

```
1 /Users/negus/PycharmProjects/CS5014/W02Lab/venv/bin/python
  /Users/negus/PycharmProjects/CS5014/P2/Src/Main.py
2
3 IN BINARY
4 ****
5 ///COMPUTING BINARY LOGISTIC: Model 1
6 (180,)
7 (180,)
8
9
10
11 STATUS: Decision Function
12 [ 8.05484879  7.75995821 -6.85928432 -7.43903394  8.
  26672073 -6.67826144
13 -7.61065876 -7.55291545  7.66537184 -7.58368533 -6.
  97941689  7.76367346
14  8.4388362   7.61591087 -7.51611844  7.48174087  7.
  29672101 -6.77581575
15  8.15624475 -7.85043114]
16
17
18
19 STATUS: Training Prediction Probability
20 [[1.59570205e-04 9.99840430e-01]
21 [9.99602373e-01 3.97626576e-04]
22 [2.71668576e-04 9.99728331e-01]
23 [3.75562751e-04 9.99624437e-01]
24 [3.25209023e-04 9.99674791e-01]
25 [1.93921128e-04 9.99806079e-01]
26 [9.99537587e-01 4.62413480e-04]
27 [3.94902147e-04 9.99605098e-01]
28 [1.96297773e-04 9.99803702e-01]
29 [4.69121087e-04 9.99530879e-01]
30 [9.99537366e-01 4.62633811e-04]
31 [1.95419606e-04 9.99804580e-01]
32 [9.98236738e-01 1.76326236e-03]
33 [2.18200123e-04 9.99781800e-01]
34 [9.99405821e-01 5.94179059e-04]
35 [1.09465537e-03 9.98905345e-01]
36 [3.16565529e-04 9.99683434e-01]
37 [6.25944063e-04 9.99374056e-01]
38 [9.99443009e-01 5.56990623e-04]
39 [2.77401458e-04 9.99722599e-01]
40 [3.57933092e-04 9.99642067e-01]
41 [9.99316290e-01 6.83710206e-04]
42 [9.99660314e-01 3.39685877e-04]
43 [9.99294226e-01 7.05774490e-04]
44 [9.99126320e-01 8.73679850e-04]
45 [4.68543746e-04 9.99531456e-01]
46 [2.37327818e-04 9.99762672e-01]
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47	[9.98808010e-01	1.19198980e-03]
48	[9.99478676e-01	5.21323891e-04]
49	[9.99513635e-01	4.86364581e-04]
50	[2.89749555e-04	9.99710250e-01]
51	[1.63870743e-04	9.99836129e-01]
52	[2.93572838e-04	9.99706427e-01]
53	[9.99533863e-01	4.66137399e-04]
54	[2.73547205e-04	9.99726453e-01]
55	[4.59910530e-04	9.99540089e-01]
56	[9.98991268e-01	1.00873214e-03]
57	[5.49239702e-04	9.99450760e-01]
58	[3.44006708e-04	9.99655993e-01]
59	[9.99493124e-01	5.06876340e-04]
60	[9.99560506e-01	4.39493803e-04]
61	[3.25986720e-04	9.99674013e-01]
62	[9.99132442e-01	8.67557842e-04]
63	[9.99555178e-01	4.44822161e-04]
64	[4.68668675e-04	9.99531331e-01]
65	[9.99342056e-01	6.57944217e-04]
66	[9.99226229e-01	7.73771449e-04]
67	[1.01463371e-03	9.98985366e-01]
68	[9.99121262e-01	8.78738477e-04]
69	[2.51631889e-04	9.99748368e-01]
70	[3.73482709e-04	9.99626517e-01]
71	[9.99468525e-01	5.31474912e-04]
72	[1.23989757e-04	9.99876010e-01]
73	[9.99094768e-01	9.05231752e-04]
74	[2.87586477e-04	9.99712414e-01]
75	[2.34524665e-04	9.99765475e-01]
76	[2.25514863e-04	9.99774485e-01]
77	[9.99545195e-01	4.54804571e-04]
78	[9.99362235e-01	6.37765335e-04]
79	[3.46645869e-04	9.99653354e-01]
80	[9.98647942e-01	1.35205790e-03]
81	[9.99511129e-01	4.88871000e-04]
82	[2.60908946e-04	9.99739091e-01]
83	[1.44643294e-04	9.99855357e-01]
84	[1.20480929e-03	9.98795191e-01]
85	[3.36859180e-04	9.99663141e-01]
86	[9.99174851e-01	8.25148585e-04]
87	[9.99480960e-01	5.19040139e-04]
88	[2.60984003e-04	9.99739016e-01]
89	[9.99463858e-01	5.36142466e-04]
90	[4.42423561e-04	9.99557576e-01]
91	[9.99483721e-01	5.16279322e-04]
92	[9.99323782e-01	6.76217576e-04]
93	[9.99660056e-01	3.39943578e-04]
94	[9.99461619e-01	5.38381428e-04]
95	[9.99578872e-01	4.21128399e-04]
96	[9.99460920e-01	5.39079664e-04]

97	[3.94294640e-04 9.99605705e-01]
98	[3.43759452e-04 9.99656241e-01]
99	[1.49108802e-04 9.99850891e-01]
100	[2.86640772e-04 9.99713359e-01]
101	[4.28928638e-04 9.99571071e-01]
102	[2.00590387e-04 9.99799410e-01]
103	[2.32717257e-04 9.99767283e-01]
104	[1.78581229e-04 9.99821419e-01]
105	[9.99564766e-01 4.35233942e-04]
106	[2.82137808e-04 9.99717862e-01]
107	[9.99555973e-01 4.44026930e-04]
108	[2.03764680e-04 9.99796235e-01]
109	[9.99431444e-01 5.68556038e-04]
110	[2.24797995e-04 9.99775202e-01]
111	[8.48584440e-04 9.99151416e-01]
112	[3.52907461e-04 9.99647093e-01]
113	[9.98779140e-01 1.22086013e-03]
114	[9.99455847e-01 5.44152973e-04]
115	[9.98682414e-01 1.31758633e-03]
116	[2.05249121e-04 9.99794751e-01]
117	[2.21889834e-04 9.99778110e-01]
118	[1.72380561e-04 9.99827619e-01]
119	[9.99534167e-01 4.65832608e-04]
120	[2.53148532e-04 9.99746851e-01]
121	[9.99556254e-01 4.43746478e-04]
122	[2.49701056e-04 9.99750299e-01]
123	[9.99476230e-01 5.23770439e-04]
124	[9.99602022e-01 3.97978276e-04]
125	[9.99482829e-01 5.17170981e-04]
126	[9.99420651e-01 5.79349371e-04]
127	[3.56124452e-04 9.99643876e-01]
128	[4.06375776e-04 9.99593624e-01]
129	[4.11648369e-04 9.99588352e-01]
130	[2.85482910e-04 9.99714517e-01]
131	[9.99308897e-01 6.91102504e-04]
132	[9.99613672e-01 3.86327979e-04]
133	[9.99566706e-01 4.33293542e-04]
134	[9.99532195e-01 4.67804989e-04]
135	[9.99537670e-01 4.62329902e-04]
136	[1.82489317e-04 9.99817511e-01]
137	[9.99482884e-01 5.17115711e-04]
138	[9.99499557e-01 5.00442518e-04]
139	[3.82562400e-04 9.99617438e-01]
140	[9.99434437e-01 5.65562987e-04]
141	[9.99606759e-01 3.93241363e-04]
142	[3.13766667e-04 9.99686233e-01]
143	[9.99626903e-01 3.73096738e-04]
144	[3.20800475e-04 9.99679200e-01]
145	[6.50041029e-04 9.99349959e-01]
146	[3.52701328e-04 9.99647299e-01]

147	[6.61129582e-04 9.99338870e-01]
148	[9.99010625e-01 9.89374545e-04]
149	[3.38494703e-04 9.99661505e-01]
150	[9.99643581e-01 3.56418999e-04]
151	[2.10672251e-04 9.99789328e-01]
152	[2.95005996e-04 9.99704994e-01]
153	[9.99502416e-01 4.97584461e-04]
154	[9.99585652e-01 4.14347684e-04]
155	[2.69304673e-04 9.99730695e-01]
156	[2.81709444e-04 9.99718291e-01]
157	[3.77829012e-04 9.99622171e-01]
158	[9.99629368e-01 3.70631680e-04]
159	[9.99497055e-01 5.02944899e-04]
160	[9.99424782e-01 5.75217884e-04]
161	[3.16933271e-04 9.99683067e-01]
162	[4.44765769e-04 9.99555234e-01]
163	[9.99027970e-01 9.72030250e-04]
164	[9.99179993e-01 8.20007078e-04]
165	[4.05800058e-04 9.99594200e-01]
166	[3.93078813e-04 9.99606921e-01]
167	[9.99611824e-01 3.88176395e-04]
168	[9.99570705e-01 4.29294720e-04]
169	[9.99394632e-01 6.05368179e-04]
170	[9.99537314e-01 4.62685688e-04]
171	[9.99387448e-01 6.12551527e-04]
172	[2.70153654e-04 9.99729846e-01]
173	[9.98281003e-01 1.71899733e-03]
174	[9.99549857e-01 4.50142681e-04]
175	[9.99460199e-01 5.39801180e-04]
176	[4.40461657e-04 9.99559538e-01]
177	[9.99593251e-01 4.06749194e-04]
178	[2.56021646e-04 9.99743978e-01]
179	[9.99592767e-01 4.07232688e-04]
180	[9.99470401e-01 5.29598558e-04]
181	[9.99424947e-01 5.75052763e-04]
182	[9.99552517e-01 4.47483254e-04]
183	[2.55544291e-04 9.99744456e-01]
184	[2.61171337e-04 9.99738829e-01]
185	[9.98940210e-01 1.05978976e-03]
186	[9.98936330e-01 1.06367013e-03]
187	[3.90585010e-04 9.99609415e-01]
188	[4.16287172e-04 9.99583713e-01]
189	[9.99457211e-01 5.42788982e-04]
190	[9.99070162e-01 9.29838023e-04]
191	[9.99491763e-01 5.08236905e-04]
192	[3.82537890e-04 9.99617462e-01]
193	[9.99372379e-01 6.27621384e-04]
194	[3.69835861e-04 9.99630164e-01]
195	[1.69327166e-04 9.99830673e-01]
196	[9.99597830e-01 4.02170406e-04]

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197 [9.99040711e-01 9.59288715e-04]
198 [4.11711546e-04 9.99588288e-01]
199 [9.99393924e-01 6.06075754e-04]]
200
201
202
203 STATUS: Testing on Training Set
204 [1 0 1 1 1 0 1 1 1 0 1 0 1 0 1 1 1 0 1 1 0 0 0 0 1 1 0 0
   0 1 1 1 0 1 1 0
205 1 1 0 0 1 0 0 1 0 0 1 0 1 1 0 1 0 1 1 1 0 0 1 0 0 1 1 1 1
   0 0 1 0 1 0 0 0
206 0 0 0 1 1 1 1 1 1 1 1 0 1 0 1 1 1 0 0 0 1 1 1 0 1 0 1
   0 0 0 0 1 1 1 1
207 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1 1 1 0 1 0 1 1 0 0 1 1 1 0
   0 1 1 0 0 1 1 0
208 0 0 0 0 1 0 0 0 1 0 1 0 0 0 0 1 1 0 0 1 1 0 0 0 1 0 1 1 0
   0 1 0]
209
210
211
212 STATUS: Training Accuracy Score
213 1.0
214
215
216
217 STATUS: Predicting actual outputs based Given Test Data
218 [1 1 0 0 1 0 0 0 1 0 0 1 1 1 0 1 1 0 1 0]
219
220
221
222 STATUS: actual loss
223 [[3.17457599e-04 9.99682542e-01]
224 [4.26292599e-04 9.99573707e-01]
225 [9.98951436e-01 1.04856425e-03]
226 [9.99412493e-01 5.87507459e-04]
227 [2.56860449e-04 9.99743140e-01]
228 [9.98743617e-01 1.25638263e-03]
229 [9.99505099e-01 4.94900519e-04]
230 [9.99475697e-01 5.24303474e-04]
231 [4.68562758e-04 9.99531437e-01]
232 [9.99491576e-01 5.08424475e-04]
233 [9.99070020e-01 9.29980160e-04]
234 [4.24712426e-04 9.99575288e-01]
235 [2.16254960e-04 9.99783745e-01]
236 [4.92309338e-04 9.99507691e-01]
237 [9.99456055e-01 5.43944937e-04]
238 [5.62958868e-04 9.99437041e-01]
239 [6.77298449e-04 9.99322702e-01]
240 [9.98860261e-01 1.13973883e-03]
241 [2.86855587e-04 9.99713144e-01]
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242 [9.99610568e-01 3.89432249e-04]
243
244
245
246 STATUS: Plotting Charts
247 None
248
249
250
251 STATUS: Printing Classification Report
252      precision    recall   f1-score   support
253
254          0         1.00     1.00     1.00      90
255          1         1.00     1.00     1.00      90
256
257 avg / total       1.00     1.00     1.00      180
258
259
260
261
262 STATUS: Printing log loss
263 0.00048765720315783535
264
265
266
267 STATUS: Computing Confusion Matrix
268 [[90  0]
269 [ 0 90]]
270 ****
271 ///COMPUTING BINARY LOGISTIC: Model 2
272 (180,,)
273 (180,,)
274
275
276
277 STATUS: Decision Function
278 [ 4.17926472  3.72829202 -5.02767015 -3.82559136  4.
  56814723 -4.3023478
279 -3.86078333 -3.77294358  3.54198724 -4.08159633 -4.
  23450054  3.63336875
280  4.75670834  3.645635   -3.74151217  3.7391908   2.
  89519214 -4.11141412
281  4.34351213 -5.05627773]
282
283
284
285 STATUS: Training Prediction Probability
286 [[0.0021724  0.9978276 ]
287 [0.97938612 0.02061388]
288 [0.01276205 0.98723795]]
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289	[0.02577217 0.97422783]
290	[0.01252342 0.98747658]
291	[0.00471055 0.99528945]
292	[0.97017322 0.02982678]
293	[0.01140959 0.98859041]
294	[0.00359032 0.99640968]
295	[0.02493473 0.97506527]
296	[0.96027362 0.03972638]
297	[0.00311676 0.99688324]
298	[0.99274551 0.00725449]
299	[0.0024442 0.9975558]
300	[0.98262925 0.01737075]
301	[0.09937394 0.90062606]
302	[0.00905039 0.99094961]
303	[0.03853021 0.96146979]
304	[0.97714428 0.02285572]
305	[0.00762214 0.99237786]
306	[0.02741706 0.97258294]
307	[0.97368948 0.02631052]
308	[0.98757961 0.01242039]
309	[0.99154363 0.00845637]
310	[0.91759406 0.08240594]
311	[0.02776727 0.97223273]
312	[0.00345752 0.99654248]
313	[0.99491038 0.00508962]
314	[0.96998787 0.03001213]
315	[0.97438624 0.02561376]
316	[0.00482507 0.99517493]
317	[0.00194403 0.99805597]
318	[0.01285152 0.98714848]
319	[0.97645261 0.02354739]
320	[0.00453866 0.99546134]
321	[0.02290792 0.97709208]
322	[0.9923755 0.0076245]
323	[0.04000628 0.95999372]
324	[0.01607525 0.98392475]
325	[0.96842549 0.03157451]
326	[0.97285338 0.02714662]
327	[0.01031586 0.98968414]
328	[0.98982154 0.01017846]
329	[0.97515795 0.02484205]
330	[0.02392519 0.97607481]
331	[0.91378293 0.08621707]
332	[0.99079729 0.00920271]
333	[0.07631729 0.92368271]
334	[0.99098752 0.00901248]
335	[0.00700299 0.99299701]
336	[0.01556305 0.98443695]
337	[0.97754306 0.02245694]
338	[0.00244391 0.99755609]

339	[0.99024992 0.00975008]
340	[0.00738759 0.99261241]
341	[0.00428114 0.99571886]
342	[0.00739375 0.99260625]
343	[0.96364979 0.03635021]
344	[0.96750346 0.03249654]
345	[0.02049997 0.97950003]
346	[0.98358135 0.01641865]
347	[0.97014452 0.02985548]
348	[0.00467046 0.99532954]
349	[0.00239169 0.99760831]
350	[0.10199447 0.89800553]
351	[0.01500283 0.98499717]
352	[0.98510645 0.01489355]
353	[0.97050148 0.02949852]
354	[0.0048064 0.9951936]
355	[0.99068206 0.00931794]
356	[0.02800303 0.97199697]
357	[0.97367441 0.02632559]
358	[0.96989398 0.03010602]
359	[0.98178006 0.01821994]
360	[0.98291483 0.01708517]
361	[0.97782278 0.02217722]
362	[0.97130286 0.02869714]
363	[0.0223486 0.9776514]
364	[0.00875202 0.99124798]
365	[0.00266581 0.99733419]
366	[0.00495489 0.99504511]
367	[0.02163614 0.97836386]
368	[0.002688 0.997312]
369	[0.00613093 0.99386907]
370	[0.00269904 0.99730096]
371	[0.97422294 0.02577706]
372	[0.01123091 0.98876909]
373	[0.98950847 0.01049153]
374	[0.00321964 0.99678036]
375	[0.9880102 0.0119898]
376	[0.00363782 0.99636218]
377	[0.08311676 0.91688324]
378	[0.02172998 0.97827002]
379	[0.99143975 0.00856025]
380	[0.98807514 0.01192486]
381	[0.99074314 0.00925686]
382	[0.0034405 0.9965595]
383	[0.00439447 0.99560553]
384	[0.00179384 0.99820616]
385	[0.96184681 0.03815319]
386	[0.00516346 0.99483654]
387	[0.98802679 0.01197321]
388	[0.00718693 0.99281307]

389	[0.97441915 0.02558085]
390	[0.9813142 0.0186858]
391	[0.99062724 0.00937276]
392	[0.97180399 0.02819601]
393	[0.00727478 0.99272522]
394	[0.01712868 0.98287132]
395	[0.02031952 0.97968048]
396	[0.01304516 0.98695484]
397	[0.98899204 0.01100796]
398	[0.99477373 0.00522627]
399	[0.97848805 0.02151195]
400	[0.96922423 0.03077577]
401	[0.98864278 0.01135722]
402	[0.00400435 0.99599565]
403	[0.97541684 0.02458316]
404	[0.98090068 0.01909932]
405	[0.01984711 0.98015289]
406	[0.95706399 0.04293601]
407	[0.99010629 0.00989371]
408	[0.0085883 0.9914117]
409	[0.98517941 0.01482059]
410	[0.01742259 0.98257741]
411	[0.04568123 0.95431877]
412	[0.01628268 0.98371732]
413	[0.05459741 0.94540259]
414	[0.99193378 0.00806622]
415	[0.01443065 0.98556935]
416	[0.98034741 0.01965259]
417	[0.00554788 0.99445212]
418	[0.01405788 0.98594212]
419	[0.96961683 0.03038317]
420	[0.97578191 0.02421809]
421	[0.00639207 0.99360793]
422	[0.00994457 0.99005543]
423	[0.01634259 0.98365741]
424	[0.98830874 0.01169126]
425	[0.98505762 0.01494238]
426	[0.96384162 0.03615838]
427	[0.01538514 0.98461486]
428	[0.03418404 0.96581596]
429	[0.99612096 0.00387904]
430	[0.99769079 0.00230921]
431	[0.01771062 0.98228938]
432	[0.01544554 0.98455446]
433	[0.96951676 0.03048324]
434	[0.97261091 0.02738909]
435	[0.99189215 0.00810785]
436	[0.97425863 0.02574137]
437	[0.96385473 0.03614527]
438	[0.00652358 0.99347642]

```
439 [0.97352027 0.02647973]
440 [0.98630913 0.01369087]
441 [0.94797518 0.05202482]
442 [0.02552696 0.97447304]
443 [0.98424604 0.01575396]
444 [0.00718542 0.99281458]
445 [0.98969115 0.01030885]
446 [0.96505542 0.03494458]
447 [0.97512762 0.02487238]
448 [0.97734998 0.02265002]
449 [0.00801656 0.99198344]
450 [0.01229509 0.98770491]
451 [0.98073861 0.01926139]
452 [0.98794913 0.01205087]
453 [0.02460703 0.97539297]
454 [0.01550701 0.98449299]
455 [0.96377938 0.03622062]
456 [0.99611697 0.00388303]
457 [0.98118942 0.01881058]
458 [0.01197204 0.98802796]
459 [0.9572135 0.0427865 ]
460 [0.01555939 0.98444061]
461 [0.00376378 0.99623622]
462 [0.98785081 0.01214919]
463 [0.99248782 0.00751218]
464 [0.01892291 0.98107709]
465 [0.98851292 0.01148708]]
466
467
468
469 STATUS: Testing on Training Set
470 [1 0 1 1 1 1 0 1 1 1 0 1 0 1 0 1 1 1 0 1 1 0 0 0 0 1 1 0 0
   0 1 1 1 0 1 1 0
471 1 1 0 0 1 0 0 1 0 0 1 0 1 1 0 1 0 1 1 1 0 0 1 0 0 1 1 1 1
   0 0 1 0 1 0 0 0
472 0 0 0 1 1 1 1 1 1 1 0 1 0 1 0 1 1 1 0 0 0 1 1 1 0 1 0 1
   0 0 0 0 1 1 1 1
473 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1 1 1 0 1 0 1 1 0 0 1 1 1 0 0
   0 1 1 0 0 1 1 0
474 0 0 0 0 1 0 0 0 1 0 1 0 0 0 0 1 1 0 0 1 1 0 0 0 1 0 1 1 0
   0 1 0]
475
476
477
478 STATUS: Training Accuracy Score
479 1.0
480
481
482
483 STATUS: Predicting actual outputs based Given Test Data
```

```
484 [1 1 0 0 1 0 0 0 1 0 0 1 1 1 0 1 1 0 1 0]  
485  
486  
487  
488 STATUS: actual loss  
489 [[0.01507891 0.98492109]  
490 [0.02346978 0.97653022]  
491 [0.99348861 0.00651139]  
492 [0.9786598 0.0213402 ]  
493 [0.01027059 0.98972941]  
494 [0.98664406 0.01335594]  
495 [0.97938253 0.02061747]  
496 [0.9775321 0.0224679 ]  
497 [0.02814089 0.97185911]  
498 [0.98339972 0.01660028]  
499 [0.98571983 0.01428017]  
500 [0.0257466 0.9742534 ]  
501 [0.00852063 0.99147937]  
502 [0.0254407 0.9745593 ]  
503 [0.97683131 0.02316869]  
504 [0.02322129 0.97677871]  
505 [0.05239175 0.94760825]  
506 [0.98387954 0.01612046]  
507 [0.01282423 0.98717577]  
508 [0.99367109 0.00632891]]  
509  
510  
511  
512 STATUS: Plotting Charts  
513 None  
514  
515  
516  
517 STATUS: Printing Classification Report  
518 precision recall f1-score support  
519  
520 0 1.00 1.00 1.00 90  
521 1 1.00 1.00 1.00 90  
522  
523 avg / total 1.00 1.00 1.00 180  
524  
525  
526  
527  
528 STATUS: Printing log loss  
529 0.019440585682674927  
530  
531  
532  
533 STATUS: Computing Confusion Matrix
```

```
534 [[90  0]
535 [ 0 90]]
536 ****
537 ///COMPUTING BINARY NEURAL NET: Model 1
538
539
540 Simple Neural Network Model created
541
542
543
544 STATUS: Training Prediction Probability
545 [[0.0000000e+00 1.0000000e+00]
546 [1.0000000e+00 1.86987614e-55]
547 [0.0000000e+00 1.0000000e+00]
548 [0.0000000e+00 1.0000000e+00]
549 [0.0000000e+00 1.0000000e+00]
550 [0.0000000e+00 1.0000000e+00]
551 [1.0000000e+00 6.27669824e-55]
552 [0.0000000e+00 1.0000000e+00]
553 [0.0000000e+00 1.0000000e+00]
554 [0.0000000e+00 1.0000000e+00]
555 [1.0000000e+00 1.92525993e-54]
556 [0.0000000e+00 1.0000000e+00]
557 [1.0000000e+00 4.52391096e-44]
558 [0.0000000e+00 1.0000000e+00]
559 [1.0000000e+00 8.34781422e-53]
560 [0.0000000e+00 1.0000000e+00]
561 [0.0000000e+00 1.0000000e+00]
562 [0.0000000e+00 1.0000000e+00]
563 [1.0000000e+00 2.07898462e-50]
564 [0.0000000e+00 1.0000000e+00]
565 [0.0000000e+00 1.0000000e+00]
566 [1.0000000e+00 1.12221225e-54]
567 [1.0000000e+00 1.07545078e-57]
568 [1.0000000e+00 2.78294650e-49]
569 [1.0000000e+00 2.41878981e-52]
570 [0.0000000e+00 1.0000000e+00]
571 [0.0000000e+00 1.0000000e+00]
572 [1.0000000e+00 1.08963718e-50]
573 [1.0000000e+00 2.91914442e-52]
574 [1.0000000e+00 1.36227423e-55]
575 [0.0000000e+00 1.0000000e+00]
576 [0.0000000e+00 1.0000000e+00]
577 [0.0000000e+00 1.0000000e+00]
578 [1.0000000e+00 2.95234702e-55]
579 [0.0000000e+00 1.0000000e+00]
580 [0.0000000e+00 1.0000000e+00]
581 [1.0000000e+00 9.44139351e-49]
582 [0.0000000e+00 1.0000000e+00]
583 [0.0000000e+00 1.0000000e+00]
```

584	[1.0000000e+00 1.49098417e-52]
585	[1.0000000e+00 2.46380370e-47]
586	[0.0000000e+00 1.0000000e+00]
587	[1.0000000e+00 2.39134076e-47]
588	[1.0000000e+00 1.35906103e-56]
589	[0.0000000e+00 1.0000000e+00]
590	[1.0000000e+00 3.97890181e-54]
591	[1.0000000e+00 3.08985528e-49]
592	[0.0000000e+00 1.0000000e+00]
593	[1.0000000e+00 1.22615317e-46]
594	[0.0000000e+00 1.0000000e+00]
595	[0.0000000e+00 1.0000000e+00]
596	[1.0000000e+00 6.08503214e-52]
597	[0.0000000e+00 1.0000000e+00]
598	[1.0000000e+00 1.77207676e-49]
599	[0.0000000e+00 1.0000000e+00]
600	[0.0000000e+00 1.0000000e+00]
601	[0.0000000e+00 1.0000000e+00]
602	[1.0000000e+00 1.18429888e-59]
603	[1.0000000e+00 1.76801947e-54]
604	[0.0000000e+00 1.0000000e+00]
605	[1.0000000e+00 4.30838707e-43]
606	[1.0000000e+00 8.31640143e-56]
607	[0.0000000e+00 1.0000000e+00]
608	[0.0000000e+00 1.0000000e+00]
609	[0.0000000e+00 1.0000000e+00]
610	[0.0000000e+00 1.0000000e+00]
611	[1.0000000e+00 2.41844002e-56]
612	[1.0000000e+00 4.78227530e-57]
613	[0.0000000e+00 1.0000000e+00]
614	[1.0000000e+00 1.16720234e-54]
615	[0.0000000e+00 1.0000000e+00]
616	[1.0000000e+00 1.45745685e-53]
617	[1.0000000e+00 2.80409411e-56]
618	[1.0000000e+00 6.78494306e-56]
619	[1.0000000e+00 9.98588991e-51]
620	[1.0000000e+00 8.21174383e-52]
621	[1.0000000e+00 2.31374815e-51]
622	[0.0000000e+00 1.0000000e+00]
623	[0.0000000e+00 1.0000000e+00]
624	[0.0000000e+00 1.0000000e+00]
625	[0.0000000e+00 1.0000000e+00]
626	[0.0000000e+00 1.0000000e+00]
627	[0.0000000e+00 1.0000000e+00]
628	[0.0000000e+00 1.0000000e+00]
629	[0.0000000e+00 1.0000000e+00]
630	[1.0000000e+00 1.67007880e-52]
631	[0.0000000e+00 1.0000000e+00]
632	[1.0000000e+00 6.33777442e-50]
633	[0.0000000e+00 1.0000000e+00]

634	[1.0000000e+00 4.49248507e-50]
635	[0.0000000e+00 1.0000000e+00]
636	[0.0000000e+00 1.0000000e+00]
637	[0.0000000e+00 1.0000000e+00]
638	[1.0000000e+00 5.21909181e-50]
639	[1.0000000e+00 2.64073662e-51]
640	[1.0000000e+00 6.19473201e-50]
641	[0.0000000e+00 1.0000000e+00]
642	[0.0000000e+00 1.0000000e+00]
643	[0.0000000e+00 1.0000000e+00]
644	[1.0000000e+00 1.07874507e-52]
645	[0.0000000e+00 1.0000000e+00]
646	[1.0000000e+00 5.95070881e-52]
647	[0.0000000e+00 1.0000000e+00]
648	[1.0000000e+00 2.31241758e-45]
649	[1.0000000e+00 2.52377233e-54]
650	[1.0000000e+00 1.90718802e-57]
651	[1.0000000e+00 2.38759734e-55]
652	[0.0000000e+00 1.0000000e+00]
653	[0.0000000e+00 1.0000000e+00]
654	[0.0000000e+00 1.0000000e+00]
655	[0.0000000e+00 1.0000000e+00]
656	[1.0000000e+00 7.10940915e-53]
657	[1.0000000e+00 1.40580755e-55]
658	[1.0000000e+00 2.50617483e-53]
659	[1.0000000e+00 2.52266872e-51]
660	[1.0000000e+00 1.86882368e-53]
661	[0.0000000e+00 1.0000000e+00]
662	[1.0000000e+00 5.89535918e-56]
663	[1.0000000e+00 2.43471592e-57]
664	[0.0000000e+00 1.0000000e+00]
665	[1.0000000e+00 5.84659978e-56]
666	[1.0000000e+00 6.95009961e-55]
667	[0.0000000e+00 1.0000000e+00]
668	[1.0000000e+00 7.63696076e-52]
669	[0.0000000e+00 1.0000000e+00]
670	[0.0000000e+00 1.0000000e+00]
671	[0.0000000e+00 1.0000000e+00]
672	[0.0000000e+00 1.0000000e+00]
673	[1.0000000e+00 9.58001858e-47]
674	[0.0000000e+00 1.0000000e+00]
675	[1.0000000e+00 7.78320697e-49]
676	[0.0000000e+00 1.0000000e+00]
677	[0.0000000e+00 1.0000000e+00]
678	[1.0000000e+00 3.65143231e-56]
679	[1.0000000e+00 1.54956102e-57]
680	[0.0000000e+00 1.0000000e+00]
681	[0.0000000e+00 1.0000000e+00]
682	[0.0000000e+00 1.0000000e+00]
683	[1.0000000e+00 1.87486451e-56]

```

684 [1.0000000e+00 6.65160570e-51]
685 [1.0000000e+00 7.65094972e-53]
686 [0.0000000e+00 1.0000000e+00]
687 [0.0000000e+00 1.0000000e+00]
688 [1.0000000e+00 1.31207959e-50]
689 [1.0000000e+00 1.78799978e-50]
690 [0.0000000e+00 1.0000000e+00]
691 [0.0000000e+00 1.0000000e+00]
692 [1.0000000e+00 1.30937761e-56]
693 [1.0000000e+00 1.43102295e-51]
694 [1.0000000e+00 2.40637649e-54]
695 [1.0000000e+00 1.29930049e-51]
696 [1.0000000e+00 7.61937114e-51]
697 [0.0000000e+00 1.0000000e+00]
698 [1.0000000e+00 3.03314959e-47]
699 [1.0000000e+00 2.55859978e-54]
700 [1.0000000e+00 1.32101106e-52]
701 [0.0000000e+00 1.0000000e+00]
702 [1.0000000e+00 1.92185275e-54]
703 [0.0000000e+00 1.0000000e+00]
704 [1.0000000e+00 5.43221936e-55]
705 [1.0000000e+00 4.46134873e-54]
706 [1.0000000e+00 2.14940979e-54]
707 [1.0000000e+00 1.82625695e-57]
708 [0.0000000e+00 1.0000000e+00]
709 [0.0000000e+00 1.0000000e+00]
710 [1.0000000e+00 5.65135562e-48]
711 [1.0000000e+00 4.61800983e-46]
712 [0.0000000e+00 1.0000000e+00]
713 [0.0000000e+00 1.0000000e+00]
714 [1.0000000e+00 2.67474812e-48]
715 [1.0000000e+00 2.13494528e-48]
716 [1.0000000e+00 9.20751458e-49]
717 [0.0000000e+00 1.0000000e+00]
718 [1.0000000e+00 2.24402967e-48]
719 [0.0000000e+00 1.0000000e+00]
720 [0.0000000e+00 1.0000000e+00]
721 [1.0000000e+00 6.35893939e-50]
722 [1.0000000e+00 1.03926736e-46]
723 [0.0000000e+00 1.0000000e+00]
724 [1.0000000e+00 5.15651215e-54]]
725
726
727
728 STATUS: Testing on Training Set
729 [1 0 1 1 1 1 0 1 1 1 0 1 0 1 1 1 0 1 1 0 0 0 0 1 1 0 0
     0 1 1 1 0 1 1 0
730 1 1 0 0 1 0 0 1 0 0 1 0 1 1 0 1 0 1 1 1 0 0 1 0 0 1 1 1 1
     0 0 1 0 1 0 0 0
731 0 0 0 1 1 1 1 1 1 1 1 0 1 0 1 1 1 0 0 0 1 1 1 0 1 0 1
```

```
731 0 0 0 0 1 1 1 1
732 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1 1 1 0 1 0 1 1 0 0 1 1 1 0 0
0 1 1 0 0 1 1 0
733 0 0 0 0 1 0 0 0 1 0 1 0 0 0 0 1 1 0 0 1 1 0 0 0 1 0 1 1 0
0 1 0]
734
735
736
737 STATUS: Training Accuracy Score
738 1.0
739
740
741
742 STATUS: Predicting actual outputs based Given Test Data
743 [1 1 0 0 1 0 0 0 1 0 0 1 1 1 0 1 1 0 1 0]
744
745
746
747 STATUS: Plotting Charts
748 None
749 0
750 0 23.618100
751 1 22.901954
752 2 8.997470
753 3 10.906374
754 4 24.235646
755 5 10.149283
756 6 10.850489
757 7 10.989978
758 8 22.606102
759 9 10.499837
760 10 10.257025
761 11 22.751216
762 12 24.535081
763 13 22.770695
764 14 11.039891
765 15 22.919262
766 16 21.578990
767 17 10.452486
768 18 23.878925
769 19 8.952041
770
771
772
773 STATUS: Printing Classification Report
774 precision recall f1-score support
775
776 0 1.00 1.00 1.00 90
777 1 1.00 1.00 1.00 90
778
```

```
779 avg / total      1.00      1.00      1.00      180
780
781
782
783
784 STATUS: Computing Log Loss
785 9.992007221626413e-16
786
787
788
789 STATUS: Computing Confusion Matrix
790 [[90  0]
791 [ 0 90]]
792 ****
793 ///COMPUTING BINARY NEURAL NET: Model 2
794
795
796 Simple Neural Network Model created
797
798
799
800 STATUS: Training Prediction Probability
801 [[0.19078928 0.80921072]
802 [0.36210736 0.63789264]
803 [0.21615302 0.78384698]
804 [0.22701402 0.77298598]
805 [0.21586829 0.78413171]
806 [0.20155617 0.79844383]
807 [0.35444618 0.64555382]
808 [0.21446816 0.78553184]
809 [0.19772428 0.80227572]
810 [0.22649138 0.77350862]
811 [0.34849511 0.65150489]
812 [0.19575176 0.80424824]
813 [0.38386149 0.61613851]
814 [0.19239879 0.80760121]
815 [0.36565936 0.63434064]
816 [0.24980612 0.75019388]
817 [0.21102099 0.78897901]
818 [0.23348761 0.76651239]
819 [0.35996634 0.64003366]
820 [0.20849621 0.79150379]
821 [0.22799644 0.77200356]
822 [0.35704752 0.64295248]
823 [0.37263246 0.62736754]
824 [0.38065266 0.61934734]
825 [0.33318173 0.66681827]
826 [0.22819855 0.77180145]
827 [0.19719712 0.80280288]
828 [0.39130544 0.60869456]
```

829	[0.35431768 0.64568232]
830	[0.35760403 0.64239597]
831	[0.201898 0.798102]
832	[0.18928262 0.81071738]
833	[0.21625849 0.78374151]
834	[0.35934813 0.64065187]
835	[0.20102811 0.79897189]
836	[0.22515592 0.77484408]
837	[0.38281953 0.61718047]
838	[0.23410409 0.76589591]
839	[0.21966275 0.78033725]
840	[0.35326487 0.64673513]
841	[0.35639884 0.64360116]
842	[0.21296254 0.78703746]
843	[0.37678117 0.62321883]
844	[0.35823834 0.64176166]
845	[0.2258393 0.7741607]
846	[0.33221772 0.66778228]
847	[0.378885 0.621115]
848	[0.24506889 0.75493111]
849	[0.37932138 0.62067862]
850	[0.20726027 0.79273973]
851	[0.21916715 0.78083285]
852	[0.36033134 0.63966866]
853	[0.1923972 0.8076028]
854	[0.37767851 0.62232149]
855	[0.2080395 0.7919605]
856	[0.20020061 0.79979939]
857	[0.20805169 0.79194831]
858	[0.35034094 0.64965906]
859	[0.35266761 0.64733239]
860	[0.2234189 0.7765811]
861	[0.36682984 0.63317016]
862	[0.35442623 0.64557377]
863	[0.20143465 0.79856535]
864	[0.19210146 0.80789854]
865	[0.25028345 0.74971655]
866	[0.21860734 0.78139266]
867	[0.36885528 0.63114472]
868	[0.35467572 0.64532428]
869	[0.20184277 0.79815723]
870	[0.37862507 0.62137493]
871	[0.2283333 0.7716667]
872	[0.35703565 0.64296435]
873	[0.35425289 0.64574711]
874	[0.36466865 0.63533135]
875	[0.36600353 0.63399647]
876	[0.36059126 0.63940874]
877	[0.35524697 0.64475303]
878	[0.2247681 0.7752319]

879	[0.21052614 0.78947386]
880	[0.19359065 0.80640935]
881	[0.20227635 0.79772365]
882	[0.22426085 0.77573915]
883	[0.19370483 0.80629517]
884	[0.20533251 0.79466749]
885	[0.19376128 0.80623872]
886	[0.35747226 0.64252774]
887	[0.2142317 0.7857683]
888	[0.37614921 0.62385079]
889	[0.19620325 0.80379675]
890	[0.37336713 0.62663287]
891	[0.19790835 0.80209165]
892	[0.24658095 0.75341905]
893	[0.22432854 0.77567146]
894	[0.38039737 0.61960263]
895	[0.37348026 0.62651974]
896	[0.37876245 0.62123755]
897	[0.1971282 0.8028718]
898	[0.20057041 0.79942959]
899	[0.1881979 0.8118021]
900	[0.34933511 0.65066489]
901	[0.20286509 0.79713491]
902	[0.37339598 0.62660402]
903	[0.20763784 0.79236216]
904	[0.35763069 0.64236931]
905	[0.36414469 0.63585531]
906	[0.37850256 0.62149744]
907	[0.35561232 0.64438768]
908	[0.20781499 0.79218501]
909	[0.22063732 0.77936268]
910	[0.22328122 0.77671878]
911	[0.21648443 0.78351557]
912	[0.3751473 0.6248527]
913	[0.39074771 0.60925229]
914	[0.3612229 0.6387771]
915	[0.35379646 0.64620354]
916	[0.3744963 0.6255037]
917	[0.19925714 0.80074286]
918	[0.35845556 0.64154444]
919	[0.36369049 0.63630951]
920	[0.22291528 0.77708472]
921	[0.34687857 0.65312143]
922	[0.37737327 0.62262673]
923	[0.21024783 0.78975217]
924	[0.36895734 0.63104266]
925	[0.22089925 0.77910075]
926	[0.23629643 0.76370357]
927	[0.21985927 0.78014073]
928	[0.23928817 0.76071183]

929	[0.38164071 0.61835929]
930	[0.21801502 0.78198498]
931	[0.36309801 0.63690199]
932	[0.20389381 0.79610619]
933	[0.21761721 0.78238279]
934	[0.3540628 0.6459372]
935	[0.35876579 0.64123421]
936	[0.20593552 0.79406448]
937	[0.21241718 0.78758282]
938	[0.21991559 0.78008441]
939	[0.37389234 0.62610766]
940	[0.36878724 0.63121276]
941	[0.35045085 0.64954915]
942	[0.21899144 0.78100856]
943	[0.23153847 0.76846153]
944	[0.39703535 0.60296465]
945	[0.40803902 0.59196098]
946	[0.22115197 0.77884803]
947	[0.2190513 0.7809487]
948	[0.35399459 0.64600541]
949	[0.35621444 0.64378556]
950	[0.38153301 0.61846699]
951	[0.35750099 0.64249901]
952	[0.35045838 0.64954162]
953	[0.20623048 0.79376952]
954	[0.3569146 0.6430854]
955	[0.3706059 0.6293941]
956	[0.34287364 0.65712636]
957	[0.22686263 0.77313737]
958	[0.36768824 0.63231176]
959	[0.20763477 0.79236523]
960	[0.3765156 0.6234844]
961	[0.35115997 0.64884003]
962	[0.35821304 0.64178696]
963	[0.36015381 0.63984619]
964	[0.20923518 0.79076482]
965	[0.21559105 0.78440895]
966	[0.36351516 0.63648484]
967	[0.37326134 0.62673866]
968	[0.22628243 0.77371757]
969	[0.219112 0.780888]
970	[0.35041512 0.64958488]
971	[0.39701362 0.60298638]
972	[0.36400658 0.63599342]
973	[0.21519045 0.78480955]
974	[0.34695119 0.65304881]
975	[0.21916355 0.78083645]
976	[0.19838577 0.80161423]
977	[0.37309213 0.62690787]
978	[0.3831303 0.6168697]


```
1024 18 23.878925
1025 19 8.952041
1026
1027
1028
1029 /Users/negus/PycharmProjects/CS5014/W02Lab/venv/lib/
    python3.6/site-packages/sklearn/metrics/classification.py
        :1135: UndefinedMetricWarning: Precision and F-score are
        ill-defined and being set to 0.0 in labels with no
        predicted samples.
1030 STATUS: Printing Classification Report
1031     'precision', 'predicted', average, warn_for)
1032         precision      recall   f1-score   support
1033
1034         0          0.00      0.00      0.00       90
1035         1          0.50      1.00      0.67       90
1036
1037 avg / total      0.25      0.50      0.33      180
1038
1039
1040
1041
1042 STATUS: Computing Log Loss
1043 0.624180412512119
1044
1045
1046
1047 STATUS: Computing Confusion Matrix
1048 [[ 0 90]
1049 [ 0 90]]
1050
1051 IN MULTI-CLASS
1052 ****
1053 //COMPUTING MULTICLASS LOGISTIC: Model 1
1054 (450,)
1055 (450,)
1056
1057
1058
1059 STATUS: Decision Function
1060 [[-1.55246103e+01 -1.44563649e+01  1.93629621e+01  6.
11326867e+00
1061    4.50474437e+00]
1062 [ 1.40657073e+01  4.38236217e-01  5.97716146e-02 -7.
07595846e+00
1063    -7.48775665e+00]
1064 [-1.40048235e+01 -1.36528748e+01  1.78332498e+01  5.
83338316e+00
1065    3.99106533e+00]
1066 [ 1.54397331e+01  9.73066752e-01 -8.86273842e-01 -7.
```

1066	12790471e+00
1067	-8.39862127e+00]
1068	[1.47670812e+01 1.10356353e+00 -1.36079257e+00 -6.
	35067520e+00
1069	-8.15917696e+00]
1070	[1.43266505e+01 6.72386575e-01 1.96465693e-01 -7.
	48585778e+00
1071	-7.70964502e+00]
1072	[-1.64823392e+01 -1.49067506e+01 2.16123441e+01 4.
	92913085e+00
1073	4.84761474e+00]
1074	[1.53674615e+01 7.62515523e-01 -2.79913993e-01 -7.
	34217714e+00
1075	-8.50788590e+00]
1076	[-3.31993180e+01 5.31545498e+00 4.09618720e+00 3.
	92330475e+00
1077	1.98643711e+01]
1078	[-1.68131013e+00 1.35383859e+01 -4.80092696e+00 -6.
	28543679e+00
1079	-7.70712023e-01]
1080	[-3.21085978e+01 4.53669464e+00 6.04716294e+00 2.
	23109867e+00
1081	1.92936415e+01]
1082	[-1.57203592e+01 -1.26288521e+01 6.99190039e+00 1.
	70262270e+01
1083	4.33108388e+00]
1084	[-1.49195571e+01 -1.11425154e+01 3.02106027e+00 1.
	97113443e+01
1085	3.32966798e+00]
1086	[-1.65534751e+01 -1.54960607e+01 2.28274036e+01 4.
	14240397e+00
1087	5.07972817e+00]
1088	[1.34433002e+01 1.04112337e+00 -2.44862990e+00 -4.
	47364664e+00
1089	-7.56214705e+00]
1090	[-3.35899525e+01 4.47403469e+00 6.51621527e+00 2.
	26212513e+00
1091	2.03375774e+01]
1092	[-1.69438367e+01 -1.57162272e+01 2.30777616e+01 4.
	23106878e+00
1093	5.35123348e+00]
1094	[-3.14594395e+01 5.50319334e+00 3.29207486e+00 3.
	79384847e+00
1095	1.88703228e+01]
1096	[-1.41241414e+01 -1.11444618e+01 3.02482702e+00 1.
	94048144e+01
1097	2.83896180e+00]
1098	[-1.46649252e+01 -1.15218447e+01 4.02780110e+00 1.
	88238628e+01
1099	3.33510603e+00]

1100	[-3.24568371e+01	6.51206548e+00	1.17400158e+00	5.
	41953487e+00			
1101	1.93512352e+01]			
1102	[-1.64638780e+00	1.31842279e+01	-4.28837927e+00	-6.
	58614863e+00			
1103	-6.63312178e-01]			
1104	[-1.37654353e+01	-1.31367165e+01	1.67146472e+01	6.
	74548193e+00			
1105	3.44202254e+00]			
1106	[-1.89889254e+00	1.22781275e+01	-4.06254469e+00	-5.
	89012606e+00			
1107	-4.26564229e-01]			
1108	[-3.13547886e+01	4.58870892e+00	4.84403412e+00	3.
	08082824e+00			
1109	1.88412173e+01]			
1110	[-1.31771505e+01	-1.29405625e+01	1.59513667e+01	6.
	83976637e+00			
1111	3.32657983e+00]			
1112	[-1.49757509e+01	-1.14024681e+01	2.80789714e+00	2.
	01806068e+01			
1113	3.38971503e+00]			
1114	[-1.70336511e+01	-1.56074769e+01	2.28506364e+01	4.
	40448478e+00			
1115	5.38600681e+00]			
1116	[1.43052621e+01	3.21180640e-01	6.77977634e-01	-7.
	73900598e+00			
1117	-7.56541443e+00]			
1118	[-9.67532143e-01	1.18035909e+01	-4.03504386e+00	-5.
	68835626e+00			
1119	-1.11265860e+00]			
1120	[-3.18608847e-02	1.36446200e+01	-7.27667998e+00	-4.
	50443753e+00			
1121	-1.83164156e+00]			
1122	[-6.06327234e-01	1.20062050e+01	-5.65400794e+00	-4.
	42559503e+00			
1123	-1.32027481e+00]			
1124	[-1.57544042e+01	-1.23221889e+01	5.57158573e+00	1.
	85292163e+01			
1125	3.97579099e+00]			
1126	[-1.91357925e+00	1.38100249e+01	-4.87102595e+00	-6.
	29645831e+00			
1127	-7.28961419e-01]			
1128	[-1.19525502e+01	-1.37734395e+01	1.89537701e+01	3.
	61695379e+00			
1129	3.15526583e+00]			
1130	[-3.26106059e+01	5.48160610e+00	3.53681026e+00	4.
	26757278e+00			
1131	1.93246168e+01]			
1132	[-1.50981995e+01	-1.41921704e+01	1.92510443e+01	5.
	82685099e+00			

```
1133 4.21247466e+00]
1134 [-1.56842153e+01 -1.19954090e+01 4.90480986e+00 1.
88735517e+01
1135 3.90126277e+00]
1136 [-1.91018194e+00 1.25898891e+01 -4.66857510e+00 -5.
54130179e+00
1137 -4.69830258e-01]
1138 [-3.31622925e+01 4.48312693e+00 6.37276143e+00 2.
45538961e+00
1139 1.98510145e+01]
1140 [ 1.50339747e+01 5.86398265e-01 -1.00030821e-01 -7.
45164980e+00
1141 -8.06869231e+00]
1142 [ 1.54276272e+01 8.01628886e-01 -2.74841855e-01 -7.
55510861e+00
1143 -8.39930560e+00]
1144 [-1.81348428e+00 1.33557231e+01 -4.27928082e+00 -6.
63211382e+00
1145 -6.30844150e-01]
1146 [-2.08927402e+00 1.35871040e+01 -4.63730033e+00 -6.
28917306e+00
1147 -5.71356572e-01]
1148 [-1.41451257e+01 -1.13534571e+01 4.50356116e+00 1.
78898220e+01
1149 3.10519971e+00]
1150 [ 1.49505556e+01 1.12706886e+00 -1.38312907e+00 -6.
39257714e+00
1151 -8.30191827e+00]
1152 [-1.34393402e+01 -1.09322257e+01 3.38510615e+00 1.
81534254e+01
1153 2.83303436e+00]
1154 [-3.33566863e+01 5.26325327e+00 4.14883554e+00 3.
86543379e+00
1155 2.00791636e+01]
1156 [-1.54611477e+01 -1.18403694e+01 4.58214138e+00 1.
89487508e+01
1157 3.77062490e+00]
1158 [-3.28558366e+01 5.62968972e+00 2.91341199e+00 4.
72692118e+00
1159 1.95858137e+01]]
1160
1161
1162
1163 STATUS: Training Prediction Probability
1164 [[4.50966371e-07 9.99998838e-01 5.95675537e-09 1.
04214742e-08
1165 6.94377074e-07]
1166 [5.94832789e-16 1.53423713e-15 9.99999211e-01 5.
70076032e-07
1167 2.18952469e-07]
```

```
1168 [1.44382335e-25 5.77403923e-08 3.31689474e-07 8.  
    76994857e-09  
1169  9.9999602e-01]  
1170 ...  
1171 [2.59904093e-16 1.42672922e-14 1.08412737e-06 9.  
    99998668e-01  
1172  2.47670063e-07]  
1173 [1.05180830e-22 1.36879746e-06 1.39641454e-07 3.  
    34709601e-07  
1174  9.99998157e-01]  
1175 [1.99277836e-06 9.99996523e-01 2.64142769e-08 2.  
    19878965e-08  
1176  1.43548350e-06]]  
1177  
1178  
1179  
1180 STATUS: Testing on Training Set  
1181 [1 2 4 3 0 3 1 1 0 2 3 3 2 3 4 4 2 1 1 1 1 0 0 2 2 4 3 1  
    3 3 0 4 0 4 4 2 0  
1182 4 4 2 1 2 1 0 0 3 0 0 3 2 4 4 1 0 2 3 2 3 1 2 0 3 0 3 4  
    0 2 2 1 0 1 1 2 2  
1183 3 1 4 2 1 3 2 2 1 1 4 2 4 1 4 1 4 4 1 1 3 1 1 1 0 2 1  
    0 0 4 0 4 0 3 4 3  
1184 3 4 2 2 4 4 3 4 1 3 1 2 0 4 0 3 4 2 4 4 2 1 0 2 3 1 1 1  
    0 4 0 3 2 2 3 4 2  
1185 2 3 3 2 1 3 4 4 1 1 3 4 0 4 2 0 0 0 4 3 1 4 1 0 3 2 4 1  
    2 0 4 4 3 1 0 4 4  
1186 4 0 3 1 1 3 3 3 1 0 4 3 3 2 3 0 1 2 2 1 4 1 0 2 2 2 3 4  
    3 1 4 3 2 3 1 2 1  
1187 2 4 0 0 4 2 0 4 0 4 1 4 1 4 1 1 0 0 2 4 2 2 0 1 1 2 1 3  
    0 0 2 2 1 2 2 4 4  
1188 3 2 1 0 4 0 3 2 4 3 1 4 3 4 0 0 2 4 0 0 2 0 3 0 0 4 2 0  
    0 2 2 4 3 0 0 3 2  
1189 1 3 2 2 0 3 2 3 2 3 1 3 0 4 0 4 4 3 4 2 3 4 1 0 1 1 1 1  
    3 4 3 2 4 0 3 1 0  
1190 0 0 3 1 4 4 2 2 0 0 3 3 4 3 4 4 2 0 4 2 3 3 0 4 2 0 3 3  
    2 3 0 1 1 0 0 0 3  
1191 3 1 4 1 0 1 2 0 2 3 3 1 0 2 4 1 3 3 0 0 0 0 2 2 3 1 4 2  
    3 2 2 0 4 1 3 1 2  
1192 4 1 2 1 1 3 1 1 2 4 2 0 1 3 3 4 4 0 2 3 2 4 1 3 1 4 3 4  
    3 1 0 0 3 1 2 0 4  
1193 0 3 2 3 4 1]  
1194  
1195  
1196  
1197 STATUS: Training Accuracy Score  
1198 1.0  
1199  
1200  
1201
```

```
1202 STATUS: Predicting actual outputs based Given Test Data
1203 [2 0 2 0 0 0 2 0 4 1 4 3 3 2 0 4 2 4 3 3 4 1 2 1 4 2 3 2
     0 1 1 1 3 1 2 4 2
1204 3 1 4 0 0 1 1 3 0 3 4 3 4]
1205
1206
1207
1208 STATUS: actual loss
1209 [[7.05535548e-16 2.05329810e-15 9.99997887e-01 1.
      76088234e-06
1210 3.52498370e-07]
1211 [9.99997965e-01 1.20687872e-06 8.26605979e-07 6.
      58097657e-10
1212 4.35962029e-10]
1213 [1.48900920e-14 2.11712629e-14 9.99992881e-01 6.
      14498835e-06
1214 9.73671812e-07]
1215 [9.99999397e-01 5.21442452e-07 8.12278625e-08 1.
      58124506e-10
1216 4.43745529e-11]
1217 [9.99998736e-01 1.16415049e-06 9.90268277e-08 6.
      74022470e-10
1218 1.10471955e-10]
1219 [9.99998094e-01 1.17497245e-06 7.30025229e-07 3.
      36470643e-10
1220 2.69003304e-10]
1221 [2.85554629e-17 1.38025280e-16 9.99999891e-01 5.
      68293233e-08
1222 5.23806024e-08]
1223 [9.99999386e-01 4.54100812e-07 1.60114584e-07 1.
      37192059e-10
1224 4.27629930e-11]
1225 [9.01015583e-24 4.80270259e-07 1.41894129e-07 1.
      19366520e-07
1226 9.99999258e-01]
1227 [2.45566783e-07 9.99999131e-01 1.08476895e-08 2.
      45823172e-09
1228 6.10432088e-07]
1229 [4.74558908e-23 3.90066302e-07 1.76655223e-06 3.
      88893627e-08
1230 9.99997804e-01]
1231 [6.00230356e-15 1.32112046e-13 4.38658909e-05 9.
      99953068e-01
1232 3.06583677e-06]
1233 [9.11991037e-16 3.98417989e-14 5.64289157e-08 9.
      99999867e-01
1234 7.68295567e-08]
1235 [7.89044793e-18 2.27159500e-17 9.99999973e-01 7.
      67728639e-09
1236 1.96011913e-08]
```

```
1237 [9.99995748e-01 4.10961541e-06 1.25377785e-07 1.  
65488187e-08  
1238 7.54133635e-10]  
1239 [3.79813924e-24 1.28988344e-07 9.94164429e-07 1.  
41231103e-08  
1240 9.99998863e-01]  
1241 [4.15758064e-18 1.41900751e-17 9.99999973e-01 6.  
53108420e-09  
1242 2.00201178e-08]  
1243 [1.38695081e-22 1.56577209e-06 1.71574204e-07 2.  
83380199e-07  
1244 9.99997979e-01]  
1245 [2.74510820e-15 5.40278750e-14 7.69594272e-08 9.  
99999859e-01  
1246 6.39059927e-08]  
1247 [2.85761649e-15 6.62256819e-14 3.75104107e-07 9.  
99999437e-01  
1248 1.87636866e-07]  
1249 [3.16255821e-23 2.65471497e-06 1.27563434e-08 8.  
90303099e-07  
1250 9.99996442e-01]  
1251 [3.62363846e-07 9.99998641e-01 2.58072983e-08 2.  
59318790e-09  
1252 9.68476700e-07]  
1253 [5.78958290e-14 1.08566634e-13 9.99951460e-01 4.  
68193555e-05  
1254 1.72088262e-06]  
1255 [6.96621308e-07 9.99996174e-01 8.00450659e-08 1.  
28714082e-08  
1256 3.03683235e-06]  
1257 [1.58544409e-22 6.45971794e-07 8.33872941e-07 1.  
43004367e-07  
1258 9.99998377e-01]  
1259 [2.23664129e-13 2.83364355e-13 9.99886346e-01 1.  
10365384e-04  
1260 3.28908692e-06]  
1261 [5.39247110e-16 1.92151961e-14 2.85185885e-08 9.  
99999920e-01  
1262 5.10279740e-08]  
1263 [4.76951265e-18 1.98542551e-17 9.99999964e-01 9.  
74850736e-09  
1264 2.60140353e-08]  
1265 [9.99997947e-01 8.44869598e-07 1.20710389e-06 2.  
66867146e-10  
1266 3.17457041e-10]  
1267 [2.84164211e-06 9.99994543e-01 1.32240952e-07 2.  
53128774e-08  
1268 2.45777294e-06]  
1269 [1.14915669e-06 9.99998647e-01 8.20340765e-10 1.  
31209081e-08
```

```
1270  1.89995989e-07]
1271  [3.33000320e-06 9.99994945e-01 2.13926593e-08 7.
      30731320e-08
1272  1.63072662e-06]
1273  [1.29065915e-15 3.99395994e-14 2.35814928e-06 9.
      99997164e-01
1274  4.78108477e-07]
1275  [1.48362859e-07 9.99999357e-01 7.70765750e-09 1.
      85295554e-09
1276  4.85063034e-07]
1277  [3.78055442e-14 6.12002668e-15 9.99999644e-01 2.
      18426419e-07
1278  1.37656471e-07]
1279  [2.78495864e-23 9.72873196e-07 1.39136840e-07 2.
      88940398e-07
1280  9.99998599e-01]
1281  [1.20868245e-15 2.99085688e-15 9.99998227e-01 1.
      47892507e-06
1282  2.94327904e-07]
1283  [9.81187469e-16 3.92446261e-14 8.57930295e-07 9.
      99998828e-01
1284  3.14497385e-07]
1285  [5.04310489e-07 9.99997321e-01 3.19700323e-08 1.
      33574233e-08
1286  2.12928988e-06]
1287  [9.47572861e-24 2.11743716e-07 1.40109752e-06 2.
      78724664e-08
1288  9.99998359e-01]
1289  [9.99999201e-01 5.31492261e-07 2.67537449e-07 1.
      71639415e-10
1290  9.26059453e-11]
1291  [9.99999404e-01 4.44640877e-07 1.51531905e-07 1.
      04405747e-10
1292  4.48842848e-11]
1293  [2.58283381e-07 9.99998875e-01 2.19388889e-08 2.
      08637438e-09
1294  8.42772866e-07]
1295  [1.55537516e-07 9.99999120e-01 1.21686216e-08 2.
      33261024e-09
1296  7.09673074e-07]
1297  [1.22292032e-14 1.99436406e-13 1.53610171e-06 9.
      99998084e-01
1298  3.79419206e-07]
1299  [9.99998927e-01 9.92054453e-07 8.06065625e-08 5.
      38015451e-10
1300  7.97220453e-11]
1301  [1.90298774e-14 2.33486599e-13 3.85656088e-07 9.
      99999392e-01
1302  2.22043703e-07]
1303  [6.21019173e-24 3.67732177e-07 1.20655233e-07 9.
```

```
1303 08795876e-08
1304 9.99999421e-01]
1305 [1.13755024e-15 4.25064273e-14 5.76315670e-07 9.
99999168e-01
1306 2.55990177e-07]
1307 [1.67834069e-23 8.68824033e-07 5.74470058e-08 3.
52260892e-07
1308 9.99998721e-01]]
1309
1310
1311
1312 STATUS: Plotting Charts
1313 None
1314
1315
1316
1317 STATUS: Printing Classification Report
1318 precision recall f1-score support
1319
1320 0 1.00 1.00 1.00 90
1321 1 1.00 1.00 1.00 90
1322 2 1.00 1.00 1.00 90
1323 3 1.00 1.00 1.00 90
1324 4 1.00 1.00 1.00 90
1325
1326 avg / total 1.00 1.00 1.00 450
1327
1328
1329
1330
1331 STATUS: Printing log loss
1332 1.837322605606062e-06
1333
1334
1335
1336 STATUS: Computing Confusion Matrix
1337 [[90 0 0 0 0]
1338 [ 0 90 0 0 0]
1339 [ 0 0 90 0 0]
1340 [ 0 0 0 90 0]
1341 [ 0 0 0 0 90]]
1342 ****
1343 //COMPUTING MULTICLASS LOGISTIC: Model 2
1344 (450,)
1345 (450,)
1346
1347
1348
1349 STATUS: Decision Function
1350 [[-42.49150157 -1.21910085 18.88033683 14.32118553 10
```

1350	.50907453]					
1351	[38.81603691	32.47156403	-13.17473719	18.33983428	-76	
	.45269834]					
1352	[-35.62511263	1.62606226	16.17329872	14.6605588	3	
	.16518778]					
1353	[40.78399541	33.28700909	-13.95059459	18.4371012	-78	
	.55751129]					
1354	[40.73019288	33.26471543	-13.92938322	18.434442	-78	
	.49996726]					
1355	[38.0690371	32.16203652	-12.8802364	18.3029136	-75	
	.65375116]					
1356	[-48.61428438	-3.75614265	21.2942121	14.0185652	17	
	.05764381]					
1357	[39.34321891	32.69000764	-13.38257595	18.3658904	-77	
	.01654127]					
1358	[-62.7715228	-9.62234871	26.87562969	13.31883957	32	
	.19939542]					
1359	[16.82995132	23.36138981	-4.50683733	17.2531656	-52	
	.9376711]					
1360	[-60.75745967	-8.7877997	26.08159578	13.41838523	30	
	.04527166]					
1361	[-18.83549588	8.58302298	9.55407967	15.49039049	-14	
	.79200126]					
1362	[-13.93369935	10.6141358	7.62157189	15.73266321	-20	
	.03467525]					
1363	[-49.34417775	-4.05858192	21.58196877	13.98249001	17	
	.83829493]					
1364	[42.38789014	33.95160036	-14.58292174	18.51637417	-80	
	.272943]					
1365	[-65.32570813	-10.68070325	27.88260397	13.19259822	34	
	.93120219]					
1366	[-49.65093493	-4.1856901	21.70290619	13.96732845	18	
	.16638441]					
1367	[-59.01298859	-8.06495909	25.39384714	13.50460622	28	
	.17948774]					
1368	[-14.72948012	10.28439537	7.93530432	15.69333152	-19	
	.18355482]					
1369	[-14.6855	10.30261901	7.91796538	15.69550525	-19	
	.23059338]					
1370	[-58.07610725	-7.67675209	25.02448654	13.55091185	27	
	.17745442]					
1371	[15.79688761	22.9333286	-4.09955734	17.20210613	-51	
	.83276677]					
1372	[-35.53477957	1.66349275	16.13768538	14.66502354	3	
	.06857283]					
1373	[16.95027584	23.41124758	-4.55427465	17.25911268	-53	
	.06636316]					
1374	[-60.89331795	-8.84409406	26.1351572	13.4116704	30	
	.19057771]					
1375	[-33.48137162	2.51434472	15.32813998	14.76651382	0	

1375	.87236816]					
1376	[-14.30245359	10.46133846	7.76695133	15.71443743	-19	
	.64027734]					
1377	[-50.82396799	-4.67174914	22.16536837	13.90935095	19	
	.42099175]					
1378	[38.95719267	32.53005346	-13.23038711	18.34681094	-76	
	.60367025]					
1379	[17.72075563	23.73050428	-4.8580323	17.29719386	-53	
	.89042313]					
1380	[20.76310922	24.99113666	-6.05746437	17.44756307	-57	
	.14434604]					
1381	[20.64766831	24.94330246	-6.01195239	17.44185737	-57	
	.02087721]					
1382	[-18.07459019	8.89831255	9.25409656	15.52799848	-15	
	.60582135]					
1383	[15.93889869	22.99217244	-4.15554447	17.20912507	-51	
	.98465349]					
1384	[-34.63117302	2.03791197	15.7814432	14.70968455	2	
	.10212828]					
1385	[-61.25790595	-8.99516507	26.27889413	13.39365053	30	
	.58051964]					
1386	[-42.45990983	-1.20601046	18.86788195	14.32274696	10	
	.47528586]					
1387	[-17.16811417	9.27392077	8.8967231	15.57280132	-16	
	.57533492]					
1388	[17.44696974	23.61705811	-4.75009364	17.28366192	-53	
	.59759781]					
1389	[-64.84567922	-10.48179803	27.69335507	13.21632379	34	
	.41779143]					
1390	[39.24190461	32.64802696	-13.34263331	18.36088292	-76	
	.90818144]					
1391	[39.24681581	32.65006197	-13.34456953	18.36112565	-76	
	.91343418]					
1392	[15.45760059	22.79274132	-3.9657952	17.18533677	-51	
	.46988528]					
1393	[15.5844366	22.8452972	-4.01579964	17.19160567	-51	
	.60554164]					
1394	[-14.35195192	10.44082829	7.78646579	15.71199096	-19	
	.58733683]					
1395	[40.46093193	33.15314422	-13.82322849	18.4211337	-78	
	.21198154]					
1396	[-11.32366976	11.69563002	6.5925813	15.86166468	-22	
	.82620977]					
1397	[-62.70342812	-9.59413294	26.84878372	13.32220517	32	
	.12656534]					
1398	[-16.50532221	9.54855584	8.63542082	15.60556	-17	
	.28421831]					
1399	[-59.50736484	-8.26980928	25.5887524	13.48017153	28	
	.70824357]]					
1400						

```
1401
1402
1403 STATUS: Training Prediction Probability
1404 [[3.16371306e-03 9.95474270e-01 2.67493810e-13 1.
36201703e-03
1405 1.00803847e-34]
1406 [4.96258795e-27 2.95756400e-09 9.86447947e-01 1.
33984127e-02
1407 1.53637536e-04]
1408 [1.34199450e-49 2.33563009e-24 1.58210578e-05 4.
74827176e-13
1409 9.99984179e-01]
1410 ...
1411 [3.76301783e-17 2.59522658e-04 1.32206696e-02 9.
86519808e-01
1412 4.18149132e-12]
1413 [2.13403731e-38 2.46258275e-16 6.81775653e-02 5.
23469600e-07
1414 9.31821911e-01]
1415 [5.17642153e-03 9.93824119e-01 1.35006529e-13 9.
99459666e-04
1416 2.87818330e-35]]
1417
1418
1419
1420 STATUS: Testing on Training Set
1421 [1 2 4 3 0 3 1 1 0 2 3 3 2 3 4 4 2 1 1 1 1 0 0 2 2 4 3 1
3 3 0 4 0 4 4 2 0
1422 4 4 2 1 2 1 0 0 3 0 0 3 2 4 4 1 0 2 3 2 3 1 2 0 3 0 3 4
0 2 2 1 0 1 1 2 2
1423 3 1 4 2 1 3 2 2 1 1 4 2 4 1 4 1 4 4 1 1 3 1 1 1 0 2 1
0 0 4 0 4 0 3 4 3
1424 3 4 2 2 4 4 3 4 1 3 1 2 0 4 0 3 4 2 4 4 2 1 0 2 3 1 1 1
0 4 0 3 2 2 3 4 2
1425 2 3 3 2 1 3 4 4 1 1 3 4 0 4 2 0 0 0 4 3 1 4 1 0 3 2 4 1
2 0 4 4 3 1 0 4 4
1426 4 0 3 1 1 3 3 3 1 0 4 3 3 2 3 0 1 2 2 1 4 1 0 2 2 2 3 4
3 1 4 3 2 3 1 2 1
1427 2 4 0 0 4 2 0 4 0 4 1 4 1 4 1 1 0 0 2 4 2 2 0 1 1 2 1 3
0 0 2 2 1 2 2 4 4
1428 3 2 1 0 4 0 3 2 4 3 1 4 3 4 0 0 2 4 0 0 2 0 3 0 0 4 2 0
0 2 2 4 3 0 0 3 2
1429 1 3 2 2 0 3 2 3 2 3 1 3 0 4 0 4 4 4 3 4 2 3 4 1 0 1 1 1 1
3 4 3 2 4 0 3 1 0
1430 0 0 3 1 4 4 2 2 0 0 3 3 4 3 4 4 4 2 0 4 2 3 3 0 4 2 0 3 3
2 3 0 1 1 0 0 0 3
1431 3 1 4 1 0 1 2 0 2 3 3 1 0 2 4 1 3 3 0 0 0 0 2 2 3 1 4 2
3 2 2 0 4 1 3 1 2
1432 4 1 2 1 1 3 1 1 2 4 2 0 1 3 3 4 4 4 0 2 3 2 4 1 3 1 4 3 4
3 1 0 0 3 1 2 0 4
```

```
1433 0 3 2 3 4 1]
1434
1435
1436
1437 STATUS: Training Accuracy Score
1438 1.0
1439
1440
1441
1442 STATUS: Predicting actual outputs based Given Test Data
1443 [2 0 2 0 0 0 2 0 4 1 4 3 3 2 0 4 2 4 3 3 4 1 2 1 4 2 3 2
     0 1 1 1 3 1 2 4 2
1444 3 1 4 0 0 1 1 3 0 3 4 3 4]
1445
1446
1447
1448 STATUS: actual loss
1449 [[2.19748519e-27 1.84629819e-09 9.89410961e-01 1.
     03600646e-02
     2.28972693e-04]
1451 [9.98246650e-01 1.75334873e-03 2.62985353e-23 1.
     27801529e-09
1452 8.68284821e-51]
1453 [2.61677408e-23 3.94226603e-07 8.19465080e-01 1.
     80532689e-01
1454 1.83729819e-06]
1455 [9.99445554e-01 5.54446123e-04 1.69366976e-24 1.
     97072623e-10
1456 1.48047582e-52]
1457 [9.99427816e-01 5.72184079e-04 1.82557276e-24 2.
     07410077e-10
1458 1.65482016e-52]
1459 [9.97287043e-01 2.71295395e-03 7.44443667e-23 2.
     59717858e-09
1460 4.07043448e-50]
1461 [4.29136853e-31 1.30088599e-11 9.85076765e-01 6.
     81862449e-04
1462 1.42413724e-02]
1463 [9.98711788e-01 1.28821169e-03 1.26159052e-23 7.
     74644002e-10
1464 2.91768509e-51]
1465 [5.65643114e-42 6.83810129e-19 4.85071940e-03 6.
     28299929e-09
1466 9.95149274e-01]
1467 [1.45156480e-03 9.96332097e-01 7.85935408e-13 2.
     21633832e-03
1468 7.28019469e-34]
1469 [3.60332588e-40 1.33918351e-17 1.86391516e-02 5.
     90015843e-08
1470 9.81360789e-01]
```

1471	[1.23275868e-15 9.96757503e-04 2.63217086e-03 9. 96371072e-01 1472 7.02984053e-14]
1473	[1.29819949e-13 5.94744978e-03 2.98316165e-04 9. 93754234e-01 1474 2.90884960e-16]
1475	[1.53742829e-31 7.14626711e-12 9.76402588e-01 4. 88896843e-04 1476 2.31085148e-02]
1477	[9.99783194e-01 2.16806216e-04 1.81049195e-25 4. 29178708e-11 1478 5.35775503e-54]
1479	[2.87474945e-44 1.55104388e-20 8.67871869e-04 3. 61965497e-10 1480 9.99132128e-01]
1481	[9.97177563e-32 5.54724625e-12 9.71296803e-01 4. 24456542e-04 1482 2.82787408e-02]
1483	[1.27876560e-38 1.71095671e-16 5.81050579e-02 3. 98824854e-07 1484 9.41894543e-01]
1485	[6.10121513e-14 4.45455610e-03 4.25213605e-04 9. 95120230e-01 1486 7.09637033e-16]
1487	[6.36128555e-14 4.52633913e-03 4.16970354e-04 9. 95056691e-01 1488 6.75516431e-16]
1489	[8.45531650e-38 6.53569389e-16 1.04054099e-01 1. 08230339e-06 1490 8.95944819e-01]
1491	[7.92378367e-04 9.95977557e-01 1.81140833e-12 3. 23006498e-03 1492 3.37090802e-33]
1493	[2.94625107e-23 4.20992304e-07 8.13459898e-01 1. 86537965e-01 1494 1.71590280e-06]
1495	[1.55752517e-03 9.96321375e-01 7.13062271e-13 2. 12110030e-03 1496 6.08968900e-34]
1497	[2.72461801e-40 1.09646897e-17 1.70330394e-02 5. 07635564e-08 1498 9.82966910e-01]
1499	[4.03943097e-22 1.73404820e-06 6.36827400e-01 3. 63170530e-01 1500 3.35706544e-07]
1501	[9.14979053e-14 5.20222813e-03 3.51586289e-04 9. 94446186e-01 1502 4.39768131e-16]
1503	[1.87918143e-32 2.07789064e-12 9.39365766e-01 2. 43945000e-04

```
1504   6.03902888e-02]
1505   [9.98385539e-01 1.61445963e-03 2.16033131e-23 1.
11769480e-09
1506   6.48415206e-51]
1507   [2.44477483e-03 9.95954605e-01 3.82292574e-13 1.
60062033e-03
1508   1.94043495e-34]
1509   [1.43640742e-02 9.85114306e-01 3.23035706e-14 5.
21620013e-04
1510   2.10135643e-36]
1511   [1.34373819e-02 9.86018054e-01 3.54967425e-14 5.
44563666e-04
1512   2.49628359e-36]
1513   [2.54209214e-15 1.31635827e-03 1.87883715e-03 9.
96804805e-01
1514   3.00167710e-14]
1515   [8.61177532e-04 9.96071602e-01 1.61505349e-12 3.
06722049e-03
1516   2.73066729e-33]
1517   [9.51030435e-23 8.00526444e-07 7.44929986e-01 2.
55068360e-01
1518   8.53619778e-07]
1519   [1.28598184e-40 6.40700127e-18 1.33654650e-02 3.
38839382e-08
1520   9.86634501e-01]
1521   [2.29611563e-27 1.89380215e-09 9.89271079e-01 1.
05048115e-02
1522   2.24107886e-04]
1523   [6.01807010e-15 1.83268196e-03 1.25681756e-03 9.
96910500e-01
1524   1.08867437e-14]
1525   [2.08299616e-03 9.96147853e-01 4.77118582e-13 1.
76915051e-03
1526   2.91356569e-34]
1527   [7.76070332e-44 3.16107423e-20 1.19975628e-03 6.
19153359e-10
1528   9.98800243e-01]
1529   [9.98633148e-01 1.36685139e-03 1.45288528e-23 8.
52890899e-10
1530   3.59802796e-51]
1531   [9.98637068e-01 1.36293106e-03 1.44297641e-23 8.
48921818e-10
1532   3.56165702e-51]
1533   [6.49404862e-04 9.95695810e-01 2.38254946e-12 3.
65478491e-03
1534   5.57542187e-33]
1535   [6.99560107e-04 9.95810566e-01 2.15055520e-12 3.
48987358e-03
1536   4.61942849e-33]
1537   [8.72999201e-14 5.10953624e-03 3.59423522e-04 9.
```

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1537 94531040e-01
1538 4.64852389e-16]
1539 [9.99330150e-01 6.69849308e-04 2.65703739e-24 2.
67883668e-10
1540 2.88880030e-52]
1541 [1.53756389e-12 1.52752399e-02 9.28457743e-05 9.
84631914e-01
1542 1.55361540e-17]
1543 [6.51097804e-42 7.56345217e-19 5.07782434e-03 6.
77890038e-09
1544 9.94922169e-01]
1545 [1.12979198e-14 2.33374800e-03 9.36449708e-04 9.
96729802e-01
1546 5.18475467e-15]
1547 [4.67382798e-39 8.35334408e-17 4.23103750e-02 2.
33215289e-07
1548 9.57689392e-01]]
1549
1550
1551
1552 STATUS: Plotting Charts
1553 None
1554
1555
1556
1557 STATUS: Printing Classification Report
1558 precision recall f1-score support
1559
1560 0 1.00 1.00 1.00 90
1561 1 1.00 1.00 1.00 90
1562 2 1.00 1.00 1.00 90
1563 3 1.00 1.00 1.00 90
1564 4 1.00 1.00 1.00 90
1565
1566 avg / total 1.00 1.00 1.00 450
1567
1568
1569
1570
1571 STATUS: Printing log loss
1572 0.008875200684484332
1573
1574
1575
1576 STATUS: Computing Confusion Matrix
1577 [[90 0 0 0 0]
1578 [ 0 90 0 0 0]
1579 [ 0 0 90 0 0]
1580 [ 0 0 0 90 0]
1581 [ 0 0 0 0 90]]
```

```
1582 ****
1583 ///COMPUTING MULTICLASS NEURAL NET: Model 1
1584
1585
1586 Simple Neural Network Model created
1587
1588
1589
1590 STATUS: Training Prediction Probability
1591 [[2.53496365e-058 1.00000000e+000 4.96460318e-047 1.
54079675e-081
1592 1.32182435e-033]
1593 [3.36844574e-190 5.94993732e-053 1.00000000e+000 1.
82945920e-057
1594 7.31037107e-047]
1595 [4.54925292e-252 1.52116144e-059 3.41771025e-054 8.
89305358e-110
1596 1.00000000e+000]
1597 ...
1598 [3.31341015e-168 1.02285258e-047 2.31840856e-024 1.
00000000e+000
1599 7.46749022e-018]
1600 [6.66659661e-237 7.30988886e-059 5.95947622e-063 7.
42196993e-102
1601 1.00000000e+000]
1602 [5.83105205e-050 1.00000000e+000 8.33172695e-041 4.
64530141e-071
1603 1.95046743e-029]]
1604
1605
1606
1607 STATUS: Testing on Training Set
1608 [1 2 4 3 0 3 1 1 0 2 3 3 2 3 4 4 2 1 1 1 1 0 0 2 2 4 3 1
3 3 0 4 0 4 4 2 0
1609 4 4 2 1 2 1 0 0 3 0 0 3 2 4 4 1 0 2 3 2 3 1 2 0 3 0 3 4
0 2 2 1 0 1 1 2 2
1610 3 1 4 2 1 3 2 2 1 1 4 2 4 1 4 1 4 4 1 1 3 1 1 1 0 2 1
0 0 4 0 4 0 3 4 3
1611 3 4 2 2 4 4 3 4 1 3 1 2 0 4 0 3 4 2 4 4 2 1 0 2 3 1 1 1
0 4 0 3 2 2 3 4 2
1612 2 3 3 2 1 3 4 4 1 1 3 4 0 4 2 0 0 0 4 3 1 4 1 0 3 2 4 1
2 0 4 4 3 1 0 4 4
1613 4 0 3 1 1 3 3 3 1 0 4 3 3 2 3 0 1 2 2 1 4 1 0 2 2 2 3 4
3 1 4 3 2 3 1 2 1
1614 2 4 0 0 4 2 0 4 0 4 1 4 1 4 1 1 0 0 2 4 2 2 0 1 1 2 1 3
0 0 2 2 1 2 2 4 4
1615 3 2 1 0 4 0 3 2 4 3 1 4 3 4 0 0 2 4 0 0 2 0 3 0 0 4 2 0
0 2 2 4 3 0 0 3 2
1616 1 3 2 2 0 3 2 3 2 3 1 3 0 4 0 4 4 3 4 2 3 4 1 0 1 1 1 1
3 4 3 2 4 0 3 1 0
```

```
1617  0 0 3 1 4 4 2 2 0 0 3 3 3 4 3 4 4 2 0 4 2 3 3 0 4 2 0 3 3  
    2 3 0 1 1 0 0 0 3  
1618  3 1 4 1 0 1 2 0 2 3 3 1 0 2 4 1 3 3 0 0 0 0 2 2 3 1 4 2  
    3 2 2 0 4 1 3 1 2  
1619  4 1 2 1 1 3 1 1 2 4 2 0 1 3 3 4 4 0 2 3 2 4 1 3 1 4 3 4  
    3 1 0 0 3 1 2 0 4  
1620  0 3 2 3 4 1]  
1621  
1622  
1623  
1624 STATUS: Training Accuracy Score  
1625 1.0  
1626  
1627  
1628  
1629 STATUS: Predicting actual outputs based Given Test Data  
1630 [2 0 2 0 0 0 2 0 4 1 4 3 3 2 0 4 2 4 3 3 4 1 2 1 4 2 3 2  
    0 1 1 1 3 1 2 4 2  
1631 3 1 4 0 0 1 1 3 0 3 4 3 4]  
1632  
1633  
1634  
1635 STATUS: Plotting Charts  
1636 None  
1637          0  
1638 0    33.844311  
1639 1    1.847763  
1640 2    31.142215  
1641 3    1.073322  
1642 4    1.094495  
1643 5    2.141726  
1644 6    36.253779  
1645 7    1.640304  
1646 8    41.825005  
1647 9    10.499837  
1648 10   41.032421  
1649 11   24.535081  
1650 12   22.606102  
1651 13   36.541010  
1652 14   0.442150  
1653 15   42.830141  
1654 16   36.661726  
1655 17   40.345928  
1656 18   22.919262  
1657 19   22.901954  
1658 20   39.977242  
1659 21   10.906374  
1660 22   31.106667  
1661 23   10.452486  
1662 24   41.085885
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1663	25	30.298599			
1664	26	22.751216			
1665	27	37.123344			
1666	28	1.792215			
1667	29	10.149283			
1668	30	8.952041			
1669	31	8.997470			
1670	32	24.235646			
1671	33	10.850489			
1672	34	30.751075			
1673	35	41.229359			
1674	36	33.831878			
1675	37	23.878925			
1676	38	10.257025			
1677	39	42.641238			
1678	40	1.680174			
1679	41	1.678241			
1680	42	11.039891			
1681	43	10.989978			
1682	44	22.770695			
1683	45	1.200456			
1684	46	21.578990			
1685	47	41.798208			
1686	48	23.618100			
1687	49	40.540478			
1688					
1689					
1690					
1691	STATUS: Printing Classification Report				
1692		precision	recall	f1-score	support
1693					
1694	0	1.00	1.00	1.00	90
1695	1	1.00	1.00	1.00	90
1696	2	1.00	1.00	1.00	90
1697	3	1.00	1.00	1.00	90
1698	4	1.00	1.00	1.00	90
1699					
1700	avg / total	1.00	1.00	1.00	450
1701					
1702					
1703					
1704					
1705	STATUS: Computing Log Loss				
1706	3.0128745783239676e-11				
1707					
1708					
1709					
1710	STATUS: Computing Confusion Matrix				
1711	[[90 0 0 0 0]				
1712	[0 90 0 0 0]				

```

1713 [ 0  0  90  0  0]
1714 [ 0  0  0  90  0]
1715 [ 0  0  0  0  90]]
1716 ****
1717 ///COMPUTING MULTICLASS NEURAL NET: Model 2
1718 /Users/negus/PycharmProjects/CS5014/W02Lab/venv/lib/
    python3.6/site-packages/sklearn/neural_network/
    multilayer_perceptron.py:564: ConvergenceWarning:
        Stochastic Optimizer: Maximum iterations (200) reached
        and the optimization hasn't converged yet.
1719     % self.max_iter, ConvergenceWarning)
1720
1721
1722 Simple Neural Network Model created
1723
1724
1725
1726 STATUS: Training Prediction Probability
1727 [[2.49111438e-02 8.87305993e-01 5.22677637e-03 8.
   16936923e-02
   8.62394181e-04]
1728 [9.61379598e-08 3.60809731e-03 4.17602924e-01 2.
   58440035e-01
   3.20348848e-01]
1729 [6.66275176e-11 6.51752513e-05 3.43107120e-01 3.
   81250447e-02
   6.18702660e-01]
1730 ...
1731 [7.69565201e-06 3.33551479e-02 2.69591347e-01 5.
   75079959e-01
   1.21965851e-01]
1732 [1.55876527e-09 3.80641817e-04 4.04490665e-01 9.
   16532538e-02
   5.03475438e-01]
1733 [2.79719603e-02 8.93279423e-01 4.53633035e-03 7.
   34774230e-02
   7.34863203e-04]]
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743 STATUS: Testing on Training Set
1744 [1 2 4 3 0 3 1 1 0 2 3 3 2 3 4 4 4 2 1 1 1 1 0 0 2 2 4 3 1
   3 3 0 4 0 4 4 2 0
1745 4 4 2 1 2 1 0 0 3 0 0 3 2 4 4 1 0 2 3 2 3 1 2 0 3 0 3 4
   0 2 2 1 0 1 1 2 2
1746 3 1 4 2 1 3 2 2 1 1 4 2 4 1 4 1 4 4 1 1 3 1 1 1 0 2 1
   0 0 4 0 4 0 3 4 3
1747 3 4 2 2 4 4 3 4 1 3 1 2 0 4 0 3 4 2 4 4 2 1 0 2 3 1 1 1
   0 4 0 3 2 2 3 4 2
1748 2 3 3 2 1 3 4 4 1 1 3 4 0 4 2 0 0 0 4 3 1 4 1 0 3 2 4 1

```

```
1748 2 0 4 4 3 1 0 4 4
1749 4 0 3 1 1 3 3 3 1 0 4 3 3 2 3 0 1 2 2 1 4 1 0 2 2 2 3 4
3 1 4 3 2 3 1 2 1
1750 2 4 0 0 4 2 0 4 0 4 1 4 1 1 0 0 2 4 2 2 0 1 1 2 1 3
0 0 2 2 1 2 2 4 4
1751 3 2 1 0 4 0 3 2 4 3 1 4 3 4 0 0 2 4 0 0 2 0 3 0 0 4 2 0
0 2 2 4 3 0 0 3 2
1752 1 3 2 2 0 3 4 3 2 3 1 3 0 4 0 4 4 3 4 2 3 4 1 0 1 1 1
3 4 3 2 4 0 3 1 0
1753 0 0 3 1 4 4 2 2 0 0 3 3 4 3 4 4 2 0 4 2 3 3 0 4 2 0 3 3
2 3 0 1 1 0 0 0 3
1754 3 1 4 1 0 1 2 0 2 3 3 1 0 2 4 1 3 3 0 0 0 0 2 2 3 1 4 2
3 2 2 0 4 1 3 1 2
1755 4 1 2 1 1 3 1 1 2 4 2 0 1 3 3 4 4 0 2 3 2 4 1 3 1 4 3 4
3 1 0 0 3 1 2 0 4
1756 0 3 2 3 4 1]
1757
1758
1759
1760 STATUS: Training Accuracy Score
1761 0.9977777777777778
1762
1763
1764
1765 STATUS: Predicting actual outputs based Given Test Data
1766 [2 0 2 0 0 0 2 0 4 1 4 3 3 2 0 4 2 4 3 3 4 1 2 1 4 3 3 2
0 1 1 1 3 1 2 4 2
1767 3 1 4 0 0 1 1 3 0 3 4 3 4]
1768
1769
1770
1771 STATUS: Plotting Charts
1772 None
1773 0
1774 0 33.844311
1775 1 1.847763
1776 2 31.142215
1777 3 1.073322
1778 4 1.094495
1779 5 2.141726
1780 6 36.253779
1781 7 1.640304
1782 8 41.825005
1783 9 10.499837
1784 10 41.032421
1785 11 24.535081
1786 12 22.606102
1787 13 36.541010
1788 14 0.442150
1789 15 42.830141
```

1790	16	36.661726			
1791	17	40.345928			
1792	18	22.919262			
1793	19	22.901954			
1794	20	39.977242			
1795	21	10.906374			
1796	22	31.106667			
1797	23	10.452486			
1798	24	41.085885			
1799	25	30.298599			
1800	26	22.751216			
1801	27	37.123344			
1802	28	1.792215			
1803	29	10.149283			
1804	30	8.952041			
1805	31	8.997470			
1806	32	24.235646			
1807	33	10.850489			
1808	34	30.751075			
1809	35	41.229359			
1810	36	33.831878			
1811	37	23.878925			
1812	38	10.257025			
1813	39	42.641238			
1814	40	1.680174			
1815	41	1.678241			
1816	42	11.039891			
1817	43	10.989978			
1818	44	22.770695			
1819	45	1.200456			
1820	46	21.578990			
1821	47	41.798208			
1822	48	23.618100			
1823	49	40.540478			
1824					
1825					
1826					
1827	STATUS: Printing Classification Report				
1828		precision	recall	f1-score	support
1829					
1830		0	1.00	1.00	1.00
1831		1	1.00	1.00	1.00
1832		2	1.00	0.99	0.99
1833		3	1.00	1.00	1.00
1834		4	0.99	1.00	0.99
1835					
1836	avg / total		1.00	1.00	1.00
1837					450
1838					
1839					

```
1840
1841 STATUS: Computing Log Loss
1842 0.41017008483144496
1843
1844
1845
1846 STATUS: Computing Confusion Matrix
1847 [[90  0  0  0  0]
1848 [ 0 90  0  0  0]
1849 [ 0  0 89  0  1]
1850 [ 0  0  0 90  0]
1851 [ 0  0  0  0 90]]
1852
1853 Process finished with exit code 0
1854
```