1 b)

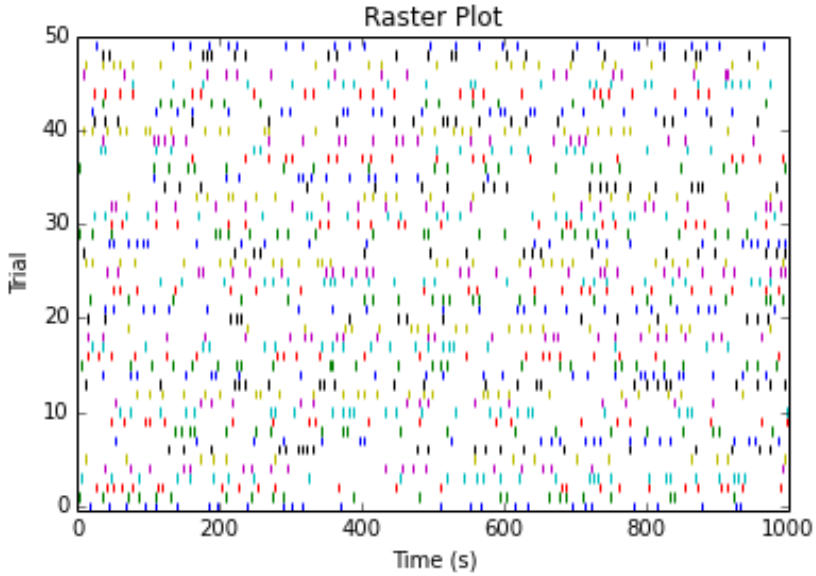

Figure 1: Spike Raster plot of a single Poisson neuron over 50 trials.

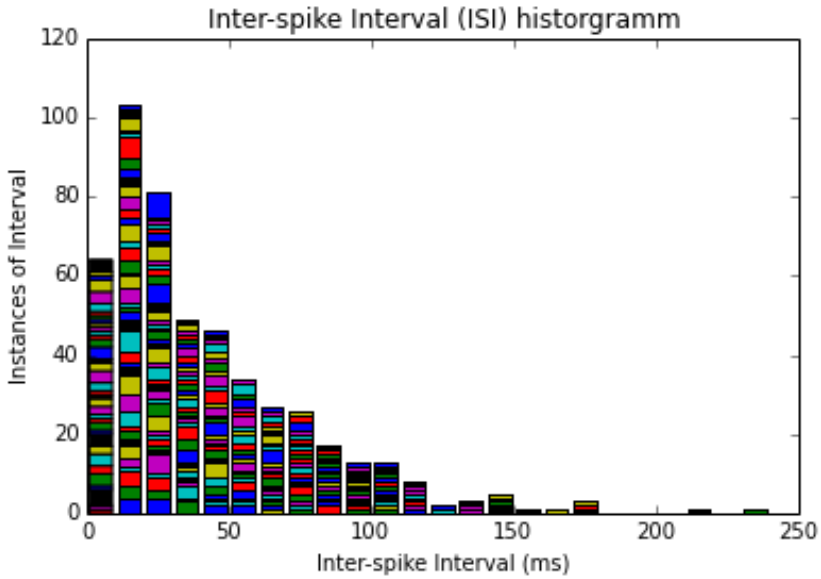

Figure 2: FInter-spike Interval (ISI) distribution. Showing a low initial distribution (under 10ms) due to the refractory period.

1 c)

The coefficient of variation for 50 trials is 0.890346929907.

1 d)

The fano factor for the first 100ms and a refactory period of 5ms is 1.06357142857.

The fano factor for the first 100ms and a refactory period of 1ms is 0.937049180328. This is larger than the 5ms refactory period case, since there are more spikes in the first 100ms.

2 a)

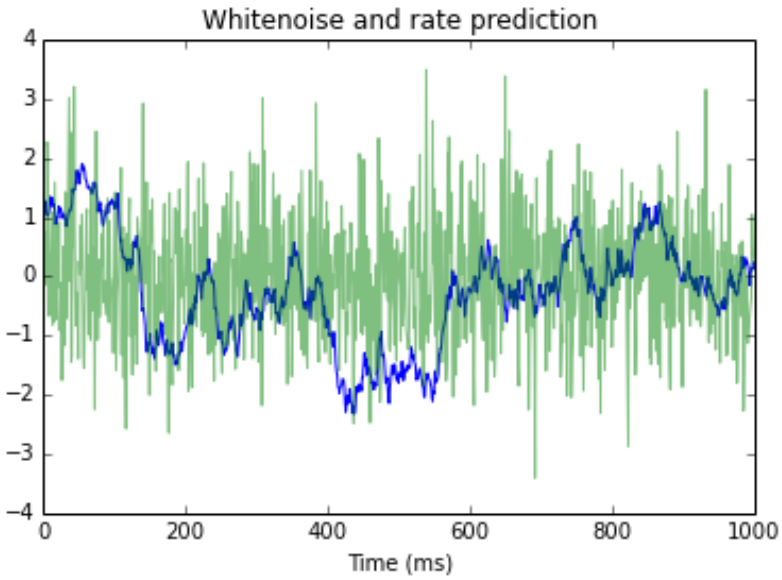

Figure 3: Linear model rate prediction overlayed with white noise stimulus.

2 b)

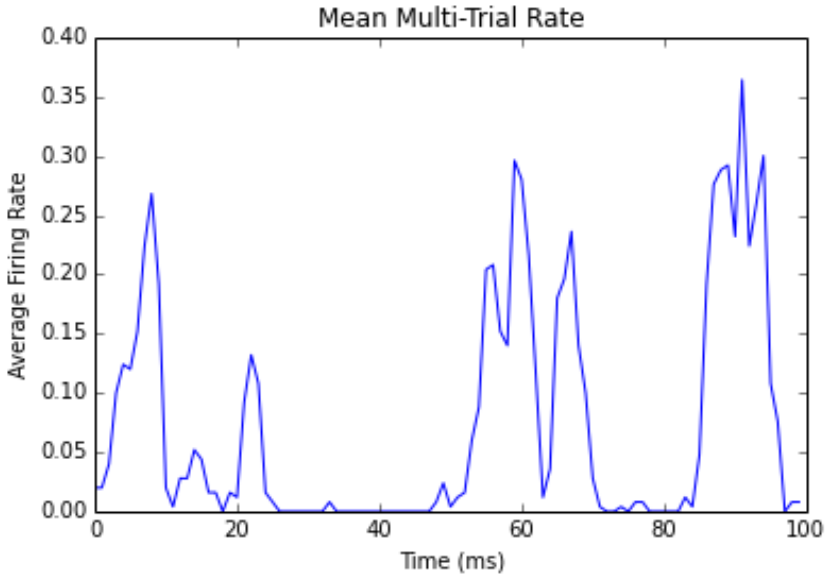

Figure 4: Average firing rate for the synthetic neuron stimulated by a white noise stimulus.

2 c)

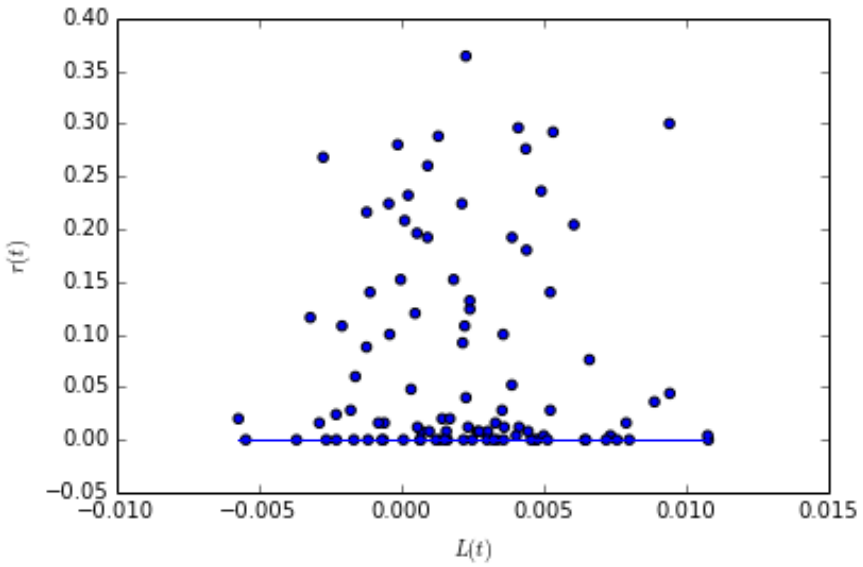

Figure 5: A failed attempt at creating a non-linear model with a fitted sigmoid resting along the 0.0 axis.

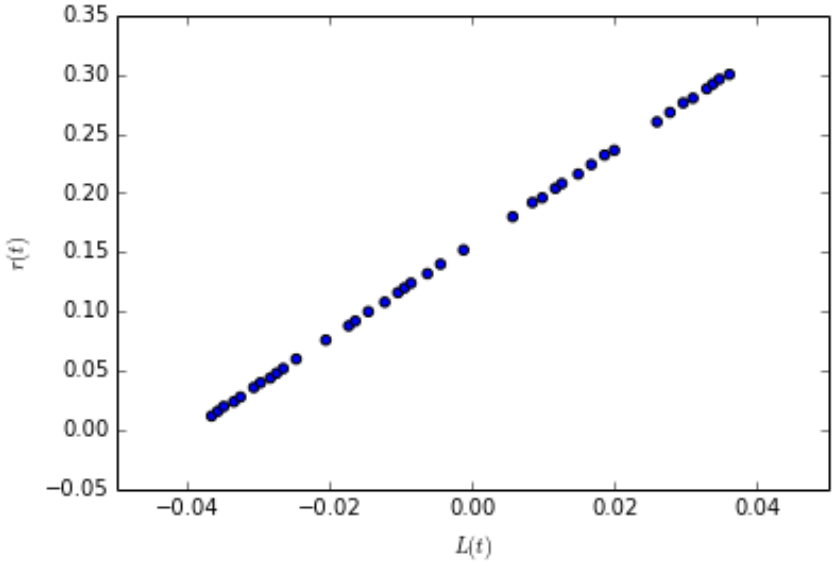

Figure 6: A compressed representation of the above data, yielding an admittedly linear, but more useful model.

2 d)

Given the linear-nonlinear model acquired $r_{est} = r_0 + F(L)$ spikes can be generated by spiking if $r_{est}\Delta t > x_{rand}$, where $x_r and$ is drawn from the uniform random distribution between $[0, 1)$ and Δt is the time since the last spike.