A Practical Guide to Tuning Spiking Neuronal Dynamics: Supplement

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Visualization of Poisson Processes

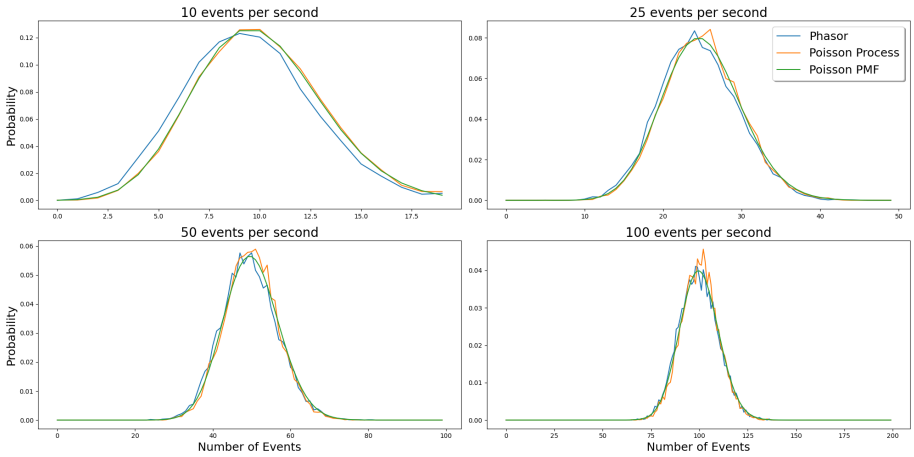

Figure 1: **Experimental comparison between a Bernoulli trial-generated Poisson process, a phasor, and the true probability mass function (pmf) of the Poisson distribution.** Featured above are plots conditioned on four different values for the number of events that happen in 1000 time steps. Each plot was generated using $10,000$ trials of both a sampled Poisson process (Section 2.1.2) and a sampled phasor (Section 2.1.3), where the x-axis is the number of events that occurred during that trial and the y-axis is the probability or the proportion of the trials that had that number of events. It can be seen that, as the number of events increases, the phasor does a more consistent job mirroring the pmf of the Poisson Distribution. This, however, does not mean that a phasor is a better encoding technique as each style of spike train encoding has its own unique strengths and weaknesses.

Additional (High) Latency-LIF Example

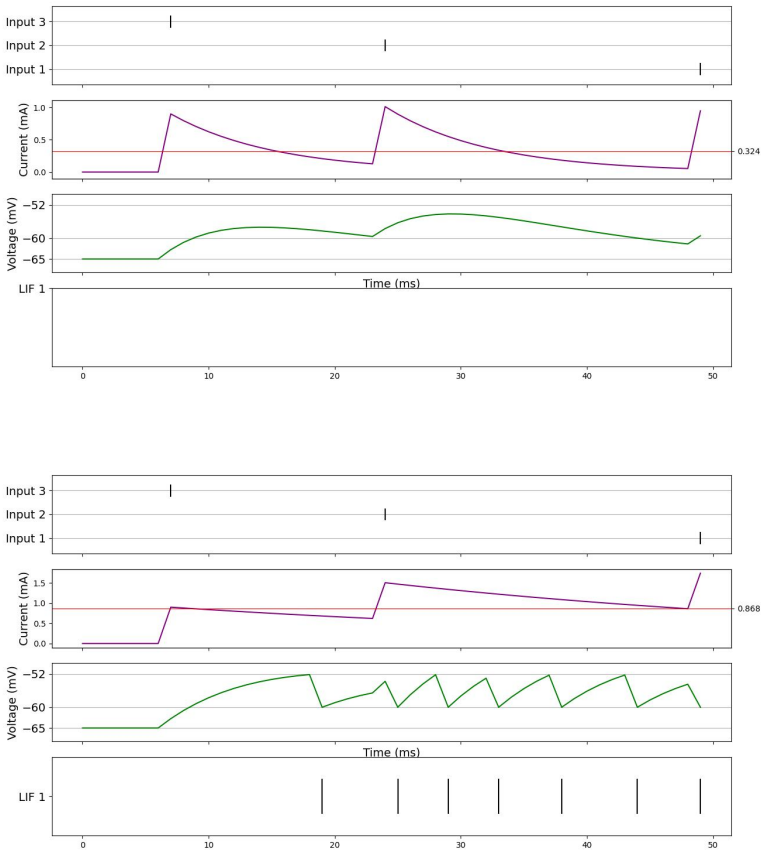

Figure 2: **(High) Latency-LIF coupled dynamics.** For the case of a high-latency variation of latency-encoded inputs, we present above a visual of the dynamics of a four-cell system – 3 latency-coding input cells synaptically wired into 1 LIF cell – under two different time constant settings (left shows a "healthy" setting; right shows a "degenerate" setting). Both cases show the scenario where two initial (high) latency-coded spikes occur near one another with the last one lagging behind. Notice, in the "healthy" setting, the closeness of two input spike pulses do ***not*** result in an output spike emission; the "degenerate" setting results in an unexpected, constant stream of output spikes emitted from the input pulses.