In [ ]:
```
# 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('../neural-network/pitcher_salaries_cleaned.csv')
df.head()
```

In [ ]:
```
# create log transformed column for salary
df['sal-log']=np.log10(df['Salary'])
df
```

Reduce down to top features

In [ ]:
```
df= df.drop(["Full Name","Team","League","Age","Earned Runs","Home Runs","Wins","Losses","Weight","Height
df.head()
```

Split Features/Target & Training/Testing Sets

Split into features and target

- **y variable**: Our target variable, `Salary`
- **X variable**: Our features; just drop `Salary` and `Full Name`

In [ ]:
```
# Split our preprocessed data into our features and target arrays
y = df["sal-log"].values
X = df.drop(["sal-log"],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)
```

Build and Instantiate `StandardScaler` object, then standardize numerical features

In [ ]:
```
# Create a StandardScaler instance
scaler = MinMaxScaler()

# 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)
```

In [ ]:
```
# see if data scaled properly
scaled_data=pd.DataFrame(X_train_scaled)
scaled_data.head()
```

In [ ]:
```
# see if data scaled properly
scaled_y=pd.DataFrame(y_train_scaled)
scaled_y.head()
```

Build Neural Net Framework

In [39]:
```
# Define the model - deep neural net
number_input_features = len(X_train[0])
hidden_nodes_layer1 = 40
hidden_nodes_layer2 = 30
hidden_nodes_layer3 = 20


nn = tf.keras.models.Sequential()

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

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

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

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

# Output layer
nn.add(tf.keras.layers.Dense(units=10, activation="relu"))

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

```
Model: "sequential_6"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_30 (Dense)            (None, 40)                320

 dense_31 (Dense)            (None, 30)                1230

 dense_32 (Dense)            (None, 30)                930

 dense_33 (Dense)            (None, 30)                930

 dense_34 (Dense)            (None, 10)                310

=================================================================
Total params: 3,720
Trainable params: 3,720
Non-trainable params: 0
_________________________________________________________________
```

Compile the Model

In [40]:
```
# Compile the model
nn.compile(loss="mean_squared_error", optimizer="adam", metrics=["accuracy"])
```

Train the model

In [41]:
```
# Train the model
fit_model = nn.fit(X_train,y_train,epochs=200)
```

```
Epoch 1/200
116/116 [==============================] - 1s 2ms/step - loss: 36.6167 - accuracy: 5.4025e-04
```

```
Epoch 2/200
116/116 [==============================] - 0s 1ms/step - loss: 22.6570 - accuracy: 8.1037e-04
Epoch 3/200
116/116 [==============================] - 0s 1ms/step - loss: 14.4083 - accuracy: 0.0038
Epoch 4/200
116/116 [==============================] - 0s 826us/step - loss: 12.8950 - accuracy: 0.0038
Epoch 5/200
116/116 [==============================] - 0s 930us/step - loss: 12.5940 - accuracy: 0.0022
Epoch 6/200
116/116 [==============================] - 0s 878us/step - loss: 12.3615 - accuracy: 0.0030
Epoch 7/200
116/116 [==============================] - 0s 852us/step - loss: 12.1492 - accuracy: 0.0022
Epoch 8/200
116/116 [==============================] - 0s 809us/step - loss: 11.9995 - accuracy: 0.0016
Epoch 9/200
116/116 [==============================] - 0s 957us/step - loss: 11.8459 - accuracy: 0.0022
Epoch 10/200
116/116 [==============================] - 0s 922us/step - loss: 11.7191 - accuracy: 0.0019
Epoch 11/200
116/116 [==============================] - 0s 896us/step - loss: 11.6325 - accuracy: 0.0014
Epoch 12/200
116/116 [==============================] - 0s 930us/step - loss: 11.6320 - accuracy: 0.0022
Epoch 13/200
116/116 [==============================] - 0s 852us/step - loss: 11.6986 - accuracy: 0.0024
Epoch 14/200
116/116 [==============================] - 0s 817us/step - loss: 11.6157 - accuracy: 0.0016
Epoch 15/200
116/116 [==============================] - 0s 826us/step - loss: 11.6546 - accuracy: 0.0014
Epoch 16/200
116/116 [==============================] - 0s 870us/step - loss: 11.5551 - accuracy: 0.0016
Epoch 17/200
116/116 [==============================] - 0s 861us/step - loss: 11.5551 - accuracy: 0.0019
Epoch 18/200
116/116 [==============================] - 0s 930us/step - loss: 11.5160 - accuracy: 0.0022
Epoch 19/200
116/116 [==============================] - 0s 1ms/step - loss: 11.5296 - accuracy: 0.0016
Epoch 20/200
116/116 [==============================] - 0s 843us/step - loss: 11.5458 - accuracy: 0.0032
Epoch 21/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4893 - accuracy: 0.0016
Epoch 22/200
116/116 [==============================] - 0s 1ms/step - loss: 11.5315 - accuracy: 0.0022
Epoch 23/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4964 - accuracy: 0.0022
Epoch 24/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4871 - accuracy: 5.4025e-04
Epoch 25/200
116/116 [==============================] - 0s 861us/step - loss: 11.4945 - accuracy: 0.0022
Epoch 26/200
116/116 [==============================] - 0s 887us/step - loss: 11.4909 - accuracy: 0.0016
Epoch 27/200
116/116 [==============================] - 0s 1ms/step - loss: 11.5022 - accuracy: 0.0014
Epoch 28/200
116/116 [==============================] - 0s 861us/step - loss: 11.4777 - accuracy: 0.0022
Epoch 29/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4723 - accuracy: 0.0022
Epoch 30/200
116/116 [==============================] - 0s 843us/step - loss: 11.4769 - accuracy: 0.0035
Epoch 31/200
116/116 [==============================] - 0s 852us/step - loss: 11.4946 - accuracy: 0.0024
Epoch 32/200
116/116 [==============================] - 0s 870us/step - loss: 11.4806 - accuracy: 0.0014
Epoch 33/200
116/116 [==============================] - 0s 878us/step - loss: 11.4610 - accuracy: 0.0016
Epoch 34/200
116/116 [==============================] - 0s 878us/step - loss: 11.4636 - accuracy: 0.0022
Epoch 35/200
116/116 [==============================] - 0s 922us/step - loss: 11.4842 - accuracy: 0.0022
Epoch 36/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4732 - accuracy: 0.0024
Epoch 37/200
116/116 [==============================] - 0s 878us/step - loss: 11.4434 - accuracy: 0.0014
Epoch 38/200
116/116 [==============================] - 0s 913us/step - loss: 11.4909 - accuracy: 8.1037e-04
Epoch 39/200
116/116 [==============================] - 0s 896us/step - loss: 11.4668 - accuracy: 0.0016
```

```
Epoch 40/200
116/116 [==============================] - 0s 870us/step - loss: 11.4347 - accuracy: 0.0011
Epoch 41/200
116/116 [==============================] - 0s 966us/step - loss: 11.4668 - accuracy: 0.0022
Epoch 42/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4656 - accuracy: 0.0038
Epoch 43/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4535 - accuracy: 0.0019
Epoch 44/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4425 - accuracy: 0.0022
Epoch 45/200
116/116 [==============================] - 0s 2ms/step - loss: 11.4372 - accuracy: 0.0014
Epoch 46/200
116/116 [==============================] - 0s 983us/step - loss: 11.4572 - accuracy: 0.0030
Epoch 47/200
116/116 [==============================] - 0s 870us/step - loss: 11.4142 - accuracy: 0.0027
Epoch 48/200
116/116 [==============================] - 0s 922us/step - loss: 11.4234 - accuracy: 0.0027
Epoch 49/200
116/116 [==============================] - 0s 861us/step - loss: 11.4327 - accuracy: 0.0016
Epoch 50/200
116/116 [==============================] - 0s 896us/step - loss: 11.4298 - accuracy: 8.1037e-04
Epoch 51/200
116/116 [==============================] - 0s 878us/step - loss: 11.4119 - accuracy: 8.1037e-04
Epoch 52/200
116/116 [==============================] - 0s 861us/step - loss: 11.4489 - accuracy: 0.0019
Epoch 53/200
116/116 [==============================] - 0s 949us/step - loss: 11.4233 - accuracy: 0.0016
Epoch 54/200
116/116 [==============================] - 0s 912us/step - loss: 11.4384 - accuracy: 0.0032
Epoch 55/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4153 - accuracy: 0.0030
Epoch 56/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4381 - accuracy: 0.0011
Epoch 57/200
116/116 [==============================] - 0s 2ms/step - loss: 11.4281 - accuracy: 0.0022
Epoch 58/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4579 - accuracy: 0.0027
Epoch 59/200
116/116 [==============================] - 0s 948us/step - loss: 11.4187 - accuracy: 0.0016
Epoch 60/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4269 - accuracy: 0.0011
Epoch 61/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4220 - accuracy: 0.0027
Epoch 62/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4218 - accuracy: 0.0024
Epoch 63/200
116/116 [==============================] - 0s 2ms/step - loss: 11.3981 - accuracy: 0.0030
Epoch 64/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4201 - accuracy: 0.0022
Epoch 65/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4067 - accuracy: 0.0027
Epoch 66/200
116/116 [==============================] - 0s 887us/step - loss: 11.3997 - accuracy: 0.0027
Epoch 67/200
116/116 [==============================] - 0s 1ms/step - loss: 11.4051 - accuracy: 0.0032
Epoch 68/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3957 - accuracy: 0.0014
Epoch 69/200
116/116 [==============================] - 0s 887us/step - loss: 11.4115 - accuracy: 0.0019
Epoch 70/200
116/116 [==============================] - 0s 974us/step - loss: 11.4072 - accuracy: 0.0032
Epoch 71/200
116/116 [==============================] - 0s 870us/step - loss: 11.3988 - accuracy: 0.0027
Epoch 72/200
116/116 [==============================] - 0s 852us/step - loss: 11.4060 - accuracy: 0.0038
Epoch 73/200
116/116 [==============================] - 0s 878us/step - loss: 11.4241 - accuracy: 0.0014
Epoch 74/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3883 - accuracy: 0.0030
Epoch 75/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3989 - accuracy: 0.0027
Epoch 76/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3939 - accuracy: 0.0032
Epoch 77/200
116/116 [==============================] - 0s 922us/step - loss: 11.3994 - accuracy: 0.0035
```

```
Epoch 78/200
116/116 [==============================] - 0s 861us/step - loss: 11.4122 - accuracy: 0.0022
Epoch 79/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3902 - accuracy: 0.0024
Epoch 80/200
116/116 [==============================] - 0s 878us/step - loss: 11.3970 - accuracy: 0.0038
Epoch 81/200
116/116 [==============================] - 0s 861us/step - loss: 11.3891 - accuracy: 0.0019
Epoch 82/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3992 - accuracy: 0.0046
Epoch 83/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3930 - accuracy: 0.0032
Epoch 84/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3970 - accuracy: 0.0043
Epoch 85/200
116/116 [==============================] - 0s 1ms/step - loss: 11.3826 - accuracy: 0.0041
Epoch 86/200
116/116 [==============================] - 0s 870us/step - loss: 11.3849 - accuracy: 0.0049
Epoch 87/200
116/116 [==============================] - 0s 913us/step - loss: 11.3859 - accuracy: 0.0030
Epoch 88/200
116/116 [==============================] - 0s 826us/step - loss: 11.3848 - accuracy: 0.0024
Epoch 89/200
116/116 [==============================] - 0s 870us/step - loss: 11.3764 - accuracy: 0.0016
Epoch 90/200
116/116 [==============================] - 0s 852us/step - loss: 11.3784 - accuracy: 0.0024
Epoch 91/200
116/116 [==============================] - 0s 913us/step - loss: 11.3842 - accuracy: 0.0016
Epoch 92/200
116/116 [==============================] - 0s 878us/step - loss: 11.3853 - accuracy: 0.0035
Epoch 93/200
116/116 [==============================] - 0s 983us/step - loss: 11.3801 - accuracy: 0.0024
Epoch 94/200
116/116 [==============================] - 0s 991us/step - loss: 11.3777 - accuracy: 0.0038
Epoch 95/200
116/116 [==============================] - 0s 965us/step - loss: 11.3985 - accuracy: 0.0019
Epoch 96/200
116/116 [==============================] - 0s 939us/step - loss: 5.1930 - accuracy: 0.0038
Epoch 97/200
116/116 [==============================] - 0s 930us/step - loss: 0.5306 - accuracy: 0.0024
Epoch 98/200
116/116 [==============================] - 0s 887us/step - loss: 0.4501 - accuracy: 0.0011
Epoch 99/200
116/116 [==============================] - 0s 870us/step - loss: 0.4317 - accuracy: 5.4025e-04
Epoch 100/200
116/116 [==============================] - 0s 913us/step - loss: 0.4135 - accuracy: 8.1037e-04
Epoch 101/200
116/116 [==============================] - 0s 1ms/step - loss: 0.4247 - accuracy: 0.0022
Epoch 102/200
116/116 [==============================] - 0s 878us/step - loss: 0.4076 - accuracy: 0.0019
Epoch 103/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3784 - accuracy: 0.0014
Epoch 104/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3780 - accuracy: 8.1037e-04
Epoch 105/200
116/116 [==============================] - 0s 2ms/step - loss: 0.3720 - accuracy: 0.0027
Epoch 106/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3808 - accuracy: 8.1037e-04
Epoch 107/200
116/116 [==============================] - 0s 817us/step - loss: 0.3695 - accuracy: 0.0019
Epoch 108/200
116/116 [==============================] - 0s 913us/step - loss: 0.3697 - accuracy: 0.0027
Epoch 109/200
116/116 [==============================] - 0s 1000us/step - loss: 0.3776 - accuracy: 0.0014
Epoch 110/200
116/116 [==============================] - 0s 922us/step - loss: 0.3691 - accuracy: 0.0027
Epoch 111/200
116/116 [==============================] - 0s 852us/step - loss: 0.3613 - accuracy: 0.0035
Epoch 112/200
116/116 [==============================] - 0s 887us/step - loss: 0.3593 - accuracy: 0.0032
Epoch 113/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3660 - accuracy: 0.0032
Epoch 114/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3641 - accuracy: 0.0030
Epoch 115/200
116/116 [==============================] - 0s 826us/step - loss: 0.3565 - accuracy: 0.0035
```

```
Epoch 116/200
116/116 [==============================] - 0s 878us/step - loss: 0.3586 - accuracy: 0.0032
Epoch 117/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3575 - accuracy: 0.0032
Epoch 118/200
116/116 [==============================] - 0s 852us/step - loss: 0.3694 - accuracy: 0.0022
Epoch 119/200
116/116 [==============================] - 0s 939us/step - loss: 0.3572 - accuracy: 0.0027
Epoch 120/200
116/116 [==============================] - 0s 930us/step - loss: 0.3536 - accuracy: 0.0027
Epoch 121/200
116/116 [==============================] - 0s 852us/step - loss: 0.3546 - accuracy: 0.0027
Epoch 122/200
116/116 [==============================] - 0s 904us/step - loss: 0.3640 - accuracy: 0.0027
Epoch 123/200
116/116 [==============================] - 0s 965us/step - loss: 0.3545 - accuracy: 0.0019
Epoch 124/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3580 - accuracy: 0.0027
Epoch 125/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3620 - accuracy: 0.0019
Epoch 126/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3629 - accuracy: 0.0022
Epoch 127/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3543 - accuracy: 0.0022
Epoch 128/200
116/116 [==============================] - 0s 913us/step - loss: 0.3613 - accuracy: 0.0011
Epoch 129/200
116/116 [==============================] - 0s 878us/step - loss: 0.3556 - accuracy: 0.0027
Epoch 130/200
116/116 [==============================] - 0s 843us/step - loss: 0.3610 - accuracy: 0.0019
Epoch 131/200
116/116 [==============================] - 0s 870us/step - loss: 0.3574 - accuracy: 0.0038
Epoch 132/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3579 - accuracy: 0.0027
Epoch 133/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3501 - accuracy: 0.0043
Epoch 134/200
116/116 [==============================] - 0s 1000us/step - loss: 0.3531 - accuracy: 0.0024
Epoch 135/200
116/116 [==============================] - 0s 870us/step - loss: 0.3508 - accuracy: 0.0032
Epoch 136/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3496 - accuracy: 0.0041
Epoch 137/200
116/116 [==============================] - 0s 965us/step - loss: 0.3638 - accuracy: 0.0032
Epoch 138/200
116/116 [==============================] - 0s 983us/step - loss: 0.3550 - accuracy: 0.0016
Epoch 139/200
116/116 [==============================] - 0s 852us/step - loss: 0.3552 - accuracy: 0.0019
Epoch 140/200
116/116 [==============================] - 0s 852us/step - loss: 0.3599 - accuracy: 0.0022
Epoch 141/200
116/116 [==============================] - 0s 957us/step - loss: 0.3461 - accuracy: 0.0016
Epoch 142/200
116/116 [==============================] - 0s 913us/step - loss: 0.3600 - accuracy: 8.1037e-04
Epoch 143/200
116/116 [==============================] - 0s 965us/step - loss: 0.3516 - accuracy: 0.0027
Epoch 144/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3459 - accuracy: 0.0022
Epoch 145/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3479 - accuracy: 0.0024
Epoch 146/200
116/116 [==============================] - 0s 2ms/step - loss: 0.3480 - accuracy: 0.0035
Epoch 147/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3549 - accuracy: 0.0043
Epoch 148/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3513 - accuracy: 0.0024
Epoch 149/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3489 - accuracy: 0.0022
Epoch 150/200
116/116 [==============================] - 0s 922us/step - loss: 0.3524 - accuracy: 0.0046
Epoch 151/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3479 - accuracy: 0.0027
Epoch 152/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3483 - accuracy: 0.0038
Epoch 153/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3592 - accuracy: 0.0024
```

```
Epoch 154/200
116/116 [==============================] - 0s 930us/step - loss: 0.3546 - accuracy: 0.0016
Epoch 155/200
116/116 [==============================] - 0s 852us/step - loss: 0.3494 - accuracy: 0.0043
Epoch 156/200
116/116 [==============================] - 0s 878us/step - loss: 0.3511 - accuracy: 0.0027
Epoch 157/200
116/116 [==============================] - 0s 896us/step - loss: 0.3520 - accuracy: 0.0016
Epoch 158/200
116/116 [==============================] - 0s 957us/step - loss: 0.3505 - accuracy: 0.0041
Epoch 159/200
116/116 [==============================] - 0s 939us/step - loss: 0.3502 - accuracy: 0.0024
Epoch 160/200
116/116 [==============================] - 0s 817us/step - loss: 0.3463 - accuracy: 0.0024
Epoch 161/200
116/116 [==============================] - 0s 939us/step - loss: 0.3449 - accuracy: 0.0019
Epoch 162/200
116/116 [==============================] - 0s 870us/step - loss: 0.3523 - accuracy: 0.0035
Epoch 163/200
116/116 [==============================] - 0s 913us/step - loss: 0.3486 - accuracy: 0.0027
Epoch 164/200
116/116 [==============================] - 0s 870us/step - loss: 0.3521 - accuracy: 0.0027
Epoch 165/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3503 - accuracy: 0.0027
Epoch 166/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3432 - accuracy: 0.0032
Epoch 167/200
116/116 [==============================] - 0s 2ms/step - loss: 0.3510 - accuracy: 0.0041
Epoch 168/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3526 - accuracy: 0.0030
Epoch 169/200
116/116 [==============================] - 0s 835us/step - loss: 0.3494 - accuracy: 0.0038
Epoch 170/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3467 - accuracy: 0.0046
Epoch 171/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3519 - accuracy: 0.0041
Epoch 172/200
116/116 [==============================] - 0s 878us/step - loss: 0.3512 - accuracy: 0.0043
Epoch 173/200
116/116 [==============================] - 0s 965us/step - loss: 0.3428 - accuracy: 0.0046
Epoch 174/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3490 - accuracy: 0.0046
Epoch 175/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3448 - accuracy: 0.0049
Epoch 176/200
116/116 [==============================] - 0s 965us/step - loss: 0.3503 - accuracy: 0.0038
Epoch 177/200
116/116 [==============================] - 0s 853us/step - loss: 0.3462 - accuracy: 0.0049
Epoch 178/200
116/116 [==============================] - 0s 983us/step - loss: 0.3446 - accuracy: 0.0038
Epoch 179/200
116/116 [==============================] - 0s 887us/step - loss: 0.3513 - accuracy: 0.0038
Epoch 180/200
116/116 [==============================] - 0s 870us/step - loss: 0.3508 - accuracy: 0.0030
Epoch 181/200
116/116 [==============================] - 0s 948us/step - loss: 0.3500 - accuracy: 0.0043
Epoch 182/200
116/116 [==============================] - 0s 991us/step - loss: 0.3508 - accuracy: 0.0046
Epoch 183/200
116/116 [==============================] - 0s 991us/step - loss: 0.3500 - accuracy: 0.0038
Epoch 184/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3439 - accuracy: 0.0054
Epoch 185/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3495 - accuracy: 0.0051
Epoch 186/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3444 - accuracy: 0.0046
Epoch 187/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3495 - accuracy: 0.0027
Epoch 188/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3509 - accuracy: 0.0041
Epoch 189/200
116/116 [==============================] - 0s 896us/step - loss: 0.3512 - accuracy: 0.0043
Epoch 190/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3451 - accuracy: 0.0043
Epoch 191/200
116/116 [==============================] - 0s 983us/step - loss: 0.3468 - accuracy: 0.0032
```

```
Epoch 192/200
116/116 [==============================] - 0s 861us/step - loss: 0.3462 - accuracy: 0.0043
Epoch 193/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3472 - accuracy: 0.0046
Epoch 194/200
116/116 [==============================] - 0s 922us/step - loss: 0.3488 - accuracy: 0.0043
Epoch 195/200
116/116 [==============================] - 0s 922us/step - loss: 0.3468 - accuracy: 0.0049
Epoch 196/200
116/116 [==============================] - 0s 887us/step - loss: 0.3516 - accuracy: 0.0043
Epoch 197/200
116/116 [==============================] - 0s 861us/step - loss: 0.3407 - accuracy: 0.0051
Epoch 198/200
116/116 [==============================] - 0s 930us/step - loss: 0.3470 - accuracy: 0.0043
Epoch 199/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3488 - accuracy: 0.0027
Epoch 200/200
116/116 [==============================] - 0s 1ms/step - loss: 0.3445 - accuracy: 0.0027
```

In [42]:

```
# 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}, Accuracy: {model_accuracy}")
```

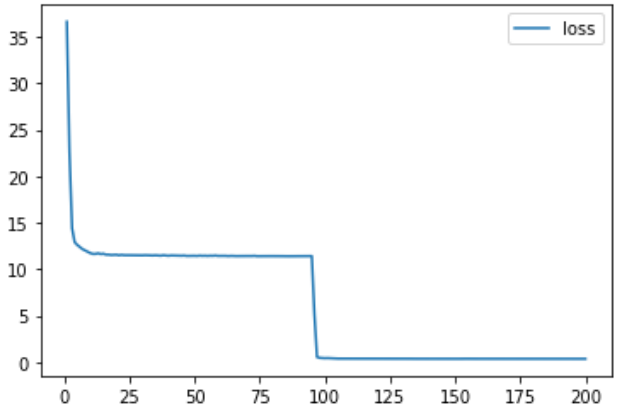
```
39/39 - 0s - loss: 0.6098 - accuracy: 0.0049 - 145ms/epoch - 4ms/step
Loss: 0.6097906231880188, Accuracy: 0.004858299624174833
```

In [43]:

```
# 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")
```

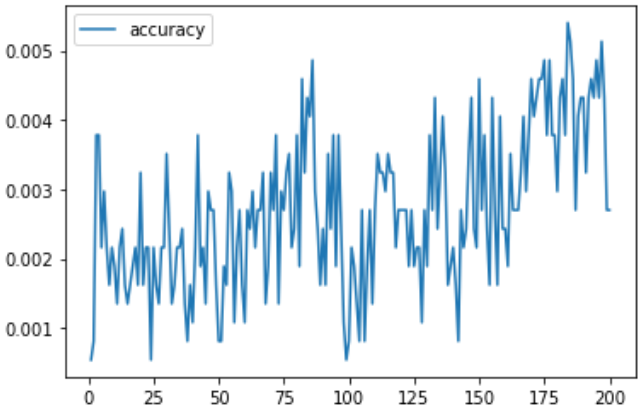
Out[43]: <AxesSubplot:>



In [44]:

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

Out[44]: <AxesSubplot:>


accuracy
0.005
0.004
0.003
0.002
0.001
0
25
50
75
100
125
150
175
200

In [ ]: