# General Form

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

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 at step is:

, where

And the log-likelihood at step 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:

Since

Therefore,

The moments of and can be evaluated by truncated summation according to p.m.f.

So,…

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

# Fisher Scoring

Since the observed information include , it is not robust to outliers. Replacing observed information by fisher information will stabilize the algorithm, but it will sacrifice the accuracy. When is somewhat large, will converge to , but for small , especially when , this will cause problem.

Pretty clean.

# In Context of Linear Regression

Let

Then , , and

For the fisher scoring version: