## Representing Neural Networks: Takeaways

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## **Syntax**

- Generating data with specific properties using scikit learn:
  - sklearn.datasets.make regression()
  - <u>sklearn.datasets.make\_classification()</u>
  - sklearn.datasets.make moons()
- Generating a regression data set with 3 features, 1000 observations, and a random seed of 1:

```
from sklearn.datasets import make_regression

data = make_regression(n_samples=1000, n_features=3, random_state=1)
```

• Returning a tuple of two NumPy objects that contain the generated data:

```
print(type(data))
tuple
```

• Retrieving the features of the generated data:

• Retrieving the first row of data:

```
print(data[0][0])
array([ 0.93514778,  1.81252782,  0.14010988])
```

• Retrieving the labels of the data:

• Retrieving the first label of the data:

```
print(data[1][0])
255.52134901495128
```

• Creating a dataframe:

```
features = pd.DataFrame(data[0])
```

## Concepts

- Neural networks are usually represented as **graphs**. A graph is a data structure that consists of nodes (represented as circles) that are connected by edges (represented as lines between the nodes).
- Graphs are a highly flexible data structure; you can even represent a list of values as a graph. Graphs are often categorized by their properties, which act as constraints. You can read about the many different ways graphs can be categorized on Wikipedia.
- Neural network models are represented as a **computational graph**. A computational graph uses nodes to describe variables and edges to describe how variables are combined.

- In a simple neural network:
  - each feature column in a data set is represented as an **input neuron**
  - each weight value is represented as an arrow from the feature column it multiples to the **output neuron**
- Inspired by biological neural networks, an **activation function** determines if the neuron *fires* or not. In a neural network model, the activation function transforms the weighted sum of the input values.

## Resources

- Graph Theory on Wikipedia
- Directed Acyclic Graph on Wikipedia
- Feedforward Neural Network on Wikipedia
- <u>Calculus on Computational Graphs</u>
  - Explores how computational graphs can be used to organize derivatives.



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