) and myPic2.jpg (dog-like cat) images with this)

Total 1pt (0.5pt for each) for submitting correct myPic {1, 2}.jpg
Total 1pt for submitting a screenshot that shows the misclassification on myPic {1.2}.jpg images. (The values with a 20% range are accepted. For example, for classification 1, accuracy > 0.8 should be fine.)

Corgi Image (myPic) should be misclassified as 0
Dog-like cat Image (myPic) should be misclassified as 1

-1pt if the classification result if wrong
-0.5pt if the code is not showing in the screenshot.
-0.5pt if either of the images are missing

Misclassification



Q4a. [1 point] On paper, **write out a SINGLE equation f (X1, X2, X3) that shows the output Y in terms of the three variables X1, X2 and X3, and the neurons' weights!**

Total 1pt for submitting screenshot of paper showing a SINGLE equation f (X1, X2, X3) that shows the output Y in terms of the three variables X1, X2 and X3, and the neurons' weights.

-0.25pt each for missing X1, X2, X3, or weights
-1 for the incorrect equation
-0.5pt for not expressing it as a SINGLE equation (i.e., instead, using placeholder variables that hold partial expressions, use of matrices, etc.)

Solution:
Using the weights in the HW5 page, the equation would be [note that it is a SINGLE, deterministic eqn that is a fn of just X1,X2,X3:

$$Y = \frac{1}{1+e^{-\left(0.0076\cdot\frac{1}{1+e^{-(7.1933\cdot X1+6.3538\cdot X2-3.0390\cdot X3)}}+0.9955\cdot\frac{1}{1+e^{-(2.8120\cdot X1+4.5113\cdot X2-5.5302\cdot X3)}}+0.9915\cdot\frac{1}{1+e^{-(1.4100\cdot X1+3.3823\cdot X2-3.5177\cdot X3)}}+0.0068\cdot\frac{1}{1+e^{-(4.8385\cdot X1-3.5587\cdot X2+2.3474\cdot X3)}}\right)}}$$

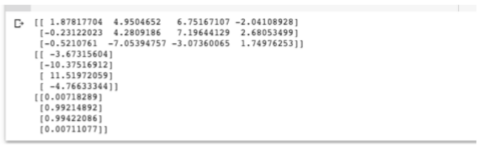
Note: The equations and values of weights shown above are just samples. Do not deduct marks for different weight values as every student may get different values. Deduct only if anyone of the weights or variables are missing.

Q4b) [1 point] Use the equation you just created, to **hand-calculate the classification** (on paper!).

Total 1pt (0.25pt for each) for the correct hand-calculated equations.

-0.25 each for wrong calculation to generate the output for [001, 011, 101, 111]

X1	X2	X3	Y
0	0	1	0
0	1	1	1
1	0	1	1
1	1	1	0



Weight Matrix[input – hidden layer]
[[1.87817704 4.9504652 6.75167107 -2.04108928]
[-0.23122023 4.2809186 7.19644129 2.68053499]
[-0.5210761 -7.05394757 -3.07360065 1.74976253]]
Weight Matrix[hidden – output layer]
[[-3.67315604]
[-10.37516912]
[11.51972059]
[-4.76633344]]
Result output
[[0.00718289]
[0.99214892]
[0.99422086]
[0.00711077]]

Let's say X1 = 0, X2 = 0, X3 = 1, students need to show the calculation step by step to get a result of 0.00718289

Equation = sig(
(sig(x1*1.87817704 +x2*-0.23122023 +x3*-0.5210761)* -3.67315604) +
(sig(x1* 4.9504652 +x2*4.2809186 +x3*-7.05394757)* -10.37516912)) +
(sig(x1*6.75167107 +x2*7.19644129 +x3*-3.07360065)* 11.51972059)) +
(sig(x1*-2.04108928+x2*2.68053499+x3*1.74976253)* -4.76633344))
)

1) [X1, X2, X3] * [1.87817704 4.9504652 6.75167107 -2.04108928] = [Hidden x'0, x'1, x'2, x'3]
[-0.23122023 4.2809186 7.19644129 2.68053499]
[-0.5210761 -7.05394757 -3.07360065 1.74976253]]

Hidden output x'0 = (1.87817704* X1 + -0.23122023*X2 + -0.5210761 * X3) = -0.5210761
Hidden output x'1 = (4.9504652 * X1 + 4.2809186 *X2 + -7.05394757 * X3) = -7.05394757
Hidden output x'2 = (6.75167107 * X1 + 7.19644129 *X2 + -3.07360065*X3)= -3.07360065
Hidden output x'3 = (-2.04108928* X1 + 2.68053499*X2 + 1.74976253* X3) = 1.74976253

2) Sigmoid output – hidden layer

Sigmoid(x'0) = Sigmoid(-0.5210761) -> 0.3726
Sigmoid(x'1) = Sigmoid(-7.05394757) -> 0.00086
Sigmoid(x'2) = Sigmoid(-3.07360065) -> 0.04421
Sigmoid(x'3) = Sigmoid(1.74976253) -> 0.85192

3) calculate output – output layer

Output = Sig(Y0 + Y1 + Y2 + Y3)

[Sig(x'0), Sig(x'1), Sig(x'2), Si(x'3)] * [-3.67315604] = [Y0, Y1, Y2, Y3]
[-10.37516912]
[11.51972059]
[-4.76633344]

Y0 = Sig(x'0) * -3.67315604 = -1.368617940504
Y1 = Sig(x'1) * -10.37516912 = -0.0089226454432
Y2 = Sig(x'2) * 11.51972059 = 0.5092868472839
Y3 = Sig(x'3) * -4.76633344 = -4.0605347842048

y0+y1+y2+y3 = -4.9287885228681

Sig(-4.9287885228681) = 0.00718 which is equal to [0.00718289]

Note: The equations and values of weights shown above are just samples. Do not deduct marks for different weight values as every student may get different values. Deduct only if anyone of the weights or variables are missing.