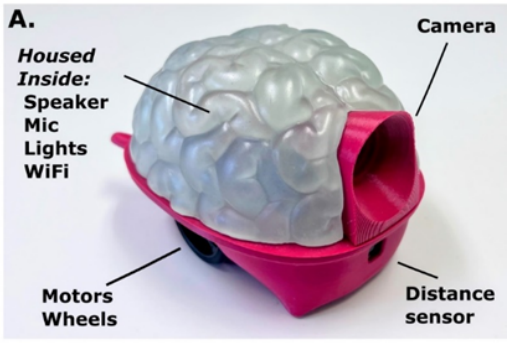
Introduction to SpikerBot

Getting Started

The SpikerBot robot uses a camera to see, a distance sensor to touch, a speaker and lights to communicate, and motors to move around. It communicates via Wi-Fi with the SpikerBot app, which runs the neural networks.

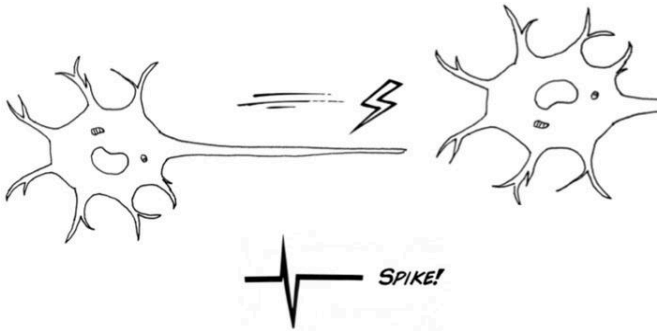


The SpikerBot app is available at **robot.backyardbrains.com**

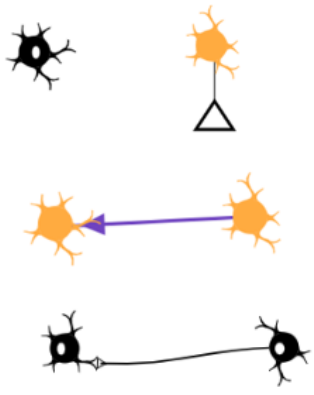
1. Turn the SpikerBot on using the power switch underneath the robot.
2. Connect your device to the SpikerBot's Wi-Fi network (the network name is written on the robot).
3. Wait for the robot's lights to change from blue to green, indicating its Wi-Fi is connected and ready to use.
4. Open the SpikerBot app and press play to start controlling the robot with your neural networks.

Building Brains

Brains consist of **neurons** connected by **synapses**. To add a neuron in the app, drag it from the left panel into the brain area.



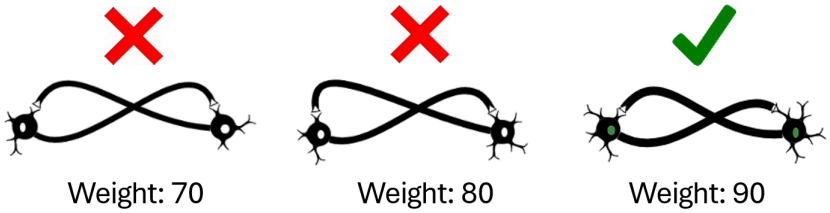
Neurons communicate with electrical signals called **spikes**. Each type of neuron generates and responds to spikes differently. Change a neuron's spiking behavior by selecting it and adjusting its properties.



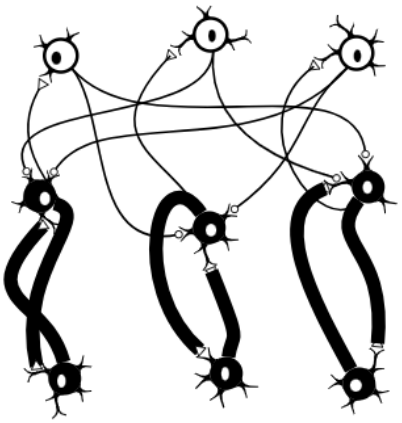
Spikes travel in one direction: from the neuron, along the axon, to the synapse, where they excite or inhibit their target. Create a synapse by selecting a neuron and dragging its axon handle to another neuron.

Neural networks can recognize many different objects in images. To create a neuron that responds to seeing a specific type of object, drag a neuron onto the camera to create a sensory neuron, then edit its sensory preferences by selecting the axon that extends from the camera to the neuron.

Neural Circuits

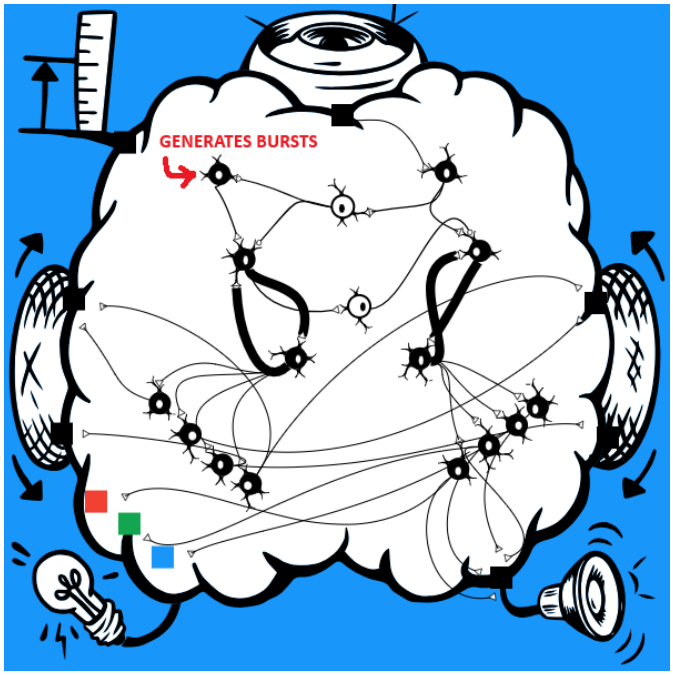


Recurrent excitation involves neural circuits creating positive feedback loops, which are crucial for sustained activities like breathing, walking and even holding thoughts in working memory. Recurrent excitation can be turned on and off by excitation and inhibition, respectively, making it a very useful neural on-off switch. To create a recurrent circuit, connect two neurons with synapses that have a **weight** of 90 or more.



Lateral inhibition is when neural circuits inhibit each other so that only one circuit can be active at a time. Lateral inhibition is essential in visual perception, where it helps us detect edges and shapes more clearly, and decision-making, where it allows the brain to take a course of action while silencing competing options. To set up lateral inhibition, let each circuit activate an inhibitory neuron that in turn inhibits all other circuits.

Exercises



Exercise 1: Design a brain that can track or approach a moving target.

Exercise 2: Create a brain that moves forward when it sees green and stops at red, using recurrent excitation to maintain movement until it sees red.

Exercise 3: Develop a brain that moves forward in response to green, backward to touch, and stops for red, using lateral inhibition to prevent simultaneous movements.

Exercise 4: Design a brain that explores unless it sees a person, using a burst-generating neuron to bias the brain towards exploration.

Troubleshooting

No Response: Ensure the robot is turned on (blue light) and has enough battery (not blinking blue).

Connection Issues: Verify your device is connected to the correct Wi-Fi network. Restart the app and the robot if necessary, and make sure the robot's lights turn green (WiFi connected).

Wheel Issues: If a tire comes off or gets stuck, remove the wheel, reposition the tire, and reattach the wheel.