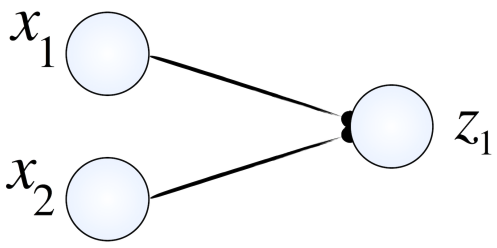
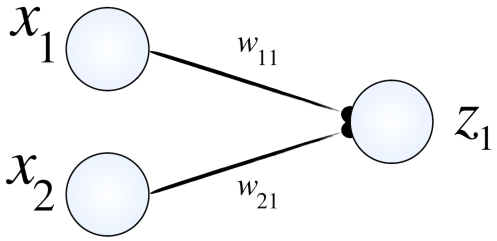
5. Exercise

As introduced in the previous section, a neural network is a powerful tool often utilized in machine learning. Because neural networks are, fundamentally, very mathematical, we'll use them to motivate Numpy!

We review the simplest neural network here:

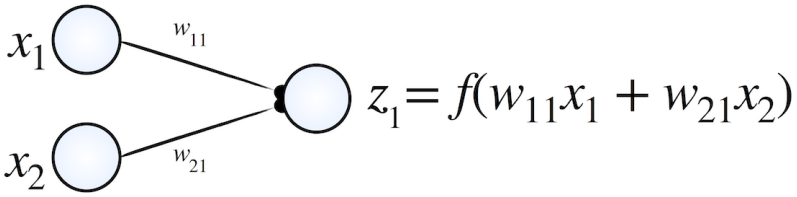


The output of the neural network, z_1, is dependent on the inputs x_1 and x_2. The importance of each of the inputs is given by values called *weights*. There is one weight from each input to each output. We show this here:



The inputs are given by x, and the outputs are given by z_1. Here, w_{11} is the weight of input 1 on output 1 (our only output in this case), and w_{21} is the weight of input 2 on output 1. In general, w_{ij} represents the weight of input i on output j.

The output, z_1, is given by $z_1 = f\left(w_{11}x_1 + w_{21}x_2\right)$:



where f is a specified nonlinear function, and it is usually the hyperbolic tangent function, $\tanh$.

If we express our inputs and weights as matrices, as shown here,

$$\vec{x} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \qquad w = \begin{bmatrix} w_{11} \\ w_{21} \end{bmatrix}$$

then we can develop an elegant mathematical expression: $z_1 = \tanh\left(w^T \vec{x}\right)$.

Neural Network

1.0/1 point (graded)

Here, we will write a function `neural_network`, which will apply a neural network operation with 2 inputs and 1 output and a given weight matrix.

Available Functions: You have access to the NumPy python library as np

Your function should take two arguments: `inputs` and `weights`, two NumPy arrays of shape $(2, 1)$ and should return a NumPy array of shape $(1, 1)$, the output of the neural network. Do not forget the $\tanh$ activation.

Grader note:: If the grader appears unresponsive and displays “Processing", it means (most likely) it has crashed. Please resubmit your answers, and leave a message in the forum and we will work on fixing it as soon as possible.

```
def neural_network(inputs, weights):
    """
     Takes an input vector and runs it through a 1-layer neural network
     with a given weight matrix and returns the output.

     Arg:
       inputs - 2 x 1 NumPy array
       weights - 2 x 1 NumPy array
     Returns (in this order):
       out - a 1 x 1 NumPy array, representing the output of the neural
    """
    #Your code here
    z = np.tanh(weights.T @ inputs)

    return z
```

Press ESC then TAB or click outside of the code editor to exit

Correct

Test results

See full output

CORRECT

See full output

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Topic: Unit 0. Course Overview, Homework 0, Project 0 (1 week):Project 0 Setup, Numpy Exercises, Tutorial on Common Packages / 5. Exercise

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Purpose of "raise NotImplementedError"?	What is the purpose of using "raise NotImplementedError" in the code?	4
Again the size issue		2
Does dot product not work for this?	I transposed A, to use np.dot(A,B) However, it is marking me wrong because the answer is off...	2
[rant] It really hates me	Your output: [[0.24136091]] Weights: [[0.25330051] [0.10347824]] Input: [[0.90767905] [0.157...	1
Grader needs work?	A local jupyter page runs my code and gives the proper answer. But the grader keeps giving t...	4
why this is not correct?	def neural_network(inputs, weights): inputs = np.array([[2], [2]]) weights= np.array([[2], [2]]) r...	3
Why matmul doesnt work in the Answer?		4
Couldnot guess whats wrong with my code	def neural_network(inputs, weights): inputs=np.array([[2],[1]]) weights=np.array([[2],[1]]) retu...	3
Incorrect submission	Hi There appears to be some issue with grader, my code is working as Jupiter notebook but g...	5
Dimension (1,1) vs (1,1,1)	Struggled with this as my code was apparently returning an array of shape (1,1,1) rather than...	2
problem	def neural_network(inputs, weights): inputs=np.random.random([2,1]) weights=np.random.r...	3
Guys Use np.matmul for multiplication, do not use *...	For those who did not know, you can also check it here. https://stackoverflow.com/questions...	5

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