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## 1. Understand the LIF Neuron Model

The Leaky Integrate-and-Fire (LIF) neuron operates as follows:

- **Input current integration:** It accumulates incoming currents over time.
- **Leakage:** The accumulated potential leaks gradually, mimicking the decay in biological neurons.
- **Thresholding:** When the membrane potential exceeds a threshold, the neuron generates a spike and resets its potential.

Equations:

- Membrane potential:  $V_{t+1} = V_t + (I_t - \frac{V_t}{\tau})$ 
  - $I_t$ : Input current
  - $\tau$ : Time constant for leakage
- If  $V_t \geq V_{th}$ : Spike,  $V_t$  resets.

## 2. High-Level Architecture in RTL

The digital neuron can be broken into the following modules:

1. **Input Interface:** To receive input spikes or currents.
2. **Membrane Potential Calculator:**



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Reason

ChatGPT can make mistakes. Check important info.



















































































