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NSCI 1230

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**Homework 2: Spike Trains and Firing Rates**

**Group 1 with Diana Xu**

**Question 2:** Create a graphic of the spike train.

* **How many spikes?** There are 105 spikes in this spike train
* **Average firing rate?** 105 spikes / 10 seconds = 10.5 Hz

**Chart, bar chart

Description automatically generated**

**Question 3:** Make a histogram to plot the firing rate of bins of width 1000 (ms).

Chart, histogram

Description automatically generated

**Question 4:** Use the Grid Extra package to make a layered plot.

**Graph 1:**

* There are 105 spikes in 10 seconds which gives an average firing rate of 10.5 Hz
* From the spike train graph we can see that there is a low firing rate over the 10 seconds because there are a lot of intervals with no spikes occurring
* The neuron looks to be firing in distinct intervals because there are periodic dense parts that show spiking occurring, then stopping, then occurring again. This could be due to a continued stimulus that is being reapplied to the neuron

**Graph 2:**

* The highest firing rates appear at the 2500 ms intervals (0, 2500, 5000, 7500, 10000) because we can see the peaks occurring with the highest average firing rates in these intervals.
* It seems like the average firing rate was inconsistent throughout the recorded time interval, with some firing rate bins being really high (~15 – 18 Hz) and some being really low (~ 0 – 5 Hz).

**Graph 3:**

* There is a high variation of firing rates throughout the recorded time intervals in 100 ms bins, where sometimes the neuron did not even fire (shown by the empty bar intervals).
* We can see the peaks at the 2500 ms intervals like we did in graph 2.
* The y-axis scale almost doubled from graph 2 which helps show the inconsistent firing rates again because some are really high (~40 - 60 Hz), but there were many bins without spikes firing which means a firing rate of 0 Hz.
* It is possible that this bin size is too small because besides the peaks, it does not show a clear pattern of firing.

