EE746 Assignment-2

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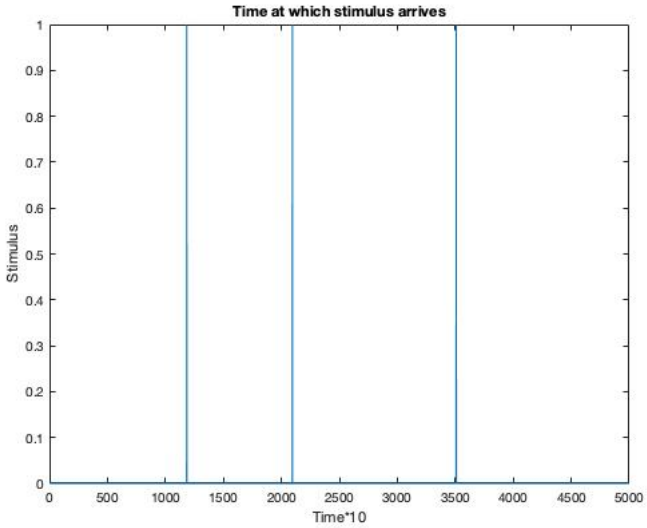
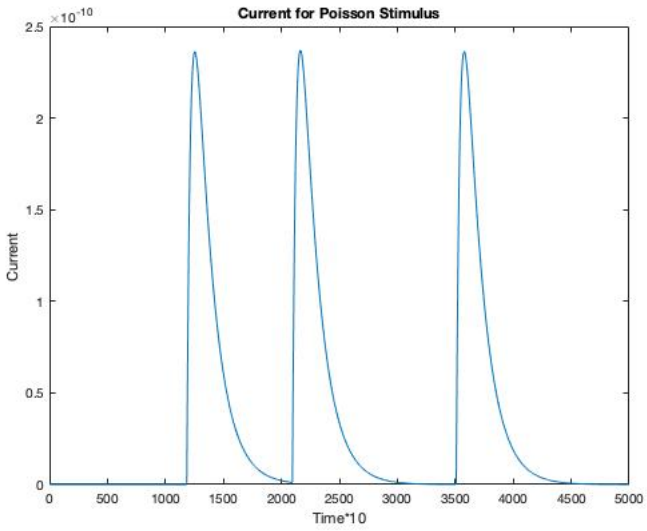
1 Question1

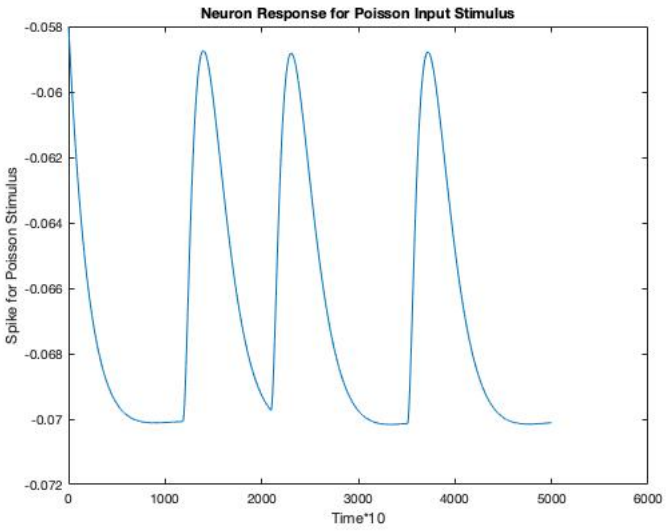
The following is the plot of poisson stimulus as was asked in part a)



The following is the plot of current corresponding to the above stimulus.

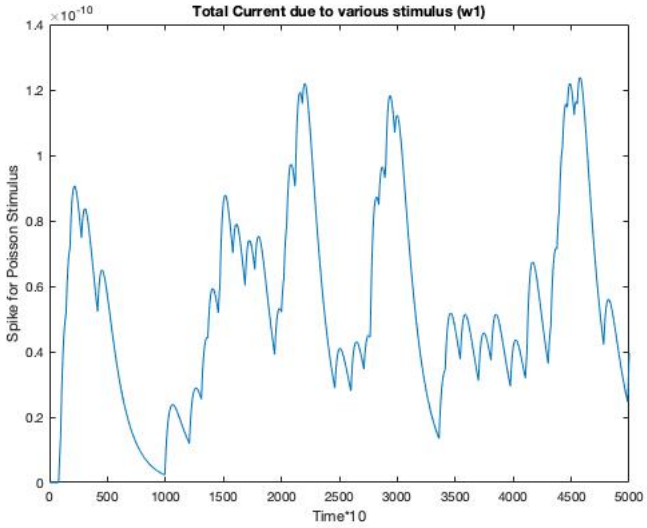


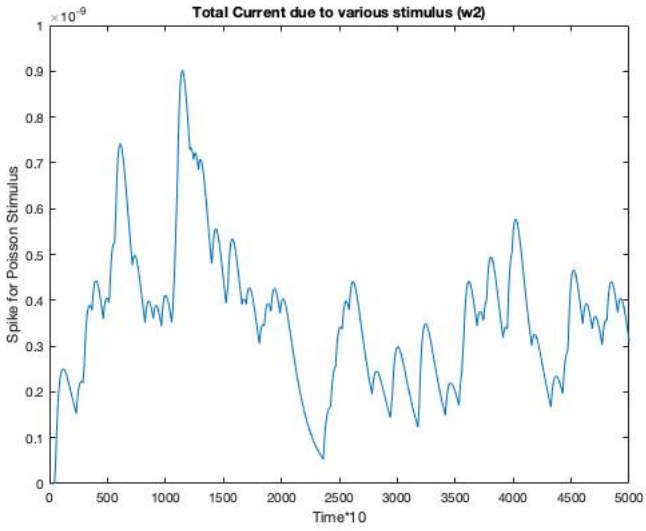
The following is the plot of the response of neuron. Since the stimulus were not close enough, the spike was not emitted.



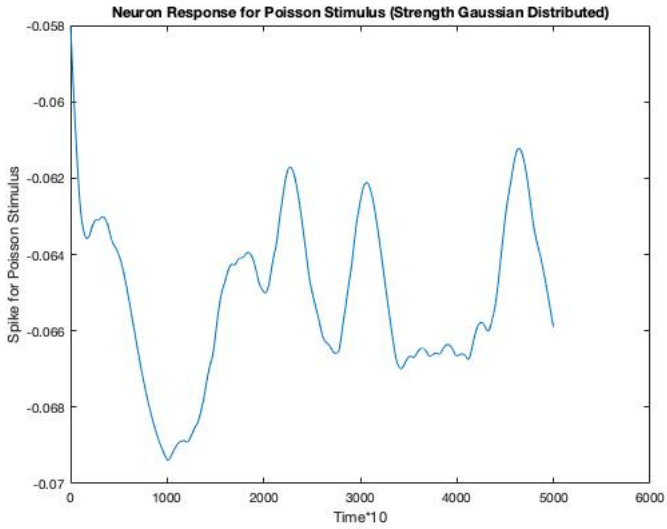
2 Question 2

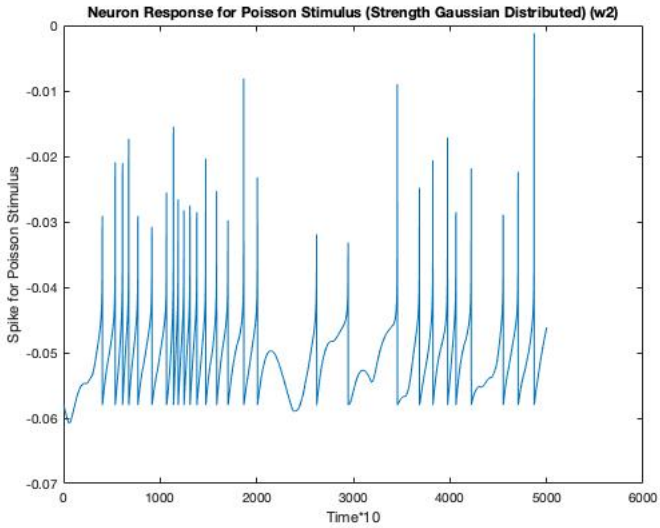
The following is the plot of current due to w = 50 and w = 250 respectively:





The following is the response of the neuron for w = 50, w = 250 respectively. We can observe that as synaptic weights strengthens, the neuron issues more spikes.





3 Question 3

No. of iterations: 31

Weight(1 to 50)	Weight(51 to 100)
172.7616	62.4824
121.3048	101.771
107.8465	99.447
81.1188	112.4974
95.5709	97.4052
157.9483	85.8423
166.2897	73.9357
71.2655	73.4053
75.2177	71.0487
85.3766	135.9323
80.1259	102.2986
95.3171	107.1717
74.62	112.8308
109.2689	105.2646
79.7751	267.9171
71.8455	82.0859
99.9878	67.7558
67.9738	121.7518
76.4406	75.0715
126.1497	74.2941
145.0841	87.8491
113.3927	170.4155
92.3011	79.3068
73.9998	105.93
134.1664	84.0046
125.7535	70.1855
69.8548	104.7754
148.5815	82.937
82.9322	71.4709
82.1396	119.9439
200.2075	120.9669
100.1965	85.7202
81.3266	120.8155
127.2369	71.858
96.2581	151.9343
92.4773	96.9125
125.845	159.9134
76.4874	109.0032
91.8285	85.4799
59.5868	78.5988
78.7986	131.6054
78.6621	100.8653
70.8738	71.8303
69.2673	88.9763
79.9354	87.9523
89.333	101.0027
74.5133	86.3421
58.9821	73.7207
81.7686	97.3235
145.2782	71.6489

Table 1: Weights to introduce Spike

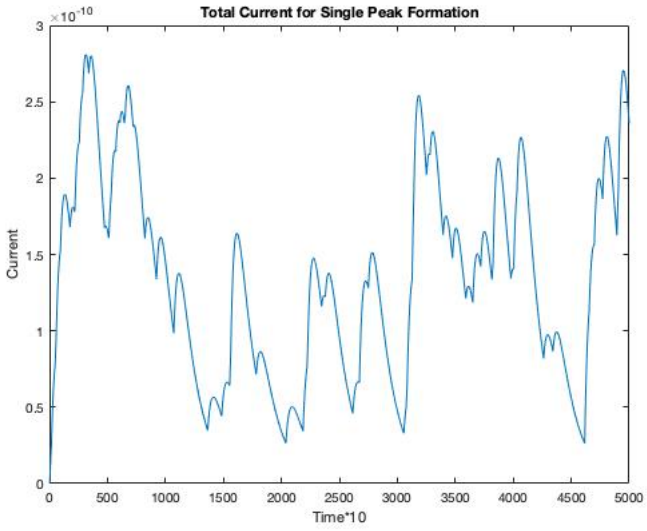


Figure 1: Time evolution of current input to the neuron during single spiking

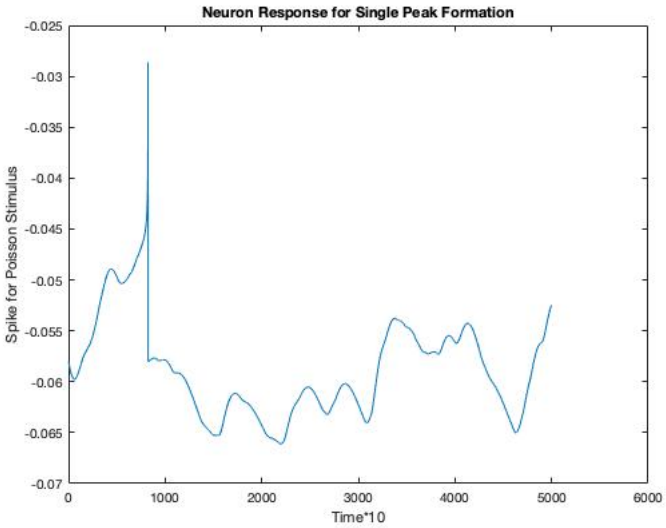


Figure 2: Single spiking of neuron after 31 iterations of updating weights

4 Question 4

No. of iterations: 22

Weight(1 to 50)	Weight(51 to 100)
124.6065	109.308
113.8075	135.5311
121.099	217.2859
98.4406	149.3105
100.9223	161.9807
144.6159	222.7018
167.6502	78.1378
146.7063	97.4245
101.7676	100.6758
191.9223	43.9366
90.625	42.2913
44.6899	169.2909
153.914	106.7375
196.2277	112.1166
124.6869	138.0093
146.4936	96.8412
160.7305	87.1708
212.1797	58.5604
126.0626	144.0239
78.6673	42.4195
152.3742	201.0195
118.1125	79.5652
155.9303	86.171
89.2207	56.3383
154.4915	114.6183
49.3272	131.2965
152.6159	107.4081
165.0395	79.0748
94.0806	135.3664
107.1197	186.6073
38.0833	147.3074
145.5379	179.6394
115.4891	138.881
200.4889	137.679
127.5286	184.164
196.5561	159.0533
81.0142	174.8142
171.1595	140.8697
99.391	82.6112
68.2936	175.0828
160.7557	160.8258
167.7903	80.2276
101.3556	88.6181
111.7724	196.4943
78.9989	117.9712
196.9062	133.0173
173.4853	186.5948
101.9576	151.9568
98.6331	153.8128
72.2292	53.4781

Table 2: Weights to remove Spike

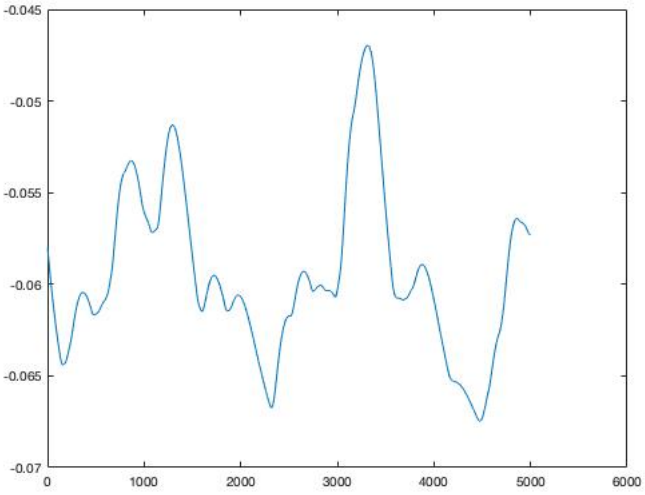


Figure 3: Time evolution of current input to the neuron during no spiking

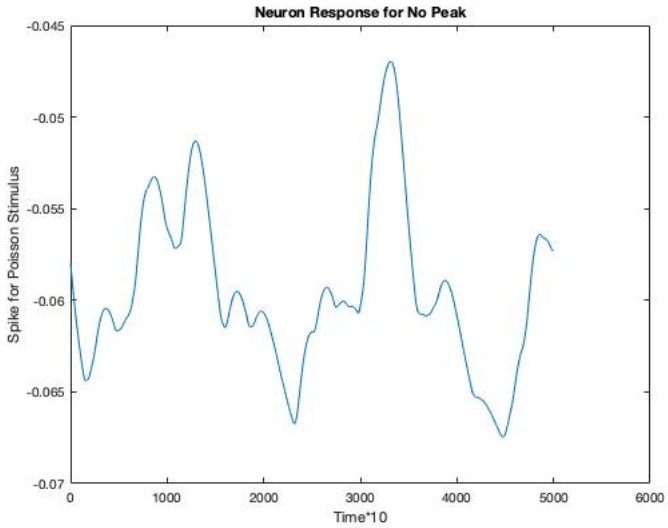
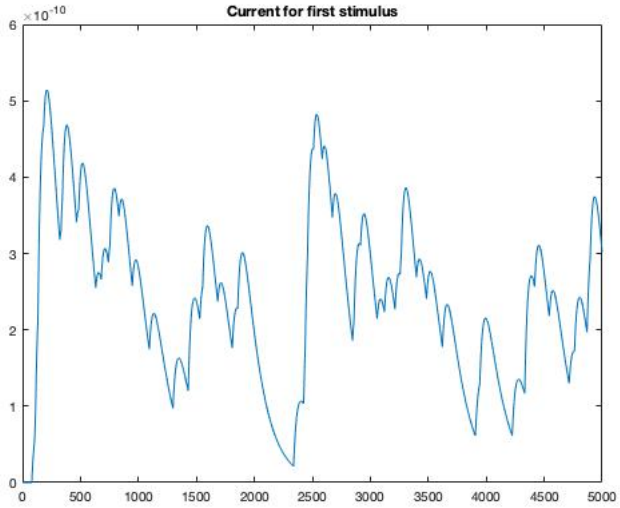
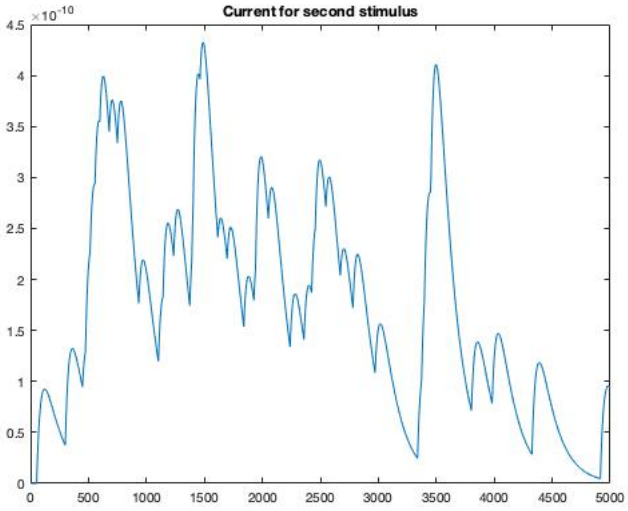


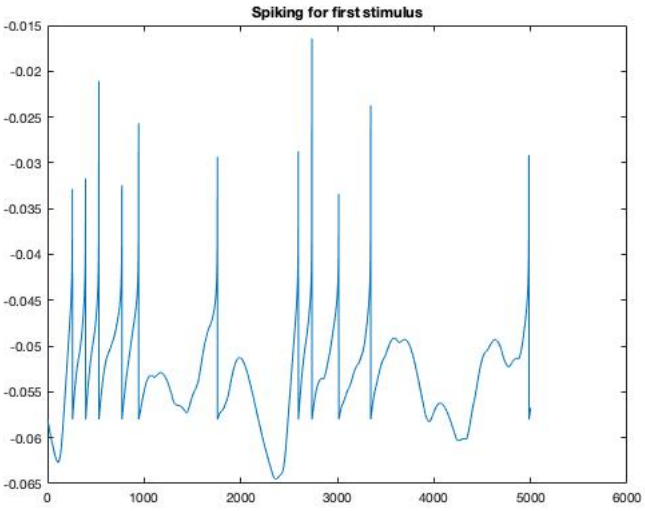
Figure 4: No spiking of neuron after 22 iterations of updating weights

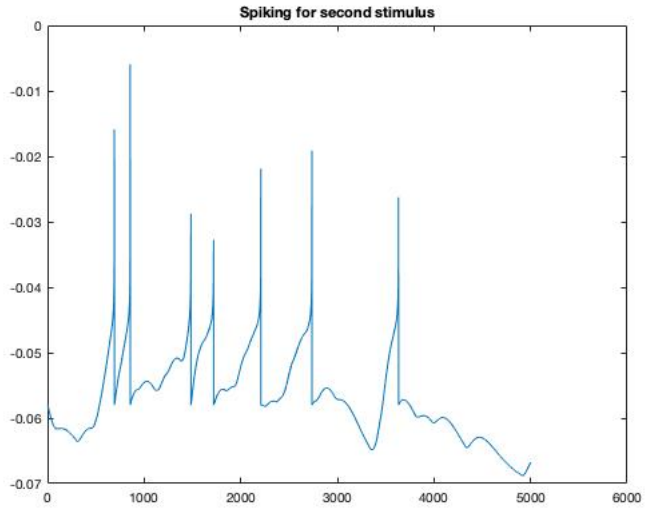
5 Question 5

5.1 Part A : Creating Stimulus For given Gaussian Distribution of weights

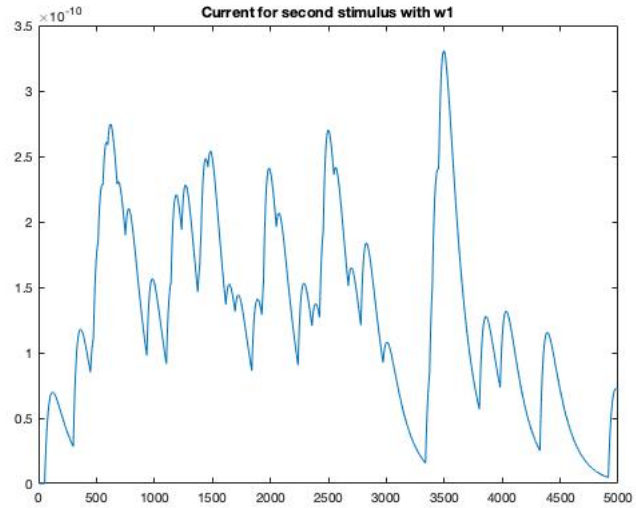


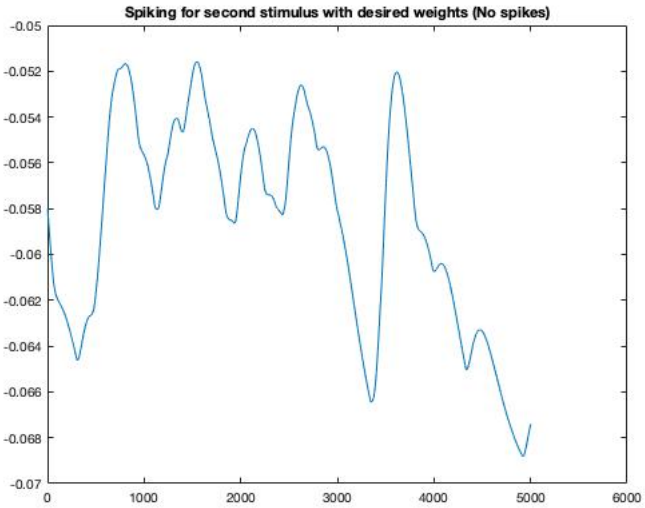




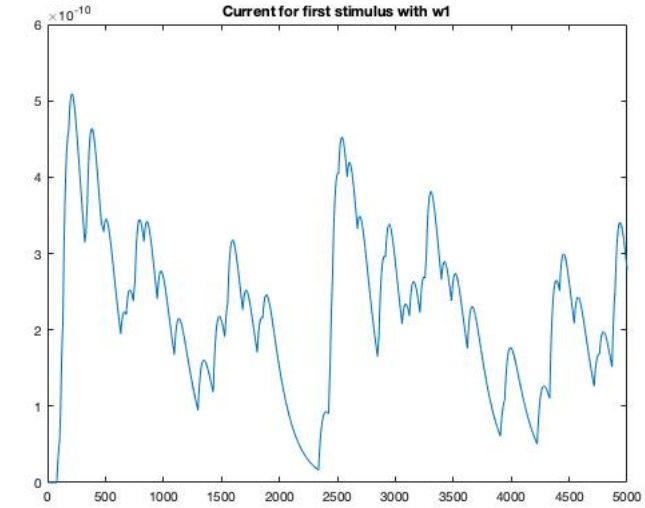


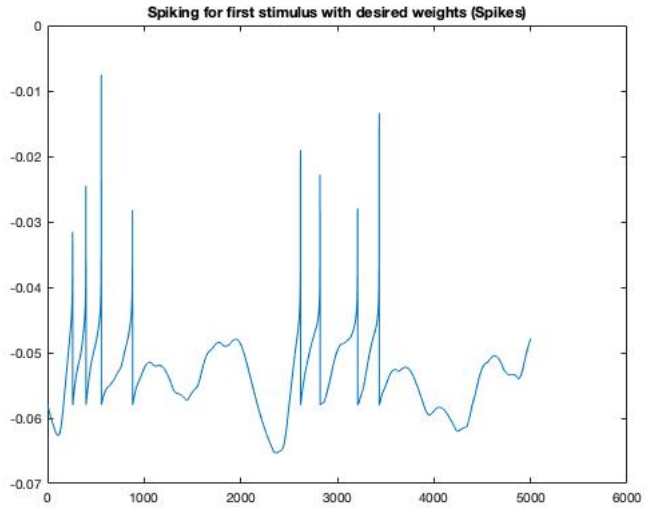
5.2 Part B : Removing Spikes from 2nd stimulus





5.3 Part C : Applying these weights to 1st stimulus

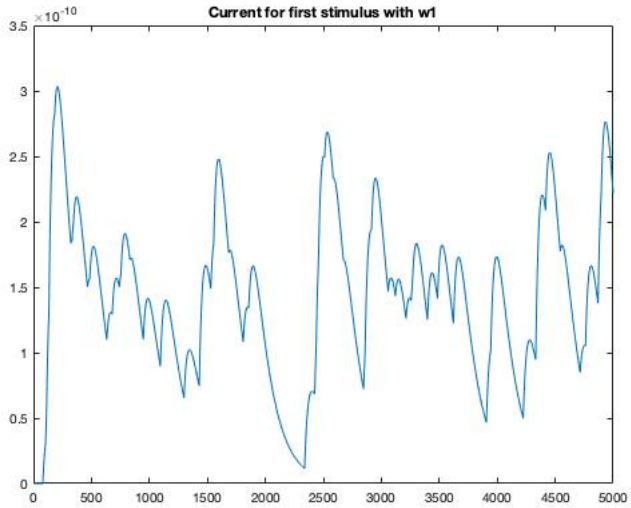


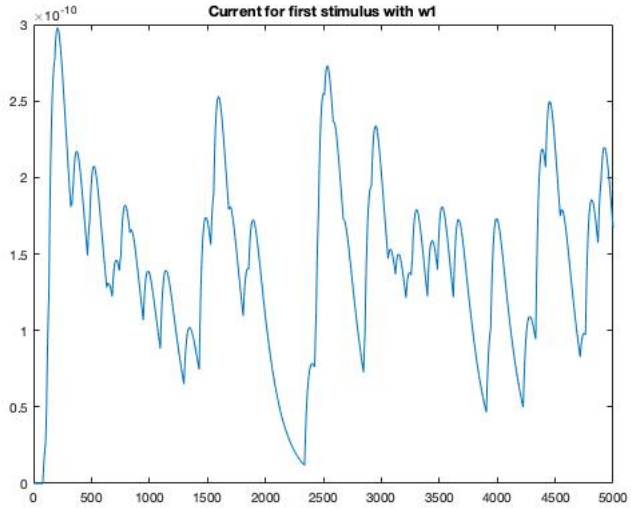


Here we see that we have differentiated the two stimulus for a given set of weights.

5.4 Part D : Reversing the stimulus 1 and 2

Now we try to obtain a spike in 2nd stimulus and no spike in first stimulus.





It is observed that here after the first iteration there is no spike in 2nd stimulus and so we generate a spike in this stimulus as in above question and then re-iterate the whole process.

```
>> main
Number of iteration in removal: 6
Number of iteration in removal: 8
Number of iteration in formation: 2
Number of iteration in removal: 1
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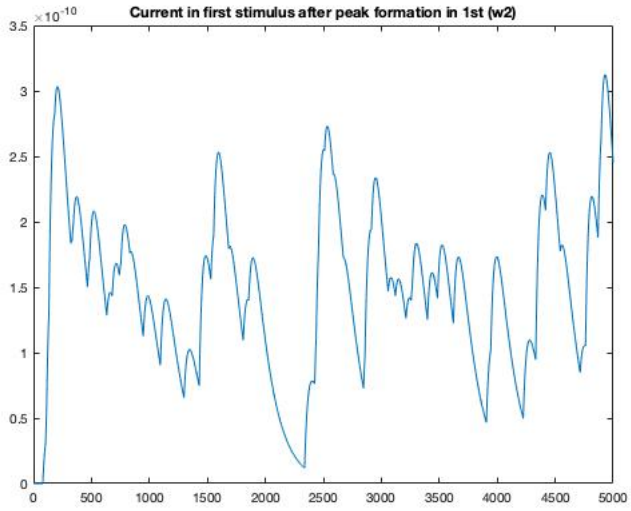
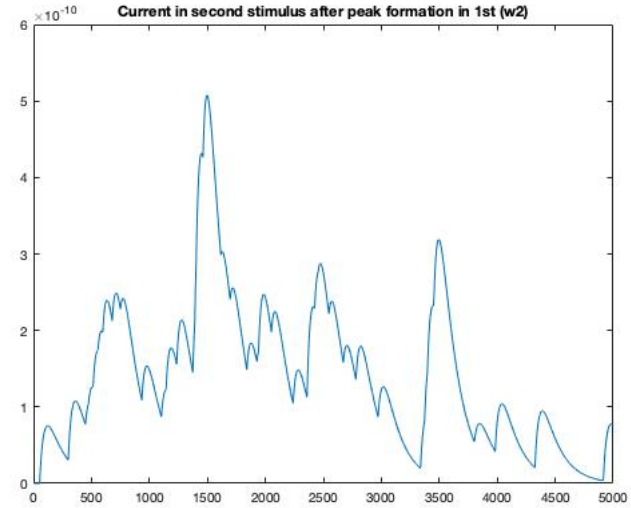
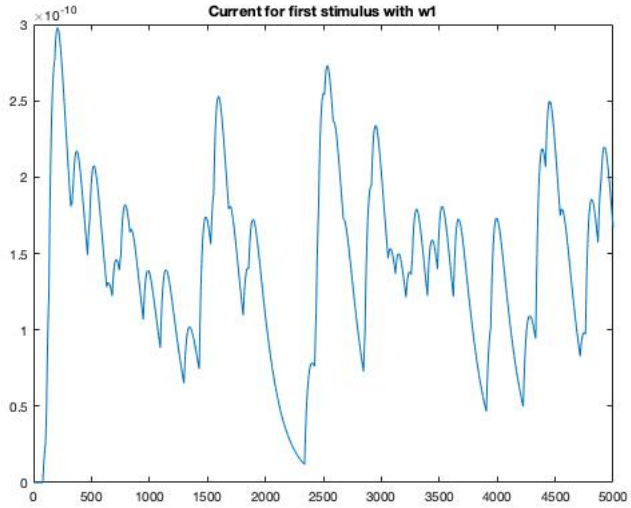
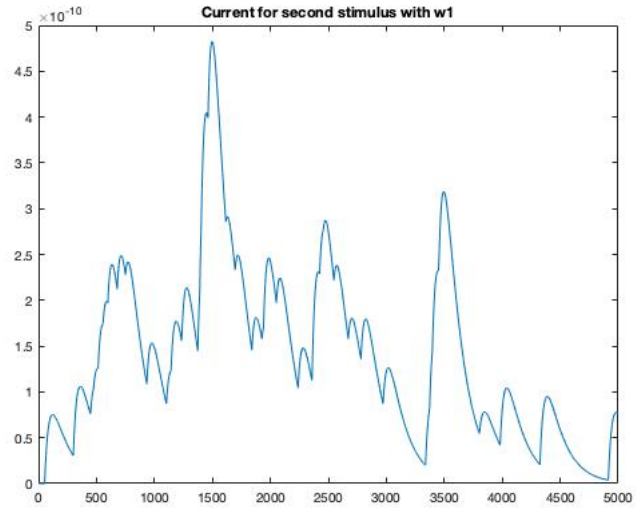
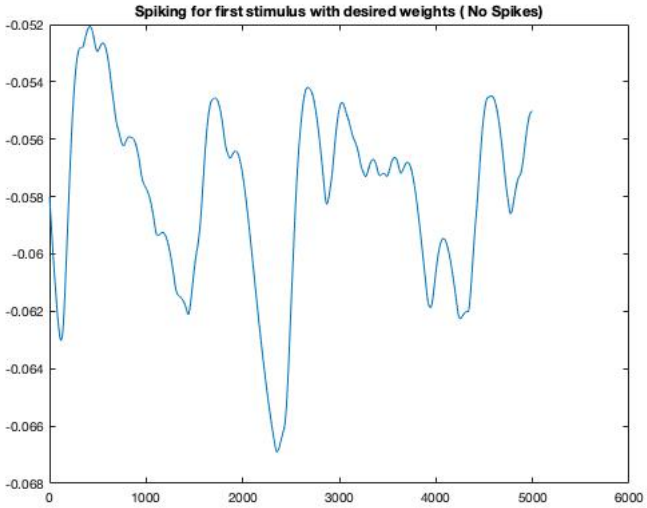
Figure 5: Screenshot of command window

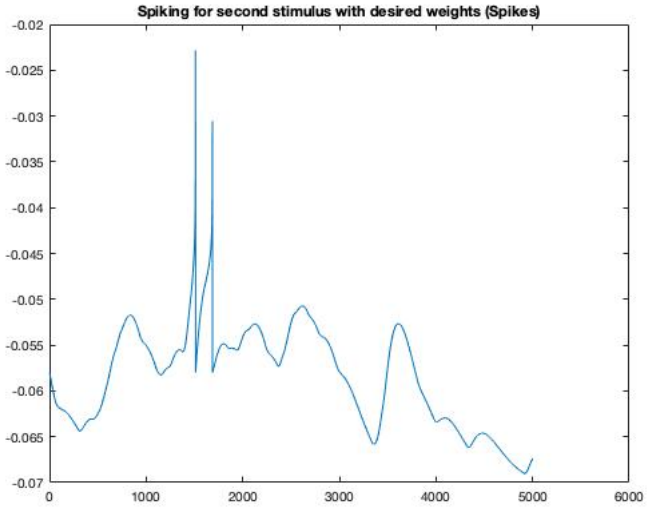

Current in first stimulus after peak formation in 1st (w2)
×10^-10
3.5
3
2.5
2
1.5
1
0.5
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000


Current in second stimulus after peak formation in 1st (w2)
×10^-10
6
5
4
3
2
1
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000


Current for first stimulus with w1
×10^-10
3
2.5
2
1.5
1
0.5
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000


Current for second stimulus with w1
×10^-10
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000


Spiking for first stimulus with desired weights (No Spikes)
-0.052
-0.054
-0.056
-0.058
-0.06
-0.062
-0.064
-0.066
-0.068
0
1000
2000
3000
4000
5000
6000


Spiking for second stimulus with desired weights (Spikes)
-0.02
-0.025
-0.03
-0.035
-0.04
-0.045
-0.05
-0.055
-0.06
-0.065
-0.07
0
1000
2000
3000
4000
5000
6000

Weight-1(1 to 50)	Weight-1(51 to 100)	Weight-2(1 to 50)	Weight-2(51 to 100)
207.9911	171.6127	124.1894	164.5567
210.399	172.6769	121.3894	161.4896
146.4925	171.5276	105.3102	141.0647
185.7059	197.2578	80.6957	162.2252
202.1091	125.8099	157.6601	146.5221
197.4785	198.9959	161.4927	163.6546
211.0019	194.9933	103.4766	160.3629
142.2203	210.0296	116.9622	172.7288
197.7853	187.8021	162.6591	154.4488
202.3935	182	132.6081	149.6738
183.3049	133.6361	139.4832	92.2478
178.6595	167.1433	165.6255	137.459
94.2428	201.3049	138.2959	165.0973
194.0022	226.1063	65.5029	185.9503
239.1282	153.7423	196.6596	77.4865
195.2464	112.2806	86.6498	111.3175
179.2689	220.3396	74.7768	181.2078
200.4342	193.9183	164.8375	159.4788
230.9631	178.2918	189.9446	146.6275
165.72	219.6135	163.4163	180.6106
168.5957	112.1189	138.6535	231.4428
223.362	195.7623	183.6934	152.9322
101.0725	170.6302	158.5783	71.3541
165.6646	191.7221	136.243	157.6727
158.9253	106.6514	130.7005	155.4561
167.5376	214.5018	80.9406	176.4067
222.8992	96.7158	132.0803	324.386
189.5919	212.7449	164.7055	174.9618
222.07	202.0691	182.6592	166.1821
181.8787	202.9284	149.5774	121.4496
80.841	176.6118	178.4274	53.0043
219.0016	174.0033	180.1074	82.6417
213.5647	197.5536	95.3988	162.4685
147.4505	189.1634	159.1856	155.5684
199.1536	206.3655	163.7843	132.0848
198.0676	182.4564	161.0204	150.0526
187.3484	192.3462	154.0757	158.1859
196.0753	132.9688	131.406	307.6516
194.2731	200.5901	159.7825	101.4237
207.8875	134.5616	171.4399	110.0267
210.6169	194.2483	181.9273	159.7437
198.1472	175.8079	161.0725	188.6998
170.2173	193.979	60.6074	159.5287
233.1525	168.8818	191.7451	138.8888
174.4258	132.3279	149.894	115.9925
216.9499	172.8907	167.8657	80.7303
86.119	196.6385	139.5871	77.6423
228.4367	107.068	187.8668	133.0256
166.6438	190.7528	206.927	85.9013
182.7952	172.9222	53.424	142.2116

Table 3: Final Weights for both the cases