Computational Neuroscience Coursework 2

Spike Trains

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Question 1:

The Fano factor of the spike count and coefficient of variation of the inter-spike interval for 1000 seconds of spike train (with a firing rate of 35 Hz) is performed over windows of width 10 ms, 50 ms and 100 ms, both with no refractory period and a refractory period of 5 ms. The obtained results have been presented below.

0 ms Refractory Period	
Coefficient of Variation	0.992993096363
Fano Factor of 10 ms windows	1.0020668937
Fano Factor of 50 ms windows	0.999634974689
Fano Factor of 100 ms windows	0.990066083755

5 ms Refractory Period	
Coefficient of Variation	0.824140224335
Fano Factor of 10 ms windows	0.750431915329
Fano Factor of 50 ms windows	0.691274177763
Fano Factor of 100 ms windows	0.67502587914

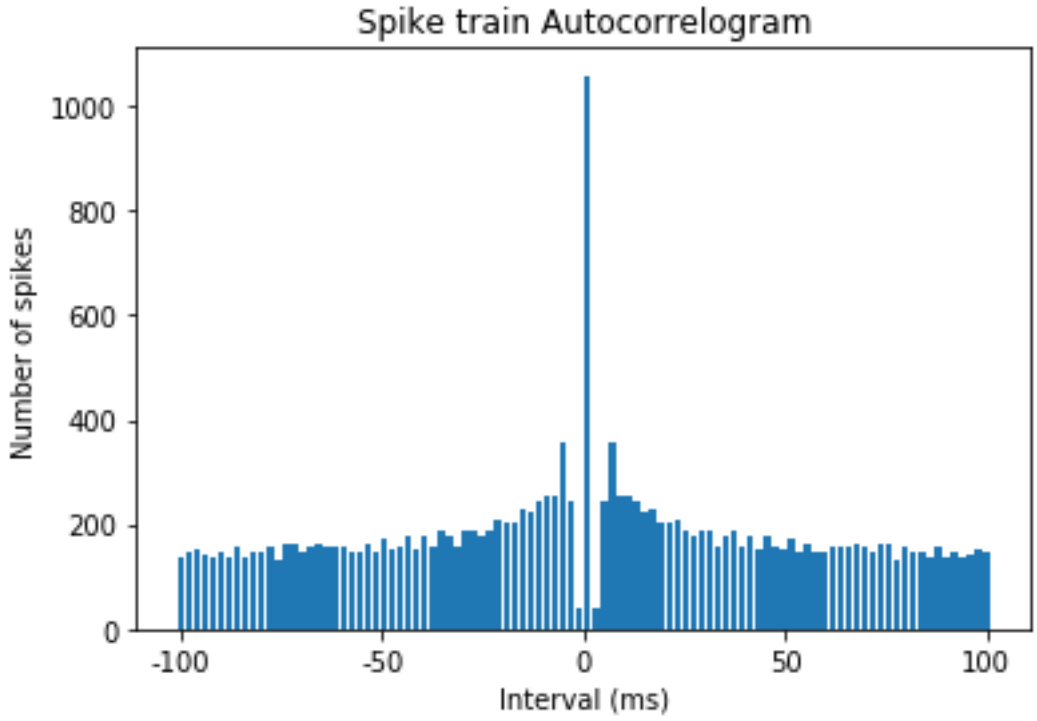
Question 2:

The Fano factor and coefficient of variation for data collected and provided by Rob de Ruyter van Steveninck, from a fly H1 neuron responding to an approximate white-noise visual motion stimulus, for 20 minutes at a sampling rate of 500Hz is calculated. The results of which are presented below.

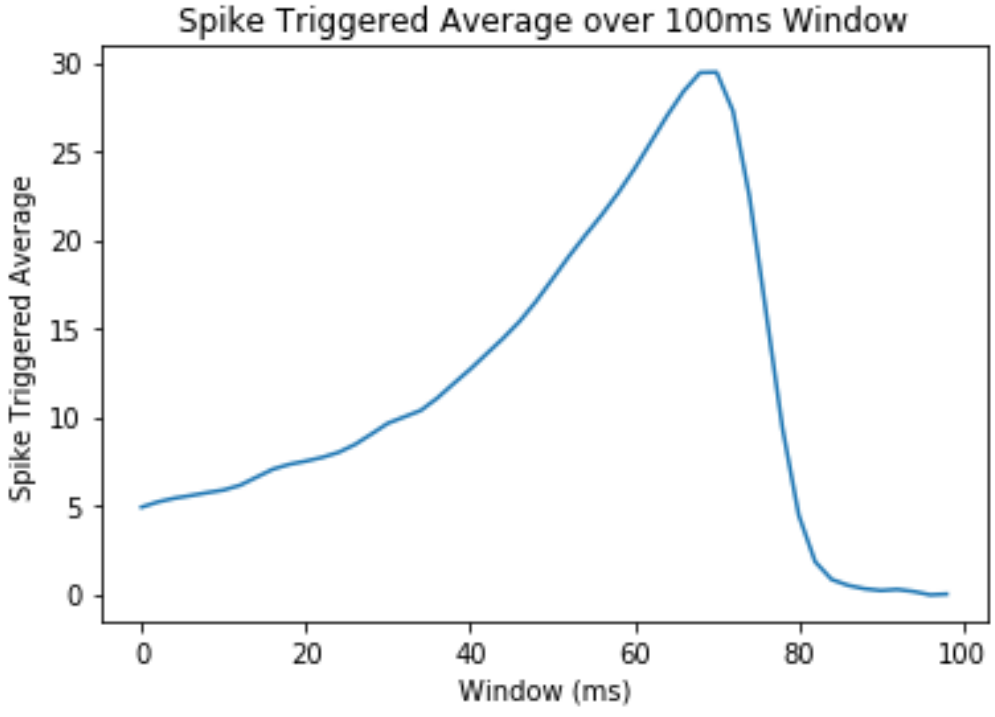
Collected for 20 mins at Sampling rate of 500Hz	
Coefficient of Variation	2.00851252895
Fano Factor of 10 ms windows	1.11768014263
Fano Factor of 50 ms windows	2.92975628486
Fano Factor of 100 ms windows	4.10295952034

Question 3:

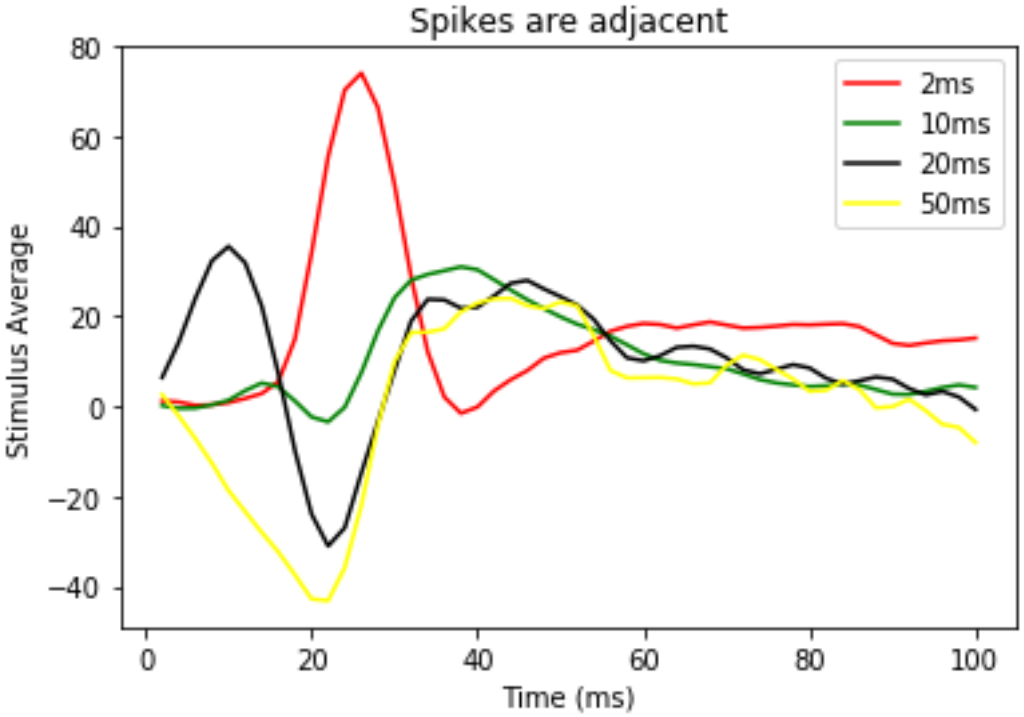
The autocorrelogram plot over the range -100 ms to +100 ms for the spike train evoked in the data provided by Rob de Ruyter van Steveninck is shown below.

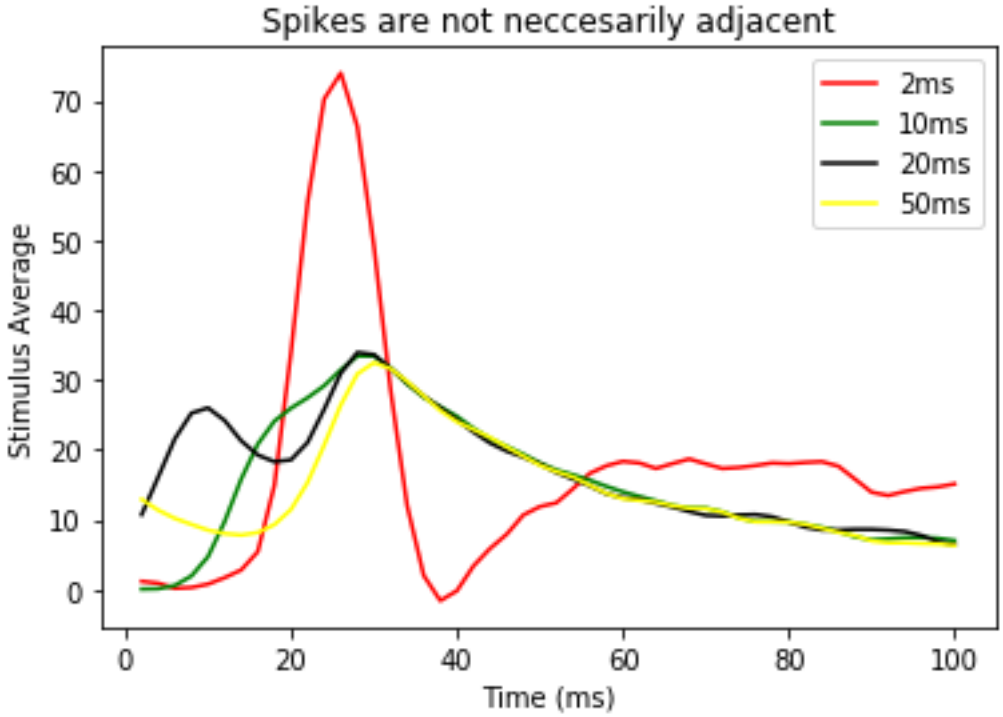


Question 4:



Question 5:


Spikes are adjacent
Stimulus Average
Time (ms)
2ms
10ms
20ms
50ms
80
60
40
20
0
−20
−40
0
20
40
60
80
100


Spikes are not neccesarily adjacent
Stimulus Average
Time (ms)
2ms
10ms
20ms
50ms
70
60
50
40
30
20
10
0
0
20
40
60
80
100