

# Brain Criticality Hypothesis Simulation

Drew Smith

March 11, 2023

## 1 Idea

**Goal** The goal of this project is to create a simulation of a brain in a state of criticality. I will be attempting to create a weak AGI. I plan to create a neural network with similar features to any other mammal's brain i.e:

- The neural network will have a branching parameter of about 1.
- Each neuron will have roughly 120 connections.
- Each neuron will have an activation threshold.
- Neuron inhibitory and excitatory postsynaptic potentials will fade over time.

I will attempt to teach the neural network simple tasks based around a simulated environment of an organism. My end goal is to create two machines running concurrently, one to simulate the environment, and one to simulate an organism living within the environment. The environment machine will provide inputs to the organism machine, and the organism machine will provide actions for the organism to take in the simulation.

## 2 Design

**Overview** The neural network will take the form of a directed graph. Each neuron will have about 120 receiving and transmitting connections to other neurons.

**Connections** Connections are the equivalent of synapses in the brain. Each connection has several attributes listed below:

1. Source neuron
2. Target neuron
3. Weight

The functions of each attribute will be described in the following sections.

**Transmitting** Upon activation, a neuron will send an activation to each of its forward connections with a signal strength based on the weight assigned to

that connection.

**Receiving** Upon reception of a signal from a connection, a neuron will add the to its level of excitation.