

CLAIMS

1. A circuit, comprising:
 - a plurality of artificial neurons;
 - a plurality of artificial synapses, wherein each of the plurality of artificial synapses is associated with a corresponding one of the plurality of artificial neurons;
 - a plurality of variable gain amplifiers, wherein each of the plurality of variable gain amplifiers is associated with a corresponding one of the plurality of artificial neurons;
 - a router, configured to connect at least one of a plurality of input sources to each of the plurality of artificial neurons via a corresponding variable gain amplifier and a corresponding artificial synapse; and
 - a gain configuration controller, configured to set a gain on each of the plurality of variable gain amplifiers based on a time division schema and an identity of an input source transmitting a spike during a given time.
2. The circuit of claim 1, wherein a number of input sources connected to a given artificial neuron of the plurality of artificial neurons is based on the time division schema and a spike transmission rate from the plurality of input sources.
3. The circuit of claim 1, wherein the router and the gain configuration controller allow a first artificial neuron of the plurality of artificial neurons to receive a first spike from a first input source of the plurality of input sources at a first gain and a second artificial neuron of the plurality of artificial neurons to receive the first spike from the first input source of the plurality of input sources at a second gain set independently of the first gain.
4. The circuit of claim 1, wherein the router and the gain configuration controller allow a first artificial neuron of the plurality of artificial neurons to receive a first spike from a first input source of the plurality of input sources during a first time and a second artificial neuron of the plurality of artificial neurons to receive a second spike from a second input source of the plurality of input sources at the first time.
5. The circuit of claim 1, wherein a first input source of the plurality of input sources transmits spikes at a first transmission rate and a second input source of the plurality of input sources transmits spikes at a second transmission rate, different from the first transmission rate.
6. The circuit of claim 1, wherein the router includes a register, configured to receive and store input spikes from the plurality of input sources and re-transmit the input spikes from the register based on the time division schema.
7. The circuit of claim 1, wherein the router and the gain configuration controller are controlled via a shared clock signal.

8. The circuit of claim 1, wherein each of the plurality of variable gain amplifiers is positioned upstream of a corresponding one artificial synapse relative to a corresponding artificial neuron.
9. The circuit of claim 1, wherein the plurality of artificial neurons, the plurality of artificial synapses, the plurality of variable gain amplifiers, the router, and the gain configuration controller are defined on a single integrated circuit.
10. A method, comprising:
training neurons in a spiking neural network (SNN);
assigning a time division schema for input sources to the neurons based on the training;
assigning gains for the neurons in the time division schema based on the training;
receiving inputs from the input sources;
setting a given gain for a given neuron based on the assigned gains and a given input source from which a given input is received; and
transmitting the given input to the given neuron according to the gain.
11. The method of claim 10, wherein setting the given gain further comprises:
setting the given gain based on an identity of a given input source from which the given input was received.
12. The method of claim 10, wherein a first neuron of the neurons receives a first input from a first input source of the input sources at a first gain, and a second neuron of the neurons receives the first input at a second gain different from the first gain.
13. The method of claim 10, wherein a first neuron of the neurons receives a first input from a first input source of the input sources at a first time and a second neuron of the neurons receives a second input from a second input source of the input sources at the first time.
14. The method of claim 10, further comprising:
storing the inputs received in a register until a corresponding time in the time division schema.
15. The method of claim 14, wherein setting the given gain further comprises:
setting the given gain based on the corresponding time being associated with a given input source from which the given input was received.
16. The method of claim 14, further comprising:
in response to receiving two input spikes from one input source of the input sources, dropping an earlier received input spike of the two input spikes from the one input source.

17. The method of claim 14, further comprising:
in response to receiving at least two input spikes during one time division for transmission to one neuron of the neurons, colliding the at least two input spikes.
18. A system, comprising:
a signal path comprising a variable gain amplifier;
an artificial neuron connected via the signal path to a plurality of input sources; and
a gain configuration controller configured to set a gain in a variable gain amplifier based on which input source of the plurality of input sources is transmitting an input spike to the artificial neuron.
19. The system of claim 18, further comprising:
a router, connected to the plurality of input sources and configured to connect one input source of the plurality of input sources at a time to the artificial neuron via the signal path.
20. The system of claim 18, further comprising:
a router, connected the gain configuration controller and the plurality of input sources, wherein the router is configured to identify to the gain configuration controller which input source of the plurality of input sources is transmitting the input spike.