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ADMISSION:664835

COURSE:APT 3025

```
> iris<-iris%>%mutate_if(is.character, as.factor)
> iris
    Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
1            5.1         3.5          1.4         0.2     setosa
2            4.9         3.0          1.4         0.2     setosa
3            4.7         3.2          1.3         0.2     setosa
4            4.6         3.1          1.5         0.2     setosa
5            5.0         3.6          1.4         0.2     setosa
6            5.4         3.9          1.7         0.4     setosa
7            4.6         3.4          1.4         0.3     setosa
8            5.0         3.4          1.5         0.2     setosa
9            4.4         2.9          1.4         0.2     setosa
10           4.9         3.1          1.5         0.1     setosa
11           5.4         3.7          1.5         0.2     setosa
12           4.8         3.4          1.6         0.2     setosa
13           4.8         3.0          1.4         0.1     setosa
14           4.3         3.0          1.1         0.1     setosa
15           5.8         4.0          1.2         0.2     setosa
16           5.7         4.4          1.5         0.4     setosa
17           5.4         3.9          1.3         0.4     setosa
18           5.1         3.5          1.4         0.3     setosa
19           5.7         3.8          1.7         0.3     setosa
20           5.1         3.8          1.5         0.3     setosa
21           5.4         3.4          1.7         0.2     setosa
22           5.1         3.7          1.5         0.4     setosa
23           4.6         3.6          1.0         0.2     setosa
24           5.1         3.3          1.7         0.5     setosa
25           4.8         3.4          1.9         0.2     setosa
26           5.0         3.0          1.6         0.2     setosa
27           5.0         3.4          1.6         0.4     setosa
28           5.2         3.5          1.5         0.2     setosa
29           5.2         3.4          1.4         0.2     setosa
30           4.7         3.2          1.6         0.2     setosa
31           4.8         3.1          1.6         0.2     setosa
32           5.4         3.4          1.5         0.4     setosa
33           5.2         4.1          1.5         0.1     setosa
```

34	5.5	4.2	1.4	0.2	setosa
35	4.9	3.1	1.5	0.2	setosa
36	5.0	3.2	1.2	0.2	setosa
37	5.5	3.5	1.3	0.2	setosa
38	4.9	3.6	1.4	0.1	setosa
39	4.4	3.0	1.3	0.2	setosa
40	5.1	3.4	1.5	0.2	setosa
41	5.0	3.5	1.3	0.3	setosa
42	4.5	2.3	1.3	0.3	setosa
43	4.4	3.2	1.3	0.2	setosa
44	5.0	3.5	1.6	0.6	setosa
45	5.1	3.8	1.9	0.4	setosa
46	4.8	3.0	1.4	0.3	setosa
47	5.1	3.8	1.6	0.2	setosa
48	4.6	3.2	1.4	0.2	setosa
49	5.3	3.7	1.5	0.2	setosa
50	5.0	3.3	1.4	0.2	setosa
51	7.0	3.2	4.7	1.4	versicolor
52	6.4	3.2	4.5	1.5	versicolor
53	6.9	3.1	4.9	1.5	versicolor
54	5.5	2.3	4.0	1.3	versicolor
55	6.5	2.8	4.6	1.5	versicolor
56	5.7	2.8	4.5	1.3	versicolor
57	6.3	3.3	4.7	1.6	versicolor
58	4.9	2.4	3.3	1.0	versicolor
59	6.6	2.9	4.6	1.3	versicolor
60	5.2	2.7	3.9	1.4	versicolor
61	5.0	2.0	3.5	1.0	versicolor
62	5.9	3.0	4.2	1.5	versicolor
63	6.0	2.2	4.0	1.0	versicolor
64	6.1	2.9	4.7	1.4	versicolor
65	5.6	2.9	3.6	1.3	versicolor
66	6.7	3.1	4.4	1.4	versicolor
67	5.6	3.0	4.5	1.5	versicolor
68	5.8	2.7	4.1	1.0	versicolor
69	6.2	2.2	4.5	1.5	versicolor
70	5.6	2.5	3.9	1.1	versicolor
71	5.9	3.2	4.8	1.8	versicolor
72	6.1	2.8	4.0	1.3	versicolor
73	6.3	2.5	4.9	1.5	versicolor
74	6.1	2.8	4.7	1.2	versicolor
75	6.4	2.9	4.3	1.3	versicolor
76	6.6	3.0	4.4	1.4	versicolor
77	6.8	2.8	4.8	1.4	versicolor
78	6.7	3.0	5.0	1.7	versicolor
79	6.0	2.9	4.5	1.5	versicolor
80	5.7	2.6	3.5	1.0	versicolor

81	5.5	2.4	3.8	1.1	versicolor
82	5.5	2.4	3.7	1.0	versicolor
83	5.8	2.7	3.9	1.2	versicolor
84	6.0	2.7	5.1	1.6	versicolor
85	5.4	3.0	4.5	1.5	versicolor
86	6.0	3.4	4.5	1.6	versicolor
87	6.7	3.1	4.7	1.5	versicolor
88	6.3	2.3	4.4	1.3	versicolor
89	5.6	3.0	4.1	1.3	versicolor
90	5.5	2.5	4.0	1.3	versicolor
91	5.5	2.6	4.4	1.2	versicolor
92	6.1	3.0	4.6	1.4	versicolor
93	5.8	2.6	4.0	1.2	versicolor
94	5.0	2.3	3.3	1.0	versicolor
95	5.6	2.7	4.2	1.3	versicolor
96	5.7	3.0	4.2	1.2	versicolor
97	5.7	2.9	4.2	1.3	versicolor
98	6.2	2.9	4.3	1.3	versicolor
99	5.1	2.5	3.0	1.1	versicolor
100	5.7	2.8	4.1	1.3	versicolor
101	6.3	3.3	6.0	2.5	virginica
102	5.8	2.7	5.1	1.9	virginica
103	7.1	3.0	5.9	2.1	virginica
104	6.3	2.9	5.6	1.8	virginica
105	6.5	3.0	5.8	2.2	virginica
106	7.6	3.0	6.6	2.1	virginica
107	4.9	2.5	4.5	1.7	virginica
108	7.3	2.9	6.3	1.8	virginica
109	6.7	2.5	5.8	1.8	virginica
110	7.2	3.6	6.1	2.5	virginica
111	6.5	3.2	5.1	2.0	virginica
112	6.4	2.7	5.3	1.9	virginica
113	6.8	3.0	5.5	2.1	virginica
114	5.7	2.5	5.0	2.0	virginica
115	5.8	2.8	5.1	2.4	virginica
116	6.4	3.2	5.3	2.3	virginica
117	6.5	3.0	5.5	1.8	virginica
118	7.7	3.8	6.7	2.2	virginica
119	7.7	2.6	6.9	2.3	virginica
120	6.0	2.2	5.0	1.5	virginica
121	6.9	3.2	5.7	2.3	virginica
122	5.6	2.8	4.9	2.0	virginica
123	7.7	2.8	6.7	2.0	virginica
124	6.3	2.7	4.9	1.8	virginica
125	6.7	3.3	5.7	2.1	virginica
126	7.2	3.2	6.0	1.8	virginica
127	6.2	2.8	4.8	1.8	virginica

```
128          6.1         3.0          4.9         1.8  virginica
129          6.4         2.8          5.6         2.1  virginica
130          7.2         3.0          5.8         1.6  virginica
131          7.4         2.8          6.1         1.9  virginica
132          7.9         3.8          6.4         2.0  virginica
133          6.4         2.8          5.6         2.2  virginica
134          6.3         2.8          5.1         1.5  virginica
135          6.1         2.6          5.6         1.4  virginica
136          7.7         3.0          6.1         2.3  virginica
137          6.3         3.4          5.6         2.4  virginica
138          6.4         3.1          5.5         1.8  virginica
139          6.0         3.0          4.8         1.8  virginica
140          6.9         3.1          5.4         2.1  virginica
141          6.7         3.1          5.6         2.4  virginica
142          6.9         3.1          5.1         2.3  virginica
143          5.8         2.7          5.1         1.9  virginica
144          6.8         3.2          5.9         2.3  virginica
145          6.7         3.3          5.7         2.5  virginica
146          6.7         3.0          5.2         2.3  virginica
147          6.3         2.5          5.0         1.9  virginica
148          6.5         3.0          5.2         2.0  virginica
149          6.2         3.4          5.4         2.3  virginica
150          5.9         3.0          5.1         1.8  virginica
```

```
> train_indices<-sample(c(1:nrow(iris)), data_rows)
> train_indices
  [1]  10  40 109  41  82  42  22  46  73   1 107 112  17  84  56  90  12
121  30
 [20]  16  98 127  18  61  97  20  62 123  55 144 129 105  70  59  89  49
67  88
 [39] 130  74  31  32  71  19  76  48 143  72 116 111   8  50  37  77  13
69  28
 [58] 108 120 102  58  63   4 132 114 149  96  86  39  36  34  79 140  68
150  11
 [77]  66 113 119  52 117 139  53 135 136  93 137  35  78   6  26  21  25
80 126
 [96]   9  60  29 141   5 146 142  85  64   3  44 118 145  15  38 110  94
83   7
[115] 148  81  43  99 131  54
> test_data <- iris[-train_indices, ]
> test_data
    Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
2            4.9         3.0          1.4         0.2     setosa
14           4.3         3.0          1.1         0.1     setosa
23           4.6         3.6          1.0         0.2     setosa
24           5.1         3.3          1.7         0.5     setosa
```

```
27           5.0         3.4          1.6         0.4     setosa
33           5.2         4.1          1.5         0.1     setosa
45           5.1         3.8          1.9         0.4     setosa
47           5.1         3.8          1.6         0.2     setosa
51           7.0         3.2          4.7         1.4 versicolor
57           6.3         3.3          4.7         1.6 versicolor
65           5.6         2.9          3.6         1.3 versicolor
75           6.4         2.9          4.3         1.3 versicolor
87           6.7         3.1          4.7         1.5 versicolor
91           5.5         2.6          4.4         1.2 versicolor
92           6.1         3.0          4.6         1.4 versicolor
95           5.6         2.7          4.2         1.3 versicolor
100          5.7         2.8          4.1         1.3 versicolor
101          6.3         3.3          6.0         2.5  virginica
103          7.1         3.0          5.9         2.1  virginica
104          6.3         2.9          5.6         1.8  virginica
106          7.6         3.0          6.6         2.1  virginica
115          5.8         2.8          5.1         2.4  virginica
122          5.6         2.8          4.9         2.0  virginica
124          6.3         2.7          4.9         1.8  virginica
125          6.7         3.3          5.7         2.1  virginica
128          6.1         3.0          4.9         1.8  virginica
133          6.4         2.8          5.6         2.2  virginica
134          6.3         2.8          5.1         1.5  virginica
138          6.4         3.1          5.5         1.8  virginica
147          6.3         2.5          5.0         1.9  virginica

>
> model <- neuralnet(Species ~ Sepal.Length + Sepal.Width + Petal.Length +
+                       Petal.Width, data = train_data, hidden = c(4,2),
linear.output = FALSE)
> model
$call
neuralnet(formula = Species ~ Sepal.Length + Sepal.Width + Petal.Length +
    Petal.Width, data = train_data, hidden = c(4, 2), linear.output =
FALSE)

$response
    versicolor setosa virginica
1        FALSE   TRUE     FALSE
2         TRUE  FALSE     FALSE
3        FALSE  FALSE      TRUE
4        FALSE   TRUE     FALSE
5         TRUE  FALSE     FALSE
6        FALSE  FALSE      TRUE
7         TRUE  FALSE     FALSE
8        FALSE   TRUE     FALSE
```

9	FALSE	FALSE	TRUE
10	TRUE	FALSE	FALSE
11	FALSE	TRUE	FALSE
12	TRUE	FALSE	FALSE
13	FALSE	FALSE	TRUE
14	FALSE	FALSE	TRUE
15	FALSE	FALSE	TRUE
16	FALSE	FALSE	TRUE
17	FALSE	TRUE	FALSE
18	FALSE	FALSE	TRUE
19	FALSE	FALSE	TRUE
20	TRUE	FALSE	FALSE
21	FALSE	FALSE	TRUE
22	FALSE	FALSE	TRUE
23	FALSE	TRUE	FALSE
24	FALSE	FALSE	TRUE
25	FALSE	FALSE	TRUE
26	FALSE	FALSE	TRUE
27	FALSE	TRUE	FALSE
28	FALSE	FALSE	TRUE
29	TRUE	FALSE	FALSE
30	FALSE	TRUE	FALSE
31	FALSE	TRUE	FALSE
32	FALSE	TRUE	FALSE
33	FALSE	TRUE	FALSE
34	TRUE	FALSE	FALSE
35	TRUE	FALSE	FALSE
36	FALSE	TRUE	FALSE
37	FALSE	FALSE	TRUE
38	FALSE	FALSE	TRUE
39	FALSE	FALSE	TRUE
40	TRUE	FALSE	FALSE
41	TRUE	FALSE	FALSE
42	FALSE	TRUE	FALSE
43	TRUE	FALSE	FALSE
44	FALSE	TRUE	FALSE
45	TRUE	FALSE	FALSE
46	TRUE	FALSE	FALSE
47	TRUE	FALSE	FALSE
48	FALSE	TRUE	FALSE
49	TRUE	FALSE	FALSE
50	FALSE	TRUE	FALSE
51	FALSE	FALSE	TRUE
52	FALSE	FALSE	TRUE
53	FALSE	TRUE	FALSE
54	FALSE	FALSE	TRUE
55	FALSE	TRUE	FALSE

56	FALSE	FALSE	TRUE
57	TRUE	FALSE	FALSE
58	TRUE	FALSE	FALSE
59	TRUE	FALSE	FALSE
60	FALSE	TRUE	FALSE
61	FALSE	TRUE	FALSE
62	FALSE	TRUE	FALSE
63	TRUE	FALSE	FALSE
64	FALSE	FALSE	TRUE
65	TRUE	FALSE	FALSE
66	FALSE	FALSE	TRUE
67	FALSE	TRUE	FALSE
68	TRUE	FALSE	FALSE
69	TRUE	FALSE	FALSE
70	FALSE	TRUE	FALSE
71	FALSE	TRUE	FALSE
72	TRUE	FALSE	FALSE
73	FALSE	FALSE	TRUE
74	TRUE	FALSE	FALSE
75	FALSE	FALSE	TRUE
76	FALSE	FALSE	TRUE
77	FALSE	FALSE	TRUE
78	TRUE	FALSE	FALSE
79	TRUE	FALSE	FALSE
80	FALSE	TRUE	FALSE
81	FALSE	TRUE	FALSE
82	TRUE	FALSE	FALSE
83	TRUE	FALSE	FALSE
84	FALSE	TRUE	FALSE
85	FALSE	FALSE	TRUE
86	FALSE	FALSE	TRUE
87	TRUE	FALSE	FALSE
88	TRUE	FALSE	FALSE
89	FALSE	FALSE	TRUE
90	FALSE	TRUE	FALSE
91	TRUE	FALSE	FALSE
92	TRUE	FALSE	FALSE
93	FALSE	TRUE	FALSE
94	FALSE	TRUE	FALSE
95	TRUE	FALSE	FALSE
96	FALSE	TRUE	FALSE
97	FALSE	FALSE	TRUE
98	FALSE	TRUE	FALSE
99	FALSE	TRUE	FALSE
100	FALSE	FALSE	TRUE
101	FALSE	TRUE	FALSE
102	FALSE	TRUE	FALSE

```
103      FALSE   TRUE     FALSE
104      FALSE  FALSE      TRUE
105       TRUE  FALSE     FALSE
106       TRUE  FALSE     FALSE
107       TRUE  FALSE     FALSE
108      FALSE  FALSE      TRUE
109      FALSE  FALSE      TRUE
110       TRUE  FALSE     FALSE
111      FALSE  FALSE      TRUE
112       TRUE  FALSE     FALSE
113      FALSE   TRUE     FALSE
114      FALSE   TRUE     FALSE
115      FALSE   TRUE     FALSE
116      FALSE   TRUE     FALSE
117       TRUE  FALSE     FALSE
118      FALSE   TRUE     FALSE
119      FALSE  FALSE      TRUE
120      FALSE  FALSE      TRUE

$covariate
    Sepal.Length Sepal.Width Petal.Length Petal.Width
55           6.5         2.8          4.6         1.5
37           5.5         3.5          1.3         0.2
146          6.7         3.0          5.2         2.3
70           5.6         2.5          3.9         1.1
45           5.1         3.8          1.9         0.4
124          6.3         2.7          4.9         1.8
20           5.1         3.8          1.5         0.3
76           6.6         3.0          4.4         1.4
144          6.8         3.2          5.9         2.3
3            4.7         3.2          1.3         0.2
88           6.3         2.3          4.4         1.3
10           4.9         3.1          1.5         0.1
136          7.7         3.0          6.1         2.3
126          7.2         3.2          6.0         1.8
102          5.8         2.7          5.1         1.9
125          6.7         3.3          5.7         2.1
64           6.1         2.9          4.7         1.4
111          6.5         3.2          5.1         2.0
122          5.6         2.8          4.9         2.0
32           5.4         3.4          1.5         0.4
147          6.3         2.5          5.0         1.9
123          7.7         2.8          6.7         2.0
95           5.6         2.7          4.2         1.3
101          6.3         3.3          6.0         2.5
149          6.2         3.4          5.4         2.3
143          5.8         2.7          5.1         1.9
```

94	5.0	2.3	3.3	1.0
150	5.9	3.0	5.1	1.8
11	5.4	3.7	1.5	0.2
83	5.8	2.7	3.9	1.2
54	5.5	2.3	4.0	1.3
57	6.3	3.3	4.7	1.6
61	5.0	2.0	3.5	1.0
48	4.6	3.2	1.4	0.2
29	5.2	3.4	1.4	0.2
69	6.2	2.2	4.5	1.5
130	7.2	3.0	5.8	1.6
115	5.8	2.8	5.1	2.4
145	6.7	3.3	5.7	2.5
17	5.4	3.9	1.3	0.4
50	5.0	3.3	1.4	0.2
96	5.7	3.0	4.2	1.2
35	4.9	3.1	1.5	0.2
93	5.8	2.6	4.0	1.2
49	5.3	3.7	1.5	0.2
12	4.8	3.4	1.6	0.2
14	4.3	3.0	1.1	0.1
60	5.2	2.7	3.9	1.4
18	5.1	3.5	1.4	0.3
97	5.7	2.9	4.2	1.3
109	6.7	2.5	5.8	1.8
134	6.3	2.8	5.1	1.5
62	5.9	3.0	4.2	1.5
113	6.8	3.0	5.5	2.1
75	6.4	2.9	4.3	1.3
119	7.7	2.6	6.9	2.3
41	5.0	3.5	1.3	0.3
27	5.0	3.4	1.6	0.4
25	4.8	3.4	1.9	0.2
89	5.6	3.0	4.1	1.3
100	5.7	2.8	4.1	1.3
91	5.5	2.6	4.4	1.2
19	5.7	3.8	1.7	0.3
137	6.3	3.4	5.6	2.4
46	4.8	3.0	1.4	0.3
103	7.1	3.0	5.9	2.1
85	5.4	3.0	4.5	1.5
6	5.4	3.9	1.7	0.4
44	5.0	3.5	1.6	0.6
86	6.0	3.4	4.5	1.6
71	5.9	3.2	4.8	1.8
36	5.0	3.2	1.2	0.2
104	6.3	2.9	5.6	1.8

42	4.5	2.3	1.3	0.3
139	6.0	3.0	4.8	1.8
118	7.7	3.8	6.7	2.2
106	7.6	3.0	6.6	2.1
9	4.4	2.9	1.4	0.2
43	4.4	3.2	1.3	0.2
84	6.0	2.7	5.1	1.6
66	6.7	3.1	4.4	1.4
39	4.4	3.0	1.3	0.2
7	4.6	3.4	1.4	0.3
72	6.1	2.8	4.0	1.3
117	6.5	3.0	5.5	1.8
108	7.3	2.9	6.3	1.8
4	4.6	3.1	1.5	0.2
38	4.9	3.6	1.4	0.1
138	6.4	3.1	5.5	1.8
65	5.6	2.9	3.6	1.3
5	5.0	3.6	1.4	0.2
2	4.9	3.0	1.4	0.2
87	6.7	3.1	4.7	1.5
82	5.5	2.4	3.7	1.0
40	5.1	3.4	1.5	0.2
77	6.8	2.8	4.8	1.4
128	6.1	3.0	4.9	1.8
67	5.6	3.0	4.5	1.5
92	6.1	3.0	4.6	1.4
131	7.4	2.8	6.1	1.9
74	6.1	2.8	4.7	1.2
56	5.7	2.8	4.5	1.3
59	6.6	2.9	4.6	1.3
120	6.0	2.2	5.0	1.5
23	4.6	3.6	1.0	0.2
13	4.8	3.0	1.4	0.1
33	5.2	4.1	1.5	0.1
107	4.9	2.5	4.5	1.7
127	6.2	2.8	4.8	1.8
24	5.1	3.3	1.7	0.5
116	6.4	3.2	5.3	2.3
34	5.5	4.2	1.4	0.2
68	5.8	2.7	4.1	1.0
58	4.9	2.4	3.3	1.0
73	6.3	2.5	4.9	1.5
80	5.7	2.6	3.5	1.0
8	5.0	3.4	1.5	0.2
99	5.1	2.5	3.0	1.1
121	6.9	3.2	5.7	2.3
133	6.4	2.8	5.6	2.2

```
$model.list
$model.list$response
[1] "versicolor" "setosa"     "virginica"

$model.list$variables
[1] "Sepal.Length" "Sepal.Width"  "Petal.Length" "Petal.Width"


$err.fct
function (x, y)
{
    1/2 * (y - x)^2
}
<bytecode: 0x5774ac69d0d8>
<environment: 0x5774ad1e7bf0>
attr(,"type")
[1] "sse"

$act.fct
function (x)
{
    1/(1 + exp(-x))
}
<bytecode: 0x5774ac6aa000>
<environment: 0x5774ad1e7758>
attr(,"type")
[1] "logistic"

$linear.output
[1] FALSE

$data
    Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
55           6.5         2.8          4.6         1.5 versicolor
37           5.5         3.5          1.3         0.2     setosa
146          6.7         3.0          5.2         2.3  virginica
70           5.6         2.5          3.9         1.1 versicolor
45           5.1         3.8          1.9         0.4     setosa
124          6.3         2.7          4.9         1.8  virginica
20           5.1         3.8          1.5         0.3     setosa
76           6.6         3.0          4.4         1.4 versicolor
144          6.8         3.2          5.9         2.3  virginica
3            4.7         3.2          1.3         0.2     setosa
88           6.3         2.3          4.4         1.3 versicolor
10           4.9         3.1          1.5         0.1     setosa
136          7.7         3.0          6.1         2.3  virginica
```

126	7.2	3.2	6.0	1.8	virginica
102	5.8	2.7	5.1	1.9	virginica
125	6.7	3.3	5.7	2.1	virginica
64	6.1	2.9	4.7	1.4	versicolor
111	6.5	3.2	5.1	2.0	virginica
122	5.6	2.8	4.9	2.0	virginica
32	5.4	3.4	1.5	0.4	setosa
147	6.3	2.5	5.0	1.9	virginica
123	7.7	2.8	6.7	2.0	virginica
95	5.6	2.7	4.2	1.3	versicolor
101	6.3	3.3	6.0	2.5	virginica
149	6.2	3.4	5.4	2.3	virginica
143	5.8	2.7	5.1	1.9	virginica
94	5.0	2.3	3.3	1.0	versicolor
150	5.9	3.0	5.1	1.8	virginica
11	5.4	3.7	1.5	0.2	setosa
83	5.8	2.7	3.9	1.2	versicolor
54	5.5	2.3	4.0	1.3	versicolor
57	6.3	3.3	4.7	1.6	versicolor
61	5.0	2.0	3.5	1.0	versicolor
48	4.6	3.2	1.4	0.2	setosa
29	5.2	3.4	1.4	0.2	setosa
69	6.2	2.2	4.5	1.5	versicolor
130	7.2	3.0	5.8	1.6	virginica
115	5.8	2.8	5.1	2.4	virginica
145	6.7	3.3	5.7	2.5	virginica
17	5.4	3.9	1.3	0.4	setosa
50	5.0	3.3	1.4	0.2	setosa
96	5.7	3.0	4.2	1.2	versicolor
35	4.9	3.1	1.5	0.2	setosa
93	5.8	2.6	4.0	1.2	versicolor
49	5.3	3.7	1.5	0.2	setosa
12	4.8	3.4	1.6	0.2	setosa
14	4.3	3.0	1.1	0.1	setosa
60	5.2	2.7	3.9	1.4	versicolor
18	5.1	3.5	1.4	0.3	setosa
97	5.7	2.9	4.2	1.3	versicolor
109	6.7	2.5	5.8	1.8	virginica
134	6.3	2.8	5.1	1.5	virginica
62	5.9	3.0	4.2	1.5	versicolor
113	6.8	3.0	5.5	2.1	virginica
75	6.4	2.9	4.3	1.3	versicolor
119	7.7	2.6	6.9	2.3	virginica
41	5.0	3.5	1.3	0.3	setosa
27	5.0	3.4	1.6	0.4	setosa
25	4.8	3.4	1.9	0.2	setosa
89	5.6	3.0	4.1	1.3	versicolor

100	5.7	2.8	4.1	1.3	versicolor
91	5.5	2.6	4.4	1.2	versicolor
19	5.7	3.8	1.7	0.3	setosa
137	6.3	3.4	5.6	2.4	virginica
46	4.8	3.0	1.4	0.3	setosa
103	7.1	3.0	5.9	2.1	virginica
85	5.4	3.0	4.5	1.5	versicolor
6	5.4	3.9	1.7	0.4	setosa
44	5.0	3.5	1.6	0.6	setosa
86	6.0	3.4	4.5	1.6	versicolor
71	5.9	3.2	4.8	1.8	versicolor
36	5.0	3.2	1.2	0.2	setosa
104	6.3	2.9	5.6	1.8	virginica
42	4.5	2.3	1.3	0.3	setosa
139	6.0	3.0	4.8	1.8	virginica
118	7.7	3.8	6.7	2.2	virginica
106	7.6	3.0	6.6	2.1	virginica
9	4.4	2.9	1.4	0.2	setosa
43	4.4	3.2	1.3	0.2	setosa
84	6.0	2.7	5.1	1.6	versicolor
66	6.7	3.1	4.4	1.4	versicolor
39	4.4	3.0	1.3	0.2	setosa
7	4.6	3.4	1.4	0.3	setosa
72	6.1	2.8	4.0	1.3	versicolor
117	6.5	3.0	5.5	1.8	virginica
108	7.3	2.9	6.3	1.8	virginica
4	4.6	3.1	1.5	0.2	setosa
38	4.9	3.6	1.4	0.1	setosa
138	6.4	3.1	5.5	1.8	virginica
65	5.6	2.9	3.6	1.3	versicolor
5	5.0	3.6	1.4	0.2	setosa
2	4.9	3.0	1.4	0.2	setosa
87	6.7	3.1	4.7	1.5	versicolor
82	5.5	2.4	3.7	1.0	versicolor
40	5.1	3.4	1.5	0.2	setosa
77	6.8	2.8	4.8	1.4	versicolor
128	6.1	3.0	4.9	1.8	virginica
67	5.6	3.0	4.5	1.5	versicolor
92	6.1	3.0	4.6	1.4	versicolor
131	7.4	2.8	6.1	1.9	virginica
74	6.1	2.8	4.7	1.2	versicolor
56	5.7	2.8	4.5	1.3	versicolor
59	6.6	2.9	4.6	1.3	versicolor
120	6.0	2.2	5.0	1.5	virginica
23	4.6	3.6	1.0	0.2	setosa
13	4.8	3.0	1.4	0.1	setosa
33	5.2	4.1	1.5	0.1	setosa

```
107          4.9         2.5          4.5         1.7  virginica
127          6.2         2.8          4.8         1.8  virginica
24           5.1         3.3          1.7         0.5     setosa
116          6.4         3.2          5.3         2.3  virginica
34           5.5         4.2          1.4         0.2     setosa
68           5.8         2.7          4.1         1.0 versicolor
58           4.9         2.4          3.3         1.0 versicolor
73           6.3         2.5          4.9         1.5 versicolor
80           5.7         2.6          3.5         1.0 versicolor
8            5.0         3.4          1.5         0.2     setosa
99           5.1         2.5          3.0         1.1 versicolor
121          6.9         3.2          5.7         2.3  virginica
133          6.4         2.8          5.6         2.2  virginica

$exclude
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$net.result[[1]]
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37  1.000000e+00 2.383741e-03 1.114457e-81
146 1.118932e-73 2.935025e-19 1.000000e+00
70  2.605431e-61 1.000000e+00 3.863890e-38
45  1.000000e+00 2.377365e-03 1.120145e-81
124 1.773171e-69 2.862667e-06 1.000000e+00
20  1.000000e+00 2.381823e-03 1.116163e-81
76  3.677713e-61 1.000000e+00 5.118417e-39
144 1.463396e-74 5.437448e-22 1.000000e+00
3   1.000000e+00 2.380866e-03 1.117016e-81
88  3.457192e-62 1.000000e+00 5.382853e-33
10  1.000000e+00 2.381766e-03 1.116214e-81
136 3.331727e-74 6.925302e-21 1.000000e+00
126 7.865024e-72 1.511826e-13 1.000000e+00
102 9.312413e-74 1.663398e-19 1.000000e+00
125 2.102869e-73 2.065557e-18 1.000000e+00
64  1.993266e-63 1.000000e+00 9.952266e-26
111 3.434009e-69 2.210669e-05 1.000000e+00
122 9.005676e-74 1.499720e-19 1.000000e+00
32  1.000000e+00 2.380331e-03 1.117494e-81
147 1.438490e-72 7.901908e-16 1.000000e+00
123 3.784652e-74 1.027164e-20 1.000000e+00
95  3.240998e-62 1.000000e+00 7.861003e-33
101 6.144976e-75 3.714824e-23 1.000000e+00
149 4.892277e-74 2.272109e-20 1.000000e+00
143 9.312413e-74 1.663398e-19 1.000000e+00
94  3.999636e-61 1.000000e+00 3.129118e-39
```

150 5.530746e-72 5.088361e-14 1.000000e+00
11 1.000000e+00 2.383744e-03 1.114455e-81
83 3.727793e-61 1.000000e+00 4.728126e-39
54 1.533889e-62 1.000000e+00 6.320193e-31
57 4.629354e-62 1.000000e+00 9.714613e-34
61 1.444481e-61 1.000000e+00 1.228269e-36
48 1.000000e+00 2.379590e-03 1.118155e-81
29 1.000000e+00 2.382865e-03 1.115236e-81
69 5.320708e-65 1.000000e+00 1.683079e-16
130 2.494088e-69 8.222171e-06 1.000000e+00
115 6.244517e-75 3.904102e-23 1.000000e+00
145 8.733447e-75 1.101758e-22 1.000000e+00
17 1.000000e+00 2.382163e-03 1.115861e-81
50 1.000000e+00 2.381995e-03 1.116010e-81
96 2.112806e-61 1.000000e+00 1.320693e-37
35 1.000000e+00 2.380569e-03 1.117281e-81
93 2.699288e-61 1.000000e+00 3.139726e-38
49 1.000000e+00 2.383462e-03 1.114705e-81
12 1.000000e+00 2.379818e-03 1.117952e-81
14 1.000000e+00 2.380630e-03 1.117227e-81
60 3.797882e-62 1.000000e+00 3.101985e-33
18 1.000000e+00 2.381570e-03 1.116388e-81
97 1.296262e-61 1.000000e+00 2.317567e-36
109 1.009941e-73 2.137785e-19 1.000000e+00
134 3.958197e-68 4.073568e-02 9.973322e-01
62 1.711760e-61 1.000000e+00 4.538435e-37
113 3.010026e-73 6.262526e-18 1.000000e+00
75 3.644473e-61 1.000000e+00 5.398333e-39
119 7.328586e-75 6.405154e-23 1.000000e+00
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27 1.000000e+00 2.378303e-03 1.119306e-81
25 1.000000e+00 2.375997e-03 1.121371e-81
89 2.065120e-61 1.000000e+00 1.509885e-37
100 1.742567e-61 1.000000e+00 4.087682e-37
91 2.555245e-64 1.000000e+00 1.697219e-20
19 1.000000e+00 2.383281e-03 1.114866e-81
137 1.398345e-74 4.724127e-22 1.000000e+00
46 1.000000e+00 2.378657e-03 1.118989e-81
103 7.521713e-74 8.593353e-20 1.000000e+00
85 9.793317e-66 9.999991e-01 3.440845e-12
6   1.000000e+00 2.381301e-03 1.116629e-81
44 1.000000e+00 2.374023e-03 1.123144e-81
86 9.135104e-62 1.000000e+00 1.804253e-35
71 3.197331e-67 9.644949e-01 1.783242e-03
36 1.000000e+00 2.382250e-03 1.115784e-81
104 1.885182e-73 1.473200e-18 1.000000e+00
42 1.000000e+00 2.372951e-03 1.124109e-81

139	3.600903e-68	3.071988e-02	9.984664e-01
118	8.136661e-74	1.095758e-19	1.000000e+00
106	2.782045e-74	3.965194e-21	1.000000e+00
9	1.000000e+00	2.377055e-03	1.120423e-81
43	1.000000e+00	2.378855e-03	1.118812e-81
84	2.043611e-71	2.897591e-12	1.000000e+00
66	4.184693e-61	1.000000e+00	2.400089e-39
39	1.000000e+00	2.378378e-03	1.119239e-81
7	1.000000e+00	2.378537e-03	1.119097e-81
72	4.032466e-61	1.000000e+00	2.982650e-39
117	3.228895e-72	9.632137e-15	1.000000e+00
108	2.395985e-73	3.092477e-18	1.000000e+00
4	1.000000e+00	2.378452e-03	1.119172e-81
38	1.000000e+00	2.383060e-03	1.115063e-81
138	2.946197e-72	7.255337e-15	1.000000e+00
65	4.536115e-61	1.000000e+00	1.495731e-39
5	1.000000e+00	2.382572e-03	1.115496e-81
2	1.000000e+00	2.380773e-03	1.117099e-81
87	1.820233e-61	1.000000e+00	3.165331e-37
82	3.631450e-61	1.000000e+00	5.512860e-39
40	1.000000e+00	2.382220e-03	1.115809e-81
77	7.494639e-62	1.000000e+00	5.759926e-35
128	9.652789e-69	5.400823e-04	9.999993e-01
67	2.319426e-64	1.000000e+00	2.994661e-20
92	2.493843e-62	1.000000e+00	3.655124e-32
131	4.621612e-73	2.358749e-17	1.000000e+00
74	5.468321e-63	1.000000e+00	2.676857e-28
56	1.085553e-63	1.000000e+00	3.512515e-24
59	2.268084e-61	1.000000e+00	8.713283e-38
120	1.475580e-71	1.058328e-12	1.000000e+00
23	1.000000e+00	2.382464e-03	1.115592e-81
13	1.000000e+00	2.381590e-03	1.116371e-81
33	1.000000e+00	2.384281e-03	1.113977e-81
107	3.782582e-73	1.269407e-17	1.000000e+00
127	3.178755e-68	2.109730e-02	9.992613e-01
24	1.000000e+00	2.375779e-03	1.121566e-81
116	5.121451e-74	2.617690e-20	1.000000e+00
34	1.000000e+00	2.384853e-03	1.113469e-81
68	3.018805e-61	1.000000e+00	1.629166e-38
58	3.956279e-61	1.000000e+00	3.335658e-39
73	2.990162e-67	9.566758e-01	2.639065e-03
80	4.889727e-61	1.000000e+00	9.631498e-40
8	1.000000e+00	2.381778e-03	1.116204e-81
99	8.423283e-46	1.000000e+00	4.222135e-48
121	3.158893e-74	5.873416e-21	1.000000e+00
133	1.159636e-74	2.647944e-22	1.000000e+00

```
$weights
$weights[[1]]
$weights[[1]][[1]]
         [,1]       [,2]       [,3]       [,4]
[1,] 2.954165 -0.1889898  2.9590994 -0.5822692
[2,] 3.632602 -1.2922141 -0.3148418 -0.5708703
[3,] 4.266830  0.2061764  0.6226494 -1.5850129
[4,] 5.528042  1.4646955  0.6562208  1.9048024
[5,] 3.716274  0.5999010 -2.4618863  0.1547923

$weights[[1]][[2]]
          [,1]        [,2]
[1,]  1.109641   -8.291534
[2,]  1.081212   -8.107311
[3,] -6.425414  348.463875
[4,]  7.201311 -136.626766
[5,] -5.840216  350.993181

$weights[[1]][[3]]
            [,1]      [,2]        [,3]
[1,]    4.167595 -106.7679    4.606187
[2,]   32.574117  100.7418 -191.027388
[3,] -175.539255   53.5948   96.154620



$generalized.weights
$generalized.weights[[1]]
            [,1]         [,2]          [,3]          [,4]          [,5]
55     5.4232733    5.1065348    -9.4551159    -6.3836547           NaN
37           NaN          NaN           NaN           NaN  4.219762e-04
146    5.7349465    7.6354918    -9.1360788   -15.8227539  1.773645e+01
70     1.7985531    1.5684620    -3.1994660    -1.5530637           NaN
45           NaN          NaN           NaN           NaN  4.707113e-03
124   17.3387736   16.1886914   -27.5197672   -29.8777340  5.362356e+01
20           NaN          NaN           NaN           NaN  1.994012e-03
76     0.8292691    0.8124906    -1.4807435    -0.9333301           NaN
144    1.2699087    2.1265668    -1.8537187    -5.2766376  3.927442e+00
3            NaN          NaN           NaN           NaN  2.157148e-03
88     5.9501457    5.3600832   -10.2007922    -6.9866782           NaN
10           NaN          NaN           NaN           NaN  2.153037e-03
136    3.2077081    3.0536206    -3.9755415    -9.7330155  9.920467e+00
126   10.3374634    6.8133408   -15.2883909   -14.3305554  3.197063e+01
102    3.7804899    4.5575405    -5.8671922    -9.7295641  1.169191e+01
125    5.0236544    6.4081259    -8.2977439   -12.0451017  1.553664e+01
64    12.3112844   10.0010233   -21.2064443   -11.1964723  3.807506e+01
```

111	17.3826314	20.1175837	-29.9764659	-31.6228434	5.375920e+01
122	3.8433524	5.8401720	-6.5656191	-10.9181296	1.188632e+01
32	NaN	NaN	NaN	NaN	9.333903e-04
147	9.2244959	8.5330512	-13.2668571	-20.6714683	2.852856e+01
123	2.3035792	1.2641637	-2.4149915	-6.1181178	7.124271e+00
95	6.9693328	5.8722325	-12.1480644	-6.3784046	NaN
101	0.1395644	0.7648629	-0.2059326	-1.9836847	4.316304e-01
149	2.8117543	5.7344743	-5.3915607	-9.7380844	8.695902e+00
143	3.7804899	4.5575405	-5.8671922	-9.7295641	1.169191e+01
94	0.6549725	0.5734253	-1.1528904	-0.6159937	NaN
150	9.3917696	10.5658231	-16.2968922	-15.9130633	2.904589e+01
11	NaN	NaN	NaN	NaN	1.076333e-03
83	0.8332002	0.7444354	-1.4685909	-0.8162174	NaN
54	8.2799735	7.2869798	-14.2166918	-9.1867425	2.560744e+01
57	6.0118262	5.3337244	-10.4554758	-6.3007409	NaN
61	3.2343471	2.8558036	-5.7258883	-2.9871684	NaN
48	NaN	NaN	NaN	NaN	3.141977e-03
29	NaN	NaN	NaN	NaN	1.127074e-03
69	15.3648873	12.7835851	-24.1240422	-23.2781667	4.751893e+01
130	16.8286316	8.8192754	-24.6211262	-18.2593139	5.204585e+01
115	0.4385983	1.0514374	-0.6965604	-2.4604753	1.356451e+00
145	0.8458168	1.7852066	-1.3819394	-3.9602017	2.615854e+00
17	NaN	NaN	NaN	NaN	6.746084e-04
50	NaN	NaN	NaN	NaN	1.601060e-03
96	2.4424916	1.8847786	-4.2313335	-1.8697528	NaN
35	NaN	NaN	NaN	NaN	2.279071e-03
93	1.6802091	1.5153301	-2.9860490	-1.5944668	NaN
49	NaN	NaN	NaN	NaN	1.295839e-03
12	NaN	NaN	NaN	NaN	3.453364e-03
14	NaN	NaN	NaN	NaN	2.574543e-03
60	6.4363451	5.7920051	-11.1947199	-6.9592548	NaN
18	NaN	NaN	NaN	NaN	1.459549e-03
97	3.6759868	3.0292114	-6.3973488	-3.2201823	NaN
109	3.9047091	2.2435805	-4.6598063	-8.5830338	1.207608e+01
134	18.4416476	12.8615358	-29.4287607	-19.6222684	5.703441e+01
62	2.8416247	2.5136640	-4.8648042	-3.2386670	NaN
113	6.5111338	7.1074475	-9.8086953	-15.8607253	2.013696e+01
75	0.8723983	0.8237542	-1.5626865	-0.8815928	NaN
119	0.3604397	0.5461369	-0.1907871	-2.5622342	1.114731e+00
41	NaN	NaN	NaN	NaN	1.401245e-03
27	NaN	NaN	NaN	NaN	2.822338e-03
25	NaN	NaN	NaN	NaN	6.186050e-03
89	2.4543504	1.9359435	-4.2093830	-2.1447475	NaN
100	2.8846762	2.4429687	-5.0203523	-2.7015280	NaN
91	15.2001223	11.4777349	-25.9740916	-12.2677862	4.700936e+01
19	NaN	NaN	NaN	NaN	1.016794e-03
137	1.1308799	2.7850830	-2.1219743	-5.3577570	3.497468e+00

46	NaN	NaN	NaN	NaN	2.270214e-03
103	3.9050767	3.7177791	-5.2698266	-10.2890384	1.207722e+01
85	16.7039571	16.7423329	-30.5636154	-17.1251862	5.166027e+01
6	NaN	NaN	NaN	NaN	1.929869e-03
44	NaN	NaN	NaN	NaN	3.307903e-03
86	4.2921893	3.6618926	-7.3466814	-4.5385909	NaN
71	17.5900041	20.0578786	-32.0139735	-25.1059058	5.440054e+01
36	NaN	NaN	NaN	NaN	9.409593e-04
104	4.3837474	3.8659868	-6.5311850	-8.4991406	1.355760e+01
42	NaN	NaN	NaN	NaN	3.026565e-03
139	18.1500092	19.5292061	-31.6493845	-27.8255356	5.613247e+01
118	3.0380432	3.4803251	-4.7408703	-7.2404754	9.395745e+00
106	1.9099248	1.4613785	-2.1064396	-5.7929933	5.906817e+00
9	NaN	NaN	NaN	NaN	4.232503e-03
43	NaN	NaN	NaN	NaN	3.601212e-03
84	11.5944996	8.8049204	-18.0540359	-15.8739419	3.585827e+01
66	0.5047915	0.4912189	-0.8959206	-0.5789363	NaN
39	NaN	NaN	NaN	NaN	3.491292e-03
7	NaN	NaN	NaN	NaN	3.503106e-03

	[,6]	[,7]	[,8]	[,9]	[,10]
55	NaN	NaN	NaN	-3.180420e+01	-2.994672e+01
37	1.021083e-03	-6.209966e-05	-0.004599573	-8.001542e-04	-1.936184e-03
146	2.361426e+01	-2.825512e+01	-48.934971977	NaN	NaN
70	NaN	NaN	NaN	-1.054742e+01	-9.198076e+00
45	6.151559e-04	-5.103240e-03	-0.006659244	-8.925660e-03	-1.166463e-03
124	5.006671e+01	-8.511028e+01	-92.402756504	-1.016814e+02	-9.493683e+01
20	6.935554e-04	-1.922107e-03	-0.004841868	-3.781059e-03	-1.315125e-03
76	NaN	NaN	NaN	-4.863159e+00	-4.764764e+00
144	6.576825e+00	-5.732989e+00	-16.319037312	NaN	NaN
3	1.007755e-03	-2.169336e-03	-0.005595723	-4.090399e-03	-1.910912e-03
88	NaN	NaN	NaN	-3.489399e+01	-3.143363e+01
10	9.184176e-04	-2.407563e-03	-0.004472999	-4.082604e-03	-1.741510e-03
136	9.443921e+00	-1.229514e+01	-30.101260704	NaN	NaN
126	2.107159e+01	-4.728235e+01	-44.320055133	NaN	NaN
102	1.409509e+01	-1.814544e+01	-30.090586475	NaN	NaN
125	1.981839e+01	-2.566240e+01	-37.251841180	NaN	NaN
64	3.093013e+01	-6.558509e+01	-34.627288131	-7.219820e+01	-5.864992e+01
111	6.221758e+01	-9.270810e+01	-97.799849724	-1.019386e+02	-1.179774e+02
122	1.806188e+01	-2.030547e+01	-33.766458842	NaN	NaN
32	1.697299e-03	-4.170100e-04	-0.007667088	-1.769901e-03	-3.218430e-03
147	2.639014e+01	-4.103036e+01	-63.930572850	NaN	NaN
123	3.909674e+00	-7.468835e+00	-18.921480009	NaN	NaN
95	NaN	NaN	NaN	-4.087090e+01	-3.443707e+01
101	2.365489e+00	-6.368871e-01	-6.134934192	NaN	NaN
149	1.773499e+01	-1.667446e+01	-30.116937404	NaN	NaN
143	1.409509e+01	-1.814544e+01	-30.090586475	NaN	NaN
94	NaN	NaN	NaN	-3.841016e+00	-3.362791e+00

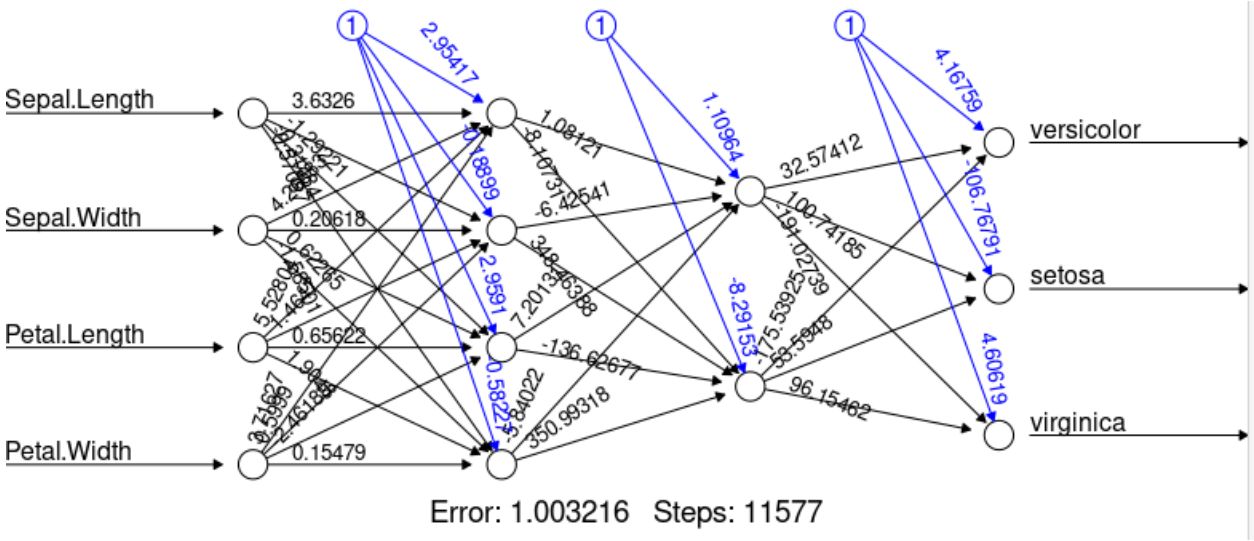
150	3.267688e+01	-5.040134e+01	-49.214271569	NaN	NaN
11	6.985015e-04	-9.375129e-04	-0.003838093	-2.040950e-03	-1.324503e-03
83	NaN	NaN	NaN	-4.886212e+00	-4.365661e+00
54	2.253642e+01	-4.396791e+01	-28.411804165	-4.855701e+01	-4.273371e+01
57	NaN	NaN	NaN	-3.525571e+01	-3.127905e+01
61	NaN	NaN	NaN	-1.896748e+01	-1.674755e+01
48	9.164066e-04	-3.396466e-03	-0.005825422	-5.957838e-03	-1.737697e-03
29	9.412628e-04	-9.571273e-04	-0.004665985	-2.137165e-03	-1.784829e-03
69	3.953575e+01	-7.460834e+01	-71.992299399	-9.010572e+01	-7.496795e+01
130	2.727534e+01	-7.614567e+01	-56.470511968	-9.868969e+01	-5.171969e+01
115	3.251776e+00	-2.154250e+00	-7.609502803	NaN	NaN
145	5.521102e+00	-4.273919e+00	-12.247700914	NaN	NaN
17	1.224273e-03	-1.623595e-04	-0.006039539	-1.279197e-03	-2.321475e-03
50	9.695645e-04	-1.534557e-03	-0.005016434	-3.035941e-03	-1.838495e-03
96	NaN	NaN	NaN	-1.432373e+01	-1.105308e+01
35	1.176482e-03	-2.442609e-03	-0.005662212	-4.321589e-03	-2.230854e-03
93	NaN	NaN	NaN	-9.853405e+00	-8.886490e+00
49	6.589273e-04	-1.200844e-03	-0.003875175	-2.457178e-03	-1.249462e-03
12	6.713689e-04	-3.819302e-03	-0.005197065	-6.548292e-03	-1.273054e-03
14	8.990175e-04	-2.737468e-03	-0.005332578	-4.881867e-03	-1.704723e-03
60	NaN	NaN	NaN	-3.774525e+01	-3.396659e+01
18	1.075849e-03	-1.226111e-03	-0.005710599	-2.767607e-03	-2.040032e-03
97	NaN	NaN	NaN	-2.155743e+01	-1.776448e+01
109	6.938713e+00	-1.441137e+01	-26.544716481	NaN	NaN
134	3.977682e+01	-9.101422e+01	-60.685716211	-1.081491e+02	-7.542509e+01
62	NaN	NaN	NaN	-1.666440e+01	-1.474111e+01
113	2.198118e+01	-3.033532e+01	-49.052405932	NaN	NaN
75	NaN	NaN	NaN	-5.116085e+00	-4.830818e+00
119	1.689036e+00	-5.900465e-01	-7.924212183	NaN	NaN
41	1.099612e-03	-1.121071e-03	-0.005863358	-2.657050e-03	-2.085091e-03
27	1.386876e-03	-2.765358e-03	-0.007767670	-5.351737e-03	-2.629805e-03
25	6.069873e-04	-7.262199e-03	-0.006199536	-1.173003e-02	-1.150974e-03
89	NaN	NaN	NaN	-1.439327e+01	-1.135313e+01
100	NaN	NaN	NaN	-1.691687e+01	-1.432653e+01
91	3.549715e+01	-8.032998e+01	-37.940536637	-8.913948e+01	-6.730994e+01
19	8.473310e-04	-8.124062e-04	-0.004389938	-1.928052e-03	-1.606715e-03
137	8.613416e+00	-6.562622e+00	-16.569915164	NaN	NaN
46	1.722257e-03	-2.221704e-03	-0.007870390	-4.304795e-03	-3.265756e-03
103	1.149796e+01	-1.629797e+01	-31.820870814	NaN	NaN
85	5.177895e+01	-9.452398e+01	-52.962999570	-9.795855e+01	-9.818360e+01
6	8.669698e-04	-1.781121e-03	-0.005493665	-3.659431e-03	-1.643954e-03
44	2.309409e-03	-2.794839e-03	-0.012541803	-6.272468e-03	-4.379118e-03
86	NaN	NaN	NaN	-2.517108e+01	-2.147477e+01
71	6.203293e+01	-9.900950e+01	-77.644941291	-1.031547e+02	-1.176273e+02
36	1.197004e-03	-6.481656e-04	-0.005536143	-1.784254e-03	-2.269767e-03
104	1.195632e+01	-2.019897e+01	-26.285260526	NaN	NaN
42	4.138874e-03	-3.577416e-03	-0.013156511	-5.738994e-03	-7.848162e-03

```
139  6.039790e+01 -9.788193e+01 -86.055930109 -1.064388e+02 -1.145269e+02
118  1.076359e+01 -1.466207e+01 -22.392591340           NaN           NaN
106  4.519600e+00 -6.514578e+00 -17.915968692           NaN           NaN
9    1.386678e-03 -4.841721e-03  -0.007284916 -8.025702e-03 -2.629429e-03
43   8.472447e-04 -3.886149e-03  -0.006161523 -6.828643e-03 -1.606551e-03
84   2.723094e+01 -5.583565e+01 -49.093281052           NaN           NaN
66            NaN           NaN           NaN -2.960295e+00 -2.880700e+00
39   1.176524e-03 -3.812804e-03  -0.006753081 -6.620212e-03 -2.230933e-03
7    9.118833e-04 -3.644098e-03  -0.006721129 -6.642613e-03 -1.729119e-03
          [,11]        [,12]
55  5.544851e+01 3.743625e+01
37  1.177538e-04 8.721742e-03
146          NaN          NaN
70  1.876292e+01 9.107774e+00
45  9.676800e-03 1.262730e-02
124 1.613867e+02 1.752147e+02
20  3.644713e-03 9.181184e-03
76  8.683660e+00 5.473414e+00
144          NaN          NaN
3   4.113511e-03 1.061065e-02
88  5.982144e+01 4.097262e+01
10  4.565238e-03 8.481731e-03
136          NaN          NaN
126          NaN          NaN
102          NaN          NaN
125          NaN          NaN
64  1.243629e+02 6.566050e+01
111 1.757937e+02 1.854487e+02
122          NaN          NaN
32  7.907373e-04 1.453838e-02
147          NaN          NaN
123          NaN          NaN
95  7.124101e+01 3.740546e+01
101          NaN          NaN
149          NaN          NaN
143          NaN          NaN
94  6.761001e+00 3.612429e+00
150          NaN          NaN
11  1.777718e-03 7.277819e-03
83  8.612393e+00 4.786619e+00
54  8.337225e+01 5.387466e+01
57  6.131501e+01 3.695001e+01
61  3.357885e+01 1.751793e+01
48  6.440402e-03 1.104621e-02
29  1.814911e-03 8.847673e-03
69  1.414728e+02 1.365123e+02
130 1.443879e+02 1.070798e+02
```

```
115          NaN          NaN
145          NaN          NaN
17  3.078671e-04 1.145222e-02
50  2.909838e-03 9.512197e-03
96  2.481420e+01 1.096496e+01
35  4.631692e-03 1.073673e-02
93  1.751136e+01 9.350578e+00
49  2.277048e-03 7.348133e-03
12  7.242186e-03 9.854710e-03
14  5.190805e-03 1.011167e-02
60  6.565023e+01 4.081180e+01
18  2.324961e-03 1.082848e-02
97  3.751656e+01 1.888441e+01
109          NaN          NaN
134 1.725818e+02 1.150727e+02
62  2.852912e+01 1.899281e+01
113          NaN          NaN
75  9.164206e+00 5.170006e+00
119          NaN          NaN
41  2.125783e-03 1.111814e-02
27  5.243690e-03 1.472911e-02
25  1.377063e-02 1.175560e-02
89  2.468547e+01 1.257764e+01
100 2.944131e+01 1.584282e+01
91  1.523223e+02 7.194311e+01
19  1.540490e-03 8.324230e-03
137          NaN          NaN
46  4.212811e-03 1.492389e-02
103          NaN          NaN
85  1.792370e+02 1.004288e+02
6   3.377374e-03 1.041713e-02
44  5.299593e-03 2.378185e-02
86  4.308382e+01 2.661608e+01
71  1.877425e+02 1.472309e+02
36  1.229056e-03 1.049767e-02
104          NaN          NaN
42  6.783520e-03 2.494747e-02
139 1.856044e+02 1.631798e+02
118          NaN          NaN
106          NaN          NaN
9   9.180905e-03 1.381371e-02
43  7.368942e-03 1.168352e-02
84           NaN          NaN
66  5.254030e+00 3.395110e+00
39  7.229866e-03 1.280524e-02
7   6.909964e-03 1.274465e-02
 [ reached getOption("max.print") -- omitted 37 rows ]
```

```
$startweights
$startweights[[1]]
$startweights[[1]][[1]]
           [,1]        [,2]       [,3]       [,4]
[1,] -1.0458348  0.77423195 -0.9602864  0.6787051
[2,] -0.3673978 -1.68289827 -1.1898026 -0.7665335
[3,]  0.2668296  0.06191503 -0.7462531 -0.2843683
[4,]  1.5280424  0.75299000  1.2208441  0.7467765
[5,] -0.2837257 -0.83605244 -0.3181927 -1.6039578

$startweights[[1]][[2]]
            [,1]       [,2]
[1,]  0.00651497 -0.5233031
[2,] -0.02191388 -0.3390795
[3,] -0.74364067 -1.2128671
[4,]  1.51092366 -1.0569400
[5,] -1.13580406  0.8177532

$startweights[[1]][[3]]
          [,1]      [,2]      [,3]
[1,] 0.3348667 -1.020637 0.4856726
[2,] 1.8163913  2.275452 0.1071237
[3,] 0.3894724  1.425514 0.9289246



$result.matrix
                                    [,1]
error                       1.003216e+00
reached.threshold           9.744090e-03
steps                       1.157700e+04
Intercept.to.1layhid1       2.954165e+00
Sepal.Length.to.1layhid1    3.632602e+00
Sepal.Width.to.1layhid1     4.266830e+00
Petal.Length.to.1layhid1    5.528042e+00
Petal.Width.to.1layhid1     3.716274e+00
Intercept.to.1layhid2      -1.889898e-01
Sepal.Length.to.1layhid2   -1.292214e+00
Sepal.Width.to.1layhid2     2.061764e-01
Petal.Length.to.1layhid2    1.464695e+00
Petal.Width.to.1layhid2     5.999010e-01
Intercept.to.1layhid3       2.959099e+00
Sepal.Length.to.1layhid3   -3.148418e-01
Sepal.Width.to.1layhid3     6.226494e-01
Petal.Length.to.1layhid3    6.562208e-01
```

```
Petal.Width.to.1layhid3  -2.461886e+00
Intercept.to.1layhid4    -5.822692e-01
Sepal.Length.to.1layhid4 -5.708703e-01
Sepal.Width.to.1layhid4  -1.585013e+00
Petal.Length.to.1layhid4  1.904802e+00
Petal.Width.to.1layhid4   1.547923e-01
Intercept.to.2layhid1     1.109641e+00
1layhid1.to.2layhid1      1.081212e+00
1layhid2.to.2layhid1     -6.425414e+00
1layhid3.to.2layhid1      7.201311e+00
1layhid4.to.2layhid1     -5.840216e+00
Intercept.to.2layhid2    -8.291534e+00
1layhid1.to.2layhid2     -8.107311e+00
1layhid2.to.2layhid2      3.484639e+02
1layhid3.to.2layhid2     -1.366268e+02
1layhid4.to.2layhid2      3.509932e+02
Intercept.to.versicolor   4.167595e+00
2layhid1.to.versicolor    3.257412e+01
2layhid2.to.versicolor   -1.755393e+02
Intercept.to.setosa      -1.067679e+02
2layhid1.to.setosa        1.007418e+02
2layhid2.to.setosa        5.359480e+01
Intercept.to.virginica    4.606187e+00
2layhid1.to.virginica    -1.910274e+02
2layhid2.to.virginica     9.615462e+01

attr(,"class")
[1] "nn"
```




```
> pred <- predict(model, test_data)
> pred
             [,1]         [,2]         [,3]
2   1.000000e+00 2.380773e-03 1.117099e-81
```

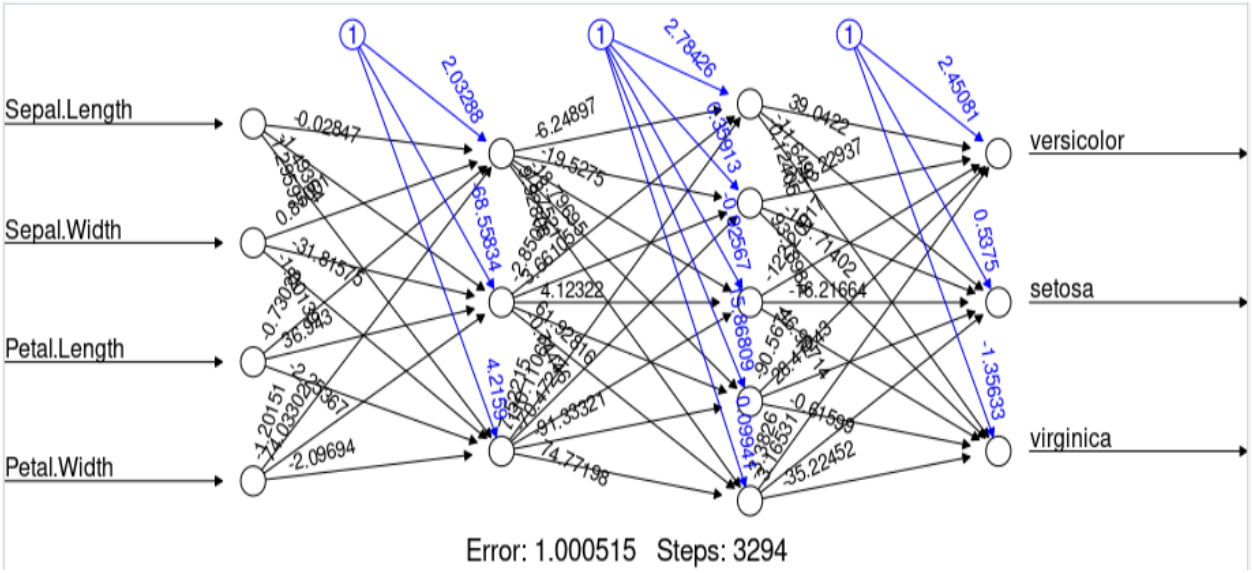
```
14  1.000000e+00 2.380630e-03 1.117227e-81
23  1.000000e+00 2.382464e-03 1.115592e-81
24  1.000000e+00 2.375779e-03 1.121566e-81
27  1.000000e+00 2.378303e-03 1.119306e-81
33  1.000000e+00 2.384281e-03 1.113977e-81
45  1.000000e+00 2.377365e-03 1.120145e-81
47  1.000000e+00 2.382340e-03 1.115703e-81
51  3.841502e-61 1.000000e+00 3.964263e-39
57  4.629354e-62 1.000000e+00 9.714613e-34
65  4.536115e-61 1.000000e+00 1.495731e-39
75  3.644473e-61 1.000000e+00 5.398333e-39
87  1.820233e-61 1.000000e+00 3.165331e-37
91  2.555245e-64 1.000000e+00 1.697219e-20
92  2.493843e-62 1.000000e+00 3.655124e-32
95  3.240998e-62 1.000000e+00 7.861003e-33
100 1.742567e-61 1.000000e+00 4.087682e-37
101 6.144976e-75 3.714824e-23 1.000000e+00
103 7.521713e-74 8.593353e-20 1.000000e+00
104 1.885182e-73 1.473200e-18 1.000000e+00
106 2.782045e-74 3.965194e-21 1.000000e+00
115 6.244517e-75 3.904102e-23 1.000000e+00
122 9.005676e-74 1.499720e-19 1.000000e+00
124 1.773171e-69 2.862667e-06 1.000000e+00
125 2.102869e-73 2.065557e-18 1.000000e+00
128 9.652789e-69 5.400823e-04 9.999993e-01
133 1.159636e-74 2.647944e-22 1.000000e+00
134 3.958197e-68 4.073568e-02 9.973322e-01
138 2.946197e-72 7.255337e-15 1.000000e+00
147 1.438490e-72 7.901908e-16 1.000000e+00

> labels<-c("setosa", "versicolor", "virginica")
> labels
[1] "setosa"     "versicolor" "virginica"
> prediction_label <- data.frame(max.col(pred)) %>%
+    mutate(pred=labels[max.col.pred.]) %>%
+    select(2) %>%
+    unlist()
> table(test_data$Species, prediction_label)
            prediction_label
             setosa versicolor virginica
  setosa          8          0         0
  versicolor      0          9         0
  virginica       0          0        13
> prediction_label
      pred1        pred2        pred3        pred4        pred5
  "setosa"     "setosa"     "setosa"     "setosa"     "setosa"
      pred6        pred7        pred8        pred9       pred10
```

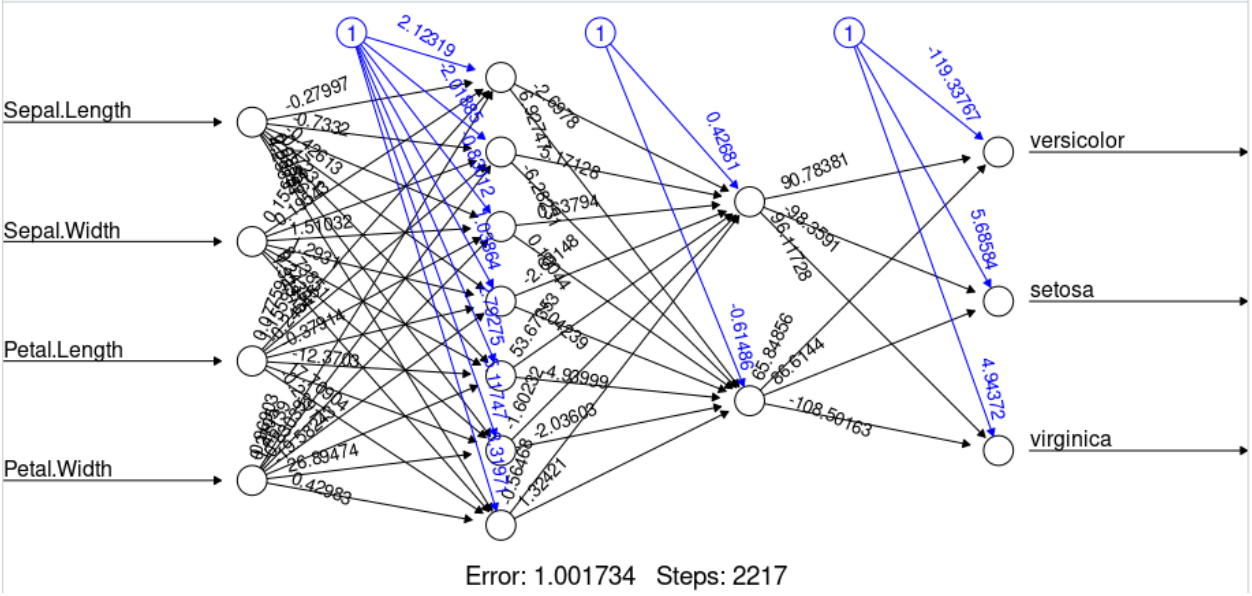
```
    "setosa"     "setosa"     "setosa" "versicolor" "versicolor"
      pred11       pred12       pred13       pred14       pred15
"versicolor" "versicolor" "versicolor" "versicolor" "versicolor"
      pred16       pred17       pred18       pred19       pred20
"versicolor" "versicolor"  "virginica"  "virginica"  "virginica"
      pred21       pred22       pred23       pred24       pred25
 "virginica"  "virginica"  "virginica"  "virginica"  "virginica"
      pred26       pred27       pred28       pred29       pred30
 "virginica"  "virginica"  "virginica"  "virginica"  "virginica"
>
> check = as.numeric(test_data$Species) == max.col(pred)
> check
 [1] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
[13] TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE
[25] TRUE TRUE TRUE TRUE TRUE TRUE
> accuracy <- (sum(check)/nrow(test_data))*100
> print(accuracy)
[1] 100
```

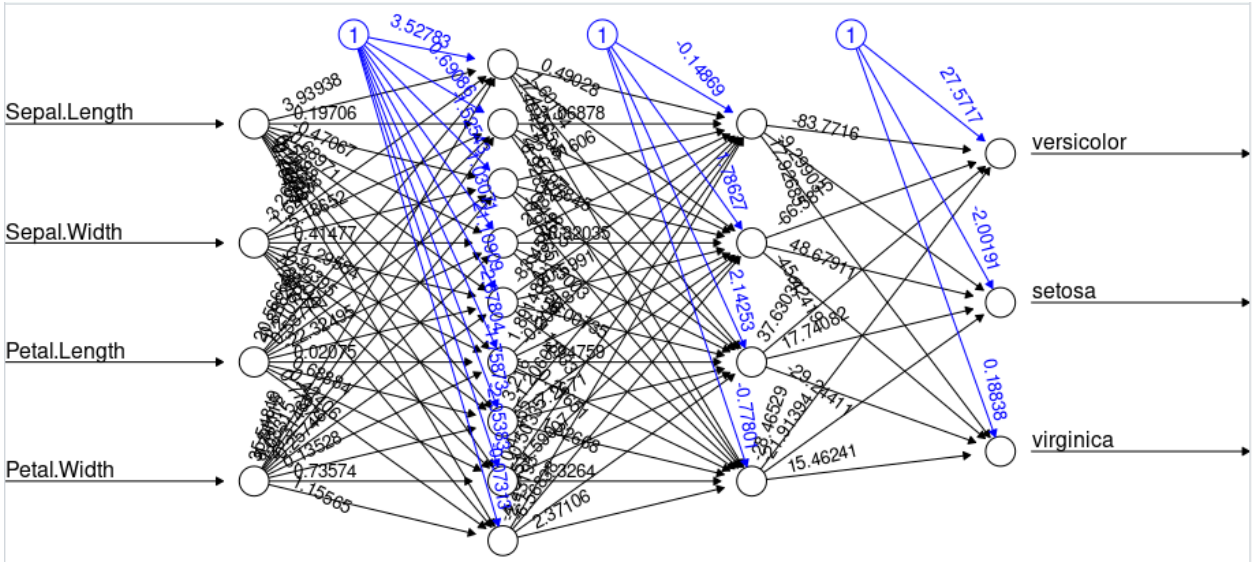
TABLE ANALYSIS

The table below i tried for different other layers and the accuracy it gives

layers	accuracy
4-2	100
3-5	100
7-2	100
9-4	100


Sepal.Length
Sepal.Width
Petal.Length
Petal.Width
versicolor
setosa
virginica
Error: 1.000515 Steps: 3294


Sepal.Length
Sepal.Width
Petal.Length
Petal.Width
versicolor
setosa
virginica
Error: 1.001734 Steps: 2217



ANALYSIS

I noticed this analysis of the iris dataset …since it's a simple dataset,the results I got were 100 % accurate because simple models achieve high accuracy.

The iris dataset is also deemed to be balanced which means that the classes in the dataset iris are well distributed hence the reason I get 100% in all types of hidden layers.