```
In [1]: import pandas as pd from
        keras.models import Sequential from
        keras.layers import Dense
```

```
In [2]: df=pd.read_csv('pima-indians-diabetes.csv')
```

```
In [3]: df.info
```

```
Out[3]: <bound method DataFrame.info of        6  148  72  35    0  33.6  0.627  50  1
        0     1   85  66  29    0  26.6  0.351  31  0
        1     8  183  64   0    0  23.3  0.672  32  1
        2     1   89  66  23   94  28.1  0.167  21  0
        3     0  137  40  35  168  43.1  2.288  33  1
        4     5  116  74   0    0  25.6  0.201  30  0 ..    ..  ...  ..  ..  ...   ...
              ...   .. ..
        762  10  101  76  48  180  32.9  0.171  63  0
        763   2  122  70  27    0  36.8  0.340  27  0
        764   5  121  72  23  112  26.2  0.245  30  0
        765   1  126  60   0    0  30.1  0.349  47  1
        766   1   93  70  31    0  30.4  0.315  23  0

        [767 rows x 9 columns]>
```

```
In [4]: df.columns
```

```
Out[4]: Index(['6', '148', '72', '35', '0', '33.6', '0.627', '50', '1'], dtype='objec
        t')
```

```
In [5]: X=df.iloc[:,0:-1].values
```

```
In [6]: y=df.iloc[:,8].values In
```

```
[7]:    # if error in graphviz then download http://www.graphviz.org/download/ and insta
        model = Sequential() model.add(Dense(12, input_dim=8, activation='relu'))
        model.add(Dense(8, activation='relu')) model.add(Dense(1, activation='sigmoid'))
        # compile the keras model
        model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'
        # fit the keras model on the dataset model.fit(X,
      ] y, epochs=150, batch_size=10)
        # evaluate the keras model
        _, accuracy = model.evaluate(X, y)
        print('Accuracy: %.2f' % (accuracy*100)) from
        ann_visualizer.visualize import ann_viz;
        ann_viz(model, title="My first neural network")
```

```
Epoch 1/150 77/77 [==============================] - 1s 1ms/step - loss: 2.7241 -
accuracy:
0.4003 Epoch 2/150 77/77 [==============================] - 0s 2ms/step - loss:
1.1503 - accuracy:
0.4224 Epoch 3/150 77/77 [==============================] - 0s 2ms/step - loss:
0.7830 - accuracy:
0.5684
Epoch 4/150
77/77 [==============================] - 0s 2ms/step - loss: 0.7232 - accuracy:
0.6232
Epoch 5/150
77/77 [==============================] - 0s 2ms/step - loss: 0.7026 - accuracy:
```

```
0.6323
Epoch 6/150
77/77 [==============================] - 0s 2ms/step - loss: 0.7072 - accuracy:
0.6441
Epoch 7/150
77/77 [==============================] - 0s 2ms/step - loss: 0.7003 - accuracy:
0.6441: 0s - loss: 0.7155 - accuracy: 0. Epoch
8/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6747 - accuracy:
0.6454
Epoch 9/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6791 - accuracy:
0.6480 Epoch
10/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6623 - accuracy:
0.6519 Epoch
11/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6628 - accuracy:
0.6558 Epoch
12/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6580 - accuracy:
0.6519 Epoch
13/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6626 - accuracy:
0.6480 Epoch
14/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6600 - accuracy:
0.6532 Epoch
15/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6514 - accuracy:
0.6519 Epoch
16/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6462 - accuracy:
0.6480 Epoch
17/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6501 - accuracy:
0.6571 Epoch 18/150 77/77 [==============================] - 0s 2ms/step - loss:
0.6439 - accuracy:
0.6519 Epoch 19/150 77/77 [==============================] - 0s 2ms/step - loss:
0.6415 - accuracy:
0.6545 Epoch 20/150 77/77 [==============================] - 0s 2ms/step - loss:
0.6467 - accuracy:
0.6519
Epoch 21/150 77/77 [==============================] - 0s 2ms/step - loss: 0.6361
- accuracy:
```

0.6493 Epoch 22/150 77/77 [==============================] - 0s 2ms/step - loss:
0.6291 - accuracy:
0.6532 Epoch 23/150 77/77 [==============================] - 0s 2ms/step - loss:
0.6241 - accuracy:
0.6532 Epoch
24/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6175 - accuracy:
0.6545 Epoch
25/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6198 - accuracy:
0.6558 Epoch
26/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6175 - accuracy:
0.6519 Epoch
27/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6080 - accuracy:
0.6545 Epoch
28/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6135 - accuracy:
0.6571 Epoch
29/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6141 - accuracy:
0.6519 Epoch
30/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6102 - accuracy:
0.6519 Epoch
31/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6080 - accuracy:
0.6532 Epoch
32/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6082 - accuracy:
0.6519 Epoch
33/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6085 - accuracy:
0.6545 Epoch 34/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6068 - accuracy:
0.6532 Epoch
35/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6063 - accuracy:
0.6545 Epoch
36/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6036 - accuracy:
0.6532 Epoch
37/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6000 - accuracy:

```
0.6532 Epoch 38/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5975 - accuracy:
0.6532 Epoch 39/150 77/77 [==============================] - 0s 2ms/step - loss:
0.6008 - accuracy:
0.6532 Epoch 40/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5979 - accuracy:
0.6493
Epoch 41/150 77/77 [==============================] - 0s 2ms/step - loss: 0.6028
- accuracy:
0.6545 Epoch 42/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5969 - accuracy:
0.6558 Epoch 43/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5953 - accuracy:
0.6558 Epoch
44/150
77/77 [==============================] - 0s 2ms/step - loss: 0.6042 - accuracy:
0.6558 Epoch
45/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5925 - accuracy:
0.6558 Epoch
46/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5953 - accuracy:
0.6519 Epoch
47/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5951 - accuracy:
0.6571 Epoch
48/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5891 - accuracy:
0.6571 Epoch
49/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5919 - accuracy:
0.6545 Epoch
50/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5884 - accuracy:
0.6532 Epoch
51/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5863 - accuracy:
0.6571 Epoch 52/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5901 - accuracy:
0.6532 Epoch
53/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5834 - accuracy:
0.6571 Epoch
54/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5954 - accuracy:
```

0.6558 Epoch
55/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5860 - accuracy:
0.6571 Epoch
56/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5861 - accuracy:
0.6558 Epoch
57/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5863 - accuracy:
0.6571 Epoch 58/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5846 - accuracy:
0.6571 Epoch 59/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5844 - accuracy:
0.6558 Epoch 60/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5833 - accuracy:
0.6571
Epoch 61/150 77/77 [==============================] - 0s 2ms/step - loss: 0.5830
- accuracy:
0.6558 Epoch 62/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5786 - accuracy:
0.6571 Epoch 63/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5846 - accuracy:
0.6571 Epoch
64/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5827 - accuracy:
0.6571 Epoch
65/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5827 - accuracy:
0.6558 Epoch
66/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5767 - accuracy:
0.6571 Epoch
67/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5801 - accuracy:
0.6571 Epoch
68/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5816 - accuracy:
0.6571 Epoch
69/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5780 - accuracy:
0.6558 Epoch
70/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5791 - accuracy:
0.6558 Epoch
71/150

77/77 [==============================] - 0s 2ms/step - loss: 0.5742 - accuracy:
0.6571 Epoch
72/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5761 - accuracy:
0.6571 Epoch
73/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5813 - accuracy:
0.6571 Epoch
74/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5748 - accuracy:
0.6571 Epoch
75/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5798 - accuracy:
0.6571 Epoch
76/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5816 - accuracy:
0.6571 Epoch
77/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5767 - accuracy:
0.6571 Epoch 78/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5781 - accuracy:
0.6571 Epoch 79/150 77/77 [==============================] - 0s 1ms/step - loss:
0.5732 - accuracy:
0.6571 Epoch 80/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5722 - accuracy:
0.6571
Epoch 81/150 77/77 [==============================] - 0s 2ms/step - loss: 0.5680
- accuracy:
0.6571 Epoch 82/150 77/77 [==============================] - 0s 1ms/step - loss:
0.5713 - accuracy:
0.6571 Epoch 83/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5757 - accuracy:
0.6571 Epoch
84/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5726 - accuracy:
0.6558 Epoch
85/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5678 - accuracy:
0.6623 Epoch
86/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5676 - accuracy:
0.7053 Epoch
87/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5708 - accuracy:

```
0.7066 Epoch
88/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5693 - accuracy:
0.7001 Epoch
89/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5681 - accuracy:
0.7053 Epoch
90/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5661 - accuracy:
0.6975 Epoch
91/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5739 - accuracy:
0.7093 Epoch
92/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5697 - accuracy:
0.6936 Epoch
93/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5709 - accuracy:
0.7040 Epoch
94/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5675 - accuracy:
0.6988 Epoch
95/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5645 - accuracy:
0.7093 Epoch
96/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5685 - accuracy:
0.7066 Epoch
97/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5701 - accuracy:
0.7001 Epoch 98/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5675 - accuracy:
0.7027 Epoch 99/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5663 - accuracy:
0.6975 Epoch 100/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5653 - accuracy:
0.7093
Epoch 101/150 77/77 [==============================] - 0s 2ms/step - loss: 0.5622
- accuracy:
0.7040 Epoch 102/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5612 - accuracy:
0.7040 Epoch 103/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5638 - accuracy:
0.7119 Epoch
104/150
```

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77/77 [==============================] - 0s 2ms/step - loss: 0.5645 - accuracy:
0.7132 Epoch
105/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5650 - accuracy:
0.7053 Epoch
106/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5577 - accuracy:
0.7158 Epoch
107/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5616 - accuracy:
0.7027 Epoch
108/150
77/77 [==============================] - 0s 3ms/step - loss: 0.5593 - accuracy:
0.7053 Epoch
109/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5621 - accuracy:
0.7001 Epoch
110/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5610 - accuracy:
0.6988 Epoch
111/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5597 - accuracy:
0.7106 Epoch
112/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5584 - accuracy:
0.7197 Epoch
113/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5605 - accuracy:
0.7093 Epoch
114/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5624 - accuracy:
0.7027 Epoch
115/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5572 - accuracy:
0.7158 Epoch
116/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5599 - accuracy:
0.7106 Epoch
117/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5572 - accuracy:
0.7132 Epoch 118/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5580 - accuracy:
0.7106 Epoch 119/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5560 - accuracy:
```

0.7066 Epoch 120/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5638 - accuracy:
0.7171
Epoch 121/150 77/77 [==============================] - 0s 1ms/step - loss: 0.5589
- accuracy:
0.7106 Epoch 122/150 77/77 [==============================] - 0s 1ms/step - loss:
0.5589 - accuracy:
0.7014 Epoch 123/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5564 - accuracy:
0.7106 Epoch
124/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5548 - accuracy:
0.7119 Epoch
125/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5525 - accuracy:
0.7236 Epoch
126/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5580 - accuracy:
0.7171 Epoch
127/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5560 - accuracy:
0.7053 Epoch
128/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5622 - accuracy:
0.7014 Epoch
129/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5630 - accuracy:
0.7080 Epoch
130/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5575 - accuracy:
0.7262 Epoch
131/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5566 - accuracy:
0.7210 Epoch
132/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5533 - accuracy:
0.7236 Epoch
133/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5626 - accuracy:
0.7093 Epoch
134/150
77/77 [==============================] - 0s 1ms/step - loss: 0.5595 - accuracy:
0.6988 Epoch
135/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5579 - accuracy:

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0.7053 Epoch
136/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5608 - accuracy:
0.7171 Epoch
137/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5590 - accuracy:
0.7040 Epoch 138/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5558 - accuracy:
0.7132 Epoch 139/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5633 - accuracy:
0.7106 Epoch 140/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5519 - accuracy:
0.7171
Epoch 141/150 77/77 [==============================] - 0s 2ms/step - loss: 0.5569
- accuracy:
0.7119 Epoch 142/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5549 - accuracy:
0.7080 Epoch 143/150 77/77 [==============================] - 0s 2ms/step - loss:
0.5592 - accuracy:
0.7040 Epoch
144/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5499 - accuracy:
0.7145 Epoch
145/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5582 - accuracy:
0.7014 Epoch
146/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5556 - accuracy:
0.7119 Epoch
147/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5603 - accuracy:
0.7158 Epoch
148/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5540 - accuracy:
0.7197 Epoch
149/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5474 - accuracy:
0.7119 Epoch
150/150
77/77 [==============================] - 0s 2ms/step - loss: 0.5535 - accuracy:
0.7275
24/24 [==============================] - 0s 1ms/step - loss: 0.5442 - accuracy:
0.7275
```

        Accuracy: 72.75

In [ ]: