Prac\_1\_ANN\_Visualize

In [6]:

*# Create your first MLP in Keras*

**from** keras.models **import** Sequential

**from** keras.layers **import** Dense

**import** numpy

*# fix random seed for reproducibility*

numpy**.**random**.**seed(7)

*# load pima indians dataset*

dataset **=** numpy**.**loadtxt("pima-indians-diabetes.csv", delimiter**=**",")

*# split into input (X) and output (Y) variables*

X **=** dataset[:,0:8] Y **=** dataset[:,8] *# create model*

model **=** Sequential()

model**.**add(Dense(12, input\_dim**=**8, activation**=**'relu')) model**.**add(Dense(8, activation**=**'relu'))

model**.**add(Dense(1, activation**=**'sigmoid'))

*# Compile model*

model**.**compile(loss**=**'binary\_crossentropy', optimizer**=**'adam', metrics**=**['accuracy'])

*# Fit the model*

model**.**fit(X, Y, epochs**=**150, batch\_size**=**10)

*# evaluate the model*

scores **=** model**.**evaluate(X, Y)

print("\n%s: %.2f%%" **%** (model**.**metrics\_names[1], scores[1]**\***100))

Prac\_1\_ANN\_Visualize

Epoch 1/150

77/77 [==============================] - 1s 2ms/step - loss: 19.0504 - accuracy: 0.5742

Epoch 2/150

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 77/77  Epoch 77/77 | [==============================]  3/150  [==============================] | * 0s * 0s | 2ms/step  2ms/step | * loss: * loss: | 4.4148  2.4078 | * accuracy: * accuracy: | 0.4076  0.4531 |
| Epoch  77/77 | 4/150  [==============================] | - 0s | 2ms/step | - loss: | 1.5378 | - accuracy: | 0.5339 |
| Epoch  77/77 | 5/150  [==============================] | - 0s | 2ms/step | - loss: | 1.1213 | - accuracy: | 0.5638 |
| Epoch  77/77 | 6/150  [==============================] | - 0s | 2ms/step | - loss: | 0.9758 | - accuracy: | 0.5833 |
| Epoch  77/77 | 7/150  [==============================] | - 0s | 2ms/step | - loss: | 0.8519 | - accuracy: | 0.6055 |
| Epoch  77/77 | 8/150  [==============================] | - 0s | 2ms/step | - loss: | 0.7874 | - accuracy: | 0.6315 |
| Epoch  77/77 | 9/150  [==============================] | - 0s | 2ms/step | - loss: | 0.7394 | - accuracy: | 0.6237 |
| Epoch  77/77 | 10/150  [==============================] | - 0s | 2ms/step | - loss: | 0.7185 | - accuracy: | 0.6445 |
| Epoch  77/77 | 11/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6875 | - accuracy: | 0.6602 |
| Epoch  77/77 | 12/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6733 | - accuracy: | 0.6680 |
| Epoch  77/77 | 13/150  [==============================] | - 0s | 2ms/step | - loss: | 0.7751 | - accuracy: | 0.6549 |
| Epoch  77/77 | 14/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6977 | - accuracy: | 0.6654 |
| Epoch  77/77 | 15/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6263 | - accuracy: | 0.6758 |
| Epoch  77/77 | 16/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6641 | - accuracy: | 0.6797 |
| Epoch  77/77 | 17/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6564 | - accuracy: | 0.6680 |
| Epoch  77/77 | 18/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6269 | - accuracy: | 0.6836 |
| Epoch  77/77 | 19/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6198 | - accuracy: | 0.6849 |
| Epoch  77/77 | 20/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6168 | - accuracy: | 0.6875 |
| Epoch  77/77 | 21/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6210 | - accuracy: | 0.7096 |
| Epoch  77/77 | 22/150  [==============================] | - 0s | 1ms/step | - loss: | 0.6160 | - accuracy: | 0.7070 |

Prac\_1\_ANN\_Visualize

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Epoch  77/77 | 23/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5965 | - accuracy: | 0.6927 |
| Epoch  77/77 | 24/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6311 | - accuracy: | 0.7070 |
| Epoch  77/77 | 25/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6163 | - accuracy: | 0.6888 |
| Epoch  77/77 | 26/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6230 | - accuracy: | 0.6771 |
| Epoch  77/77 | 27/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6175 | - accuracy: | 0.7122 |
| Epoch  77/77 | 28/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6006 | - accuracy: | 0.6940 |
| Epoch  77/77 | 29/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6157 | - accuracy: | 0.6966 |
| Epoch  77/77 | 30/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5945 | - accuracy: | 0.6992 |
| Epoch  77/77 | 31/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6638 | - accuracy: | 0.6979 |
| Epoch  77/77 | 32/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6130 | - accuracy: | 0.6823 |
| Epoch  77/77 | 33/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5816 | - accuracy: | 0.7096 |
| Epoch  77/77 | 34/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5813 | - accuracy: | 0.7161 |
| Epoch  77/77 | 35/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5930 | - accuracy: | 0.7201 |
| Epoch  77/77 | 36/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6124 | - accuracy: | 0.6836 |
| Epoch  77/77 | 37/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5789 | - accuracy: | 0.7214 |
| Epoch  77/77 | 38/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5939 | - accuracy: | 0.7174 |
| Epoch  77/77 | 39/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5786 | - accuracy: | 0.7240 |
| Epoch  77/77 | 40/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5687 | - accuracy: | 0.7214 |
| Epoch  77/77 | 41/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5656 | - accuracy: | 0.7344 |
| Epoch  77/77 | 42/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5830 | - accuracy: | 0.6966 |
| Epoch  77/77 | 43/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5609 | - accuracy: | 0.7240 |
| Epoch  77/77 | 44/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5904 | - accuracy: | 0.7096 |

Prac\_1\_ANN\_Visualize

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Epoch  77/77 | 45/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5811 | - accuracy: | 0.7253 |
| Epoch  77/77 | 46/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5531 | - accuracy: | 0.7266 |
| Epoch  77/77 | 47/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5607 | - accuracy: | 0.7344 |
| Epoch  77/77 | 48/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5978 | - accuracy: | 0.7188 |
| Epoch  77/77 | 49/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6074 | - accuracy: | 0.7005 |
| Epoch  77/77 | 50/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5833 | - accuracy: | 0.7344 |
| Epoch  77/77 | 51/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5767 | - accuracy: | 0.7292 |
| Epoch  77/77 | 52/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5650 | - accuracy: | 0.7266 |
| Epoch  77/77 | 53/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5683 | - accuracy: | 0.7292 |
| Epoch  77/77 | 54/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5678 | - accuracy: | 0.7344 |
| Epoch  77/77 | 55/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6528 | - accuracy: | 0.7044 |
| Epoch  77/77 | 56/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5423 | - accuracy: | 0.7409 |
| Epoch  77/77 | 57/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5415 | - accuracy: | 0.7474 |
| Epoch  77/77 | 58/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5951 | - accuracy: | 0.7331 |
| Epoch  77/77 | 59/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5398 | - accuracy: | 0.7344 |
| Epoch  77/77 | 60/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5639 | - accuracy: | 0.7448 |
| Epoch  77/77 | 61/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5781 | - accuracy: | 0.7318 |
| Epoch  77/77 | 62/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5754 | - accuracy: | 0.7448 |
| Epoch  77/77 | 63/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5958 | - accuracy: | 0.7174 |
| Epoch  77/77 | 64/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5320 | - accuracy: | 0.7487 |
| Epoch  77/77 | 65/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5407 | - accuracy: | 0.7318 |
| Epoch  77/77 | 66/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5869 | - accuracy: | 0.7240 |

Prac\_1\_ANN\_Visualize

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Epoch  77/77 | 67/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5661 | - accuracy: | 0.7331 |
| Epoch  77/77 | 68/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5382 | - accuracy: | 0.7461 |
| Epoch  77/77 | 69/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5305 | - accuracy: | 0.7591 |
| Epoch  77/77 | 70/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5330 | - accuracy: | 0.7461 |
| Epoch  77/77 | 71/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6156 | - accuracy: | 0.7240 |
| Epoch  77/77 | 72/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6134 | - accuracy: | 0.7240 |
| Epoch  77/77 | 73/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5552 | - accuracy: | 0.7552 |
| Epoch  77/77 | 74/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5379 | - accuracy: | 0.7474 |
| Epoch  77/77 | 75/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5452 | - accuracy: | 0.7500 |
| Epoch  77/77 | 76/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5320 | - accuracy: | 0.7487 |
| Epoch  77/77 | 77/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5616 | - accuracy: | 0.7344 |
| Epoch  77/77 | 78/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5815 | - accuracy: | 0.7409 |
| Epoch  77/77 | 79/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5645 | - accuracy: | 0.7292 |
| Epoch  77/77 | 80/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5914 | - accuracy: | 0.7344 |
| Epoch  77/77 | 81/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5233 | - accuracy: | 0.7591 |
| Epoch  77/77 | 82/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5234 | - accuracy: | 0.7539 |
| Epoch  77/77 | 83/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5455 | - accuracy: | 0.7435 |
| Epoch  77/77 | 84/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5282 | - accuracy: | 0.7513 |
| Epoch  77/77 | 85/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5210 | - accuracy: | 0.7448 |
| Epoch  77/77 | 86/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6169 | - accuracy: | 0.7135 |
| Epoch  77/77 | 87/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5431 | - accuracy: | 0.7396 |
| Epoch  77/77 | 88/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5169 | - accuracy: | 0.7513 |

Prac\_1\_ANN\_Visualize

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Epoch  77/77 | 89/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5665 | - accuracy: | 0.7435 |
| Epoch  77/77 | 90/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5370 | - accuracy: | 0.7357 |
| Epoch  77/77 | 91/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5348 | - accuracy: | 0.7526 |
| Epoch  77/77 | 92/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5356 | - accuracy: | 0.7513 |
| Epoch  77/77 | 93/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5635 | - accuracy: | 0.7435 |
| Epoch  77/77 | 94/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5300 | - accuracy: | 0.7513 |
| Epoch  77/77 | 95/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5234 | - accuracy: | 0.7357 |
| Epoch  77/77 | 96/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5252 | - accuracy: | 0.7487 |
| Epoch  77/77 | 97/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5244 | - accuracy: | 0.7409 |
| Epoch  77/77 | 98/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5279 | - accuracy: | 0.7487 |
| Epoch  77/77 | 99/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5312 | - accuracy: | 0.7435 |
| Epoch  77/77 | 100/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5268 | - accuracy: | 0.7578 |
| Epoch  77/77 | 101/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5281 | - accuracy: | 0.7591 |
| Epoch  77/77 | 102/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5197 | - accuracy: | 0.7630 |
| Epoch  77/77 | 103/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5174 | - accuracy: | 0.7474 |
| Epoch  77/77 | 104/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5076 | - accuracy: | 0.7565 |
| Epoch  77/77 | 105/150  [==============================] | - 0s | 2ms/step | - loss: | 0.6076 | - accuracy: | 0.7148 |
| Epoch  77/77 | 106/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5394 | - accuracy: | 0.7487 |
| Epoch  77/77 | 107/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5237 | - accuracy: | 0.7578 |
| Epoch  77/77 | 108/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5178 | - accuracy: | 0.7565 |
| Epoch  77/77 | 109/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5029 | - accuracy: | 0.7669 |
| Epoch  77/77 | 110/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5375 | - accuracy: | 0.7435 |

Prac\_1\_ANN\_Visualize

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Epoch  77/77 | 111/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5575 | - accuracy: | 0.7344 |
| Epoch  77/77 | 112/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5129 | - accuracy: | 0.7565 |
| Epoch  77/77 | 113/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5468 | - accuracy: | 0.7383 |
| Epoch  77/77 | 114/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5249 | - accuracy: | 0.7487 |
| Epoch  77/77 | 115/150  [==============================] | - 0s | 1ms/step | - loss: | 0.4902 | - accuracy: | 0.7682 |
| Epoch  77/77 | 116/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5091 | - accuracy: | 0.7656 |
| Epoch  77/77 | 117/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5029 | - accuracy: | 0.7474 |
| Epoch  77/77 | 118/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5277 | - accuracy: | 0.7578 |
| Epoch  77/77 | 119/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5355 | - accuracy: | 0.7487 |
| Epoch  77/77 | 120/150  [==============================] | - 0s | 1ms/step | - loss: | 0.4992 | - accuracy: | 0.7630 |
| Epoch  77/77 | 121/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4983 | - accuracy: | 0.7812 |
| Epoch  77/77 | 122/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5214 | - accuracy: | 0.7552 |
| Epoch  77/77 | 123/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5001 | - accuracy: | 0.7539 |
| Epoch  77/77 | 124/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5193 | - accuracy: | 0.7617 |
| Epoch  77/77 | 125/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5092 | - accuracy: | 0.7617 |
| Epoch  77/77 | 126/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4904 | - accuracy: | 0.7747 |
| Epoch  77/77 | 127/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5072 | - accuracy: | 0.7578 |
| Epoch  77/77 | 128/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5604 | - accuracy: | 0.7383 |
| Epoch  77/77 | 129/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5128 | - accuracy: | 0.7539 |
| Epoch  77/77 | 130/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5108 | - accuracy: | 0.7539 |
| Epoch  77/77 | 131/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5055 | - accuracy: | 0.7630 |
| Epoch  77/77 | 132/150  [==============================] | - 0s | 1ms/step | - loss: | 0.5177 | - accuracy: | 0.7513 |

Prac\_1\_ANN\_Visualize

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Epoch  77/77 | 133/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5238 | - accuracy: | 0.7591 |
| Epoch  77/77 | 134/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5101 | - accuracy: | 0.7565 |
| Epoch  77/77 | 135/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5366 | - accuracy: | 0.7617 |
| Epoch  77/77 | 136/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5116 | - accuracy: | 0.7474 |
| Epoch  77/77 | 137/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5061 | - accuracy: | 0.7630 |
| Epoch  77/77 | 138/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4889 | - accuracy: | 0.7786 |
| Epoch  77/77 | 139/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4837 | - accuracy: | 0.7826 |
| Epoch  77/77 | 140/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5285 | - accuracy: | 0.7487 |
| Epoch  77/77 | 141/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4991 | - accuracy: | 0.7617 |
| Epoch  77/77 | 142/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4880 | - accuracy: | 0.7747 |
| Epoch  77/77 | 143/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4989 | - accuracy: | 0.7721 |
| Epoch  77/77 | 144/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4899 | - accuracy: | 0.7734 |
| Epoch  77/77 | 145/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5001 | - accuracy: | 0.7669 |
| Epoch  77/77 | 146/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5052 | - accuracy: | 0.7643 |
| Epoch  77/77 | 147/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5236 | - accuracy: | 0.7552 |
| Epoch  77/77 | 148/150  [==============================] | - 0s | 2ms/step | - loss: | 0.4938 | - accuracy: | 0.7734 |
| Epoch  77/77 | 149/150  [==============================] | - 0s | 2ms/step | - loss: | 0.5186 | - accuracy: | 0.7578 |
| Epoch | 150/150 |  |  |  |  |  |  |
| 77/77 | [==============================] | - 0s | 2ms/step | - loss: | 0.4922 | - accuracy: | 0.7682 |
| 24/24 | [==============================] | - 0s | 2ms/step | - loss: | 0.4752 | - accuracy: | 0.7747 |

accuracy: 77.47%

In [ ]: