# General Form

Since we are now interested in dispersion, we need our time bin be large enough to allow multiple spikes. And we also need independent observations. Denote the number of spikes at step in neuron be and all observations at step as

If we only allow be 1 or 0, then the distribution is forced to be Bernoulli or approximately Poisson because of small intervals.

Denote , and

Then the likelihood is:

, where

And the log-likelihood is:

Then follow the same rationale as (A.3) in Eden’s paper:

Take Log on both sides:

Differentiate once and twice with respect to :

Evaluating these 2 derivatives at yields:

OK, let’s deal with and .

Then, there are four pieces remaining to deal with:

Then and can be written out as:

Now, we further need to write , , , and explicitly.

OK, put them altogether…

When and , then this is exactly as derived in Eden’s paper.

# In Context of Linear Regression

Let

Then , , and