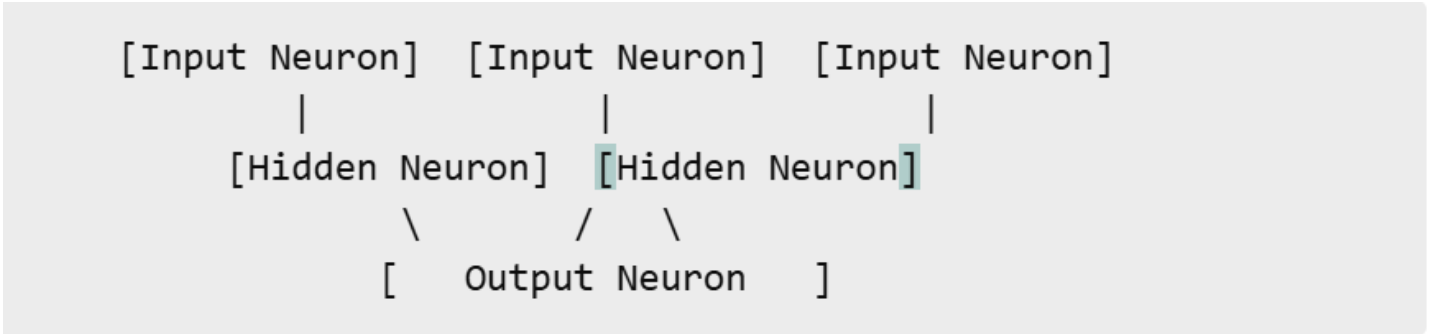
Engage: Neural Networks

**Background Information**: A neural network is a model inspired by the human brain. Just as your brain uses neurons to send and process information, an artificial neural network processes inputs (like pictures or sounds) to make outputs (like labeling something as a cat or a dog). Neural networks get better at decisions over time through training and feedback-just like how we learn from experience. THis activity will have your students simulate the process of a neural network by acting like neurons.

Activities

1. Build a human Neural Network
    a. Assign your students roles
        i. 4-6 Input Neurons
        ii. 2-4 Hidden Layer Neurons
        iii. One Output Neuron (Facing away from the input neurons)
    b. Arrange students into rows to mimic a neural network
    c. Connect students using yarn or string to simulate these connections.
    d. The teacher will display a picture or description of an animal (Ex. cat, dog, horse).
        i. Input neurons will raise the cards that match features in the pictures.
        ii. Hidden Neurons will "process" this information by adding up the votes or scores (how many cards are raised)
        iii. The Output Neurons guess the animal)
2. Explain: "Just like you learn from mistakes, neural networks do too. If you guessed wrong, you'll give feedback to help adjust how much weight each input should have.
    a. If the guess was wrong, give feedback
        i. Inputs that helped = + 1 token
        ii. Inputs that misled = - 1
3. Repeat steps 1 and 2 for a different animals and different traits
    a. Do this 2-3 times.
    b. Students should notice guesses improving



Self Driving Cars

1. Begin by asking students "What senses do humans need to drive a car?"
    a. Wait for student responses and list them on the board.
2. Ask students: What do you think that a self-driving car uses instead?
    a. Make a list of what they think.
    b. Show students a quick video of a Waymo car driving by itself.
        i. Ask students to make a list of any sensors or information they see in the video that the car may use to drive.
            1. Camera, radar, lidar, GPS, Microphones"
        ii. Ask students to think about how a car like this could be trained and write these ideas down. They will be revisited later in the unit.

Neural Networking Cards

| | | | |
|---|---|---|---|
| Four Legs | Fur | Tail | Pointed Ears |
| Whiskers | Purrs | Barks | Neighs |
| Hooves | Paws | Claws | Wags Tail |
| Climbs Trees | Chases animals | Meows | Learns commands like “sit” or “stay” |
| Hunts small rodents like mice | Can carry a human | Eats hay | Carnivore |
| Herbivore | Likes to dig | Pants when hot | Has retractable claws |