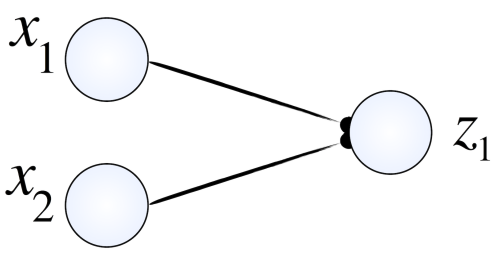
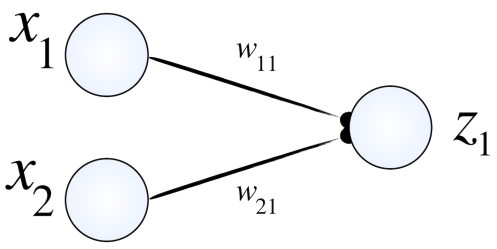
4. Exercise

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:

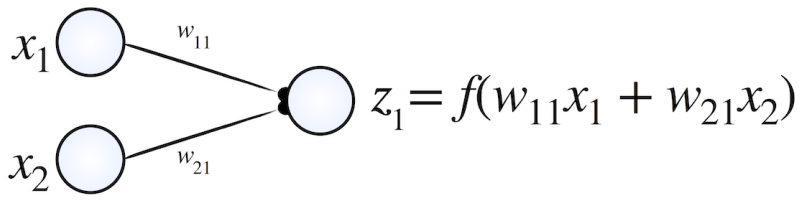


The output of the neural network, z_1, is dependent on the inputs x_1 and x_2. The importance of each of the inputs is given by values called *weights*. There is one weight from each input to each output. We show this here:



The inputs are given by x, and the outputs are given by z_1. 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 $z_1 = f(w_{11}x_1 + w_{21}x_2)$:



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: $z_1 = \tanh(w^T \vec{x})$.

Neural Network

1/1 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.

```python
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 network
    """
    return np.tanh(np.matmul(weights.T,inputs))
```

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

Correct

Test results

See full output

```
CORRECT
```

See full output

Submit You have used 3 of 99 attempts

✔ Correct (1/1 point)

Discussion

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Topic: Unit 0. Course Overview, Homework 0, Project 0 (1 week):Setup, Numpy Exercises, Tutorial on Common Packages / 4. Exercise