In [1]:

```
# Import our dependencies
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler,OneHotEncoder, MinMaxScaler
import pandas as pd
import tensorflow as tf
import numpy as np

# Import our input dataset
df = pd.read_csv('encoded_binned_df.csv')
df.head()
```

Out[1]:

	ERA	Hits	Earned Runs	Strike Outs	Home Runs	Wins	Losses	Outs Pitched	Batters Faced by Pitcher	Games Finished	Weight	Height	Games Started	salBin_low	salBin_
0	4.51	246	106	105	16	10	14	635	925	0	200	75	33	1	
1	5.97	37	23	25	0	0	5	104	162	0	185	75	7	1	
2	3.77	13	6	7	0	1	2	43	63	0	195	76	3	1	
3	4.53	214	95	82	20	7	18	566	797	0	178	71	31	1	
4	2.76	179	57	127	13	12	8	557	784	1	180	74	24	1	

In [2]:

```
### Drop unnecessary columns
df= df.filter(['Batters Faced by Pitcher','Outs Pitched','ERA','Games Finished','Strike Outs',"salBin_low
df.head()
```

Out[2]:

	Batters Faced by Pitcher	Outs Pitched	ERA	Games Finished	Strike Outs	salBin_low	salBin_mid	salBin_high	salBin_top
0	925	635	4.51	0	105	1	0	0	0
1	162	104	5.97	0	25	1	0	0	0
2	63	43	3.77	0	7	1	0	0	0
3	797	566	4.53	0	82	1	0	0	0
4	784	557	2.76	1	127	1	0	0	0

Split Features/Target & Training/Testing Sets

Split into features and target

- **y variable**: Our target variables, `Salary-Bin_low` , `Salary-Bin_mid` , `Salary-Bin_high` , `Salary-Bin_top`
- **X variable**: Our features

In [3]:

```
# Split our preprocessed data into our features and target arrays
y = df[["salBin_low","salBin_mid","salBin_high","salBin_top"]].values
X = df.drop(["salBin_low","salBin_mid","salBin_high","salBin_top"],1).values

# Split the preprocessed data into a training and testing dataset
X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=1)
```

```
C:\Users\alyss\anaconda3\envs\mlenv\lib\site-packages\ipykernel_launcher.py:3: FutureWarning: In a future
version of pandas all arguments of DataFrame.drop except for the argument 'labels' will be keyword-only
  This is separate from the ipykernel package so we can avoid doing imports until
```

Build and Instantiate `StandardScaler` object, then standardize numerical

features

In [4]:

```
# Create a StandardScaler instance
scaler = StandardScaler()

# Fit the StandardScaler
X_scaler = scaler.fit(X_train)

# Scale the data
X_train_scaled = X_scaler.transform(X_train)
X_test_scaled = X_scaler.transform(X_test)
```

Build Neural Net Framework

In [11]:

```
# Define the model - deep neural net
number_input_features = len(X_train[0])
hidden_nodes_layer1 = 144
hidden_nodes_layer2 = 64
hidden_nodes_layer3 = 16


nn = tf.keras.models.Sequential()

# First hidden layer
nn.add(
    tf.keras.layers.Dense(units=hidden_nodes_layer1, input_dim=number_input_features, activation="elu")
)

# Second hidden layer
nn.add(tf.keras.layers.Dense(units=hidden_nodes_layer2, activation="elu"))

# Third hidden layer
nn.add(tf.keras.layers.Dense(units=hidden_nodes_layer3, activation="elu"))

# Output layer
nn.add(tf.keras.layers.Dense(units=4, activation="elu"))

# Check the structure of the model
nn.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 dense_4 (Dense)             (None, 144)               864       
                                                                 
 dense_5 (Dense)             (None, 64)                9280      
                                                                 
 dense_6 (Dense)             (None, 16)                1040      
                                                                 
 dense_7 (Dense)             (None, 4)                 68        
                                                                 
=================================================================
Total params: 11,252
Trainable params: 11,252
Non-trainable params: 0
_________________________________________________________________
```

Compile the Model

In [12]:

```
# Compile the model
nn.compile(loss="CategoricalCrossentropy", optimizer="adam", metrics=["accuracy"])
```

Train the model

In [13]:

```
# Train the model
fit_model = nn.fit(X_train,y_train,epochs=200)
```

```
Epoch 1/200
116/116 [==============================] - 0s 722us/step - loss: 12.8993 - accuracy: 0.1267
Epoch 2/200
116/116 [==============================] - 0s 722us/step - loss: 12.8955 - accuracy: 0.1253
Epoch 3/200
116/116 [==============================] - 0s 748us/step - loss: 1.6673 - accuracy: 0.3879
Epoch 4/200
116/116 [==============================] - 0s 748us/step - loss: 1.1847 - accuracy: 0.4281
Epoch 5/200
116/116 [==============================] - 0s 765us/step - loss: 1.2100 - accuracy: 0.4246
Epoch 6/200
116/116 [==============================] - 0s 731us/step - loss: 1.1827 - accuracy: 0.4176
Epoch 7/200
116/116 [==============================] - 0s 704us/step - loss: 1.1765 - accuracy: 0.4246
Epoch 8/200
116/116 [==============================] - 0s 704us/step - loss: 1.1964 - accuracy: 0.4489
Epoch 9/200
116/116 [==============================] - 0s 739us/step - loss: 1.1726 - accuracy: 0.4511
Epoch 10/200
116/116 [==============================] - 0s 730us/step - loss: 1.1674 - accuracy: 0.4603
Epoch 11/200
116/116 [==============================] - 0s 713us/step - loss: 1.2568 - accuracy: 0.4290
Epoch 12/200
116/116 [==============================] - 0s 722us/step - loss: 1.1982 - accuracy: 0.4225
Epoch 13/200
116/116 [==============================] - 0s 739us/step - loss: 1.1906 - accuracy: 0.4165
Epoch 14/200
116/116 [==============================] - 0s 730us/step - loss: 1.1922 - accuracy: 0.4371
Epoch 15/200
116/116 [==============================] - 0s 739us/step - loss: 1.2001 - accuracy: 0.4152
Epoch 16/200
116/116 [==============================] - 0s 731us/step - loss: 1.1695 - accuracy: 0.4338
Epoch 17/200
116/116 [==============================] - 0s 722us/step - loss: 1.1700 - accuracy: 0.4384
Epoch 18/200
116/116 [==============================] - 0s 722us/step - loss: 1.1682 - accuracy: 0.4535
Epoch 19/200
116/116 [==============================] - 0s 704us/step - loss: 1.1652 - accuracy: 0.4554
Epoch 20/200
116/116 [==============================] - 0s 713us/step - loss: 1.1573 - accuracy: 0.4706
Epoch 21/200
116/116 [==============================] - 0s 730us/step - loss: 1.1521 - accuracy: 0.4751
Epoch 22/200
116/116 [==============================] - 0s 704us/step - loss: 1.1519 - accuracy: 0.4806
Epoch 23/200
116/116 [==============================] - 0s 704us/step - loss: 1.1651 - accuracy: 0.4765
Epoch 24/200
116/116 [==============================] - 0s 722us/step - loss: 1.1445 - accuracy: 0.4841
Epoch 25/200
116/116 [==============================] - 0s 713us/step - loss: 1.1486 - accuracy: 0.4787
Epoch 26/200
116/116 [==============================] - 0s 713us/step - loss: 1.1912 - accuracy: 0.4773
Epoch 27/200
116/116 [==============================] - 0s 713us/step - loss: 1.1403 - accuracy: 0.4838
Epoch 28/200
116/116 [==============================] - 0s 722us/step - loss: 1.1386 - accuracy: 0.4876
Epoch 29/200
116/116 [==============================] - 0s 731us/step - loss: 1.1676 - accuracy: 0.4754
Epoch 30/200
116/116 [==============================] - 0s 713us/step - loss: 1.1386 - accuracy: 0.4797
Epoch 31/200
116/116 [==============================] - 0s 713us/step - loss: 1.1449 - accuracy: 0.4876
Epoch 32/200
116/116 [==============================] - 0s 713us/step - loss: 1.1411 - accuracy: 0.4846
Epoch 33/200
116/116 [==============================] - 0s 722us/step - loss: 1.1379 - accuracy: 0.4811
Epoch 34/200
116/116 [==============================] - 0s 704us/step - loss: 1.1361 - accuracy: 0.4884
Epoch 35/200
```

```
116/116 [==============================] - 0s 722us/step - loss: 1.1332 - accuracy: 0.4827
Epoch 36/200
116/116 [==============================] - 0s 704us/step - loss: 1.1382 - accuracy: 0.4841
Epoch 37/200
116/116 [==============================] - 0s 722us/step - loss: 1.1343 - accuracy: 0.4900
Epoch 38/200
116/116 [==============================] - 0s 713us/step - loss: 1.1444 - accuracy: 0.4819
Epoch 39/200
116/116 [==============================] - 0s 713us/step - loss: 1.1479 - accuracy: 0.4841
Epoch 40/200
116/116 [==============================] - 0s 739us/step - loss: 1.1305 - accuracy: 0.4838
Epoch 41/200
116/116 [==============================] - 0s 722us/step - loss: 1.1424 - accuracy: 0.4835
Epoch 42/200
116/116 [==============================] - 0s 722us/step - loss: 1.1264 - accuracy: 0.4841
Epoch 43/200
116/116 [==============================] - 0s 722us/step - loss: 1.2424 - accuracy: 0.4568
Epoch 44/200
116/116 [==============================] - 0s 713us/step - loss: 1.1505 - accuracy: 0.4762
Epoch 45/200
116/116 [==============================] - 0s 704us/step - loss: 1.1439 - accuracy: 0.4849
Epoch 46/200
116/116 [==============================] - 0s 957us/step - loss: 1.1426 - accuracy: 0.4876
Epoch 47/200
116/116 [==============================] - 0s 762us/step - loss: 1.1344 - accuracy: 0.4878
Epoch 48/200
116/116 [==============================] - 0s 817us/step - loss: 1.1319 - accuracy: 0.4884
Epoch 49/200
116/116 [==============================] - 0s 730us/step - loss: 1.1341 - accuracy: 0.4870
Epoch 50/200
116/116 [==============================] - 0s 713us/step - loss: 1.1324 - accuracy: 0.4854
Epoch 51/200
116/116 [==============================] - 0s 730us/step - loss: 1.1264 - accuracy: 0.4892
Epoch 52/200
116/116 [==============================] - 0s 722us/step - loss: 1.1275 - accuracy: 0.4849
Epoch 53/200
116/116 [==============================] - 0s 704us/step - loss: 1.1339 - accuracy: 0.4865
Epoch 54/200
116/116 [==============================] - 0s 713us/step - loss: 1.1751 - accuracy: 0.4878
Epoch 55/200
116/116 [==============================] - 0s 722us/step - loss: 1.1337 - accuracy: 0.4819
Epoch 56/200
116/116 [==============================] - 0s 713us/step - loss: 1.1704 - accuracy: 0.4760
Epoch 57/200
116/116 [==============================] - 0s 704us/step - loss: 1.1545 - accuracy: 0.4841
Epoch 58/200
116/116 [==============================] - 0s 739us/step - loss: 1.1503 - accuracy: 0.4870
Epoch 59/200
116/116 [==============================] - 0s 730us/step - loss: 1.1436 - accuracy: 0.4827
Epoch 60/200
116/116 [==============================] - 0s 713us/step - loss: 1.1309 - accuracy: 0.4870
Epoch 61/200
116/116 [==============================] - 0s 730us/step - loss: 1.1624 - accuracy: 0.4789
Epoch 62/200
116/116 [==============================] - 0s 722us/step - loss: 1.1564 - accuracy: 0.4924
Epoch 63/200
116/116 [==============================] - 0s 704us/step - loss: 1.1307 - accuracy: 0.4854
Epoch 64/200
116/116 [==============================] - 0s 739us/step - loss: 1.1410 - accuracy: 0.4849
Epoch 65/200
116/116 [==============================] - 0s 722us/step - loss: 1.2235 - accuracy: 0.4684
Epoch 66/200
116/116 [==============================] - 0s 713us/step - loss: 1.1821 - accuracy: 0.4808
Epoch 67/200
116/116 [==============================] - 0s 704us/step - loss: 1.1511 - accuracy: 0.4770
Epoch 68/200
116/116 [==============================] - 0s 731us/step - loss: 1.1687 - accuracy: 0.4819
Epoch 69/200
116/116 [==============================] - 0s 722us/step - loss: 1.1677 - accuracy: 0.4862
Epoch 70/200
116/116 [==============================] - 0s 730us/step - loss: 1.1461 - accuracy: 0.4876
Epoch 71/200
116/116 [==============================] - 0s 722us/step - loss: 1.1374 - accuracy: 0.4851
Epoch 72/200
116/116 [==============================] - 0s 730us/step - loss: 1.1330 - accuracy: 0.4860
Epoch 73/200
```

```
116/116 [==============================] - 0s 730us/step - loss: 1.1304 - accuracy: 0.4884
Epoch 74/200
116/116 [==============================] - 0s 713us/step - loss: 1.1275 - accuracy: 0.4824
Epoch 75/200
116/116 [==============================] - 0s 722us/step - loss: 1.1305 - accuracy: 0.4827
Epoch 76/200
116/116 [==============================] - 0s 722us/step - loss: 1.1314 - accuracy: 0.4851
Epoch 77/200
116/116 [==============================] - 0s 730us/step - loss: 1.1311 - accuracy: 0.4849
Epoch 78/200
116/116 [==============================] - 0s 713us/step - loss: 1.1315 - accuracy: 0.4797
Epoch 79/200
116/116 [==============================] - 0s 713us/step - loss: 1.1292 - accuracy: 0.4773
Epoch 80/200
116/116 [==============================] - 0s 713us/step - loss: 1.1257 - accuracy: 0.4849
Epoch 81/200
116/116 [==============================] - 0s 722us/step - loss: 1.1262 - accuracy: 0.4854
Epoch 82/200
116/116 [==============================] - 0s 722us/step - loss: 1.1232 - accuracy: 0.4897
Epoch 83/200
116/116 [==============================] - 0s 722us/step - loss: 1.1305 - accuracy: 0.4881
Epoch 84/200
116/116 [==============================] - 0s 704us/step - loss: 1.1262 - accuracy: 0.4811
Epoch 85/200
116/116 [==============================] - 0s 722us/step - loss: 1.1340 - accuracy: 0.4865
Epoch 86/200
116/116 [==============================] - 0s 713us/step - loss: 1.1297 - accuracy: 0.4870
Epoch 87/200
116/116 [==============================] - 0s 730us/step - loss: 1.1239 - accuracy: 0.4914
Epoch 88/200
116/116 [==============================] - 0s 722us/step - loss: 1.1332 - accuracy: 0.4878
Epoch 89/200
116/116 [==============================] - 0s 730us/step - loss: 1.1226 - accuracy: 0.4841
Epoch 90/200
116/116 [==============================] - 0s 730us/step - loss: 1.1226 - accuracy: 0.4860
Epoch 91/200
116/116 [==============================] - 0s 730us/step - loss: 1.1319 - accuracy: 0.4862
Epoch 92/200
116/116 [==============================] - 0s 713us/step - loss: 1.1303 - accuracy: 0.4860
Epoch 93/200
116/116 [==============================] - 0s 713us/step - loss: 1.1279 - accuracy: 0.4884
Epoch 94/200
116/116 [==============================] - 0s 722us/step - loss: 1.1246 - accuracy: 0.4833
Epoch 95/200
116/116 [==============================] - 0s 730us/step - loss: 1.1310 - accuracy: 0.4851
Epoch 96/200
116/116 [==============================] - 0s 730us/step - loss: 1.2627 - accuracy: 0.4406
Epoch 97/200
116/116 [==============================] - 0s 722us/step - loss: 1.2260 - accuracy: 0.4571
Epoch 98/200
116/116 [==============================] - 0s 722us/step - loss: 1.2031 - accuracy: 0.4619
Epoch 99/200
116/116 [==============================] - 0s 739us/step - loss: 1.1579 - accuracy: 0.4789
Epoch 100/200
116/116 [==============================] - 0s 722us/step - loss: 1.1396 - accuracy: 0.4865
Epoch 101/200
116/116 [==============================] - 0s 730us/step - loss: 1.1314 - accuracy: 0.4878
Epoch 102/200
116/116 [==============================] - 0s 713us/step - loss: 1.1738 - accuracy: 0.4781
Epoch 103/200
116/116 [==============================] - 0s 713us/step - loss: 1.2679 - accuracy: 0.4279
Epoch 104/200
116/116 [==============================] - 0s 713us/step - loss: 1.2297 - accuracy: 0.4379
Epoch 105/200
116/116 [==============================] - 0s 713us/step - loss: 1.2161 - accuracy: 0.4422
Epoch 106/200
116/116 [==============================] - 0s 739us/step - loss: 1.2066 - accuracy: 0.4435
Epoch 107/200
116/116 [==============================] - 0s 742us/step - loss: 1.1996 - accuracy: 0.4457
Epoch 108/200
116/116 [==============================] - 0s 974us/step - loss: 1.1942 - accuracy: 0.4522
Epoch 109/200
116/116 [==============================] - 0s 739us/step - loss: 1.1893 - accuracy: 0.4535
Epoch 110/200
116/116 [==============================] - 0s 722us/step - loss: 1.1855 - accuracy: 0.4538
Epoch 111/200
```

```
116/116 [==============================] - 0s 713us/step - loss: 1.1757 - accuracy: 0.4616
Epoch 112/200
116/116 [==============================] - 0s 716us/step - loss: 1.1550 - accuracy: 0.4800
Epoch 113/200
116/116 [==============================] - 0s 722us/step - loss: 1.1553 - accuracy: 0.4795
Epoch 114/200
116/116 [==============================] - 0s 713us/step - loss: 1.1456 - accuracy: 0.4895
Epoch 115/200
116/116 [==============================] - 0s 713us/step - loss: 1.1382 - accuracy: 0.4860
Epoch 116/200
116/116 [==============================] - 0s 730us/step - loss: 1.1344 - accuracy: 0.4878
Epoch 117/200
116/116 [==============================] - 0s 720us/step - loss: 1.1326 - accuracy: 0.4870
Epoch 118/200
116/116 [==============================] - 0s 722us/step - loss: 1.1327 - accuracy: 0.4846
Epoch 119/200
116/116 [==============================] - 0s 730us/step - loss: 1.1330 - accuracy: 0.4833
Epoch 120/200
116/116 [==============================] - 0s 730us/step - loss: 1.1300 - accuracy: 0.4841
Epoch 121/200
116/116 [==============================] - 0s 722us/step - loss: 1.1354 - accuracy: 0.4868
Epoch 122/200
116/116 [==============================] - 0s 730us/step - loss: 1.1311 - accuracy: 0.4878
Epoch 123/200
116/116 [==============================] - 0s 722us/step - loss: 1.1304 - accuracy: 0.4862
Epoch 124/200
116/116 [==============================] - 0s 757us/step - loss: 1.1319 - accuracy: 0.4819
Epoch 125/200
116/116 [==============================] - 0s 730us/step - loss: 1.1425 - accuracy: 0.4835
Epoch 126/200
116/116 [==============================] - 0s 722us/step - loss: 1.1301 - accuracy: 0.4846
Epoch 127/200
116/116 [==============================] - 0s 722us/step - loss: 1.1318 - accuracy: 0.4843
Epoch 128/200
116/116 [==============================] - 0s 748us/step - loss: 1.1242 - accuracy: 0.4827
Epoch 129/200
116/116 [==============================] - 0s 800us/step - loss: 1.1259 - accuracy: 0.4862
Epoch 130/200
116/116 [==============================] - 0s 791us/step - loss: 1.1255 - accuracy: 0.4884
Epoch 131/200
116/116 [==============================] - 0s 730us/step - loss: 1.1230 - accuracy: 0.4878
Epoch 132/200
116/116 [==============================] - 0s 730us/step - loss: 1.1237 - accuracy: 0.4895
Epoch 133/200
116/116 [==============================] - 0s 730us/step - loss: 1.1232 - accuracy: 0.4884
Epoch 134/200
116/116 [==============================] - 0s 800us/step - loss: 1.1254 - accuracy: 0.4851
Epoch 135/200
116/116 [==============================] - 0s 817us/step - loss: 1.1233 - accuracy: 0.4841
Epoch 136/200
116/116 [==============================] - 0s 722us/step - loss: 1.1286 - accuracy: 0.4868
Epoch 137/200
116/116 [==============================] - 0s 730us/step - loss: 1.1219 - accuracy: 0.4908
Epoch 138/200
116/116 [==============================] - 0s 800us/step - loss: 1.1438 - accuracy: 0.4889
Epoch 139/200
116/116 [==============================] - 0s 822us/step - loss: 1.1686 - accuracy: 0.4784
Epoch 140/200
116/116 [==============================] - 0s 782us/step - loss: 1.1451 - accuracy: 0.4854
Epoch 141/200
116/116 [==============================] - 0s 739us/step - loss: 1.1238 - accuracy: 0.4881
Epoch 142/200
116/116 [==============================] - 0s 800us/step - loss: 1.1265 - accuracy: 0.4846
Epoch 143/200
116/116 [==============================] - 0s 1000us/step - loss: 1.1279 - accuracy: 0.4868
Epoch 144/200
116/116 [==============================] - 0s 730us/step - loss: 1.1226 - accuracy: 0.4892
Epoch 145/200
116/116 [==============================] - 0s 730us/step - loss: 1.1244 - accuracy: 0.4849
Epoch 146/200
116/116 [==============================] - 0s 791us/step - loss: 1.1238 - accuracy: 0.4849
Epoch 147/200
116/116 [==============================] - 0s 765us/step - loss: 1.1252 - accuracy: 0.4865
Epoch 148/200
116/116 [==============================] - 0s 707us/step - loss: 1.1358 - accuracy: 0.4838
Epoch 149/200
```

```
116/116 [==============================] - 0s 730us/step - loss: 1.1228 - accuracy: 0.4908
Epoch 150/200
116/116 [==============================] - 0s 783us/step - loss: 1.1222 - accuracy: 0.4905
Epoch 151/200
116/116 [==============================] - 0s 791us/step - loss: 1.1211 - accuracy: 0.4900
Epoch 152/200
116/116 [==============================] - 0s 732us/step - loss: 1.1233 - accuracy: 0.4846
Epoch 153/200
116/116 [==============================] - 0s 739us/step - loss: 1.1224 - accuracy: 0.4849
Epoch 154/200
116/116 [==============================] - 0s 735us/step - loss: 1.1201 - accuracy: 0.4892
Epoch 155/200
116/116 [==============================] - 0s 739us/step - loss: 1.1279 - accuracy: 0.4878
Epoch 156/200
116/116 [==============================] - 0s 722us/step - loss: 1.1294 - accuracy: 0.4862
Epoch 157/200
116/116 [==============================] - 0s 748us/step - loss: 1.1219 - accuracy: 0.4868
Epoch 158/200
116/116 [==============================] - 0s 739us/step - loss: 1.1213 - accuracy: 0.4889
Epoch 159/200
116/116 [==============================] - 0s 713us/step - loss: 1.1206 - accuracy: 0.4841
Epoch 160/200
116/116 [==============================] - 0s 730us/step - loss: 1.1226 - accuracy: 0.4824
Epoch 161/200
116/116 [==============================] - 0s 713us/step - loss: 1.1271 - accuracy: 0.4862
Epoch 162/200
116/116 [==============================] - 0s 722us/step - loss: 1.1277 - accuracy: 0.4862
Epoch 163/200
116/116 [==============================] - 0s 751us/step - loss: 1.1297 - accuracy: 0.4873
Epoch 164/200
116/116 [==============================] - 0s 791us/step - loss: 1.1265 - accuracy: 0.4784
Epoch 165/200
116/116 [==============================] - 0s 800us/step - loss: 1.1255 - accuracy: 0.4876
Epoch 166/200
116/116 [==============================] - 0s 774us/step - loss: 1.1239 - accuracy: 0.4870
Epoch 167/200
116/116 [==============================] - 0s 739us/step - loss: 1.1195 - accuracy: 0.4919
Epoch 168/200
116/116 [==============================] - 0s 713us/step - loss: 1.1232 - accuracy: 0.4862
Epoch 169/200
116/116 [==============================] - 0s 730us/step - loss: 1.1216 - accuracy: 0.4838
Epoch 170/200
116/116 [==============================] - 0s 722us/step - loss: 1.1236 - accuracy: 0.4846
Epoch 171/200
116/116 [==============================] - 0s 722us/step - loss: 1.1235 - accuracy: 0.4878
Epoch 172/200
116/116 [==============================] - 0s 730us/step - loss: 1.1300 - accuracy: 0.4908
Epoch 173/200
116/116 [==============================] - 0s 730us/step - loss: 1.1183 - accuracy: 0.4849
Epoch 174/200
116/116 [==============================] - 0s 722us/step - loss: 1.1180 - accuracy: 0.4849
Epoch 175/200
116/116 [==============================] - 0s 713us/step - loss: 1.1218 - accuracy: 0.4835
Epoch 176/200
116/116 [==============================] - 0s 722us/step - loss: 1.1169 - accuracy: 0.4835
Epoch 177/200
116/116 [==============================] - 0s 713us/step - loss: 1.1197 - accuracy: 0.4838
Epoch 178/200
116/116 [==============================] - 0s 713us/step - loss: 1.1177 - accuracy: 0.4870
Epoch 179/200
116/116 [==============================] - 0s 722us/step - loss: 1.1323 - accuracy: 0.4876
Epoch 180/200
116/116 [==============================] - 0s 722us/step - loss: 1.1307 - accuracy: 0.4870
Epoch 181/200
116/116 [==============================] - 0s 965us/step - loss: 1.1383 - accuracy: 0.4803
Epoch 182/200
116/116 [==============================] - 0s 730us/step - loss: 1.1239 - accuracy: 0.4800
Epoch 183/200
116/116 [==============================] - 0s 722us/step - loss: 1.1251 - accuracy: 0.4865
Epoch 184/200
116/116 [==============================] - 0s 739us/step - loss: 1.1226 - accuracy: 0.4843
Epoch 185/200
116/116 [==============================] - 0s 774us/step - loss: 1.1256 - accuracy: 0.4835
Epoch 186/200
116/116 [==============================] - 0s 783us/step - loss: 1.1219 - accuracy: 0.4841
Epoch 187/200
```

```
116/116 [==============================] - 0s 774us/step - loss: 1.1202 - accuracy: 0.4895
Epoch 188/200
116/116 [==============================] - 0s 713us/step - loss: 1.1304 - accuracy: 0.4827
Epoch 189/200
116/116 [==============================] - 0s 704us/step - loss: 1.1233 - accuracy: 0.4843
Epoch 190/200
116/116 [==============================] - 0s 757us/step - loss: 1.1188 - accuracy: 0.4876
Epoch 191/200
116/116 [==============================] - 0s 748us/step - loss: 1.1293 - accuracy: 0.4922
Epoch 192/200
116/116 [==============================] - 0s 843us/step - loss: 1.1280 - accuracy: 0.4870
Epoch 193/200
116/116 [==============================] - 0s 765us/step - loss: 1.1212 - accuracy: 0.4889
Epoch 194/200
116/116 [==============================] - 0s 713us/step - loss: 1.1194 - accuracy: 0.4860
Epoch 195/200
116/116 [==============================] - 0s 713us/step - loss: 1.1188 - accuracy: 0.4854
Epoch 196/200
116/116 [==============================] - 0s 722us/step - loss: 1.1231 - accuracy: 0.4833
Epoch 197/200
116/116 [==============================] - 0s 713us/step - loss: 1.1334 - accuracy: 0.4811
Epoch 198/200
116/116 [==============================] - 0s 713us/step - loss: 1.1251 - accuracy: 0.4857
Epoch 199/200
116/116 [==============================] - 0s 704us/step - loss: 1.1231 - accuracy: 0.4854
Epoch 200/200
116/116 [==============================] - 0s 704us/step - loss: 1.1208 - accuracy: 0.4881
```

In [14]:

```python
# Evaluate the model using the test data
model_loss, model_accuracy = nn.evaluate(X_test_scaled,y_test,verbose=2)
print(f"Loss: {model_loss*100:.2f}%, Accuracy: {model_accuracy*100:.2f}%")
```

```
39/39 - 0s - loss: 7.1363 - accuracy: 0.1830 - 85ms/epoch - 2ms/step
Loss: 713.63%, Accuracy: 18.30%
```

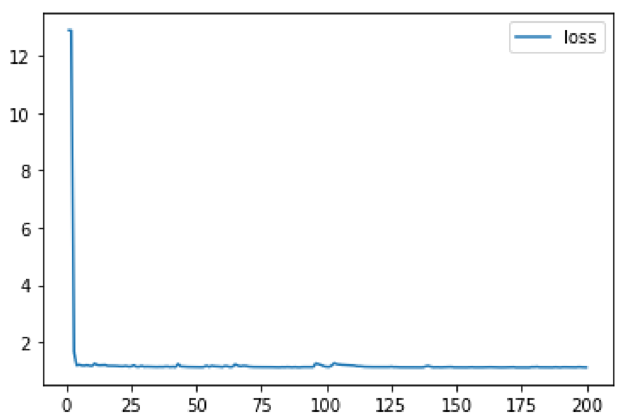
In [15]:

```python
# Create a DataFrame containing training history
history_df = pd.DataFrame(fit_model.history, index=range(1,len(fit_model.history["loss"])+1))

# Plot the loss
history_df.plot(y="loss")
```

Out[15]:

```
<AxesSubplot:>
```

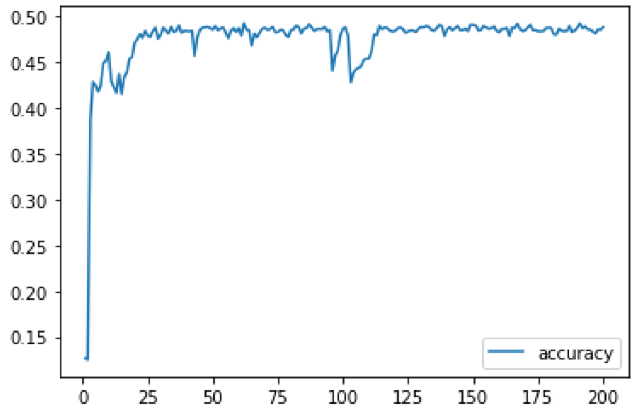


In [16]:

```python
# Plot the accuracy
history_df.plot(y="accuracy")
```

Out[16]:

```
<AxesSubplot:>
```



0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
accuracy
0
25
50
75
100
125
150
175
200

In [ ]: