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Notebook 2 - Introduction

Workflow Initial MLPRegressor --> MLPRegressor Optimization --> MLPR vs. RFR Comparison--> RFR Baseline WiDS Submission

We have refined our ability to prepare and evaluate models in this notebook. We adopted a data reduction strategy to reduce each parameter's data type to minimize memory load and run times. We will run our MLPRegressor on Google Collab and on my local machine to compare run times to establish more efficient methodology moving forward.

We will optimize a Multi-layer Perceptron Regressor(MLPR or MLPRegressor) as they have shown success in predictive modeling with times-series data. We will compare our scoring metrics from the MLPRegressor to our optimized Random Forest Regressor(RFR) from Notebook 1.

We will make a submission to WiDS Kaggle Submission page to give ourselves a true baseline to improve upon moving forward on this project.

In [1]:
```
#Import python libraries
import numpy as np
import pandas as pd
```

```
import matplotlib.pyplot as plt
import seaborn as sns
from datetime import datetime
from math import sqrt
```

In [2]:

```
#Import scoring metrics
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error
from sklearn.metrics import r2_score
```

In [3]:

```
# Read in clean training set with start date as datetime index
time_training_data =
pd.read_csv('data/time_training_data_clean.csv',
index_col='startdate')
```

In [4]:

```
time_training_data.head()
```

Out[4]:

	index	lat	lon	contest-pevpr-sfc-gauss-14d__pevpr	nmme0-tmp2m-34w__cancm30	nmme0-tmp2m-34w__cancm40	nm tm 34w__cc
startdate							
2014-09-01	0	0.000000	0.833333	237.00	29.02	31.64	
2014-09-01	290938	0.818182	0.633333	323.63	24.18	26.75	
2014-09-01	35819	0.227273	0.900000	385.92	31.16	32.19	
2014-09-01	290207	0.818182	0.600000	303.36	23.34	25.66	
2014-09-01	289476	0.818182	0.566667	319.97	22.50	24.57	

5 rows × 261 columns

In [5]:

```
time_training_data.dtypes
```

Out[5]:
```
index                                      int64
lat                                      float64
lon                                      float64
contest-pevpr-sfc-gauss-14d__pevpr       float64
nmme0-tmp2m-34w__cancm30                 float64
                                          ...
Dsc                                        int64
Dwa                                        int64
Dwb                                        int64
month_number                               int64
season_number                              int64
Length: 261, dtype: object
```

In [6]:
```
#Change index of startdate to date time
time_training_data.index =  pd.to_datetime(time_training_data.index)
```

Data Reduction Function

- We will reduce run times of models using this data reduction function converting all data types to the data type of lowest memory usage.
- Function acquired from my esteemed teammate in the contest Daniel Logan.

In [7]:
```
#Function acquired from Daniel Logan - WiDS teammate
def reduce_mem_usage(df, verbose=True):
    numerics = ['int16', 'int32', 'int64', 'float16', 'float32', 
'float64']
    start_mem = df.memory_usage().sum() / 1024**2
    for col in df.columns:
        col_type = df[col].dtypes
        if col_type in numerics:
            c_min = df[col].min()
            c_max = df[col].max()
            if str(col_type)[:3] == 'int':
                if c_min > np.iinfo(np.int8).min and c_max < 
np.iinfo(np.int8).max:
                    df[col] = df[col].astype(np.int8)
                elif c_min > np.iinfo(np.int16).min and c_max < 
np.iinfo(np.int16).max:
                    df[col] = df[col].astype(np.int16)
                elif c_min > np.iinfo(np.int32).min and c_max < 
np.iinfo(np.int32).max:
                    df[col] = df[col].astype(np.int32)
                elif c_min > np.iinfo(np.int64).min and c_max < 
```

```
np.iinfo(np.int64).max:
                    df[col] = df[col].astype(np.int64)
            else:
                if c_min > np.finfo(np.float32).min and c_max <
np.finfo(np.float32).max:
                    df[col] = df[col].astype(np.float32)
                else:
                    df[col] = df[col].astype(np.float64)
    end_mem = df.memory_usage().sum() / 1024**2
    if verbose: print('Mem. usage decreased to {:5.2f} Mb ({:.1f}%
reduction)'.format(end_mem, 100 * (start_mem - end_mem) /
start_mem))
    return df
```

In [8]:

```
time_training_data = reduce_mem_usage(time_training_data)
```

```
Mem. usage decreased to 355.46 Mb (52.7% reduction)
```

We were able to reduce our data set by 52.7% in memory usage.

Set up X and y

- X - All features but our target
- y - Our target `contest-tmp2m-14d__tmp2m`

In [9]:

```
# Set up independent variables of all columns except target
X = time_training_data.drop(['contest-tmp2m-14d__tmp2m'], axis = 1)
```

In [10]:

```
# Set up array for target data - dependent variable
y = time_training_data['contest-tmp2m-14d__tmp2m']
```

In [11]:

```
# Check
X.shape
```

Out[11]:

```
(375734, 260)
```

In [12]:

```
y.shape
```

Out[12]:

```
(375734,)
```

Time Series Split

- We will run the TimeSeriesSplit to set up our training and test data or really our train and validation data as our real test set will be used for our submission to the WiDS Datathon.
- This TimeSeriesSplit method was used for our train test split for the Random Forest Regressor in the last notebook.

In [13]:
```
from sklearn.model_selection import TimeSeriesSplit
from sklearn.neural_network import MLPRegressor
```

In [63]:
```
for train_idx, test_idx in TimeSeriesSplit(n_splits=5).split(X):
    X_train, X_test = X.iloc[train_idx, :], X.iloc[test_idx,:]
    y_train, y_test = y.iloc[train_idx], y.iloc[test_idx]
```

In [64]:
```
#Check
X_train
```

Out[64]:

	index	lat	lon	contest-pevpr-sfc-gauss-14d__pevpr	nmme0-tmp2m-34w__cancm30	nmme0-tmp2m-34w__cancm40	nm tm 34w__cc
startdate							
2014-09-01	0	0.000000	0.833333	237.000000	29.020000	31.639999	29.57
2014-09-01	290938	0.818182	0.633333	323.630005	24.180000	26.750000	21.09
2014-09-01	35819	0.227273	0.900000	385.920013	31.160000	32.189999	33.25
2014-09-01	290207	0.818182	0.600000	303.359985	23.340000	25.660000	20.45
2014-09-01	289476	0.818182	0.566667	319.970001	22.500000	24.570000	19.67
...	...	...	...	...	...	...	
2016-05-02	285699	0.818182	0.366667	235.639999	3.780000	4.280000	0.08
2016-05-02	49586	0.272727	0.733333	573.750000	16.160000	18.850000	15.1
2016-05-02	306167	0.863636	0.400000	202.020004	3.760000	3.940000	0.68
2016-05-02	34235	0.227273	0.800000	555.150024	18.139999	20.209999	17.32
2016-05-02	107335	0.409091	0.800000	522.510010	15.030000	17.459999	14.50

313112 rows × 260 columns

In [65]:

```
#Visualize test set - Make sure testing data is after training data.
plt.figure()
sns.set(rc={'figure.figsize':(10,7)})
y_train.groupby('startdate').mean().plot(label=' training data')
y_test.groupby('startdate').mean().plot(label = 'test data')
plt.xlabel('Start Date')
plt.ylabel('Target - Mean Temp - contest-tmp2m-14d__tmp2m')
plt.legend()
plt.show()
```

Scaling Training Set and Test Set

- Unlike the Random Forest Regressor model in Notebook 1, we will need to scale our data for the MLPRegressor.
- We will move ahead with a standard scale.
- Scaling was carried out after the train test split or TimeSeriesSplit to prevent data leakage caused by scaling data set together.

In [66]:
```
from sklearn.preprocessing import StandardScaler
```

In [67]:
```
sc_X = StandardScaler()
X_trainscaled=sc_X.fit_transform(X_train)
X_testscaled=sc_X.transform(X_test)
```

In [68]:
```
%%time
#Instantiate
MLPmodel = MLPRegressor(verbose = 1, random_state = 32)
#Fit Model
MLPmodel.fit(X_trainscaled, y_train)
print(MLPmodel)
```

```
Iteration 1, loss = 2.04532533
Iteration 2, loss = 0.39310842
Iteration 3, loss = 0.32106602
Iteration 4, loss = 0.28316622
Iteration 5, loss = 0.26270250
Iteration 6, loss = 0.24549686
Iteration 7, loss = 0.23248149
Iteration 8, loss = 0.22277903
Iteration 9, loss = 0.21456016
Iteration 10, loss = 0.20773738
Iteration 11, loss = 0.20164685
Iteration 12, loss = 0.19679936
Iteration 13, loss = 0.19283130
Iteration 14, loss = 0.18799976
Iteration 15, loss = 0.18445011
Iteration 16, loss = 0.18186433
Iteration 17, loss = 0.17850235
Iteration 18, loss = 0.17571395
Iteration 19, loss = 0.17379656
Iteration 20, loss = 0.17130016
Iteration 21, loss = 0.16885780
Iteration 22, loss = 0.16706870
Iteration 23, loss = 0.16405897
Iteration 24, loss = 0.16283499
Iteration 25, loss = 0.16018233
Iteration 26, loss = 0.15931057
Iteration 27, loss = 0.15841832
Iteration 28, loss = 0.15551032
Iteration 29, loss = 0.15468517
Iteration 30, loss = 0.15318294
Iteration 31, loss = 0.15269531
Iteration 32, loss = 0.15197254
Iteration 33, loss = 0.14954753
Iteration 34, loss = 0.14837674
Iteration 35, loss = 0.14731917
Iteration 36, loss = 0.14575367
Iteration 37, loss = 0.14561427
Iteration 38, loss = 0.14368584
Iteration 39, loss = 0.14389476
Iteration 40, loss = 0.14371448
Iteration 41, loss = 0.14234587
Iteration 42, loss = 0.14110936
Iteration 43, loss = 0.14091141
Iteration 44, loss = 0.14009954
Iteration 45, loss = 0.13934019
Iteration 46, loss = 0.13808868
Iteration 47, loss = 0.13756303
Iteration 48, loss = 0.13727737
Iteration 49, loss = 0.13567177
Iteration 50, loss = 0.13538173
Iteration 51, loss = 0.13558051
Iteration 52, loss = 0.13396142
```

```
Iteration 53, loss = 0.13391056
Iteration 54, loss = 0.13294026
Iteration 55, loss = 0.13290755
Iteration 56, loss = 0.13227418
Iteration 57, loss = 0.13114962
Iteration 58, loss = 0.13103851
Iteration 59, loss = 0.13030266
Iteration 60, loss = 0.12978693
Iteration 61, loss = 0.12898116
Iteration 62, loss = 0.12931209
Iteration 63, loss = 0.12864215
Iteration 64, loss = 0.12793555
Iteration 65, loss = 0.12760359
Iteration 66, loss = 0.12641830
Iteration 67, loss = 0.12601000
Iteration 68, loss = 0.12573410
Iteration 69, loss = 0.12491419
Iteration 70, loss = 0.12536608
Iteration 71, loss = 0.12415244
Iteration 72, loss = 0.12450612
Iteration 73, loss = 0.12508573
Iteration 74, loss = 0.12264054
Iteration 75, loss = 0.12290639
Iteration 76, loss = 0.12248208
Iteration 77, loss = 0.12260181
Iteration 78, loss = 0.12182968
Iteration 79, loss = 0.12076272
Iteration 80, loss = 0.12157737
Iteration 81, loss = 0.12099624
Iteration 82, loss = 0.12104895
Iteration 83, loss = 0.11938014
Iteration 84, loss = 0.12052817
Iteration 85, loss = 0.11964590
Iteration 86, loss = 0.11892760
Iteration 87, loss = 0.11923068
Iteration 88, loss = 0.11852072
Iteration 89, loss = 0.11864776
Iteration 90, loss = 0.11772069
Iteration 91, loss = 0.11760041
Iteration 92, loss = 0.11716669
Iteration 93, loss = 0.11704229
Iteration 94, loss = 0.11621897
Iteration 95, loss = 0.11679520
Iteration 96, loss = 0.11639352
Iteration 97, loss = 0.11534935
Iteration 98, loss = 0.11606756
Iteration 99, loss = 0.11551397
Iteration 100, loss = 0.11484713
Iteration 101, loss = 0.11546663
Iteration 102, loss = 0.11404456
Iteration 103, loss = 0.11389698
Iteration 104, loss = 0.11422433
```

```
Iteration 105, loss = 0.11422343
Iteration 106, loss = 0.11337326
Iteration 107, loss = 0.11346187
Iteration 108, loss = 0.11322951
Iteration 109, loss = 0.11330746
Iteration 110, loss = 0.11237352
Iteration 111, loss = 0.11220486
Iteration 112, loss = 0.11201358
Iteration 113, loss = 0.11255476
Iteration 114, loss = 0.11225842
Iteration 115, loss = 0.11136105
Iteration 116, loss = 0.11168375
Iteration 117, loss = 0.11095250
Iteration 118, loss = 0.11132822
Iteration 119, loss = 0.11062547
Iteration 120, loss = 0.11075992
Iteration 121, loss = 0.11077712
Iteration 122, loss = 0.10984595
Iteration 123, loss = 0.10956232
Iteration 124, loss = 0.11004432
Iteration 125, loss = 0.10941263
Iteration 126, loss = 0.10856401
Iteration 127, loss = 0.10933931
Iteration 128, loss = 0.10910508
Iteration 129, loss = 0.10834796
Iteration 130, loss = 0.10887268
Iteration 131, loss = 0.10831674
Iteration 132, loss = 0.10827360
Iteration 133, loss = 0.10775965
Iteration 134, loss = 0.10770056
Iteration 135, loss = 0.10743483
Iteration 136, loss = 0.10704511
Iteration 137, loss = 0.10738379
Iteration 138, loss = 0.10722922
Iteration 139, loss = 0.10659810
Iteration 140, loss = 0.10730078
Iteration 141, loss = 0.10671529
Iteration 142, loss = 0.10628884
Iteration 143, loss = 0.10565194
Iteration 144, loss = 0.10653304
Iteration 145, loss = 0.10580532
Iteration 146, loss = 0.10610719
Iteration 147, loss = 0.10542191
Iteration 148, loss = 0.10558782
Iteration 149, loss = 0.10556073
Iteration 150, loss = 0.10590409
Iteration 151, loss = 0.10457442
Iteration 152, loss = 0.10574777
Iteration 153, loss = 0.10494768
Iteration 154, loss = 0.10451796
Iteration 155, loss = 0.10465692
Iteration 156, loss = 0.10413120
```

```
Iteration 157, loss = 0.10422073
Iteration 158, loss = 0.10407996
Iteration 159, loss = 0.10337566
Iteration 160, loss = 0.10405418
Iteration 161, loss = 0.10319503
Iteration 162, loss = 0.10332270
Iteration 163, loss = 0.10346247
Iteration 164, loss = 0.10317548
Iteration 165, loss = 0.10297489
Iteration 166, loss = 0.10293467
Iteration 167, loss = 0.10306985
Iteration 168, loss = 0.10251854
Iteration 169, loss = 0.10204389
Iteration 170, loss = 0.10279692
Iteration 171, loss = 0.10255768
Iteration 172, loss = 0.10228901
Iteration 173, loss = 0.10204469
Iteration 174, loss = 0.10235418
Iteration 175, loss = 0.10167121
Iteration 176, loss = 0.10145332
Iteration 177, loss = 0.10192758
Iteration 178, loss = 0.10190777
Iteration 179, loss = 0.10096845
Iteration 180, loss = 0.10095728
Iteration 181, loss = 0.10145210
Iteration 182, loss = 0.10064443
Iteration 183, loss = 0.10080530
Iteration 184, loss = 0.10117985
Iteration 185, loss = 0.10089194
Iteration 186, loss = 0.10006934
Iteration 187, loss = 0.10030082
Iteration 188, loss = 0.09991087
Iteration 189, loss = 0.10075584
Iteration 190, loss = 0.09948067
Iteration 191, loss = 0.09967786
Iteration 192, loss = 0.09988814
Iteration 193, loss = 0.09981245
Iteration 194, loss = 0.09936004
Iteration 195, loss = 0.09971038
Iteration 196, loss = 0.09971689
Iteration 197, loss = 0.09926481
Iteration 198, loss = 0.09923469
Iteration 199, loss = 0.09930714
Iteration 200, loss = 0.09917278
MLPRegressor(random_state=32, verbose=1)
CPU times: user 1h 21min 51s, sys: 3min 21s, total: 1h 25min 13s
Wall time: 15min 41s
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (200) reached and the optimization hasn't converged yet.
  warnings.warn(
```

In [59]:
```
# Get Predictions from MLP Model with scaled training data
pred = MLPmodel.predict(X_testscaled)
```

In [60]:
```
# Gather results in dataframe for visualization of expected vs.
predictions
results_MLP = pd.DataFrame(data = {'Actual':y_test, \
                                   'Predictions':pred},
index=y_test.index)
```

In [61]:
```
results_MLP
```

Out[61]:

startdate	Actual	Predictions
2016-01-01	8.568278	7.288152
2016-01-01	10.872447	10.716764
2016-01-01	-7.024219	-7.287463
2016-01-01	-6.184810	-5.734422
2016-01-01	9.002110	8.020726
...	...	...
2016-08-31	19.772009	12.712725
2016-08-31	19.998930	12.922713
2016-08-31	20.392469	12.926745
2016-08-31	10.406187	6.491517
2016-08-31	15.910995	11.701444

125244 rows × 2 columns

In [62]:
```
# Error Metrics for initial MLP
print('R-squared =
{:.3f}'.format(r2_score(results_MLP['Actual'],results_MLP['Predictions
print('RMSE =
{:.3f}'.format(sqrt(mean_squared_error(results_MLP['Actual'],results_M
```

```
R-squared = 0.851
RMSE = 3.662
```

Initial MLPRegressor Evaluation

Alright we are getting reasonable results when scaling the data. These metrics are not better than our Random Forest Regressor in the last notebook. We will try to optimize the

MLPRegressor with a grid search and hope to get better scoring metrics. Initial MLPRegressor using Google Collab took 31min 43s. With Jupyter Notebooks on my cpu, the run time was 13 min 24s.

Optimized RFR

- R-squared = 0.909
- RMSE = 1.694

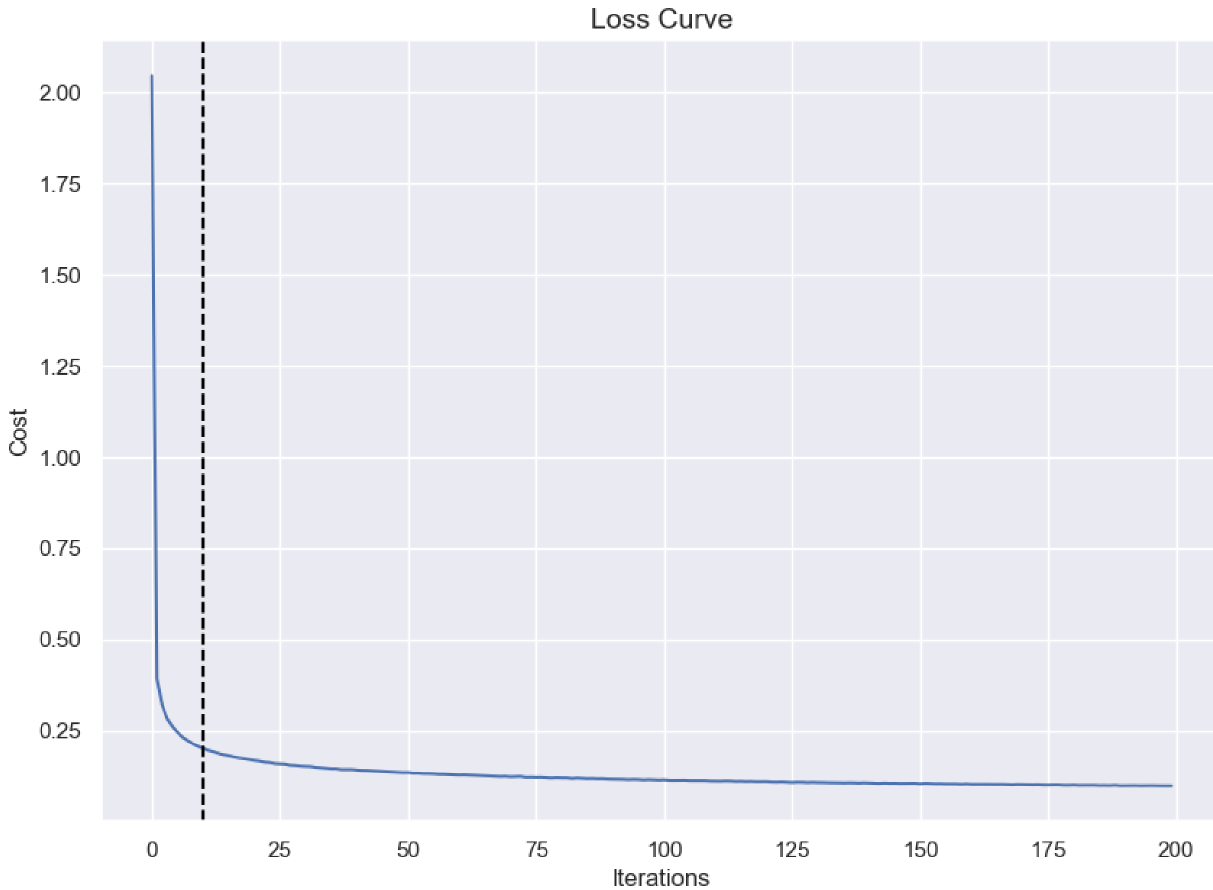
MLPR - Initial attempt -- 5 splits on Times Series split - With smaller test set in May-Aug 2016

- R-squared = 0.828
- RMSE = 2.327

MLPR - Initial attempt -- 2 splits on Times Series split - With larger test set in Jan-

- R-squared = 0.851
- RMSE = 3.662

In [60]:
```
plt.figure()
sns.set(rc={'figure.figsize':(10,7)})
plt.plot(MLPmodel.loss_curve_)
plt.title("Loss Curve", fontsize=14)
plt.xlabel('Iterations')
plt.ylabel('Cost')
plt.axvline(x=10, color = 'black', linestyle = '--')
plt.show()
```



Loss vs. Iteration Analysis

- Ther is a significant reduction in loss within the first 5-10 interations of our MLPRegressor. Then, there is a incremental improvement in loss until iteration 100 where the model loss plateaus more or less.

In [22]:

```
#Set up Grid Search to tune hyper parameters of MLPR
MLPmodel = MLPRegressor(verbose = 1, random_state = 32)

param_grid = {
    'hidden_layer_sizes': [(150,100,50), (120,80,40), (100,50,30)],
    'max_iter': [50, 100],
    'activation': ['tanh', 'relu'],
    'solver': ['sgd', 'adam'],
    'alpha': [0.0001, 0.05],
    'learning_rate': ['constant','adaptive'],
}
```

In [23]:

```
%%time
from sklearn.model_selection import GridSearchCV
```

```
tscv = TimeSeriesSplit(n_splits=2)

MLPgrid = GridSearchCV(MLPmodel, param_grid, cv=tscv)
MLPgrid.fit(X_trainscaled, y_train)
```

```
Iteration 1, loss = 1.83822557
Iteration 2, loss = 0.38234857
Iteration 3, loss = 0.30971924
Iteration 4, loss = 0.27343127
Iteration 5, loss = 0.25038407
Iteration 6, loss = 0.23341592
Iteration 7, loss = 0.22035070
Iteration 8, loss = 0.20983228
Iteration 9, loss = 0.20058795
Iteration 10, loss = 0.19276502
Iteration 11, loss = 0.18529484
Iteration 12, loss = 0.17880647
Iteration 13, loss = 0.17340267
Iteration 14, loss = 0.16801613
Iteration 15, loss = 0.16331782
Iteration 16, loss = 0.15915049
Iteration 17, loss = 0.15488190
Iteration 18, loss = 0.15097114
Iteration 19, loss = 0.14787599
Iteration 20, loss = 0.14459589
Iteration 21, loss = 0.14132549
Iteration 22, loss = 0.13841173
Iteration 23, loss = 0.13531648
Iteration 24, loss = 0.13320000
Iteration 25, loss = 0.13094294
Iteration 26, loss = 0.12820895
Iteration 27, loss = 0.12551969
Iteration 28, loss = 0.12396192
Iteration 29, loss = 0.12183486
Iteration 30, loss = 0.11962543
Iteration 31, loss = 0.11754387
Iteration 32, loss = 0.11554755
Iteration 33, loss = 0.11424073
Iteration 34, loss = 0.11264785
Iteration 35, loss = 0.11058517
Iteration 36, loss = 0.10923633
Iteration 37, loss = 0.10755377
Iteration 38, loss = 0.10610542
Iteration 39, loss = 0.10476968
Iteration 40, loss = 0.10302151
Iteration 41, loss = 0.10202254
Iteration 42, loss = 0.10085443
Iteration 43, loss = 0.09968993
Iteration 44, loss = 0.09824686
Iteration 45, loss = 0.09739712
Iteration 46, loss = 0.09573992
Iteration 47, loss = 0.09492709
Iteration 48, loss = 0.09355740
Iteration 49, loss = 0.09225722
Iteration 50, loss = 0.09181435
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.65712022
Iteration 2, loss = 0.36470407
Iteration 3, loss = 0.30452285
Iteration 4, loss = 0.27045975
Iteration 5, loss = 0.24792828
Iteration 6, loss = 0.23021757
Iteration 7, loss = 0.21649479
Iteration 8, loss = 0.20523018
Iteration 9, loss = 0.19564704
Iteration 10, loss = 0.18757568
Iteration 11, loss = 0.18024403
Iteration 12, loss = 0.17386408
Iteration 13, loss = 0.16794808
Iteration 14, loss = 0.16240636
Iteration 15, loss = 0.15726358
Iteration 16, loss = 0.15280309
Iteration 17, loss = 0.14839971
Iteration 18, loss = 0.14455465
Iteration 19, loss = 0.14062162
Iteration 20, loss = 0.13757709
Iteration 21, loss = 0.13383076
Iteration 22, loss = 0.13083802
Iteration 23, loss = 0.12800712
Iteration 24, loss = 0.12513527
Iteration 25, loss = 0.12258032
Iteration 26, loss = 0.12028404
Iteration 27, loss = 0.11771438
Iteration 28, loss = 0.11552761
Iteration 29, loss = 0.11361252
Iteration 30, loss = 0.11143448
Iteration 31, loss = 0.10959984
Iteration 32, loss = 0.10768833
Iteration 33, loss = 0.10590289
Iteration 34, loss = 0.10415888
Iteration 35, loss = 0.10254619
Iteration 36, loss = 0.10066156
Iteration 37, loss = 0.09931004
Iteration 38, loss = 0.09791917
Iteration 39, loss = 0.09674749
Iteration 40, loss = 0.09520389
Iteration 41, loss = 0.09375280
Iteration 42, loss = 0.09267459
Iteration 43, loss = 0.09128617
Iteration 44, loss = 0.09020865
Iteration 45, loss = 0.08897570
Iteration 46, loss = 0.08786659
Iteration 47, loss = 0.08647433
Iteration 48, loss = 0.08562313
Iteration 49, loss = 0.08455831
Iteration 50, loss = 0.08370582
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.21784197
Iteration 2, loss = 0.53670990
Iteration 3, loss = 0.32140394
Iteration 4, loss = 0.24923310
Iteration 5, loss = 0.21409960
Iteration 6, loss = 0.19272404
Iteration 7, loss = 0.17377965
Iteration 8, loss = 0.16108912
Iteration 9, loss = 0.14856481
Iteration 10, loss = 0.14043594
Iteration 11, loss = 0.13118614
Iteration 12, loss = 0.12484687
Iteration 13, loss = 0.12000148
Iteration 14, loss = 0.10961677
Iteration 15, loss = 0.10642682
Iteration 16, loss = 0.10027691
Iteration 17, loss = 0.09821414
Iteration 18, loss = 0.09437600
Iteration 19, loss = 0.08920445
Iteration 20, loss = 0.08814140
Iteration 21, loss = 0.08420526
Iteration 22, loss = 0.08112398
Iteration 23, loss = 0.07370692
Iteration 24, loss = 0.07508614
Iteration 25, loss = 0.07178792
Iteration 26, loss = 0.07041007
Iteration 27, loss = 0.06694692
Iteration 28, loss = 0.06332870
Iteration 29, loss = 0.06449757
Iteration 30, loss = 0.06254968
Iteration 31, loss = 0.06126823
Iteration 32, loss = 0.05866844
Iteration 33, loss = 0.05791683
Iteration 34, loss = 0.05525904
Iteration 35, loss = 0.05598644
Iteration 36, loss = 0.05436686
Iteration 37, loss = 0.05344361
Iteration 38, loss = 0.05175846
Iteration 39, loss = 0.05144433
Iteration 40, loss = 0.04878767
Iteration 41, loss = 0.04998921
Iteration 42, loss = 0.04934702
Iteration 43, loss = 0.04675970
Iteration 44, loss = 0.04623638
Iteration 45, loss = 0.04540511
Iteration 46, loss = 0.04636908
Iteration 47, loss = 0.04470001
Iteration 48, loss = 0.04279676
Iteration 49, loss = 0.04237063
Iteration 50, loss = 0.04190273
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.93073650
Iteration 2, loss = 0.45599182
Iteration 3, loss = 0.28886073
Iteration 4, loss = 0.22973905
Iteration 5, loss = 0.19478623
Iteration 6, loss = 0.17448536
Iteration 7, loss = 0.15844713
Iteration 8, loss = 0.14315497
Iteration 9, loss = 0.13503007
Iteration 10, loss = 0.12304589
Iteration 11, loss = 0.11667796
Iteration 12, loss = 0.10967141
Iteration 13, loss = 0.10258564
Iteration 14, loss = 0.09769300
Iteration 15, loss = 0.09387318
Iteration 16, loss = 0.08959938
Iteration 17, loss = 0.08463124
Iteration 18, loss = 0.08304690
Iteration 19, loss = 0.07924504
Iteration 20, loss = 0.07711107
Iteration 21, loss = 0.07460753
Iteration 22, loss = 0.07239511
Iteration 23, loss = 0.07043923
Iteration 24, loss = 0.06871954
Iteration 25, loss = 0.06685495
Iteration 26, loss = 0.06475883
Iteration 27, loss = 0.06324273
Iteration 28, loss = 0.06316966
Iteration 29, loss = 0.06188568
Iteration 30, loss = 0.05996672
Iteration 31, loss = 0.05889611
Iteration 32, loss = 0.05794866
Iteration 33, loss = 0.05731312
Iteration 34, loss = 0.05648661
Iteration 35, loss = 0.05503090
Iteration 36, loss = 0.05465997
Iteration 37, loss = 0.05417951
Iteration 38, loss = 0.05296242
Iteration 39, loss = 0.05238155
Iteration 40, loss = 0.05072246
Iteration 41, loss = 0.05115623
Iteration 42, loss = 0.05118778
Iteration 43, loss = 0.04995347
Iteration 44, loss = 0.04930629
Iteration 45, loss = 0.04861428
Iteration 46, loss = 0.04849660
Iteration 47, loss = 0.04801227
Iteration 48, loss = 0.04749235
Iteration 49, loss = 0.04736662
Iteration 50, loss = 0.04729974
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83822557
Iteration 2, loss = 0.38234857
Iteration 3, loss = 0.30971924
Iteration 4, loss = 0.27343127
Iteration 5, loss = 0.25038407
Iteration 6, loss = 0.23341592
Iteration 7, loss = 0.22035070
Iteration 8, loss = 0.20983228
Iteration 9, loss = 0.20058795
Iteration 10, loss = 0.19276502
Iteration 11, loss = 0.18529484
Iteration 12, loss = 0.17880647
Iteration 13, loss = 0.17340267
Iteration 14, loss = 0.16801613
Iteration 15, loss = 0.16331782
Iteration 16, loss = 0.15915049
Iteration 17, loss = 0.15488190
Iteration 18, loss = 0.15097114
Iteration 19, loss = 0.14787599
Iteration 20, loss = 0.14459589
Iteration 21, loss = 0.14132549
Iteration 22, loss = 0.13841173
Iteration 23, loss = 0.13531648
Iteration 24, loss = 0.13320000
Iteration 25, loss = 0.13094294
Iteration 26, loss = 0.12820895
Iteration 27, loss = 0.12551969
Iteration 28, loss = 0.12396192
Iteration 29, loss = 0.12183486
Iteration 30, loss = 0.11962543
Iteration 31, loss = 0.11754387
Iteration 32, loss = 0.11554755
Iteration 33, loss = 0.11424073
Iteration 34, loss = 0.11264785
Iteration 35, loss = 0.11058517
Iteration 36, loss = 0.10923633
Iteration 37, loss = 0.10755377
Iteration 38, loss = 0.10610542
Iteration 39, loss = 0.10476968
Iteration 40, loss = 0.10302151
Iteration 41, loss = 0.10202254
Iteration 42, loss = 0.10085443
Iteration 43, loss = 0.09968993
Iteration 44, loss = 0.09824686
Iteration 45, loss = 0.09739712
Iteration 46, loss = 0.09573992
Iteration 47, loss = 0.09492709
Iteration 48, loss = 0.09355740
Iteration 49, loss = 0.09225722
Iteration 50, loss = 0.09181435
Iteration 51, loss = 0.09047010
Iteration 52, loss = 0.08923998
```

```
Iteration 53, loss = 0.08821661
Iteration 54, loss = 0.08773129
Iteration 55, loss = 0.08641263
Iteration 56, loss = 0.08573619
Iteration 57, loss = 0.08470687
Iteration 58, loss = 0.08372630
Iteration 59, loss = 0.08312695
Iteration 60, loss = 0.08211104
Iteration 61, loss = 0.08155190
Iteration 62, loss = 0.08029304
Iteration 63, loss = 0.07982679
Iteration 64, loss = 0.07876493
Iteration 65, loss = 0.07846036
Iteration 66, loss = 0.07739047
Iteration 67, loss = 0.07678083
Iteration 68, loss = 0.07623083
Iteration 69, loss = 0.07503030
Iteration 70, loss = 0.07440585
Iteration 71, loss = 0.07386585
Iteration 72, loss = 0.07358405
Iteration 73, loss = 0.07248806
Iteration 74, loss = 0.07205310
Iteration 75, loss = 0.07154757
Iteration 76, loss = 0.07093833
Iteration 77, loss = 0.07030462
Iteration 78, loss = 0.06955646
Iteration 79, loss = 0.06912011
Iteration 80, loss = 0.06865550
Iteration 81, loss = 0.06778793
Iteration 82, loss = 0.06747679
Iteration 83, loss = 0.06697107
Iteration 84, loss = 0.06634605
Iteration 85, loss = 0.06566812
Iteration 86, loss = 0.06548995
Iteration 87, loss = 0.06506505
Iteration 88, loss = 0.06433298
Iteration 89, loss = 0.06381786
Iteration 90, loss = 0.06365799
Iteration 91, loss = 0.06296674
Iteration 92, loss = 0.06266930
Iteration 93, loss = 0.06173849
Iteration 94, loss = 0.06133975
Iteration 95, loss = 0.06109433
Iteration 96, loss = 0.06065245
Iteration 97, loss = 0.06038128
Iteration 98, loss = 0.05989850
Iteration 99, loss = 0.05964058
Iteration 100, loss = 0.05913823
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.65712022
Iteration 2, loss = 0.36470407
Iteration 3, loss = 0.30452285
Iteration 4, loss = 0.27045975
Iteration 5, loss = 0.24792828
Iteration 6, loss = 0.23021757
Iteration 7, loss = 0.21649479
Iteration 8, loss = 0.20523018
Iteration 9, loss = 0.19564704
Iteration 10, loss = 0.18757568
Iteration 11, loss = 0.18024403
Iteration 12, loss = 0.17386408
Iteration 13, loss = 0.16794808
Iteration 14, loss = 0.16240636
Iteration 15, loss = 0.15726358
Iteration 16, loss = 0.15280309
Iteration 17, loss = 0.14839971
Iteration 18, loss = 0.14455465
Iteration 19, loss = 0.14062162
Iteration 20, loss = 0.13757709
Iteration 21, loss = 0.13383076
Iteration 22, loss = 0.13083802
Iteration 23, loss = 0.12800712
Iteration 24, loss = 0.12513527
Iteration 25, loss = 0.12258032
Iteration 26, loss = 0.12028404
Iteration 27, loss = 0.11771438
Iteration 28, loss = 0.11552761
Iteration 29, loss = 0.11361252
Iteration 30, loss = 0.11143448
Iteration 31, loss = 0.10959984
Iteration 32, loss = 0.10768833
Iteration 33, loss = 0.10590289
Iteration 34, loss = 0.10415888
Iteration 35, loss = 0.10254619
Iteration 36, loss = 0.10066156
Iteration 37, loss = 0.09931004
Iteration 38, loss = 0.09791917
Iteration 39, loss = 0.09674749
Iteration 40, loss = 0.09520389
Iteration 41, loss = 0.09375280
Iteration 42, loss = 0.09267459
Iteration 43, loss = 0.09128617
Iteration 44, loss = 0.09020865
Iteration 45, loss = 0.08897570
Iteration 46, loss = 0.08786659
Iteration 47, loss = 0.08647433
Iteration 48, loss = 0.08562313
Iteration 49, loss = 0.08455831
Iteration 50, loss = 0.08370582
Iteration 51, loss = 0.08247239
Iteration 52, loss = 0.08148918
```

```
Iteration 53, loss = 0.08066848
Iteration 54, loss = 0.07976093
Iteration 55, loss = 0.07865382
Iteration 56, loss = 0.07766458
Iteration 57, loss = 0.07691845
Iteration 58, loss = 0.07615315
Iteration 59, loss = 0.07526252
Iteration 60, loss = 0.07445427
Iteration 61, loss = 0.07348881
Iteration 62, loss = 0.07275106
Iteration 63, loss = 0.07231305
Iteration 64, loss = 0.07161840
Iteration 65, loss = 0.07075000
Iteration 66, loss = 0.06994220
Iteration 67, loss = 0.06914766
Iteration 68, loss = 0.06856677
Iteration 69, loss = 0.06794785
Iteration 70, loss = 0.06730142
Iteration 71, loss = 0.06669523
Iteration 72, loss = 0.06584151
Iteration 73, loss = 0.06546310
Iteration 74, loss = 0.06453528
Iteration 75, loss = 0.06415886
Iteration 76, loss = 0.06370039
Iteration 77, loss = 0.06303240
Iteration 78, loss = 0.06258360
Iteration 79, loss = 0.06181517
Iteration 80, loss = 0.06144831
Iteration 81, loss = 0.06083240
Iteration 82, loss = 0.06023351
Iteration 83, loss = 0.05983862
Iteration 84, loss = 0.05926417
Iteration 85, loss = 0.05884915
Iteration 86, loss = 0.05837806
Iteration 87, loss = 0.05793672
Iteration 88, loss = 0.05745207
Iteration 89, loss = 0.05698165
Iteration 90, loss = 0.05657595
Iteration 91, loss = 0.05608066
Iteration 92, loss = 0.05556825
Iteration 93, loss = 0.05528933
Iteration 94, loss = 0.05487669
Iteration 95, loss = 0.05434653
Iteration 96, loss = 0.05406523
Iteration 97, loss = 0.05369502
Iteration 98, loss = 0.05327614
Iteration 99, loss = 0.05296385
Iteration 100, loss = 0.05259946
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.21784197
Iteration 2, loss = 0.53670990
Iteration 3, loss = 0.32140394
Iteration 4, loss = 0.24923310
Iteration 5, loss = 0.21409960
Iteration 6, loss = 0.19272404
Iteration 7, loss = 0.17377965
Iteration 8, loss = 0.16108912
Iteration 9, loss = 0.14856481
Iteration 10, loss = 0.14043594
Iteration 11, loss = 0.13118614
Iteration 12, loss = 0.12484687
Iteration 13, loss = 0.12000148
Iteration 14, loss = 0.10961677
Iteration 15, loss = 0.10642682
Iteration 16, loss = 0.10027691
Iteration 17, loss = 0.09821414
Iteration 18, loss = 0.09437600
Iteration 19, loss = 0.08920445
Iteration 20, loss = 0.08814140
Iteration 21, loss = 0.08420526
Iteration 22, loss = 0.08112398
Iteration 23, loss = 0.07370692
Iteration 24, loss = 0.07508614
Iteration 25, loss = 0.07178792
Iteration 26, loss = 0.07041007
Iteration 27, loss = 0.06694692
Iteration 28, loss = 0.06332870
Iteration 29, loss = 0.06449757
Iteration 30, loss = 0.06254968
Iteration 31, loss = 0.06126823
Iteration 32, loss = 0.05866844
Iteration 33, loss = 0.05791683
Iteration 34, loss = 0.05525904
Iteration 35, loss = 0.05598644
Iteration 36, loss = 0.05436686
Iteration 37, loss = 0.05344361
Iteration 38, loss = 0.05175846
Iteration 39, loss = 0.05144433
Iteration 40, loss = 0.04878767
Iteration 41, loss = 0.04998921
Iteration 42, loss = 0.04934702
Iteration 43, loss = 0.04675970
Iteration 44, loss = 0.04623638
Iteration 45, loss = 0.04540511
Iteration 46, loss = 0.04636908
Iteration 47, loss = 0.04470001
Iteration 48, loss = 0.04279676
Iteration 49, loss = 0.04237063
Iteration 50, loss = 0.04190273
Iteration 51, loss = 0.04154682
Iteration 52, loss = 0.04241054
```

```
Iteration 53, loss = 0.04089767
Iteration 54, loss = 0.04024670
Iteration 55, loss = 0.04103595
Iteration 56, loss = 0.03911093
Iteration 57, loss = 0.03891938
Iteration 58, loss = 0.03933842
Iteration 59, loss = 0.03891796
Iteration 60, loss = 0.03776854
Iteration 61, loss = 0.03723065
Iteration 62, loss = 0.03616500
Iteration 63, loss = 0.03781800
Iteration 64, loss = 0.03584322
Iteration 65, loss = 0.03603546
Iteration 66, loss = 0.03614071
Iteration 67, loss = 0.03546366
Iteration 68, loss = 0.03471959
Iteration 69, loss = 0.03434591
Iteration 70, loss = 0.03360070
Iteration 71, loss = 0.03369394
Iteration 72, loss = 0.03463234
Iteration 73, loss = 0.03376344
Iteration 74, loss = 0.03313436
Iteration 75, loss = 0.03303825
Iteration 76, loss = 0.03327269
Iteration 77, loss = 0.03203343
Iteration 78, loss = 0.03261486
Iteration 79, loss = 0.03191883
Iteration 80, loss = 0.03098096
Iteration 81, loss = 0.03283203
Iteration 82, loss = 0.03077798
Iteration 83, loss = 0.03178884
Iteration 84, loss = 0.03075289
Iteration 85, loss = 0.03046843
Iteration 86, loss = 0.03096769
Iteration 87, loss = 0.03013507
Iteration 88, loss = 0.03014758
Iteration 89, loss = 0.03054142
Iteration 90, loss = 0.03063861
Iteration 91, loss = 0.02960791
Iteration 92, loss = 0.02968618
Iteration 93, loss = 0.02849979
Iteration 94, loss = 0.02877563
Iteration 95, loss = 0.02934433
Iteration 96, loss = 0.02905355
Iteration 97, loss = 0.02828600
Iteration 98, loss = 0.02872959
Iteration 99, loss = 0.02830582
Iteration 100, loss = 0.02839229
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.93073650
Iteration 2, loss = 0.45599182
Iteration 3, loss = 0.28886073
Iteration 4, loss = 0.22973905
Iteration 5, loss = 0.19478623
Iteration 6, loss = 0.17448536
Iteration 7, loss = 0.15844713
Iteration 8, loss = 0.14315497
Iteration 9, loss = 0.13503007
Iteration 10, loss = 0.12304589
Iteration 11, loss = 0.11667796
Iteration 12, loss = 0.10967141
Iteration 13, loss = 0.10258564
Iteration 14, loss = 0.09769300
Iteration 15, loss = 0.09387318
Iteration 16, loss = 0.08959938
Iteration 17, loss = 0.08463124
Iteration 18, loss = 0.08304690
Iteration 19, loss = 0.07924504
Iteration 20, loss = 0.07711107
Iteration 21, loss = 0.07460753
Iteration 22, loss = 0.07239511
Iteration 23, loss = 0.07043923
Iteration 24, loss = 0.06871954
Iteration 25, loss = 0.06685495
Iteration 26, loss = 0.06475883
Iteration 27, loss = 0.06324273
Iteration 28, loss = 0.06316966
Iteration 29, loss = 0.06188568
Iteration 30, loss = 0.05996672
Iteration 31, loss = 0.05889611
Iteration 32, loss = 0.05794866
Iteration 33, loss = 0.05731312
Iteration 34, loss = 0.05648661
Iteration 35, loss = 0.05503090
Iteration 36, loss = 0.05465997
Iteration 37, loss = 0.05417951
Iteration 38, loss = 0.05296242
Iteration 39, loss = 0.05238155
Iteration 40, loss = 0.05072246
Iteration 41, loss = 0.05115623
Iteration 42, loss = 0.05118778
Iteration 43, loss = 0.04995347
Iteration 44, loss = 0.04930629
Iteration 45, loss = 0.04861428
Iteration 46, loss = 0.04849660
Iteration 47, loss = 0.04801227
Iteration 48, loss = 0.04749235
Iteration 49, loss = 0.04736662
Iteration 50, loss = 0.04729974
Iteration 51, loss = 0.04583556
Iteration 52, loss = 0.04575328
```

```
Iteration 53, loss = 0.04621617
Iteration 54, loss = 0.04500881
Iteration 55, loss = 0.04538198
Iteration 56, loss = 0.04415334
Iteration 57, loss = 0.04397929
Iteration 58, loss = 0.04390146
Iteration 59, loss = 0.04397152
Iteration 60, loss = 0.04336869
Iteration 61, loss = 0.04253146
Iteration 62, loss = 0.04284411
Iteration 63, loss = 0.04273249
Iteration 64, loss = 0.04244097
Iteration 65, loss = 0.04225319
Iteration 66, loss = 0.04176986
Iteration 67, loss = 0.04202339
Iteration 68, loss = 0.04139967
Iteration 69, loss = 0.04140290
Iteration 70, loss = 0.04092559
Iteration 71, loss = 0.04073589
Iteration 72, loss = 0.04032713
Iteration 73, loss = 0.04070249
Iteration 74, loss = 0.04096447
Iteration 75, loss = 0.03988473
Iteration 76, loss = 0.03997398
Iteration 77, loss = 0.03949007
Iteration 78, loss = 0.04012688
Iteration 79, loss = 0.03928734
Iteration 80, loss = 0.03899547
Iteration 81, loss = 0.03942679
Iteration 82, loss = 0.03887854
Iteration 83, loss = 0.03916713
Iteration 84, loss = 0.03851526
Iteration 85, loss = 0.03802201
Iteration 86, loss = 0.03784236
Iteration 87, loss = 0.03862088
Iteration 88, loss = 0.03803656
Iteration 89, loss = 0.03752089
Iteration 90, loss = 0.03746179
Iteration 91, loss = 0.03771276
Iteration 92, loss = 0.03783044
Iteration 93, loss = 0.03718743
Iteration 94, loss = 0.03714439
Iteration 95, loss = 0.03726564
Iteration 96, loss = 0.03667234
Iteration 97, loss = 0.03772134
Iteration 98, loss = 0.03652367
Iteration 99, loss = 0.03678433
Iteration 100, loss = 0.03662392
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83822557
Iteration 2, loss = 0.38234857
Iteration 3, loss = 0.30971924
Iteration 4, loss = 0.27343127
Iteration 5, loss = 0.25038407
Iteration 6, loss = 0.23341592
Iteration 7, loss = 0.22035070
Iteration 8, loss = 0.20983228
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Iteration 10, loss = 0.19276502
Iteration 11, loss = 0.18529484
Iteration 12, loss = 0.17880647
Iteration 13, loss = 0.17340267
Iteration 14, loss = 0.16801613
Iteration 15, loss = 0.16331782
Iteration 16, loss = 0.15915049
Iteration 17, loss = 0.15488190
Iteration 18, loss = 0.15097114
Iteration 19, loss = 0.14787599
Iteration 20, loss = 0.14459589
Iteration 21, loss = 0.14132549
Iteration 22, loss = 0.13841173
Iteration 23, loss = 0.13531648
Iteration 24, loss = 0.13320000
Iteration 25, loss = 0.13094294
Iteration 26, loss = 0.12820895
Iteration 27, loss = 0.12551969
Iteration 28, loss = 0.12396192
Iteration 29, loss = 0.12183486
Iteration 30, loss = 0.11962543
Iteration 31, loss = 0.11754387
Iteration 32, loss = 0.11554755
Iteration 33, loss = 0.11424073
Iteration 34, loss = 0.11264785
Iteration 35, loss = 0.11058517
Iteration 36, loss = 0.10923633
Iteration 37, loss = 0.10755377
Iteration 38, loss = 0.10610542
Iteration 39, loss = 0.10476968
Iteration 40, loss = 0.10302151
Iteration 41, loss = 0.10202254
Iteration 42, loss = 0.10085443
Iteration 43, loss = 0.09968993
Iteration 44, loss = 0.09824686
Iteration 45, loss = 0.09739712
Iteration 46, loss = 0.09573992
Iteration 47, loss = 0.09492709
Iteration 48, loss = 0.09355740
Iteration 49, loss = 0.09225722
Iteration 50, loss = 0.09181435
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.65712022
Iteration 2, loss = 0.36470407
Iteration 3, loss = 0.30452285
Iteration 4, loss = 0.27045975
Iteration 5, loss = 0.24792828
Iteration 6, loss = 0.23021757
Iteration 7, loss = 0.21649479
Iteration 8, loss = 0.20523018
Iteration 9, loss = 0.19564704
Iteration 10, loss = 0.18757568
Iteration 11, loss = 0.18024403
Iteration 12, loss = 0.17386408
Iteration 13, loss = 0.16794808
Iteration 14, loss = 0.16240636
Iteration 15, loss = 0.15726358
Iteration 16, loss = 0.15280309
Iteration 17, loss = 0.14839971
Iteration 18, loss = 0.14455465
Iteration 19, loss = 0.14062162
Iteration 20, loss = 0.13757709
Iteration 21, loss = 0.13383076
Iteration 22, loss = 0.13083802
Iteration 23, loss = 0.12800712
Iteration 24, loss = 0.12513527
Iteration 25, loss = 0.12258032
Iteration 26, loss = 0.12028404
Iteration 27, loss = 0.11771438
Iteration 28, loss = 0.11552761
Iteration 29, loss = 0.11361252
Iteration 30, loss = 0.11143448
Iteration 31, loss = 0.10959984
Iteration 32, loss = 0.10768833
Iteration 33, loss = 0.10590289
Iteration 34, loss = 0.10415888
Iteration 35, loss = 0.10254619
Iteration 36, loss = 0.10066156
Iteration 37, loss = 0.09931004
Iteration 38, loss = 0.09791917
Iteration 39, loss = 0.09674749
Iteration 40, loss = 0.09520389
Iteration 41, loss = 0.09375280
Iteration 42, loss = 0.09267459
Iteration 43, loss = 0.09128617
Iteration 44, loss = 0.09020865
Iteration 45, loss = 0.08897570
Iteration 46, loss = 0.08786659
Iteration 47, loss = 0.08647433
Iteration 48, loss = 0.08562313
Iteration 49, loss = 0.08455831
Iteration 50, loss = 0.08370582
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.21784197
Iteration 2, loss = 0.53670990
Iteration 3, loss = 0.32140394
Iteration 4, loss = 0.24923310
Iteration 5, loss = 0.21409960
Iteration 6, loss = 0.19272404
Iteration 7, loss = 0.17377965
Iteration 8, loss = 0.16108912
Iteration 9, loss = 0.14856481
Iteration 10, loss = 0.14043594
Iteration 11, loss = 0.13118614
Iteration 12, loss = 0.12484687
Iteration 13, loss = 0.12000148
Iteration 14, loss = 0.10961677
Iteration 15, loss = 0.10642682
Iteration 16, loss = 0.10027691
Iteration 17, loss = 0.09821414
Iteration 18, loss = 0.09437600
Iteration 19, loss = 0.08920445
Iteration 20, loss = 0.08814140
Iteration 21, loss = 0.08420526
Iteration 22, loss = 0.08112398
Iteration 23, loss = 0.07370692
Iteration 24, loss = 0.07508614
Iteration 25, loss = 0.07178792
Iteration 26, loss = 0.07041007
Iteration 27, loss = 0.06694692
Iteration 28, loss = 0.06332870
Iteration 29, loss = 0.06449757
Iteration 30, loss = 0.06254968
Iteration 31, loss = 0.06126823
Iteration 32, loss = 0.05866844
Iteration 33, loss = 0.05791683
Iteration 34, loss = 0.05525904
Iteration 35, loss = 0.05598644
Iteration 36, loss = 0.05436686
Iteration 37, loss = 0.05344361
Iteration 38, loss = 0.05175846
Iteration 39, loss = 0.05144433
Iteration 40, loss = 0.04878767
Iteration 41, loss = 0.04998921
Iteration 42, loss = 0.04934702
Iteration 43, loss = 0.04675970
Iteration 44, loss = 0.04623638
Iteration 45, loss = 0.04540511
Iteration 46, loss = 0.04636908
Iteration 47, loss = 0.04470001
Iteration 48, loss = 0.04279676
Iteration 49, loss = 0.04237063
Iteration 50, loss = 0.04190273
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.93073650
Iteration 2, loss = 0.45599182
Iteration 3, loss = 0.28886073
Iteration 4, loss = 0.22973905
Iteration 5, loss = 0.19478623
Iteration 6, loss = 0.17448536
Iteration 7, loss = 0.15844713
Iteration 8, loss = 0.14315497
Iteration 9, loss = 0.13503007
Iteration 10, loss = 0.12304589
Iteration 11, loss = 0.11667796
Iteration 12, loss = 0.10967141
Iteration 13, loss = 0.10258564
Iteration 14, loss = 0.09769300
Iteration 15, loss = 0.09387318
Iteration 16, loss = 0.08959938
Iteration 17, loss = 0.08463124
Iteration 18, loss = 0.08304690
Iteration 19, loss = 0.07924504
Iteration 20, loss = 0.07711107
Iteration 21, loss = 0.07460753
Iteration 22, loss = 0.07239511
Iteration 23, loss = 0.07043923
Iteration 24, loss = 0.06871954
Iteration 25, loss = 0.06685495
Iteration 26, loss = 0.06475883
Iteration 27, loss = 0.06324273
Iteration 28, loss = 0.06316966
Iteration 29, loss = 0.06188568
Iteration 30, loss = 0.05996672
Iteration 31, loss = 0.05889611
Iteration 32, loss = 0.05794866
Iteration 33, loss = 0.05731312
Iteration 34, loss = 0.05648661
Iteration 35, loss = 0.05503090
Iteration 36, loss = 0.05465997
Iteration 37, loss = 0.05417951
Iteration 38, loss = 0.05296242
Iteration 39, loss = 0.05238155
Iteration 40, loss = 0.05072246
Iteration 41, loss = 0.05115623
Iteration 42, loss = 0.05118778
Iteration 43, loss = 0.04995347
Iteration 44, loss = 0.04930629
Iteration 45, loss = 0.04861428
Iteration 46, loss = 0.04849660
Iteration 47, loss = 0.04801227
Iteration 48, loss = 0.04749235
Iteration 49, loss = 0.04736662
Iteration 50, loss = 0.04729974
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83822557
Iteration 2, loss = 0.38234857
Iteration 3, loss = 0.30971924
Iteration 4, loss = 0.27343127
Iteration 5, loss = 0.25038407
Iteration 6, loss = 0.23341592
Iteration 7, loss = 0.22035070
Iteration 8, loss = 0.20983228
Iteration 9, loss = 0.20058795
Iteration 10, loss = 0.19276502
Iteration 11, loss = 0.18529484
Iteration 12, loss = 0.17880647
Iteration 13, loss = 0.17340267
Iteration 14, loss = 0.16801613
Iteration 15, loss = 0.16331782
Iteration 16, loss = 0.15915049
Iteration 17, loss = 0.15488190
Iteration 18, loss = 0.15097114
Iteration 19, loss = 0.14787599
Iteration 20, loss = 0.14459589
Iteration 21, loss = 0.14132549
Iteration 22, loss = 0.13841173
Iteration 23, loss = 0.13531648
Iteration 24, loss = 0.13320000
Iteration 25, loss = 0.13094294
Iteration 26, loss = 0.12820895
Iteration 27, loss = 0.12551969
Iteration 28, loss = 0.12396192
Iteration 29, loss = 0.12183486
Iteration 30, loss = 0.11962543
Iteration 31, loss = 0.11754387
Iteration 32, loss = 0.11554755
Iteration 33, loss = 0.11424073
Iteration 34, loss = 0.11264785
Iteration 35, loss = 0.11058517
Iteration 36, loss = 0.10923633
Iteration 37, loss = 0.10755377
Iteration 38, loss = 0.10610542
Iteration 39, loss = 0.10476968
Iteration 40, loss = 0.10302151
Iteration 41, loss = 0.10202254
Iteration 42, loss = 0.10085443
Iteration 43, loss = 0.09968993
Iteration 44, loss = 0.09824686
Iteration 45, loss = 0.09739712
Iteration 46, loss = 0.09573992
Iteration 47, loss = 0.09492709
Iteration 48, loss = 0.09355740
Iteration 49, loss = 0.09225722
Iteration 50, loss = 0.09181435
Iteration 51, loss = 0.09047010
Iteration 52, loss = 0.08923998
```

```
Iteration 53, loss = 0.08821661
Iteration 54, loss = 0.08773129
Iteration 55, loss = 0.08641263
Iteration 56, loss = 0.08573619
Iteration 57, loss = 0.08470687
Iteration 58, loss = 0.08372630
Iteration 59, loss = 0.08312695
Iteration 60, loss = 0.08211104
Iteration 61, loss = 0.08155190
Iteration 62, loss = 0.08029304
Iteration 63, loss = 0.07982679
Iteration 64, loss = 0.07876493
Iteration 65, loss = 0.07846036
Iteration 66, loss = 0.07739047
Iteration 67, loss = 0.07678083
Iteration 68, loss = 0.07623083
Iteration 69, loss = 0.07503030
Iteration 70, loss = 0.07440585
Iteration 71, loss = 0.07386585
Iteration 72, loss = 0.07358405
Iteration 73, loss = 0.07248806
Iteration 74, loss = 0.07205310
Iteration 75, loss = 0.07154757
Iteration 76, loss = 0.07093833
Iteration 77, loss = 0.07030462
Iteration 78, loss = 0.06955646
Iteration 79, loss = 0.06912011
Iteration 80, loss = 0.06865550
Iteration 81, loss = 0.06778793
Iteration 82, loss = 0.06747679
Iteration 83, loss = 0.06697107
Iteration 84, loss = 0.06634605
Iteration 85, loss = 0.06566812
Iteration 86, loss = 0.06548995
Iteration 87, loss = 0.06506505
Iteration 88, loss = 0.06433298
Iteration 89, loss = 0.06381786
Iteration 90, loss = 0.06365799
Iteration 91, loss = 0.06296674
Iteration 92, loss = 0.06266930
Iteration 93, loss = 0.06173849
Iteration 94, loss = 0.06133975
Iteration 95, loss = 0.06109433
Iteration 96, loss = 0.06065245
Iteration 97, loss = 0.06038128
Iteration 98, loss = 0.05989850
Iteration 99, loss = 0.05964058
Iteration 100, loss = 0.05913823
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.65712022
Iteration 2, loss = 0.36470407
Iteration 3, loss = 0.30452285
Iteration 4, loss = 0.27045975
Iteration 5, loss = 0.24792828
Iteration 6, loss = 0.23021757
Iteration 7, loss = 0.21649479
Iteration 8, loss = 0.20523018
Iteration 9, loss = 0.19564704
Iteration 10, loss = 0.18757568
Iteration 11, loss = 0.18024403
Iteration 12, loss = 0.17386408
Iteration 13, loss = 0.16794808
Iteration 14, loss = 0.16240636
Iteration 15, loss = 0.15726358
Iteration 16, loss = 0.15280309
Iteration 17, loss = 0.14839971
Iteration 18, loss = 0.14455465
Iteration 19, loss = 0.14062162
Iteration 20, loss = 0.13757709
Iteration 21, loss = 0.13383076
Iteration 22, loss = 0.13083802
Iteration 23, loss = 0.12800712
Iteration 24, loss = 0.12513527
Iteration 25, loss = 0.12258032
Iteration 26, loss = 0.12028404
Iteration 27, loss = 0.11771438
Iteration 28, loss = 0.11552761
Iteration 29, loss = 0.11361252
Iteration 30, loss = 0.11143448
Iteration 31, loss = 0.10959984
Iteration 32, loss = 0.10768833
Iteration 33, loss = 0.10590289
Iteration 34, loss = 0.10415888
Iteration 35, loss = 0.10254619
Iteration 36, loss = 0.10066156
Iteration 37, loss = 0.09931004
Iteration 38, loss = 0.09791917
Iteration 39, loss = 0.09674749
Iteration 40, loss = 0.09520389
Iteration 41, loss = 0.09375280
Iteration 42, loss = 0.09267459
Iteration 43, loss = 0.09128617
Iteration 44, loss = 0.09020865
Iteration 45, loss = 0.08897570
Iteration 46, loss = 0.08786659
Iteration 47, loss = 0.08647433
Iteration 48, loss = 0.08562313
Iteration 49, loss = 0.08455831
Iteration 50, loss = 0.08370582
Iteration 51, loss = 0.08247239
Iteration 52, loss = 0.08148918
```

```
Iteration 53, loss = 0.08066848
Iteration 54, loss = 0.07976093
Iteration 55, loss = 0.07865382
Iteration 56, loss = 0.07766458
Iteration 57, loss = 0.07691845
Iteration 58, loss = 0.07615315
Iteration 59, loss = 0.07526252
Iteration 60, loss = 0.07445427
Iteration 61, loss = 0.07348881
Iteration 62, loss = 0.07275106
Iteration 63, loss = 0.07231305
Iteration 64, loss = 0.07161840
Iteration 65, loss = 0.07075000
Iteration 66, loss = 0.06994220
Iteration 67, loss = 0.06914766
Iteration 68, loss = 0.06856677
Iteration 69, loss = 0.06794785
Iteration 70, loss = 0.06730142
Iteration 71, loss = 0.06669523
Iteration 72, loss = 0.06584151
Iteration 73, loss = 0.06546310
Iteration 74, loss = 0.06453528
Iteration 75, loss = 0.06415886
Iteration 76, loss = 0.06370039
Iteration 77, loss = 0.06303240
Iteration 78, loss = 0.06258360
Iteration 79, loss = 0.06181517
Iteration 80, loss = 0.06144831
Iteration 81, loss = 0.06083240
Iteration 82, loss = 0.06023351
Iteration 83, loss = 0.05983862
Iteration 84, loss = 0.05926417
Iteration 85, loss = 0.05884915
Iteration 86, loss = 0.05837806
Iteration 87, loss = 0.05793672
Iteration 88, loss = 0.05745207
Iteration 89, loss = 0.05698165
Iteration 90, loss = 0.05657595
Iteration 91, loss = 0.05608066
Iteration 92, loss = 0.05556825
Iteration 93, loss = 0.05528933
Iteration 94, loss = 0.05487669
Iteration 95, loss = 0.05434653
Iteration 96, loss = 0.05406523
Iteration 97, loss = 0.05369502
Iteration 98, loss = 0.05327614
Iteration 99, loss = 0.05296385
Iteration 100, loss = 0.05259946
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.21784197
Iteration 2, loss = 0.53670990
Iteration 3, loss = 0.32140394
Iteration 4, loss = 0.24923310
Iteration 5, loss = 0.21409960
Iteration 6, loss = 0.19272404
Iteration 7, loss = 0.17377965
Iteration 8, loss = 0.16108912
Iteration 9, loss = 0.14856481
Iteration 10, loss = 0.14043594
Iteration 11, loss = 0.13118614
Iteration 12, loss = 0.12484687
Iteration 13, loss = 0.12000148
Iteration 14, loss = 0.10961677
Iteration 15, loss = 0.10642682
Iteration 16, loss = 0.10027691
Iteration 17, loss = 0.09821414
Iteration 18, loss = 0.09437600
Iteration 19, loss = 0.08920445
Iteration 20, loss = 0.08814140
Iteration 21, loss = 0.08420526
Iteration 22, loss = 0.08112398
Iteration 23, loss = 0.07370692
Iteration 24, loss = 0.07508614
Iteration 25, loss = 0.07178792
Iteration 26, loss = 0.07041007
Iteration 27, loss = 0.06694692
Iteration 28, loss = 0.06332870
Iteration 29, loss = 0.06449757
Iteration 30, loss = 0.06254968
Iteration 31, loss = 0.06126823
Iteration 32, loss = 0.05866844
Iteration 33, loss = 0.05791683
Iteration 34, loss = 0.05525904
Iteration 35, loss = 0.05598644
Iteration 36, loss = 0.05436686
Iteration 37, loss = 0.05344361
Iteration 38, loss = 0.05175846
Iteration 39, loss = 0.05144433
Iteration 40, loss = 0.04878767
Iteration 41, loss = 0.04998921
Iteration 42, loss = 0.04934702
Iteration 43, loss = 0.04675970
Iteration 44, loss = 0.04623638
Iteration 45, loss = 0.04540511
Iteration 46, loss = 0.04636908
Iteration 47, loss = 0.04470001
Iteration 48, loss = 0.04279676
Iteration 49, loss = 0.04237063
Iteration 50, loss = 0.04190273
Iteration 51, loss = 0.04154682
Iteration 52, loss = 0.04241054
```

```
Iteration 53, loss = 0.04089767
Iteration 54, loss = 0.04024670
Iteration 55, loss = 0.04103595
Iteration 56, loss = 0.03911093
Iteration 57, loss = 0.03891938
Iteration 58, loss = 0.03933842
Iteration 59, loss = 0.03891796
Iteration 60, loss = 0.03776854
Iteration 61, loss = 0.03723065
Iteration 62, loss = 0.03616500
Iteration 63, loss = 0.03781800
Iteration 64, loss = 0.03584322
Iteration 65, loss = 0.03603546
Iteration 66, loss = 0.03614071
Iteration 67, loss = 0.03546366
Iteration 68, loss = 0.03471959
Iteration 69, loss = 0.03434591
Iteration 70, loss = 0.03360070
Iteration 71, loss = 0.03369394
Iteration 72, loss = 0.03463234
Iteration 73, loss = 0.03376344
Iteration 74, loss = 0.03313436
Iteration 75, loss = 0.03303825
Iteration 76, loss = 0.03327269
Iteration 77, loss = 0.03203343
Iteration 78, loss = 0.03261486
Iteration 79, loss = 0.03191883
Iteration 80, loss = 0.03098096
Iteration 81, loss = 0.03283203
Iteration 82, loss = 0.03077798
Iteration 83, loss = 0.03178884
Iteration 84, loss = 0.03075289
Iteration 85, loss = 0.03046843
Iteration 86, loss = 0.03096769
Iteration 87, loss = 0.03013507
Iteration 88, loss = 0.03014758
Iteration 89, loss = 0.03054142
Iteration 90, loss = 0.03063861
Iteration 91, loss = 0.02960791
Iteration 92, loss = 0.02968618
Iteration 93, loss = 0.02849979
Iteration 94, loss = 0.02877563
Iteration 95, loss = 0.02934433
Iteration 96, loss = 0.02905355
Iteration 97, loss = 0.02828600
Iteration 98, loss = 0.02872959
Iteration 99, loss = 0.02830582
Iteration 100, loss = 0.02839229
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.93073650
Iteration 2, loss = 0.45599182
Iteration 3, loss = 0.28886073
Iteration 4, loss = 0.22973905
Iteration 5, loss = 0.19478623
Iteration 6, loss = 0.17448536
Iteration 7, loss = 0.15844713
Iteration 8, loss = 0.14315497
Iteration 9, loss = 0.13503007
Iteration 10, loss = 0.12304589
Iteration 11, loss = 0.11667796
Iteration 12, loss = 0.10967141
Iteration 13, loss = 0.10258564
Iteration 14, loss = 0.09769300
Iteration 15, loss = 0.09387318
Iteration 16, loss = 0.08959938
Iteration 17, loss = 0.08463124
Iteration 18, loss = 0.08304690
Iteration 19, loss = 0.07924504
Iteration 20, loss = 0.07711107
Iteration 21, loss = 0.07460753
Iteration 22, loss = 0.07239511
Iteration 23, loss = 0.07043923
Iteration 24, loss = 0.06871954
Iteration 25, loss = 0.06685495
Iteration 26, loss = 0.06475883
Iteration 27, loss = 0.06324273
Iteration 28, loss = 0.06316966
Iteration 29, loss = 0.06188568
Iteration 30, loss = 0.05996672
Iteration 31, loss = 0.05889611
Iteration 32, loss = 0.05794866
Iteration 33, loss = 0.05731312
Iteration 34, loss = 0.05648661
Iteration 35, loss = 0.05503090
Iteration 36, loss = 0.05465997
Iteration 37, loss = 0.05417951
Iteration 38, loss = 0.05296242
Iteration 39, loss = 0.05238155
Iteration 40, loss = 0.05072246
Iteration 41, loss = 0.05115623
Iteration 42, loss = 0.05118778
Iteration 43, loss = 0.04995347
Iteration 44, loss = 0.04930629
Iteration 45, loss = 0.04861428
Iteration 46, loss = 0.04849660
Iteration 47, loss = 0.04801227
Iteration 48, loss = 0.04749235
Iteration 49, loss = 0.04736662
Iteration 50, loss = 0.04729974
Iteration 51, loss = 0.04583556
Iteration 52, loss = 0.04575328
```

```
Iteration 53, loss = 0.04621617
Iteration 54, loss = 0.04500881
Iteration 55, loss = 0.04538198
Iteration 56, loss = 0.04415334
Iteration 57, loss = 0.04397929
Iteration 58, loss = 0.04390146
Iteration 59, loss = 0.04397152
Iteration 60, loss = 0.04336869
Iteration 61, loss = 0.04253146
Iteration 62, loss = 0.04284411
Iteration 63, loss = 0.04273249
Iteration 64, loss = 0.04244097
Iteration 65, loss = 0.04225319
Iteration 66, loss = 0.04176986
Iteration 67, loss = 0.04202339
Iteration 68, loss = 0.04139967
Iteration 69, loss = 0.04140290
Iteration 70, loss = 0.04092559
Iteration 71, loss = 0.04073589
Iteration 72, loss = 0.04032713
Iteration 73, loss = 0.04070249
Iteration 74, loss = 0.04096447
Iteration 75, loss = 0.03988473
Iteration 76, loss = 0.03997398
Iteration 77, loss = 0.03949007
Iteration 78, loss = 0.04012688
Iteration 79, loss = 0.03928734
Iteration 80, loss = 0.03899547
Iteration 81, loss = 0.03942679
Iteration 82, loss = 0.03887854
Iteration 83, loss = 0.03916713
Iteration 84, loss = 0.03851526
Iteration 85, loss = 0.03802201
Iteration 86, loss = 0.03784236
Iteration 87, loss = 0.03862088
Iteration 88, loss = 0.03803656
Iteration 89, loss = 0.03752089
Iteration 90, loss = 0.03746179
Iteration 91, loss = 0.03771276
Iteration 92, loss = 0.03783044
Iteration 93, loss = 0.03718743
Iteration 94, loss = 0.03714439
Iteration 95, loss = 0.03726564
Iteration 96, loss = 0.03667234
Iteration 97, loss = 0.03772134
Iteration 98, loss = 0.03652367
Iteration 99, loss = 0.03678433
Iteration 100, loss = 0.03662392
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.15532577
Iteration 2, loss = 0.39343972
Iteration 3, loss = 0.31877239
Iteration 4, loss = 0.28081219
Iteration 5, loss = 0.25778406
Iteration 6, loss = 0.23950796
Iteration 7, loss = 0.22597633
Iteration 8, loss = 0.21423855
Iteration 9, loss = 0.20529436
Iteration 10, loss = 0.19730490
Iteration 11, loss = 0.18962429
Iteration 12, loss = 0.18351231
Iteration 13, loss = 0.17793223
Iteration 14, loss = 0.17227001
Iteration 15, loss = 0.16799199
Iteration 16, loss = 0.16330386
Iteration 17, loss = 0.15934790
Iteration 18, loss = 0.15570746
Iteration 19, loss = 0.15197342
Iteration 20, loss = 0.14879394
Iteration 21, loss = 0.14569451
Iteration 22, loss = 0.14277227
Iteration 23, loss = 0.14011437
Iteration 24, loss = 0.13742010
Iteration 25, loss = 0.13520361
Iteration 26, loss = 0.13247948
Iteration 27, loss = 0.13033816
Iteration 28, loss = 0.12884792
Iteration 29, loss = 0.12616039
Iteration 30, loss = 0.12453787
Iteration 31, loss = 0.12229934
Iteration 32, loss = 0.12019452
Iteration 33, loss = 0.11837287
Iteration 34, loss = 0.11687369
Iteration 35, loss = 0.11539931
Iteration 36, loss = 0.11328846
Iteration 37, loss = 0.11219901
Iteration 38, loss = 0.11018904
Iteration 39, loss = 0.10892576
Iteration 40, loss = 0.10752466
Iteration 41, loss = 0.10600019
Iteration 42, loss = 0.10469339
Iteration 43, loss = 0.10332750
Iteration 44, loss = 0.10222080
Iteration 45, loss = 0.10089640
Iteration 46, loss = 0.09995207
Iteration 47, loss = 0.09858791
Iteration 48, loss = 0.09768258
Iteration 49, loss = 0.09631769
Iteration 50, loss = 0.09527707
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.87154053
Iteration 2, loss = 0.36984641
Iteration 3, loss = 0.30516072
Iteration 4, loss = 0.26994873
Iteration 5, loss = 0.24698589
Iteration 6, loss = 0.23022427
Iteration 7, loss = 0.21633826
Iteration 8, loss = 0.20582139
Iteration 9, loss = 0.19615374
Iteration 10, loss = 0.18765500
Iteration 11, loss = 0.18006272
Iteration 12, loss = 0.17382802
Iteration 13, loss = 0.16796413
Iteration 14, loss = 0.16289001
Iteration 15, loss = 0.15812997
Iteration 16, loss = 0.15364505
Iteration 17, loss = 0.14933868
Iteration 18, loss = 0.14575272
Iteration 19, loss = 0.14237033
Iteration 20, loss = 0.13907103
Iteration 21, loss = 0.13642913
Iteration 22, loss = 0.13356152
Iteration 23, loss = 0.13071465
Iteration 24, loss = 0.12837162
Iteration 25, loss = 0.12605723
Iteration 26, loss = 0.12373836
Iteration 27, loss = 0.12178743
Iteration 28, loss = 0.11997184
Iteration 29, loss = 0.11779571
Iteration 30, loss = 0.11604227
Iteration 31, loss = 0.11430701
Iteration 32, loss = 0.11251499
Iteration 33, loss = 0.11090184
Iteration 34, loss = 0.10925848
Iteration 35, loss = 0.10787363
Iteration 36, loss = 0.10640827
Iteration 37, loss = 0.10508527
Iteration 38, loss = 0.10370952
Iteration 39, loss = 0.10239924
Iteration 40, loss = 0.10104234
Iteration 41, loss = 0.09982584
Iteration 42, loss = 0.09899792
Iteration 43, loss = 0.09763897
Iteration 44, loss = 0.09626285
Iteration 45, loss = 0.09529664
Iteration 46, loss = 0.09427948
Iteration 47, loss = 0.09337258
Iteration 48, loss = 0.09214950
Iteration 49, loss = 0.09132326
Iteration 50, loss = 0.09040691
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.95007903
Iteration 2, loss = 0.89860534
Iteration 3, loss = 0.43090945
Iteration 4, loss = 0.29672167
Iteration 5, loss = 0.23836571
Iteration 6, loss = 0.20469992
Iteration 7, loss = 0.18703825
Iteration 8, loss = 0.16745081
Iteration 9, loss = 0.15797741
Iteration 10, loss = 0.14938935
Iteration 11, loss = 0.13819736
Iteration 12, loss = 0.13012764
Iteration 13, loss = 0.12605646
Iteration 14, loss = 0.12030603
Iteration 15, loss = 0.11454012
Iteration 16, loss = 0.11011978
Iteration 17, loss = 0.10506112
Iteration 18, loss = 0.10146477
Iteration 19, loss = 0.09738579
Iteration 20, loss = 0.09428762
Iteration 21, loss = 0.09163282
Iteration 22, loss = 0.08808688
Iteration 23, loss = 0.08529721
Iteration 24, loss = 0.08556597
Iteration 25, loss = 0.08235728
Iteration 26, loss = 0.07957660
Iteration 27, loss = 0.07545961
Iteration 28, loss = 0.07523147
Iteration 29, loss = 0.07416414
Iteration 30, loss = 0.07205068
Iteration 31, loss = 0.07023346
Iteration 32, loss = 0.06965688
Iteration 33, loss = 0.06781974
Iteration 34, loss = 0.06574960
Iteration 35, loss = 0.06410801
Iteration 36, loss = 0.06377814
Iteration 37, loss = 0.06275171
Iteration 38, loss = 0.06040437
Iteration 39, loss = 0.05970472
Iteration 40, loss = 0.05974403
Iteration 41, loss = 0.05847945
Iteration 42, loss = 0.05616877
Iteration 43, loss = 0.05623548
Iteration 44, loss = 0.05534542
Iteration 45, loss = 0.05468963
Iteration 46, loss = 0.05404690
Iteration 47, loss = 0.05409210
Iteration 48, loss = 0.05374392
Iteration 49, loss = 0.05123322
Iteration 50, loss = 0.05210727
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.30522517
Iteration 2, loss = 0.64824290
Iteration 3, loss = 0.33222301
Iteration 4, loss = 0.25001003
Iteration 5, loss = 0.20885924
Iteration 6, loss = 0.18571819
Iteration 7, loss = 0.16572888
Iteration 8, loss = 0.15166235
Iteration 9, loss = 0.14082520
Iteration 10, loss = 0.13186499
Iteration 11, loss = 0.12484348
Iteration 12, loss = 0.11807725
Iteration 13, loss = 0.11180171
Iteration 14, loss = 0.10692312
Iteration 15, loss = 0.10156887
Iteration 16, loss = 0.09835988
Iteration 17, loss = 0.09496421
Iteration 18, loss = 0.08927314
Iteration 19, loss = 0.08783164
Iteration 20, loss = 0.08511380
Iteration 21, loss = 0.08244346
Iteration 22, loss = 0.08097415
Iteration 23, loss = 0.07784105
Iteration 24, loss = 0.07721806
Iteration 25, loss = 0.07390274
Iteration 26, loss = 0.07296439
Iteration 27, loss = 0.07139478
Iteration 28, loss = 0.06998576
Iteration 29, loss = 0.06868677
Iteration 30, loss = 0.06775640
Iteration 31, loss = 0.06623529
Iteration 32, loss = 0.06536271
Iteration 33, loss = 0.06461181
Iteration 34, loss = 0.06275234
Iteration 35, loss = 0.06256400
Iteration 36, loss = 0.06067474
Iteration 37, loss = 0.06168964
Iteration 38, loss = 0.05935376
Iteration 39, loss = 0.05896557
Iteration 40, loss = 0.05888834
Iteration 41, loss = 0.05778169
Iteration 42, loss = 0.05652172
Iteration 43, loss = 0.05708312
Iteration 44, loss = 0.05646905
Iteration 45, loss = 0.05573602
Iteration 46, loss = 0.05513469
Iteration 47, loss = 0.05435184
Iteration 48, loss = 0.05378221
Iteration 49, loss = 0.05358814
Iteration 50, loss = 0.05394177
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
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  warnings.warn(
```

```
Iteration 1, loss = 2.15532577
Iteration 2, loss = 0.39343972
Iteration 3, loss = 0.31877239
Iteration 4, loss = 0.28081219
Iteration 5, loss = 0.25778406
Iteration 6, loss = 0.23950796
Iteration 7, loss = 0.22597633
Iteration 8, loss = 0.21423855
Iteration 9, loss = 0.20529436
Iteration 10, loss = 0.19730490
Iteration 11, loss = 0.18962429
Iteration 12, loss = 0.18351231
Iteration 13, loss = 0.17793223
Iteration 14, loss = 0.17227001
Iteration 15, loss = 0.16799199
Iteration 16, loss = 0.16330386
Iteration 17, loss = 0.15934790
Iteration 18, loss = 0.15570746
Iteration 19, loss = 0.15197342
Iteration 20, loss = 0.14879394
Iteration 21, loss = 0.14569451
Iteration 22, loss = 0.14277227
Iteration 23, loss = 0.14011437
Iteration 24, loss = 0.13742010
Iteration 25, loss = 0.13520361
Iteration 26, loss = 0.13247948
Iteration 27, loss = 0.13033816
Iteration 28, loss = 0.12884792
Iteration 29, loss = 0.12616039
Iteration 30, loss = 0.12453787
Iteration 31, loss = 0.12229934
Iteration 32, loss = 0.12019452
Iteration 33, loss = 0.11837287
Iteration 34, loss = 0.11687369
Iteration 35, loss = 0.11539931
Iteration 36, loss = 0.11328846
Iteration 37, loss = 0.11219901
Iteration 38, loss = 0.11018904
Iteration 39, loss = 0.10892576
Iteration 40, loss = 0.10752466
Iteration 41, loss = 0.10600019
Iteration 42, loss = 0.10469339
Iteration 43, loss = 0.10332750
Iteration 44, loss = 0.10222080
Iteration 45, loss = 0.10089640
Iteration 46, loss = 0.09995207
Iteration 47, loss = 0.09858791
Iteration 48, loss = 0.09768258
Iteration 49, loss = 0.09631769
Iteration 50, loss = 0.09527707
Iteration 51, loss = 0.09411867
Iteration 52, loss = 0.09315386
```

```
Iteration 53, loss = 0.09193551
Iteration 54, loss = 0.09107593
Iteration 55, loss = 0.09029313
Iteration 56, loss = 0.08910757
Iteration 57, loss = 0.08824472
Iteration 58, loss = 0.08729992
Iteration 59, loss = 0.08663289
Iteration 60, loss = 0.08582608
Iteration 61, loss = 0.08487516
Iteration 62, loss = 0.08415947
Iteration 63, loss = 0.08328396
Iteration 64, loss = 0.08252720
Iteration 65, loss = 0.08158233
Iteration 66, loss = 0.08111944
Iteration 67, loss = 0.08008782
Iteration 68, loss = 0.07948108
Iteration 69, loss = 0.07877411
Iteration 70, loss = 0.07816953
Iteration 71, loss = 0.07732647
Iteration 72, loss = 0.07658329
Iteration 73, loss = 0.07640389
Iteration 74, loss = 0.07556192
Iteration 75, loss = 0.07504514
Iteration 76, loss = 0.07447729
Iteration 77, loss = 0.07369694
Iteration 78, loss = 0.07296104
Iteration 79, loss = 0.07247008
Iteration 80, loss = 0.07206407
Iteration 81, loss = 0.07135928
Iteration 82, loss = 0.07089460
Iteration 83, loss = 0.07047618
Iteration 84, loss = 0.06976830
Iteration 85, loss = 0.06900083
Iteration 86, loss = 0.06859532
Iteration 87, loss = 0.06809592
Iteration 88, loss = 0.06787188
Iteration 89, loss = 0.06708862
Iteration 90, loss = 0.06678453
Iteration 91, loss = 0.06628728
Iteration 92, loss = 0.06566632
Iteration 93, loss = 0.06537726
Iteration 94, loss = 0.06500960
Iteration 95, loss = 0.06469511
Iteration 96, loss = 0.06431144
Iteration 97, loss = 0.06358698
Iteration 98, loss = 0.06305510
Iteration 99, loss = 0.06252799
Iteration 100, loss = 0.06219326
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.87154053
Iteration 2, loss = 0.36984641
Iteration 3, loss = 0.30516072
Iteration 4, loss = 0.26994873
Iteration 5, loss = 0.24698589
Iteration 6, loss = 0.23022427
Iteration 7, loss = 0.21633826
Iteration 8, loss = 0.20582139
Iteration 9, loss = 0.19615374
Iteration 10, loss = 0.18765500
Iteration 11, loss = 0.18006272
Iteration 12, loss = 0.17382802
Iteration 13, loss = 0.16796413
Iteration 14, loss = 0.16289001
Iteration 15, loss = 0.15812997
Iteration 16, loss = 0.15364505
Iteration 17, loss = 0.14933868
Iteration 18, loss = 0.14575272
Iteration 19, loss = 0.14237033
Iteration 20, loss = 0.13907103
Iteration 21, loss = 0.13642913
Iteration 22, loss = 0.13356152
Iteration 23, loss = 0.13071465
Iteration 24, loss = 0.12837162
Iteration 25, loss = 0.12605723
Iteration 26, loss = 0.12373836
Iteration 27, loss = 0.12178743
Iteration 28, loss = 0.11997184
Iteration 29, loss = 0.11779571
Iteration 30, loss = 0.11604227
Iteration 31, loss = 0.11430701
Iteration 32, loss = 0.11251499
Iteration 33, loss = 0.11090184
Iteration 34, loss = 0.10925848
Iteration 35, loss = 0.10787363
Iteration 36, loss = 0.10640827
Iteration 37, loss = 0.10508527
Iteration 38, loss = 0.10370952
Iteration 39, loss = 0.10239924
Iteration 40, loss = 0.10104234
Iteration 41, loss = 0.09982584
Iteration 42, loss = 0.09899792
Iteration 43, loss = 0.09763897
Iteration 44, loss = 0.09626285
Iteration 45, loss = 0.09529664
Iteration 46, loss = 0.09427948
Iteration 47, loss = 0.09337258
Iteration 48, loss = 0.09214950
Iteration 49, loss = 0.09132326
Iteration 50, loss = 0.09040691
Iteration 51, loss = 0.08934927
Iteration 52, loss = 0.08840254
```

```
Iteration 53, loss = 0.08769428
Iteration 54, loss = 0.08666737
Iteration 55, loss = 0.08584739
Iteration 56, loss = 0.08505522
Iteration 57, loss = 0.08419740
Iteration 58, loss = 0.08360420
Iteration 59, loss = 0.08275419
Iteration 60, loss = 0.08180130
Iteration 61, loss = 0.08133939
Iteration 62, loss = 0.08039931
Iteration 63, loss = 0.07977045
Iteration 64, loss = 0.07899364
Iteration 65, loss = 0.07844505
Iteration 66, loss = 0.07750442
Iteration 67, loss = 0.07688027
Iteration 68, loss = 0.07634798
Iteration 69, loss = 0.07572928
Iteration 70, loss = 0.07531053
Iteration 71, loss = 0.07449440
Iteration 72, loss = 0.07391494
Iteration 73, loss = 0.07319661
Iteration 74, loss = 0.07282381
Iteration 75, loss = 0.07228326
Iteration 76, loss = 0.07153390
Iteration 77, loss = 0.07101744
Iteration 78, loss = 0.07049496
Iteration 79, loss = 0.07006452
Iteration 80, loss = 0.06961019
Iteration 81, loss = 0.06907920
Iteration 82, loss = 0.06858898
Iteration 83, loss = 0.06798621
Iteration 84, loss = 0.06753785
Iteration 85, loss = 0.06711620
Iteration 86, loss = 0.06671475
Iteration 87, loss = 0.06606726
Iteration 88, loss = 0.06585792
Iteration 89, loss = 0.06540590
Iteration 90, loss = 0.06486181
Iteration 91, loss = 0.06440600
Iteration 92, loss = 0.06394931
Iteration 93, loss = 0.06359469
Iteration 94, loss = 0.06300005
Iteration 95, loss = 0.06274133
Iteration 96, loss = 0.06235245
Iteration 97, loss = 0.06195429
Iteration 98, loss = 0.06178340
Iteration 99, loss = 0.06125224
Iteration 100, loss = 0.06087035
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.95007903
Iteration 2, loss = 0.89860534
Iteration 3, loss = 0.43090945
Iteration 4, loss = 0.29672167
Iteration 5, loss = 0.23836571
Iteration 6, loss = 0.20469992
Iteration 7, loss = 0.18703825
Iteration 8, loss = 0.16745081
Iteration 9, loss = 0.15797741
Iteration 10, loss = 0.14938935
Iteration 11, loss = 0.13819736
Iteration 12, loss = 0.13012764
Iteration 13, loss = 0.12605646
Iteration 14, loss = 0.12030603
Iteration 15, loss = 0.11454012
Iteration 16, loss = 0.11011978
Iteration 17, loss = 0.10506112
Iteration 18, loss = 0.10146477
Iteration 19, loss = 0.09738579
Iteration 20, loss = 0.09428762
Iteration 21, loss = 0.09163282
Iteration 22, loss = 0.08808688
Iteration 23, loss = 0.08529721
Iteration 24, loss = 0.08556597
Iteration 25, loss = 0.08235728
Iteration 26, loss = 0.07957660
Iteration 27, loss = 0.07545961
Iteration 28, loss = 0.07523147
Iteration 29, loss = 0.07416414
Iteration 30, loss = 0.07205068
Iteration 31, loss = 0.07023346
Iteration 32, loss = 0.06965688
Iteration 33, loss = 0.06781974
Iteration 34, loss = 0.06574960
Iteration 35, loss = 0.06410801
Iteration 36, loss = 0.06377814
Iteration 37, loss = 0.06275171
Iteration 38, loss = 0.06040437
Iteration 39, loss = 0.05970472
Iteration 40, loss = 0.05974403
Iteration 41, loss = 0.05847945
Iteration 42, loss = 0.05616877
Iteration 43, loss = 0.05623548
Iteration 44, loss = 0.05534542
Iteration 45, loss = 0.05468963
Iteration 46, loss = 0.05404690
Iteration 47, loss = 0.05409210
Iteration 48, loss = 0.05374392
Iteration 49, loss = 0.05123322
Iteration 50, loss = 0.05210727
Iteration 51, loss = 0.04964791
Iteration 52, loss = 0.05004423
```

```
Iteration 53, loss = 0.04940226
Iteration 54, loss = 0.04817692
Iteration 55, loss = 0.04800785
Iteration 56, loss = 0.04759017
Iteration 57, loss = 0.04736742
Iteration 58, loss = 0.04652995
Iteration 59, loss = 0.04836212
Iteration 60, loss = 0.04561903
Iteration 61, loss = 0.04498975
Iteration 62, loss = 0.04527102
Iteration 63, loss = 0.04475023
Iteration 64, loss = 0.04292378
Iteration 65, loss = 0.04279393
Iteration 66, loss = 0.04399331
Iteration 67, loss = 0.04199936
Iteration 68, loss = 0.04238465
Iteration 69, loss = 0.04200100
Iteration 70, loss = 0.04105749
Iteration 71, loss = 0.04241084
Iteration 72, loss = 0.04074487
Iteration 73, loss = 0.03986202
Iteration 74, loss = 0.04161642
Iteration 75, loss = 0.04112469
Iteration 76, loss = 0.04169475
Iteration 77, loss = 0.03876561
Iteration 78, loss = 0.04001380
Iteration 79, loss = 0.03887021
Iteration 80, loss = 0.03839580
Iteration 81, loss = 0.03833841
Iteration 82, loss = 0.03779856
Iteration 83, loss = 0.03917616
Iteration 84, loss = 0.03734818
Iteration 85, loss = 0.03863037
Iteration 86, loss = 0.03816627
Iteration 87, loss = 0.03526823
Iteration 88, loss = 0.03708719
Iteration 89, loss = 0.03696573
Iteration 90, loss = 0.03801300
Iteration 91, loss = 0.03526996
Iteration 92, loss = 0.03592328
Iteration 93, loss = 0.03550895
Iteration 94, loss = 0.03635505
Iteration 95, loss = 0.03692918
Iteration 96, loss = 0.03491642
Iteration 97, loss = 0.03546942
Iteration 98, loss = 0.03511079
Iteration 99, loss = 0.03565220
Iteration 100, loss = 0.03586012
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
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```

```
Iteration 1, loss = 11.30522517
Iteration 2, loss = 0.64824290
Iteration 3, loss = 0.33222301
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Iteration 8, loss = 0.15166235
Iteration 9, loss = 0.14082520
Iteration 10, loss = 0.13186499
Iteration 11, loss = 0.12484348
Iteration 12, loss = 0.11807725
Iteration 13, loss = 0.11180171
Iteration 14, loss = 0.10692312
Iteration 15, loss = 0.10156887
Iteration 16, loss = 0.09835988
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Iteration 19, loss = 0.08783164
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Iteration 21, loss = 0.08244346
Iteration 22, loss = 0.08097415
Iteration 23, loss = 0.07784105
Iteration 24, loss = 0.07721806
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Iteration 26, loss = 0.07296439
Iteration 27, loss = 0.07139478
Iteration 28, loss = 0.06998576
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Iteration 30, loss = 0.06775640
Iteration 31, loss = 0.06623529
Iteration 32, loss = 0.06536271
Iteration 33, loss = 0.06461181
Iteration 34, loss = 0.06275234
Iteration 35, loss = 0.06256400
Iteration 36, loss = 0.06067474
Iteration 37, loss = 0.06168964
Iteration 38, loss = 0.05935376
Iteration 39, loss = 0.05896557
Iteration 40, loss = 0.05888834
Iteration 41, loss = 0.05778169
Iteration 42, loss = 0.05652172
Iteration 43, loss = 0.05708312
Iteration 44, loss = 0.05646905
Iteration 45, loss = 0.05573602
Iteration 46, loss = 0.05513469
Iteration 47, loss = 0.05435184
Iteration 48, loss = 0.05378221
Iteration 49, loss = 0.05358814
Iteration 50, loss = 0.05394177
Iteration 51, loss = 0.05234197
Iteration 52, loss = 0.05203626
```

```
Iteration 53, loss = 0.05222042
Iteration 54, loss = 0.05091496
Iteration 55, loss = 0.05117624
Iteration 56, loss = 0.05104633
Iteration 57, loss = 0.05046523
Iteration 58, loss = 0.04967816
Iteration 59, loss = 0.05026631
Iteration 60, loss = 0.04950935
Iteration 61, loss = 0.04901356
Iteration 62, loss = 0.04878451
Iteration 63, loss = 0.04856701
Iteration 64, loss = 0.04822889
Iteration 65, loss = 0.04777637
Iteration 66, loss = 0.04759901
Iteration 67, loss = 0.04731421
Iteration 68, loss = 0.04695346
Iteration 69, loss = 0.04713318
Iteration 70, loss = 0.04705130
Iteration 71, loss = 0.04652174
Iteration 72, loss = 0.04686025
Iteration 73, loss = 0.04609435
Iteration 74, loss = 0.04620648
Iteration 75, loss = 0.04575359
Iteration 76, loss = 0.04529759
Iteration 77, loss = 0.04586443
Iteration 78, loss = 0.04470437
Iteration 79, loss = 0.04539546
Iteration 80, loss = 0.04505047
Iteration 81, loss = 0.04434726
Iteration 82, loss = 0.04487654
Iteration 83, loss = 0.04413282
Iteration 84, loss = 0.04434732
Iteration 85, loss = 0.04448294
Iteration 86, loss = 0.04450282
Iteration 87, loss = 0.04364103
Iteration 88, loss = 0.04335131
Iteration 89, loss = 0.04323819
Iteration 90, loss = 0.04397529
Iteration 91, loss = 0.04336111
Iteration 92, loss = 0.04350908
Iteration 93, loss = 0.04275669
Iteration 94, loss = 0.04281419
Iteration 95, loss = 0.04278931
Iteration 96, loss = 0.04276710
Iteration 97, loss = 0.04232463
Iteration 98, loss = 0.04202264
Iteration 99, loss = 0.04243852
Iteration 100, loss = 0.04236794
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.15532577
Iteration 2, loss = 0.39343972
Iteration 3, loss = 0.31877239
Iteration 4, loss = 0.28081219
Iteration 5, loss = 0.25778406
Iteration 6, loss = 0.23950796
Iteration 7, loss = 0.22597633
Iteration 8, loss = 0.21423855
Iteration 9, loss = 0.20529436
Iteration 10, loss = 0.19730490
Iteration 11, loss = 0.18962429
Iteration 12, loss = 0.18351231
Iteration 13, loss = 0.17793223
Iteration 14, loss = 0.17227001
Iteration 15, loss = 0.16799199
Iteration 16, loss = 0.16330386
Iteration 17, loss = 0.15934790
Iteration 18, loss = 0.15570746
Iteration 19, loss = 0.15197342
Iteration 20, loss = 0.14879394
Iteration 21, loss = 0.14569451
Iteration 22, loss = 0.14277227
Iteration 23, loss = 0.14011437
Iteration 24, loss = 0.13742010
Iteration 25, loss = 0.13520361
Iteration 26, loss = 0.13247948
Iteration 27, loss = 0.13033816
Iteration 28, loss = 0.12884792
Iteration 29, loss = 0.12616039
Iteration 30, loss = 0.12453787
Iteration 31, loss = 0.12229934
Iteration 32, loss = 0.12019452
Iteration 33, loss = 0.11837287
Iteration 34, loss = 0.11687369
Iteration 35, loss = 0.11539931
Iteration 36, loss = 0.11328846
Iteration 37, loss = 0.11219901
Iteration 38, loss = 0.11018904
Iteration 39, loss = 0.10892576
Iteration 40, loss = 0.10752466
Iteration 41, loss = 0.10600019
Iteration 42, loss = 0.10469339
Iteration 43, loss = 0.10332750
Iteration 44, loss = 0.10222080
Iteration 45, loss = 0.10089640
Iteration 46, loss = 0.09995207
Iteration 47, loss = 0.09858791
Iteration 48, loss = 0.09768258
Iteration 49, loss = 0.09631769
Iteration 50, loss = 0.09527707
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.87154053
Iteration 2, loss = 0.36984641
Iteration 3, loss = 0.30516072
Iteration 4, loss = 0.26994873
Iteration 5, loss = 0.24698589
Iteration 6, loss = 0.23022427
Iteration 7, loss = 0.21633826
Iteration 8, loss = 0.20582139
Iteration 9, loss = 0.19615374
Iteration 10, loss = 0.18765500
Iteration 11, loss = 0.18006272
Iteration 12, loss = 0.17382802
Iteration 13, loss = 0.16796413
Iteration 14, loss = 0.16289001
Iteration 15, loss = 0.15812997
Iteration 16, loss = 0.15364505
Iteration 17, loss = 0.14933868
Iteration 18, loss = 0.14575272
Iteration 19, loss = 0.14237033
Iteration 20, loss = 0.13907103
Iteration 21, loss = 0.13642913
Iteration 22, loss = 0.13356152
Iteration 23, loss = 0.13071465
Iteration 24, loss = 0.12837162
Iteration 25, loss = 0.12605723
Iteration 26, loss = 0.12373836
Iteration 27, loss = 0.12178743
Iteration 28, loss = 0.11997184
Iteration 29, loss = 0.11779571
Iteration 30, loss = 0.11604227
Iteration 31, loss = 0.11430701
Iteration 32, loss = 0.11251499
Iteration 33, loss = 0.11090184
Iteration 34, loss = 0.10925848
Iteration 35, loss = 0.10787363
Iteration 36, loss = 0.10640827
Iteration 37, loss = 0.10508527
Iteration 38, loss = 0.10370952
Iteration 39, loss = 0.10239924
Iteration 40, loss = 0.10104234
Iteration 41, loss = 0.09982584
Iteration 42, loss = 0.09899792
Iteration 43, loss = 0.09763897
Iteration 44, loss = 0.09626285
Iteration 45, loss = 0.09529664
Iteration 46, loss = 0.09427948
Iteration 47, loss = 0.09337258
Iteration 48, loss = 0.09214950
Iteration 49, loss = 0.09132326
Iteration 50, loss = 0.09040691
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.95007903
Iteration 2, loss = 0.89860534
Iteration 3, loss = 0.43090945
Iteration 4, loss = 0.29672167
Iteration 5, loss = 0.23836571
Iteration 6, loss = 0.20469992
Iteration 7, loss = 0.18703825
Iteration 8, loss = 0.16745081
Iteration 9, loss = 0.15797741
Iteration 10, loss = 0.14938935
Iteration 11, loss = 0.13819736
Iteration 12, loss = 0.13012764
Iteration 13, loss = 0.12605646
Iteration 14, loss = 0.12030603
Iteration 15, loss = 0.11454012
Iteration 16, loss = 0.11011978
Iteration 17, loss = 0.10506112
Iteration 18, loss = 0.10146477
Iteration 19, loss = 0.09738579
Iteration 20, loss = 0.09428762
Iteration 21, loss = 0.09163282
Iteration 22, loss = 0.08808688
Iteration 23, loss = 0.08529721
Iteration 24, loss = 0.08556597
Iteration 25, loss = 0.08235728
Iteration 26, loss = 0.07957660
Iteration 27, loss = 0.07545961
Iteration 28, loss = 0.07523147
Iteration 29, loss = 0.07416414
Iteration 30, loss = 0.07205068
Iteration 31, loss = 0.07023346
Iteration 32, loss = 0.06965688
Iteration 33, loss = 0.06781974
Iteration 34, loss = 0.06574960
Iteration 35, loss = 0.06410801
Iteration 36, loss = 0.06377814
Iteration 37, loss = 0.06275171
Iteration 38, loss = 0.06040437
Iteration 39, loss = 0.05970472
Iteration 40, loss = 0.05974403
Iteration 41, loss = 0.05847945
Iteration 42, loss = 0.05616877
Iteration 43, loss = 0.05623548
Iteration 44, loss = 0.05534542
Iteration 45, loss = 0.05468963
Iteration 46, loss = 0.05404690
Iteration 47, loss = 0.05409210
Iteration 48, loss = 0.05374392
Iteration 49, loss = 0.05123322
Iteration 50, loss = 0.05210727
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.30522517
Iteration 2, loss = 0.64824290
Iteration 3, loss = 0.33222301
Iteration 4, loss = 0.25001003
Iteration 5, loss = 0.20885924
Iteration 6, loss = 0.18571819
Iteration 7, loss = 0.16572888
Iteration 8, loss = 0.15166235
Iteration 9, loss = 0.14082520
Iteration 10, loss = 0.13186499
Iteration 11, loss = 0.12484348
Iteration 12, loss = 0.11807725
Iteration 13, loss = 0.11180171
Iteration 14, loss = 0.10692312
Iteration 15, loss = 0.10156887
Iteration 16, loss = 0.09835988
Iteration 17, loss = 0.09496421
Iteration 18, loss = 0.08927314
Iteration 19, loss = 0.08783164
Iteration 20, loss = 0.08511380
Iteration 21, loss = 0.08244346
Iteration 22, loss = 0.08097415
Iteration 23, loss = 0.07784105
Iteration 24, loss = 0.07721806
Iteration 25, loss = 0.07390274
Iteration 26, loss = 0.07296439
Iteration 27, loss = 0.07139478
Iteration 28, loss = 0.06998576
Iteration 29, loss = 0.06868677
Iteration 30, loss = 0.06775640
Iteration 31, loss = 0.06623529
Iteration 32, loss = 0.06536271
Iteration 33, loss = 0.06461181
Iteration 34, loss = 0.06275234
Iteration 35, loss = 0.06256400
Iteration 36, loss = 0.06067474
Iteration 37, loss = 0.06168964
Iteration 38, loss = 0.05935376
Iteration 39, loss = 0.05896557
Iteration 40, loss = 0.05888834
Iteration 41, loss = 0.05778169
Iteration 42, loss = 0.05652172
Iteration 43, loss = 0.05708312
Iteration 44, loss = 0.05646905
Iteration 45, loss = 0.05573602
Iteration 46, loss = 0.05513469
Iteration 47, loss = 0.05435184
Iteration 48, loss = 0.05378221
Iteration 49, loss = 0.05358814
Iteration 50, loss = 0.05394177
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_network/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.15532577
Iteration 2, loss = 0.39343972
Iteration 3, loss = 0.31877239
Iteration 4, loss = 0.28081219
Iteration 5, loss = 0.25778406
Iteration 6, loss = 0.23950796
Iteration 7, loss = 0.22597633
Iteration 8, loss = 0.21423855
Iteration 9, loss = 0.20529436
Iteration 10, loss = 0.19730490
Iteration 11, loss = 0.18962429
Iteration 12, loss = 0.18351231
Iteration 13, loss = 0.17793223
Iteration 14, loss = 0.17227001
Iteration 15, loss = 0.16799199
Iteration 16, loss = 0.16330386
Iteration 17, loss = 0.15934790
Iteration 18, loss = 0.15570746
Iteration 19, loss = 0.15197342
Iteration 20, loss = 0.14879394
Iteration 21, loss = 0.14569451
Iteration 22, loss = 0.14277227
Iteration 23, loss = 0.14011437
Iteration 24, loss = 0.13742010
Iteration 25, loss = 0.13520361
Iteration 26, loss = 0.13247948
Iteration 27, loss = 0.13033816
Iteration 28, loss = 0.12884792
Iteration 29, loss = 0.12616039
Iteration 30, loss = 0.12453787
Iteration 31, loss = 0.12229934
Iteration 32, loss = 0.12019452
Iteration 33, loss = 0.11837287
Iteration 34, loss = 0.11687369
Iteration 35, loss = 0.11539931
Iteration 36, loss = 0.11328846
Iteration 37, loss = 0.11219901
Iteration 38, loss = 0.11018904
Iteration 39, loss = 0.10892576
Iteration 40, loss = 0.10752466
Iteration 41, loss = 0.10600019
Iteration 42, loss = 0.10469339
Iteration 43, loss = 0.10332750
Iteration 44, loss = 0.10222080
Iteration 45, loss = 0.10089640
Iteration 46, loss = 0.09995207
Iteration 47, loss = 0.09858791
Iteration 48, loss = 0.09768258
Iteration 49, loss = 0.09631769
Iteration 50, loss = 0.09527707
Iteration 51, loss = 0.09411867
Iteration 52, loss = 0.09315386
```

```
Iteration 53, loss = 0.09193551
Iteration 54, loss = 0.09107593
Iteration 55, loss = 0.09029313
Iteration 56, loss = 0.08910757
Iteration 57, loss = 0.08824472
Iteration 58, loss = 0.08729992
Iteration 59, loss = 0.08663289
Iteration 60, loss = 0.08582608
Iteration 61, loss = 0.08487516
Iteration 62, loss = 0.08415947
Iteration 63, loss = 0.08328396
Iteration 64, loss = 0.08252720
Iteration 65, loss = 0.08158233
Iteration 66, loss = 0.08111944
Iteration 67, loss = 0.08008782
Iteration 68, loss = 0.07948108
Iteration 69, loss = 0.07877411
Iteration 70, loss = 0.07816953
Iteration 71, loss = 0.07732647
Iteration 72, loss = 0.07658329
Iteration 73, loss = 0.07640389
Iteration 74, loss = 0.07556192
Iteration 75, loss = 0.07504514
Iteration 76, loss = 0.07447729
Iteration 77, loss = 0.07369694
Iteration 78, loss = 0.07296104
Iteration 79, loss = 0.07247008
Iteration 80, loss = 0.07206407
Iteration 81, loss = 0.07135928
Iteration 82, loss = 0.07089460
Iteration 83, loss = 0.07047618
Iteration 84, loss = 0.06976830
Iteration 85, loss = 0.06900083
Iteration 86, loss = 0.06859532
Iteration 87, loss = 0.06809592
Iteration 88, loss = 0.06787188
Iteration 89, loss = 0.06708862
Iteration 90, loss = 0.06678453
Iteration 91, loss = 0.06628728
Iteration 92, loss = 0.06566632
Iteration 93, loss = 0.06537726
Iteration 94, loss = 0.06500960
Iteration 95, loss = 0.06469511
Iteration 96, loss = 0.06431144
Iteration 97, loss = 0.06358698
Iteration 98, loss = 0.06305510
Iteration 99, loss = 0.06252799
Iteration 100, loss = 0.06219326
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.87154053
Iteration 2, loss = 0.36984641
Iteration 3, loss = 0.30516072
Iteration 4, loss = 0.26994873
Iteration 5, loss = 0.24698589
Iteration 6, loss = 0.23022427
Iteration 7, loss = 0.21633826
Iteration 8, loss = 0.20582139
Iteration 9, loss = 0.19615374
Iteration 10, loss = 0.18765500
Iteration 11, loss = 0.18006272
Iteration 12, loss = 0.17382802
Iteration 13, loss = 0.16796413
Iteration 14, loss = 0.16289001
Iteration 15, loss = 0.15812997
Iteration 16, loss = 0.15364505
Iteration 17, loss = 0.14933868
Iteration 18, loss = 0.14575272
Iteration 19, loss = 0.14237033
Iteration 20, loss = 0.13907103
Iteration 21, loss = 0.13642913
Iteration 22, loss = 0.13356152
Iteration 23, loss = 0.13071465
Iteration 24, loss = 0.12837162
Iteration 25, loss = 0.12605723
Iteration 26, loss = 0.12373836
Iteration 27, loss = 0.12178743
Iteration 28, loss = 0.11997184
Iteration 29, loss = 0.11779571
Iteration 30, loss = 0.11604227
Iteration 31, loss = 0.11430701
Iteration 32, loss = 0.11251499
Iteration 33, loss = 0.11090184
Iteration 34, loss = 0.10925848
Iteration 35, loss = 0.10787363
Iteration 36, loss = 0.10640827
Iteration 37, loss = 0.10508527
Iteration 38, loss = 0.10370952
Iteration 39, loss = 0.10239924
Iteration 40, loss = 0.10104234
Iteration 41, loss = 0.09982584
Iteration 42, loss = 0.09899792
Iteration 43, loss = 0.09763897
Iteration 44, loss = 0.09626285
Iteration 45, loss = 0.09529664
Iteration 46, loss = 0.09427948
Iteration 47, loss = 0.09337258
Iteration 48, loss = 0.09214950
Iteration 49, loss = 0.09132326
Iteration 50, loss = 0.09040691
Iteration 51, loss = 0.08934927
Iteration 52, loss = 0.08840254
```

```
Iteration 53, loss = 0.08769428
Iteration 54, loss = 0.08666737
Iteration 55, loss = 0.08584739
Iteration 56, loss = 0.08505522
Iteration 57, loss = 0.08419740
Iteration 58, loss = 0.08360420
Iteration 59, loss = 0.08275419
Iteration 60, loss = 0.08180130
Iteration 61, loss = 0.08133939
Iteration 62, loss = 0.08039931
Iteration 63, loss = 0.07977045
Iteration 64, loss = 0.07899364
Iteration 65, loss = 0.07844505
Iteration 66, loss = 0.07750442
Iteration 67, loss = 0.07688027
Iteration 68, loss = 0.07634798
Iteration 69, loss = 0.07572928
Iteration 70, loss = 0.07531053
Iteration 71, loss = 0.07449440
Iteration 72, loss = 0.07391494
Iteration 73, loss = 0.07319661
Iteration 74, loss = 0.07282381
Iteration 75, loss = 0.07228326
Iteration 76, loss = 0.07153390
Iteration 77, loss = 0.07101744
Iteration 78, loss = 0.07049496
Iteration 79, loss = 0.07006452
Iteration 80, loss = 0.06961019
Iteration 81, loss = 0.06907920
Iteration 82, loss = 0.06858898
Iteration 83, loss = 0.06798621
Iteration 84, loss = 0.06753785
Iteration 85, loss = 0.06711620
Iteration 86, loss = 0.06671475
Iteration 87, loss = 0.06606726
Iteration 88, loss = 0.06585792
Iteration 89, loss = 0.06540590
Iteration 90, loss = 0.06486181
Iteration 91, loss = 0.06440600
Iteration 92, loss = 0.06394931
Iteration 93, loss = 0.06359469
Iteration 94, loss = 0.06300005
Iteration 95, loss = 0.06274133
Iteration 96, loss = 0.06235245
Iteration 97, loss = 0.06195429
Iteration 98, loss = 0.06178340
Iteration 99, loss = 0.06125224
Iteration 100, loss = 0.06087035
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.95007903
Iteration 2, loss = 0.89860534
Iteration 3, loss = 0.43090945
Iteration 4, loss = 0.29672167
Iteration 5, loss = 0.23836571
Iteration 6, loss = 0.20469992
Iteration 7, loss = 0.18703825
Iteration 8, loss = 0.16745081
Iteration 9, loss = 0.15797741
Iteration 10, loss = 0.14938935
Iteration 11, loss = 0.13819736
Iteration 12, loss = 0.13012764
Iteration 13, loss = 0.12605646
Iteration 14, loss = 0.12030603
Iteration 15, loss = 0.11454012
Iteration 16, loss = 0.11011978
Iteration 17, loss = 0.10506112
Iteration 18, loss = 0.10146477
Iteration 19, loss = 0.09738579
Iteration 20, loss = 0.09428762
Iteration 21, loss = 0.09163282
Iteration 22, loss = 0.08808688
Iteration 23, loss = 0.08529721
Iteration 24, loss = 0.08556597
Iteration 25, loss = 0.08235728
Iteration 26, loss = 0.07957660
Iteration 27, loss = 0.07545961
Iteration 28, loss = 0.07523147
Iteration 29, loss = 0.07416414
Iteration 30, loss = 0.07205068
Iteration 31, loss = 0.07023346
Iteration 32, loss = 0.06965688
Iteration 33, loss = 0.06781974
Iteration 34, loss = 0.06574960
Iteration 35, loss = 0.06410801
Iteration 36, loss = 0.06377814
Iteration 37, loss = 0.06275171
Iteration 38, loss = 0.06040437
Iteration 39, loss = 0.05970472
Iteration 40, loss = 0.05974403
Iteration 41, loss = 0.05847945
Iteration 42, loss = 0.05616877
Iteration 43, loss = 0.05623548
Iteration 44, loss = 0.05534542
Iteration 45, loss = 0.05468963
Iteration 46, loss = 0.05404690
Iteration 47, loss = 0.05409210
Iteration 48, loss = 0.05374392
Iteration 49, loss = 0.05123322
Iteration 50, loss = 0.05210727
Iteration 51, loss = 0.04964791
Iteration 52, loss = 0.05004423
```

```
Iteration 53, loss = 0.04940226
Iteration 54, loss = 0.04817692
Iteration 55, loss = 0.04800785
Iteration 56, loss = 0.04759017
Iteration 57, loss = 0.04736742
Iteration 58, loss = 0.04652995
Iteration 59, loss = 0.04836212
Iteration 60, loss = 0.04561903
Iteration 61, loss = 0.04498975
Iteration 62, loss = 0.04527102
Iteration 63, loss = 0.04475023
Iteration 64, loss = 0.04292378
Iteration 65, loss = 0.04279393
Iteration 66, loss = 0.04399331
Iteration 67, loss = 0.04199936
Iteration 68, loss = 0.04238465
Iteration 69, loss = 0.04200100
Iteration 70, loss = 0.04105749
Iteration 71, loss = 0.04241084
Iteration 72, loss = 0.04074487
Iteration 73, loss = 0.03986202
Iteration 74, loss = 0.04161642
Iteration 75, loss = 0.04112469
Iteration 76, loss = 0.04169475
Iteration 77, loss = 0.03876561
Iteration 78, loss = 0.04001380
Iteration 79, loss = 0.03887021
Iteration 80, loss = 0.03839580
Iteration 81, loss = 0.03833841
Iteration 82, loss = 0.03779856
Iteration 83, loss = 0.03917616
Iteration 84, loss = 0.03734818
Iteration 85, loss = 0.03863037
Iteration 86, loss = 0.03816627
Iteration 87, loss = 0.03526823
Iteration 88, loss = 0.03708719
Iteration 89, loss = 0.03696573
Iteration 90, loss = 0.03801300
Iteration 91, loss = 0.03526996
Iteration 92, loss = 0.03592328
Iteration 93, loss = 0.03550895
Iteration 94, loss = 0.03635505
Iteration 95, loss = 0.03692918
Iteration 96, loss = 0.03491642
Iteration 97, loss = 0.03546942
Iteration 98, loss = 0.03511079
Iteration 99, loss = 0.03565220
Iteration 100, loss = 0.03586012
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.30522517
Iteration 2, loss = 0.64824290
Iteration 3, loss = 0.33222301
Iteration 4, loss = 0.25001003
Iteration 5, loss = 0.20885924
Iteration 6, loss = 0.18571819
Iteration 7, loss = 0.16572888
Iteration 8, loss = 0.15166235
Iteration 9, loss = 0.14082520
Iteration 10, loss = 0.13186499
Iteration 11, loss = 0.12484348
Iteration 12, loss = 0.11807725
Iteration 13, loss = 0.11180171
Iteration 14, loss = 0.10692312
Iteration 15, loss = 0.10156887
Iteration 16, loss = 0.09835988
Iteration 17, loss = 0.09496421
Iteration 18, loss = 0.08927314
Iteration 19, loss = 0.08783164
Iteration 20, loss = 0.08511380
Iteration 21, loss = 0.08244346
Iteration 22, loss = 0.08097415
Iteration 23, loss = 0.07784105
Iteration 24, loss = 0.07721806
Iteration 25, loss = 0.07390274
Iteration 26, loss = 0.07296439
Iteration 27, loss = 0.07139478
Iteration 28, loss = 0.06998576
Iteration 29, loss = 0.06868677
Iteration 30, loss = 0.06775640
Iteration 31, loss = 0.06623529
Iteration 32, loss = 0.06536271
Iteration 33, loss = 0.06461181
Iteration 34, loss = 0.06275234
Iteration 35, loss = 0.06256400
Iteration 36, loss = 0.06067474
Iteration 37, loss = 0.06168964
Iteration 38, loss = 0.05935376
Iteration 39, loss = 0.05896557
Iteration 40, loss = 0.05888834
Iteration 41, loss = 0.05778169
Iteration 42, loss = 0.05652172
Iteration 43, loss = 0.05708312
Iteration 44, loss = 0.05646905
Iteration 45, loss = 0.05573602
Iteration 46, loss = 0.05513469
Iteration 47, loss = 0.05435184
Iteration 48, loss = 0.05378221
Iteration 49, loss = 0.05358814
Iteration 50, loss = 0.05394177
Iteration 51, loss = 0.05234197
Iteration 52, loss = 0.05203626
```

```
Iteration 53, loss = 0.05222042
Iteration 54, loss = 0.05091496
Iteration 55, loss = 0.05117624
Iteration 56, loss = 0.05104633
Iteration 57, loss = 0.05046523
Iteration 58, loss = 0.04967816
Iteration 59, loss = 0.05026631
Iteration 60, loss = 0.04950935
Iteration 61, loss = 0.04901356
Iteration 62, loss = 0.04878451
Iteration 63, loss = 0.04856701
Iteration 64, loss = 0.04822889
Iteration 65, loss = 0.04777637
Iteration 66, loss = 0.04759901
Iteration 67, loss = 0.04731421
Iteration 68, loss = 0.04695346
Iteration 69, loss = 0.04713318
Iteration 70, loss = 0.04705130
Iteration 71, loss = 0.04652174
Iteration 72, loss = 0.04686025
Iteration 73, loss = 0.04609435
Iteration 74, loss = 0.04620648
Iteration 75, loss = 0.04575359
Iteration 76, loss = 0.04529759
Iteration 77, loss = 0.04586443
Iteration 78, loss = 0.04470437
Iteration 79, loss = 0.04539546
Iteration 80, loss = 0.04505047
Iteration 81, loss = 0.04434726
Iteration 82, loss = 0.04487654
Iteration 83, loss = 0.04413282
Iteration 84, loss = 0.04434732
Iteration 85, loss = 0.04448294
Iteration 86, loss = 0.04450282
Iteration 87, loss = 0.04364103
Iteration 88, loss = 0.04335131
Iteration 89, loss = 0.04323819
Iteration 90, loss = 0.04397529
Iteration 91, loss = 0.04336111
Iteration 92, loss = 0.04350908
Iteration 93, loss = 0.04275669
Iteration 94, loss = 0.04281419
Iteration 95, loss = 0.04278931
Iteration 96, loss = 0.04276710
Iteration 97, loss = 0.04232463
Iteration 98, loss = 0.04202264
Iteration 99, loss = 0.04243852
Iteration 100, loss = 0.04236794
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.13630571
Iteration 2, loss = 0.41156979
Iteration 3, loss = 0.33075910
Iteration 4, loss = 0.29072542
Iteration 5, loss = 0.26597929
Iteration 6, loss = 0.24795240
Iteration 7, loss = 0.23403847
Iteration 8, loss = 0.22181738
Iteration 9, loss = 0.21304840
Iteration 10, loss = 0.20411347
Iteration 11, loss = 0.19674550
Iteration 12, loss = 0.19028324
Iteration 13, loss = 0.18404055
Iteration 14, loss = 0.18001161
Iteration 15, loss = 0.17429764
Iteration 16, loss = 0.17058679
Iteration 17, loss = 0.16616087
Iteration 18, loss = 0.16299671
Iteration 19, loss = 0.15917220
Iteration 20, loss = 0.15594705
Iteration 21, loss = 0.15317331
Iteration 22, loss = 0.14993045
Iteration 23, loss = 0.14694550
Iteration 24, loss = 0.14466809
Iteration 25, loss = 0.14182157
Iteration 26, loss = 0.13968836
Iteration 27, loss = 0.13708334
Iteration 28, loss = 0.13494955
Iteration 29, loss = 0.13316464
Iteration 30, loss = 0.13090123
Iteration 31, loss = 0.12884835
Iteration 32, loss = 0.12716581
Iteration 33, loss = 0.12512489
Iteration 34, loss = 0.12346389
Iteration 35, loss = 0.12158024
Iteration 36, loss = 0.12027427
Iteration 37, loss = 0.11861775
Iteration 38, loss = 0.11692579
Iteration 39, loss = 0.11594661
Iteration 40, loss = 0.11415388
Iteration 41, loss = 0.11287719
Iteration 42, loss = 0.11133956
Iteration 43, loss = 0.11029028
Iteration 44, loss = 0.10908740
Iteration 45, loss = 0.10797075
Iteration 46, loss = 0.10630308
Iteration 47, loss = 0.10542086
Iteration 48, loss = 0.10395810
Iteration 49, loss = 0.10337632
Iteration 50, loss = 0.10239999
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.89526199
Iteration 2, loss = 0.39435285
Iteration 3, loss = 0.32893198
Iteration 4, loss = 0.29247830
Iteration 5, loss = 0.26725908
Iteration 6, loss = 0.24901219
Iteration 7, loss = 0.23456497
Iteration 8, loss = 0.22222329
Iteration 9, loss = 0.21219267
Iteration 10, loss = 0.20352886
Iteration 11, loss = 0.19636202
Iteration 12, loss = 0.18942859
Iteration 13, loss = 0.18329410
Iteration 14, loss = 0.17810742
Iteration 15, loss = 0.17288713
Iteration 16, loss = 0.16864115
Iteration 17, loss = 0.16447737
Iteration 18, loss = 0.16078274
Iteration 19, loss = 0.15698763
Iteration 20, loss = 0.15376658
Iteration 21, loss = 0.15056222
Iteration 22, loss = 0.14757861
Iteration 23, loss = 0.14476262
Iteration 24, loss = 0.14187262
Iteration 25, loss = 0.13965245
Iteration 26, loss = 0.13752207
Iteration 27, loss = 0.13525965
Iteration 28, loss = 0.13294208
Iteration 29, loss = 0.13089825
Iteration 30, loss = 0.12902012
Iteration 31, loss = 0.12700497
Iteration 32, loss = 0.12528995
Iteration 33, loss = 0.12347190
Iteration 34, loss = 0.12195631
Iteration 35, loss = 0.12014656
Iteration 36, loss = 0.11867509
Iteration 37, loss = 0.11734238
Iteration 38, loss = 0.11582675
Iteration 39, loss = 0.11410159
Iteration 40, loss = 0.11293415
Iteration 41, loss = 0.11165262
Iteration 42, loss = 0.11042602
Iteration 43, loss = 0.10914110
Iteration 44, loss = 0.10781827
Iteration 45, loss = 0.10673274
Iteration 46, loss = 0.10570576
Iteration 47, loss = 0.10461887
Iteration 48, loss = 0.10368361
Iteration 49, loss = 0.10243229
Iteration 50, loss = 0.10137271
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.94845957
Iteration 2, loss = 1.10447089
Iteration 3, loss = 0.51319165
Iteration 4, loss = 0.33995558
Iteration 5, loss = 0.26653577
Iteration 6, loss = 0.22692386
Iteration 7, loss = 0.20505703
Iteration 8, loss = 0.18052043
Iteration 9, loss = 0.17052450
Iteration 10, loss = 0.15569780
Iteration 11, loss = 0.14599026
Iteration 12, loss = 0.13678452
Iteration 13, loss = 0.13306636
Iteration 14, loss = 0.12921618
Iteration 15, loss = 0.12145563
Iteration 16, loss = 0.11716851
Iteration 17, loss = 0.11175489
Iteration 18, loss = 0.10729911
Iteration 19, loss = 0.10579428
Iteration 20, loss = 0.10294765
Iteration 21, loss = 0.09915991
Iteration 22, loss = 0.09503529
Iteration 23, loss = 0.09265239
Iteration 24, loss = 0.09243001
Iteration 25, loss = 0.08791669
Iteration 26, loss = 0.09030127
Iteration 27, loss = 0.08411538
Iteration 28, loss = 0.08239041
Iteration 29, loss = 0.08028024
Iteration 30, loss = 0.08206261
Iteration 31, loss = 0.07893573
Iteration 32, loss = 0.07717577
Iteration 33, loss = 0.07664721
Iteration 34, loss = 0.07542393
Iteration 35, loss = 0.07335992
Iteration 36, loss = 0.07238967
Iteration 37, loss = 0.07051630
Iteration 38, loss = 0.07103197
Iteration 39, loss = 0.07001866
Iteration 40, loss = 0.06698506
Iteration 41, loss = 0.06767951
Iteration 42, loss = 0.06701841
Iteration 43, loss = 0.06551638
Iteration 44, loss = 0.06438078
Iteration 45, loss = 0.06505698
Iteration 46, loss = 0.06393485
Iteration 47, loss = 0.06177700
Iteration 48, loss = 0.06233264
Iteration 49, loss = 0.06294979
Iteration 50, loss = 0.05861734
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.64897593
Iteration 2, loss = 0.81975543
Iteration 3, loss = 0.38087477
Iteration 4, loss = 0.27909386
Iteration 5, loss = 0.22994017
Iteration 6, loss = 0.20062163
Iteration 7, loss = 0.18518249
Iteration 8, loss = 0.16889443
Iteration 9, loss = 0.15973776
Iteration 10, loss = 0.15033613
Iteration 11, loss = 0.14032831
Iteration 12, loss = 0.13504493
Iteration 13, loss = 0.12804213
Iteration 14, loss = 0.12272501
Iteration 15, loss = 0.11992817
Iteration 16, loss = 0.11403275
Iteration 17, loss = 0.11117440
Iteration 18, loss = 0.10694424
Iteration 19, loss = 0.10482551
Iteration 20, loss = 0.10223522
Iteration 21, loss = 0.10002135
Iteration 22, loss = 0.09620917
Iteration 23, loss = 0.09501419
Iteration 24, loss = 0.09227021
Iteration 25, loss = 0.09208538
Iteration 26, loss = 0.08927163
Iteration 27, loss = 0.08837318
Iteration 28, loss = 0.08693456
Iteration 29, loss = 0.08562405
Iteration 30, loss = 0.08389124
Iteration 31, loss = 0.08213392
Iteration 32, loss = 0.08216534
Iteration 33, loss = 0.08155407
Iteration 34, loss = 0.07905745
Iteration 35, loss = 0.07941896
Iteration 36, loss = 0.07683696
Iteration 37, loss = 0.07720381
Iteration 38, loss = 0.07646303
Iteration 39, loss = 0.07497041
Iteration 40, loss = 0.07369194
Iteration 41, loss = 0.07360791
Iteration 42, loss = 0.07258705
Iteration 43, loss = 0.07226169
Iteration 44, loss = 0.07096933
Iteration 45, loss = 0.07106527
Iteration 46, loss = 0.07002649
Iteration 47, loss = 0.06965836
Iteration 48, loss = 0.06853523
Iteration 49, loss = 0.06916452
Iteration 50, loss = 0.06756652
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
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```

```
Iteration 1, loss = 2.13630571
Iteration 2, loss = 0.41156979
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Iteration 4, loss = 0.29072542
Iteration 5, loss = 0.26597929
Iteration 6, loss = 0.24795240
Iteration 7, loss = 0.23403847
Iteration 8, loss = 0.22181738
Iteration 9, loss = 0.21304840
Iteration 10, loss = 0.20411347
Iteration 11, loss = 0.19674550
Iteration 12, loss = 0.19028324
Iteration 13, loss = 0.18404055
Iteration 14, loss = 0.18001161
Iteration 15, loss = 0.17429764
Iteration 16, loss = 0.17058679
Iteration 17, loss = 0.16616087
Iteration 18, loss = 0.16299671
Iteration 19, loss = 0.15917220
Iteration 20, loss = 0.15594705
Iteration 21, loss = 0.15317331
Iteration 22, loss = 0.14993045
Iteration 23, loss = 0.14694550
Iteration 24, loss = 0.14466809
Iteration 25, loss = 0.14182157
Iteration 26, loss = 0.13968836
Iteration 27, loss = 0.13708334
Iteration 28, loss = 0.13494955
Iteration 29, loss = 0.13316464
Iteration 30, loss = 0.13090123
Iteration 31, loss = 0.12884835
Iteration 32, loss = 0.12716581
Iteration 33, loss = 0.12512489
Iteration 34, loss = 0.12346389
Iteration 35, loss = 0.12158024
Iteration 36, loss = 0.12027427
Iteration 37, loss = 0.11861775
Iteration 38, loss = 0.11692579
Iteration 39, loss = 0.11594661
Iteration 40, loss = 0.11415388
Iteration 41, loss = 0.11287719
Iteration 42, loss = 0.11133956
Iteration 43, loss = 0.11029028
Iteration 44, loss = 0.10908740
Iteration 45, loss = 0.10797075
Iteration 46, loss = 0.10630308
Iteration 47, loss = 0.10542086
Iteration 48, loss = 0.10395810
Iteration 49, loss = 0.10337632
Iteration 50, loss = 0.10239999
Iteration 51, loss = 0.10115233
Iteration 52, loss = 0.09993617
```

```
Iteration 53, loss = 0.09911479
Iteration 54, loss = 0.09807130
Iteration 55, loss = 0.09717473
Iteration 56, loss = 0.09646534
Iteration 57, loss = 0.09554677
Iteration 58, loss = 0.09466420
Iteration 59, loss = 0.09352849
Iteration 60, loss = 0.09293403
Iteration 61, loss = 0.09219228
Iteration 62, loss = 0.09166226
Iteration 63, loss = 0.09071278
Iteration 64, loss = 0.08982822
Iteration 65, loss = 0.08913034
Iteration 66, loss = 0.08829482
Iteration 67, loss = 0.08745370
Iteration 68, loss = 0.08708800
Iteration 69, loss = 0.08657307
Iteration 70, loss = 0.08581444
Iteration 71, loss = 0.08502984
Iteration 72, loss = 0.08451935
Iteration 73, loss = 0.08408629
Iteration 74, loss = 0.08345992
Iteration 75, loss = 0.08245328
Iteration 76, loss = 0.08186417
Iteration 77, loss = 0.08125498
Iteration 78, loss = 0.08108281
Iteration 79, loss = 0.08020123
Iteration 80, loss = 0.07964847
Iteration 81, loss = 0.07921964
Iteration 82, loss = 0.07867097
Iteration 83, loss = 0.07814144
Iteration 84, loss = 0.07763240
Iteration 85, loss = 0.07731087
Iteration 86, loss = 0.07664947
Iteration 87, loss = 0.07595451
Iteration 88, loss = 0.07566664
Iteration 89, loss = 0.07530332
Iteration 90, loss = 0.07451665
Iteration 91, loss = 0.07445089
Iteration 92, loss = 0.07359830
Iteration 93, loss = 0.07353869
Iteration 94, loss = 0.07297249
Iteration 95, loss = 0.07210413
Iteration 96, loss = 0.07200217
Iteration 97, loss = 0.07183395
Iteration 98, loss = 0.07104217
Iteration 99, loss = 0.07063702
Iteration 100, loss = 0.07029157
```

```
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  warnings.warn(
```

```
Iteration 1, loss = 1.89526199
Iteration 2, loss = 0.39435285
Iteration 3, loss = 0.32893198
Iteration 4, loss = 0.29247830
Iteration 5, loss = 0.26725908
Iteration 6, loss = 0.24901219
Iteration 7, loss = 0.23456497
Iteration 8, loss = 0.22222329
Iteration 9, loss = 0.21219267
Iteration 10, loss = 0.20352886
Iteration 11, loss = 0.19636202
Iteration 12, loss = 0.18942859
Iteration 13, loss = 0.18329410
Iteration 14, loss = 0.17810742
Iteration 15, loss = 0.17288713
Iteration 16, loss = 0.16864115
Iteration 17, loss = 0.16447737
Iteration 18, loss = 0.16078274
Iteration 19, loss = 0.15698763
Iteration 20, loss = 0.15376658
Iteration 21, loss = 0.15056222
Iteration 22, loss = 0.14757861
Iteration 23, loss = 0.14476262
Iteration 24, loss = 0.14187262
Iteration 25, loss = 0.13965245
Iteration 26, loss = 0.13752207
Iteration 27, loss = 0.13525965
Iteration 28, loss = 0.13294208
Iteration 29, loss = 0.13089825
Iteration 30, loss = 0.12902012
Iteration 31, loss = 0.12700497
Iteration 32, loss = 0.12528995
Iteration 33, loss = 0.12347190
Iteration 34, loss = 0.12195631
Iteration 35, loss = 0.12014656
Iteration 36, loss = 0.11867509
Iteration 37, loss = 0.11734238
Iteration 38, loss = 0.11582675
Iteration 39, loss = 0.11410159
Iteration 40, loss = 0.11293415
Iteration 41, loss = 0.11165262
Iteration 42, loss = 0.11042602
Iteration 43, loss = 0.10914110
Iteration 44, loss = 0.10781827
Iteration 45, loss = 0.10673274
Iteration 46, loss = 0.10570576
Iteration 47, loss = 0.10461887
Iteration 48, loss = 0.10368361
Iteration 49, loss = 0.10243229
Iteration 50, loss = 0.10137271
Iteration 51, loss = 0.10056250
Iteration 52, loss = 0.09952156
```

```
Iteration 53, loss = 0.09859977
Iteration 54, loss = 0.09759321
Iteration 55, loss = 0.09676584
Iteration 56, loss = 0.09621073
Iteration 57, loss = 0.09516201
Iteration 58, loss = 0.09428851
Iteration 59, loss = 0.09352458
Iteration 60, loss = 0.09274089
Iteration 61, loss = 0.09183282
Iteration 62, loss = 0.09140756
Iteration 63, loss = 0.09037527
Iteration 64, loss = 0.08967908
Iteration 65, loss = 0.08899585
Iteration 66, loss = 0.08821431
Iteration 67, loss = 0.08772859
Iteration 68, loss = 0.08704016
Iteration 69, loss = 0.08636921
Iteration 70, loss = 0.08563291
Iteration 71, loss = 0.08512679
Iteration 72, loss = 0.08460241
Iteration 73, loss = 0.08399008
Iteration 74, loss = 0.08325671
Iteration 75, loss = 0.08270172
Iteration 76, loss = 0.08209737
Iteration 77, loss = 0.08143142
Iteration 78, loss = 0.08103059
Iteration 79, loss = 0.08063068
Iteration 80, loss = 0.08005237
Iteration 81, loss = 0.07947973
Iteration 82, loss = 0.07898445
Iteration 83, loss = 0.07828778
Iteration 84, loss = 0.07797880
Iteration 85, loss = 0.07730637
Iteration 86, loss = 0.07705752
Iteration 87, loss = 0.07650916
Iteration 88, loss = 0.07603509
Iteration 89, loss = 0.07557501
Iteration 90, loss = 0.07503735
Iteration 91, loss = 0.07474393
Iteration 92, loss = 0.07421474
Iteration 93, loss = 0.07374872
Iteration 94, loss = 0.07327456
Iteration 95, loss = 0.07310306
Iteration 96, loss = 0.07258096
Iteration 97, loss = 0.07211903
Iteration 98, loss = 0.07189192
Iteration 99, loss = 0.07127963
Iteration 100, loss = 0.07107207
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.94845957
Iteration 2, loss = 1.10447089
Iteration 3, loss = 0.51319165
Iteration 4, loss = 0.33995558
Iteration 5, loss = 0.26653577
Iteration 6, loss = 0.22692386
Iteration 7, loss = 0.20505703
Iteration 8, loss = 0.18052043
Iteration 9, loss = 0.17052450
Iteration 10, loss = 0.15569780
Iteration 11, loss = 0.14599026
Iteration 12, loss = 0.13678452
Iteration 13, loss = 0.13306636
Iteration 14, loss = 0.12921618
Iteration 15, loss = 0.12145563
Iteration 16, loss = 0.11716851
Iteration 17, loss = 0.11175489
Iteration 18, loss = 0.10729911
Iteration 19, loss = 0.10579428
Iteration 20, loss = 0.10294765
Iteration 21, loss = 0.09915991
Iteration 22, loss = 0.09503529
Iteration 23, loss = 0.09265239
Iteration 24, loss = 0.09243001
Iteration 25, loss = 0.08791669
Iteration 26, loss = 0.09030127
Iteration 27, loss = 0.08411538
Iteration 28, loss = 0.08239041
Iteration 29, loss = 0.08028024
Iteration 30, loss = 0.08206261
Iteration 31, loss = 0.07893573
Iteration 32, loss = 0.07717577
Iteration 33, loss = 0.07664721
Iteration 34, loss = 0.07542393
Iteration 35, loss = 0.07335992
Iteration 36, loss = 0.07238967
Iteration 37, loss = 0.07051630
Iteration 38, loss = 0.07103197
Iteration 39, loss = 0.07001866
Iteration 40, loss = 0.06698506
Iteration 41, loss = 0.06767951
Iteration 42, loss = 0.06701841
Iteration 43, loss = 0.06551638
Iteration 44, loss = 0.06438078
Iteration 45, loss = 0.06505698
Iteration 46, loss = 0.06393485
Iteration 47, loss = 0.06177700
Iteration 48, loss = 0.06233264
Iteration 49, loss = 0.06294979
Iteration 50, loss = 0.05861734
Iteration 51, loss = 0.06133379
Iteration 52, loss = 0.05796527
```

```
Iteration 53, loss = 0.05835490
Iteration 54, loss = 0.05854548
Iteration 55, loss = 0.05896705
Iteration 56, loss = 0.05686513
Iteration 57, loss = 0.05606124
Iteration 58, loss = 0.05649298
Iteration 59, loss = 0.05580704
Iteration 60, loss = 0.05393458
Iteration 61, loss = 0.05595349
Iteration 62, loss = 0.05375048
Iteration 63, loss = 0.05323491
Iteration 64, loss = 0.05477064
Iteration 65, loss = 0.05214619
Iteration 66, loss = 0.05333139
Iteration 67, loss = 0.05249609
Iteration 68, loss = 0.05226025
Iteration 69, loss = 0.05106021
Iteration 70, loss = 0.05127109
Iteration 71, loss = 0.05121124
Iteration 72, loss = 0.05059895
Iteration 73, loss = 0.05027903
Iteration 74, loss = 0.04987334
Iteration 75, loss = 0.04979254
Iteration 76, loss = 0.04835137
Iteration 77, loss = 0.04888134
Iteration 78, loss = 0.04854337
Iteration 79, loss = 0.04850627
Iteration 80, loss = 0.04776609
Iteration 81, loss = 0.04798728
Iteration 82, loss = 0.04707550
Iteration 83, loss = 0.04691313
Iteration 84, loss = 0.04594691
Iteration 85, loss = 0.04575911
Iteration 86, loss = 0.04653068
Iteration 87, loss = 0.04637194
Iteration 88, loss = 0.04562378
Iteration 89, loss = 0.04589552
Iteration 90, loss = 0.04478917
Iteration 91, loss = 0.04535375
Iteration 92, loss = 0.04511938
Iteration 93, loss = 0.04430479
Iteration 94, loss = 0.04555329
Iteration 95, loss = 0.04435827
Iteration 96, loss = 0.04364678
Iteration 97, loss = 0.04360709
Iteration 98, loss = 0.04362255
Iteration 99, loss = 0.04368208
Iteration 100, loss = 0.04320960
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.64897593
Iteration 2, loss = 0.81975543
Iteration 3, loss = 0.38087477
Iteration 4, loss = 0.27909386
Iteration 5, loss = 0.22994017
Iteration 6, loss = 0.20062163
Iteration 7, loss = 0.18518249
Iteration 8, loss = 0.16889443
Iteration 9, loss = 0.15973776
Iteration 10, loss = 0.15033613
Iteration 11, loss = 0.14032831
Iteration 12, loss = 0.13504493
Iteration 13, loss = 0.12804213
Iteration 14, loss = 0.12272501
Iteration 15, loss = 0.11992817
Iteration 16, loss = 0.11403275
Iteration 17, loss = 0.11117440
Iteration 18, loss = 0.10694424
Iteration 19, loss = 0.10482551
Iteration 20, loss = 0.10223522
Iteration 21, loss = 0.10002135
Iteration 22, loss = 0.09620917
Iteration 23, loss = 0.09501419
Iteration 24, loss = 0.09227021
Iteration 25, loss = 0.09208538
Iteration 26, loss = 0.08927163
Iteration 27, loss = 0.08837318
Iteration 28, loss = 0.08693456
Iteration 29, loss = 0.08562405
Iteration 30, loss = 0.08389124
Iteration 31, loss = 0.08213392
Iteration 32, loss = 0.08216534
Iteration 33, loss = 0.08155407
Iteration 34, loss = 0.07905745
Iteration 35, loss = 0.07941896
Iteration 36, loss = 0.07683696
Iteration 37, loss = 0.07720381
Iteration 38, loss = 0.07646303
Iteration 39, loss = 0.07497041
Iteration 40, loss = 0.07369194
Iteration 41, loss = 0.07360791
Iteration 42, loss = 0.07258705
Iteration 43, loss = 0.07226169
Iteration 44, loss = 0.07096933
Iteration 45, loss = 0.07106527
Iteration 46, loss = 0.07002649
Iteration 47, loss = 0.06965836
Iteration 48, loss = 0.06853523
Iteration 49, loss = 0.06916452
Iteration 50, loss = 0.06756652
Iteration 51, loss = 0.06771443
Iteration 52, loss = 0.06756843
```

```
Iteration 53, loss = 0.06702429
Iteration 54, loss = 0.06564871
Iteration 55, loss = 0.06571685
Iteration 56, loss = 0.06490287
Iteration 57, loss = 0.06493541
Iteration 58, loss = 0.06463575
Iteration 59, loss = 0.06398117
Iteration 60, loss = 0.06398324
Iteration 61, loss = 0.06317435
Iteration 62, loss = 0.06325149
Iteration 63, loss = 0.06290125
Iteration 64, loss = 0.06191544
Iteration 65, loss = 0.06162727
Iteration 66, loss = 0.06191486
Iteration 67, loss = 0.06118495
Iteration 68, loss = 0.06126265
Iteration 69, loss = 0.06057063
Iteration 70, loss = 0.06039055
Iteration 71, loss = 0.06032236
Iteration 72, loss = 0.05982024
Iteration 73, loss = 0.06023420
Iteration 74, loss = 0.05886149
Iteration 75, loss = 0.05935031
Iteration 76, loss = 0.05890497
Iteration 77, loss = 0.05848685
Iteration 78, loss = 0.05887677
Iteration 79, loss = 0.05804514
Iteration 80, loss = 0.05815629
Iteration 81, loss = 0.05838694
Iteration 82, loss = 0.05631981
Iteration 83, loss = 0.05770404
Iteration 84, loss = 0.05730358
Iteration 85, loss = 0.05744220
Iteration 86, loss = 0.05671268
Iteration 87, loss = 0.05661542
Iteration 88, loss = 0.05687931
Iteration 89, loss = 0.05609705
Iteration 90, loss = 0.05582466
Iteration 91, loss = 0.05556953
Iteration 92, loss = 0.05630414
Iteration 93, loss = 0.05541134
Iteration 94, loss = 0.05544071
Iteration 95, loss = 0.05536456
Iteration 96, loss = 0.05467858
Iteration 97, loss = 0.05502075
Iteration 98, loss = 0.05471433
Iteration 99, loss = 0.05411578
Iteration 100, loss = 0.05442966
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.13630571
Iteration 2, loss = 0.41156979
Iteration 3, loss = 0.33075910
Iteration 4, loss = 0.29072542
Iteration 5, loss = 0.26597929
Iteration 6, loss = 0.24795240
Iteration 7, loss = 0.23403847
Iteration 8, loss = 0.22181738
Iteration 9, loss = 0.21304840
Iteration 10, loss = 0.20411347
Iteration 11, loss = 0.19674550
Iteration 12, loss = 0.19028324
Iteration 13, loss = 0.18404055
Iteration 14, loss = 0.18001161
Iteration 15, loss = 0.17429764
Iteration 16, loss = 0.17058679
Iteration 17, loss = 0.16616087
Iteration 18, loss = 0.16299671
Iteration 19, loss = 0.15917220
Iteration 20, loss = 0.15594705
Iteration 21, loss = 0.15317331
Iteration 22, loss = 0.14993045
Iteration 23, loss = 0.14694550
Iteration 24, loss = 0.14466809
Iteration 25, loss = 0.14182157
Iteration 26, loss = 0.13968836
Iteration 27, loss = 0.13708334
Iteration 28, loss = 0.13494955
Iteration 29, loss = 0.13316464
Iteration 30, loss = 0.13090123
Iteration 31, loss = 0.12884835
Iteration 32, loss = 0.12716581
Iteration 33, loss = 0.12512489
Iteration 34, loss = 0.12346389
Iteration 35, loss = 0.12158024
Iteration 36, loss = 0.12027427
Iteration 37, loss = 0.11861775
Iteration 38, loss = 0.11692579
Iteration 39, loss = 0.11594661
Iteration 40, loss = 0.11415388
Iteration 41, loss = 0.11287719
Iteration 42, loss = 0.11133956
Iteration 43, loss = 0.11029028
Iteration 44, loss = 0.10908740
Iteration 45, loss = 0.10797075
Iteration 46, loss = 0.10630308
Iteration 47, loss = 0.10542086
Iteration 48, loss = 0.10395810
Iteration 49, loss = 0.10337632
Iteration 50, loss = 0.10239999
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.89526199
Iteration 2, loss = 0.39435285
Iteration 3, loss = 0.32893198
Iteration 4, loss = 0.29247830
Iteration 5, loss = 0.26725908
Iteration 6, loss = 0.24901219
Iteration 7, loss = 0.23456497
Iteration 8, loss = 0.22222329
Iteration 9, loss = 0.21219267
Iteration 10, loss = 0.20352886
Iteration 11, loss = 0.19636202
Iteration 12, loss = 0.18942859
Iteration 13, loss = 0.18329410
Iteration 14, loss = 0.17810742
Iteration 15, loss = 0.17288713
Iteration 16, loss = 0.16864115
Iteration 17, loss = 0.16447737
Iteration 18, loss = 0.16078274
Iteration 19, loss = 0.15698763
Iteration 20, loss = 0.15376658
Iteration 21, loss = 0.15056222
Iteration 22, loss = 0.14757861
Iteration 23, loss = 0.14476262
Iteration 24, loss = 0.14187262
Iteration 25, loss = 0.13965245
Iteration 26, loss = 0.13752207
Iteration 27, loss = 0.13525965
Iteration 28, loss = 0.13294208
Iteration 29, loss = 0.13089825
Iteration 30, loss = 0.12902012
Iteration 31, loss = 0.12700497
Iteration 32, loss = 0.12528995
Iteration 33, loss = 0.12347190
Iteration 34, loss = 0.12195631
Iteration 35, loss = 0.12014656
Iteration 36, loss = 0.11867509
Iteration 37, loss = 0.11734238
Iteration 38, loss = 0.11582675
Iteration 39, loss = 0.11410159
Iteration 40, loss = 0.11293415
Iteration 41, loss = 0.11165262
Iteration 42, loss = 0.11042602
Iteration 43, loss = 0.10914110
Iteration 44, loss = 0.10781827
Iteration 45, loss = 0.10673274
Iteration 46, loss = 0.10570576
Iteration 47, loss = 0.10461887
Iteration 48, loss = 0.10368361
Iteration 49, loss = 0.10243229
Iteration 50, loss = 0.10137271
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.94845957
Iteration 2, loss = 1.10447089
Iteration 3, loss = 0.51319165
Iteration 4, loss = 0.33995558
Iteration 5, loss = 0.26653577
Iteration 6, loss = 0.22692386
Iteration 7, loss = 0.20505703
Iteration 8, loss = 0.18052043
Iteration 9, loss = 0.17052450
Iteration 10, loss = 0.15569780
Iteration 11, loss = 0.14599026
Iteration 12, loss = 0.13678452
Iteration 13, loss = 0.13306636
Iteration 14, loss = 0.12921618
Iteration 15, loss = 0.12145563
Iteration 16, loss = 0.11716851
Iteration 17, loss = 0.11175489
Iteration 18, loss = 0.10729911
Iteration 19, loss = 0.10579428
Iteration 20, loss = 0.10294765
Iteration 21, loss = 0.09915991
Iteration 22, loss = 0.09503529
Iteration 23, loss = 0.09265239
Iteration 24, loss = 0.09243001
Iteration 25, loss = 0.08791669
Iteration 26, loss = 0.09030127
Iteration 27, loss = 0.08411538
Iteration 28, loss = 0.08239041
Iteration 29, loss = 0.08028024
Iteration 30, loss = 0.08206261
Iteration 31, loss = 0.07893573
Iteration 32, loss = 0.07717577
Iteration 33, loss = 0.07664721
Iteration 34, loss = 0.07542393
Iteration 35, loss = 0.07335992
Iteration 36, loss = 0.07238967
Iteration 37, loss = 0.07051630
Iteration 38, loss = 0.07103197
Iteration 39, loss = 0.07001866
Iteration 40, loss = 0.06698506
Iteration 41, loss = 0.06767951
Iteration 42, loss = 0.06701841
Iteration 43, loss = 0.06551638
Iteration 44, loss = 0.06438078
Iteration 45, loss = 0.06505698
Iteration 46, loss = 0.06393485
Iteration 47, loss = 0.06177700
Iteration 48, loss = 0.06233264
Iteration 49, loss = 0.06294979
Iteration 50, loss = 0.05861734
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.64897593
Iteration 2, loss = 0.81975543
Iteration 3, loss = 0.38087477
Iteration 4, loss = 0.27909386
Iteration 5, loss = 0.22994017
Iteration 6, loss = 0.20062163
Iteration 7, loss = 0.18518249
Iteration 8, loss = 0.16889443
Iteration 9, loss = 0.15973776
Iteration 10, loss = 0.15033613
Iteration 11, loss = 0.14032831
Iteration 12, loss = 0.13504493
Iteration 13, loss = 0.12804213
Iteration 14, loss = 0.12272501
Iteration 15, loss = 0.11992817
Iteration 16, loss = 0.11403275
Iteration 17, loss = 0.11117440
Iteration 18, loss = 0.10694424
Iteration 19, loss = 0.10482551
Iteration 20, loss = 0.10223522
Iteration 21, loss = 0.10002135
Iteration 22, loss = 0.09620917
Iteration 23, loss = 0.09501419
Iteration 24, loss = 0.09227021
Iteration 25, loss = 0.09208538
Iteration 26, loss = 0.08927163
Iteration 27, loss = 0.08837318
Iteration 28, loss = 0.08693456
Iteration 29, loss = 0.08562405
Iteration 30, loss = 0.08389124
Iteration 31, loss = 0.08213392
Iteration 32, loss = 0.08216534
Iteration 33, loss = 0.08155407
Iteration 34, loss = 0.07905745
Iteration 35, loss = 0.07941896
Iteration 36, loss = 0.07683696
Iteration 37, loss = 0.07720381
Iteration 38, loss = 0.07646303
Iteration 39, loss = 0.07497041
Iteration 40, loss = 0.07369194
Iteration 41, loss = 0.07360791
Iteration 42, loss = 0.07258705
Iteration 43, loss = 0.07226169
Iteration 44, loss = 0.07096933
Iteration 45, loss = 0.07106527
Iteration 46, loss = 0.07002649
Iteration 47, loss = 0.06965836
Iteration 48, loss = 0.06853523
Iteration 49, loss = 0.06916452
Iteration 50, loss = 0.06756652
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.13630571
Iteration 2, loss = 0.41156979
Iteration 3, loss = 0.33075910
Iteration 4, loss = 0.29072542
Iteration 5, loss = 0.26597929
Iteration 6, loss = 0.24795240
Iteration 7, loss = 0.23403847
Iteration 8, loss = 0.22181738
Iteration 9, loss = 0.21304840
Iteration 10, loss = 0.20411347
Iteration 11, loss = 0.19674550
Iteration 12, loss = 0.19028324
Iteration 13, loss = 0.18404055
Iteration 14, loss = 0.18001161
Iteration 15, loss = 0.17429764
Iteration 16, loss = 0.17058679
Iteration 17, loss = 0.16616087
Iteration 18, loss = 0.16299671
Iteration 19, loss = 0.15917220
Iteration 20, loss = 0.15594705
Iteration 21, loss = 0.15317331
Iteration 22, loss = 0.14993045
Iteration 23, loss = 0.14694550
Iteration 24, loss = 0.14466809
Iteration 25, loss = 0.14182157
Iteration 26, loss = 0.13968836
Iteration 27, loss = 0.13708334
Iteration 28, loss = 0.13494955
Iteration 29, loss = 0.13316464
Iteration 30, loss = 0.13090123
Iteration 31, loss = 0.12884835
Iteration 32, loss = 0.12716581
Iteration 33, loss = 0.12512489
Iteration 34, loss = 0.12346389
Iteration 35, loss = 0.12158024
Iteration 36, loss = 0.12027427
Iteration 37, loss = 0.11861775
Iteration 38, loss = 0.11692579
Iteration 39, loss = 0.11594661
Iteration 40, loss = 0.11415388
Iteration 41, loss = 0.11287719
Iteration 42, loss = 0.11133956
Iteration 43, loss = 0.11029028
Iteration 44, loss = 0.10908740
Iteration 45, loss = 0.10797075
Iteration 46, loss = 0.10630308
Iteration 47, loss = 0.10542086
Iteration 48, loss = 0.10395810
Iteration 49, loss = 0.10337632
Iteration 50, loss = 0.10239999
Iteration 51, loss = 0.10115233
Iteration 52, loss = 0.09993617
```

```
Iteration 53, loss = 0.09911479
Iteration 54, loss = 0.09807130
Iteration 55, loss = 0.09717473
Iteration 56, loss = 0.09646534
Iteration 57, loss = 0.09554677
Iteration 58, loss = 0.09466420
Iteration 59, loss = 0.09352849
Iteration 60, loss = 0.09293403
Iteration 61, loss = 0.09219228
Iteration 62, loss = 0.09166226
Iteration 63, loss = 0.09071278
Iteration 64, loss = 0.08982822
Iteration 65, loss = 0.08913034
Iteration 66, loss = 0.08829482
Iteration 67, loss = 0.08745370
Iteration 68, loss = 0.08708800
Iteration 69, loss = 0.08657307
Iteration 70, loss = 0.08581444
Iteration 71, loss = 0.08502984
Iteration 72, loss = 0.08451935
Iteration 73, loss = 0.08408629
Iteration 74, loss = 0.08345992
Iteration 75, loss = 0.08245328
Iteration 76, loss = 0.08186417
Iteration 77, loss = 0.08125498
Iteration 78, loss = 0.08108281
Iteration 79, loss = 0.08020123
Iteration 80, loss = 0.07964847
Iteration 81, loss = 0.07921964
Iteration 82, loss = 0.07867097
Iteration 83, loss = 0.07814144
Iteration 84, loss = 0.07763240
Iteration 85, loss = 0.07731087
Iteration 86, loss = 0.07664947
Iteration 87, loss = 0.07595451
Iteration 88, loss = 0.07566664
Iteration 89, loss = 0.07530332
Iteration 90, loss = 0.07451665
Iteration 91, loss = 0.07445089
Iteration 92, loss = 0.07359830
Iteration 93, loss = 0.07353869
Iteration 94, loss = 0.07297249
Iteration 95, loss = 0.07210413
Iteration 96, loss = 0.07200217
Iteration 97, loss = 0.07183395
Iteration 98, loss = 0.07104217
Iteration 99, loss = 0.07063702
Iteration 100, loss = 0.07029157
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.89526199
Iteration 2, loss = 0.39435285
Iteration 3, loss = 0.32893198
Iteration 4, loss = 0.29247830
Iteration 5, loss = 0.26725908
Iteration 6, loss = 0.24901219
Iteration 7, loss = 0.23456497
Iteration 8, loss = 0.22222329
Iteration 9, loss = 0.21219267
Iteration 10, loss = 0.20352886
Iteration 11, loss = 0.19636202
Iteration 12, loss = 0.18942859
Iteration 13, loss = 0.18329410
Iteration 14, loss = 0.17810742
Iteration 15, loss = 0.17288713
Iteration 16, loss = 0.16864115
Iteration 17, loss = 0.16447737
Iteration 18, loss = 0.16078274
Iteration 19, loss = 0.15698763
Iteration 20, loss = 0.15376658
Iteration 21, loss = 0.15056222
Iteration 22, loss = 0.14757861
Iteration 23, loss = 0.14476262
Iteration 24, loss = 0.14187262
Iteration 25, loss = 0.13965245
Iteration 26, loss = 0.13752207
Iteration 27, loss = 0.13525965
Iteration 28, loss = 0.13294208
Iteration 29, loss = 0.13089825
Iteration 30, loss = 0.12902012
Iteration 31, loss = 0.12700497
Iteration 32, loss = 0.12528995
Iteration 33, loss = 0.12347190
Iteration 34, loss = 0.12195631
Iteration 35, loss = 0.12014656
Iteration 36, loss = 0.11867509
Iteration 37, loss = 0.11734238
Iteration 38, loss = 0.11582675
Iteration 39, loss = 0.11410159
Iteration 40, loss = 0.11293415
Iteration 41, loss = 0.11165262
Iteration 42, loss = 0.11042602
Iteration 43, loss = 0.10914110
Iteration 44, loss = 0.10781827
Iteration 45, loss = 0.10673274
Iteration 46, loss = 0.10570576
Iteration 47, loss = 0.10461887
Iteration 48, loss = 0.10368361
Iteration 49, loss = 0.10243229
Iteration 50, loss = 0.10137271
Iteration 51, loss = 0.10056250
Iteration 52, loss = 0.09952156
```

```
Iteration 53, loss = 0.09859977
Iteration 54, loss = 0.09759321
Iteration 55, loss = 0.09676584
Iteration 56, loss = 0.09621073
Iteration 57, loss = 0.09516201
Iteration 58, loss = 0.09428851
Iteration 59, loss = 0.09352458
Iteration 60, loss = 0.09274089
Iteration 61, loss = 0.09183282
Iteration 62, loss = 0.09140756
Iteration 63, loss = 0.09037527
Iteration 64, loss = 0.08967908
Iteration 65, loss = 0.08899585
Iteration 66, loss = 0.08821431
Iteration 67, loss = 0.08772859
Iteration 68, loss = 0.08704016
Iteration 69, loss = 0.08636921
Iteration 70, loss = 0.08563291
Iteration 71, loss = 0.08512679
Iteration 72, loss = 0.08460241
Iteration 73, loss = 0.08399008
Iteration 74, loss = 0.08325671
Iteration 75, loss = 0.08270172
Iteration 76, loss = 0.08209737
Iteration 77, loss = 0.08143142
Iteration 78, loss = 0.08103059
Iteration 79, loss = 0.08063068
Iteration 80, loss = 0.08005237
Iteration 81, loss = 0.07947973
Iteration 82, loss = 0.07898445
Iteration 83, loss = 0.07828778
Iteration 84, loss = 0.07797880
Iteration 85, loss = 0.07730637
Iteration 86, loss = 0.07705752
Iteration 87, loss = 0.07650916
Iteration 88, loss = 0.07603509
Iteration 89, loss = 0.07557501
Iteration 90, loss = 0.07503735
Iteration 91, loss = 0.07474393
Iteration 92, loss = 0.07421474
Iteration 93, loss = 0.07374872
Iteration 94, loss = 0.07327456
Iteration 95, loss = 0.07310306
Iteration 96, loss = 0.07258096
Iteration 97, loss = 0.07211903
Iteration 98, loss = 0.07189192
Iteration 99, loss = 0.07127963
Iteration 100, loss = 0.07107207
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.94845957
Iteration 2, loss = 1.10447089
Iteration 3, loss = 0.51319165
Iteration 4, loss = 0.33995558
Iteration 5, loss = 0.26653577
Iteration 6, loss = 0.22692386
Iteration 7, loss = 0.20505703
Iteration 8, loss = 0.18052043
Iteration 9, loss = 0.17052450
Iteration 10, loss = 0.15569780
Iteration 11, loss = 0.14599026
Iteration 12, loss = 0.13678452
Iteration 13, loss = 0.13306636
Iteration 14, loss = 0.12921618
Iteration 15, loss = 0.12145563
Iteration 16, loss = 0.11716851
Iteration 17, loss = 0.11175489
Iteration 18, loss = 0.10729911
Iteration 19, loss = 0.10579428
Iteration 20, loss = 0.10294765
Iteration 21, loss = 0.09915991
Iteration 22, loss = 0.09503529
Iteration 23, loss = 0.09265239
Iteration 24, loss = 0.09243001
Iteration 25, loss = 0.08791669
Iteration 26, loss = 0.09030127
Iteration 27, loss = 0.08411538
Iteration 28, loss = 0.08239041
Iteration 29, loss = 0.08028024
Iteration 30, loss = 0.08206261
Iteration 31, loss = 0.07893573
Iteration 32, loss = 0.07717577
Iteration 33, loss = 0.07664721
Iteration 34, loss = 0.07542393
Iteration 35, loss = 0.07335992
Iteration 36, loss = 0.07238967
Iteration 37, loss = 0.07051630
Iteration 38, loss = 0.07103197
Iteration 39, loss = 0.07001866
Iteration 40, loss = 0.06698506
Iteration 41, loss = 0.06767951
Iteration 42, loss = 0.06701841
Iteration 43, loss = 0.06551638
Iteration 44, loss = 0.06438078
Iteration 45, loss = 0.06505698
Iteration 46, loss = 0.06393485
Iteration 47, loss = 0.06177700
Iteration 48, loss = 0.06233264
Iteration 49, loss = 0.06294979
Iteration 50, loss = 0.05861734
Iteration 51, loss = 0.06133379
Iteration 52, loss = 0.05796527
```

```
Iteration 53, loss = 0.05835490
Iteration 54, loss = 0.05854548
Iteration 55, loss = 0.05896705
Iteration 56, loss = 0.05686513
Iteration 57, loss = 0.05606124
Iteration 58, loss = 0.05649298
Iteration 59, loss = 0.05580704
Iteration 60, loss = 0.05393458
Iteration 61, loss = 0.05595349
Iteration 62, loss = 0.05375048
Iteration 63, loss = 0.05323491
Iteration 64, loss = 0.05477064
Iteration 65, loss = 0.05214619
Iteration 66, loss = 0.05333139
Iteration 67, loss = 0.05249609
Iteration 68, loss = 0.05226025
Iteration 69, loss = 0.05106021
Iteration 70, loss = 0.05127109
Iteration 71, loss = 0.05121124
Iteration 72, loss = 0.05059895
Iteration 73, loss = 0.05027903
Iteration 74, loss = 0.04987334
Iteration 75, loss = 0.04979254
Iteration 76, loss = 0.04835137
Iteration 77, loss = 0.04888134
Iteration 78, loss = 0.04854337
Iteration 79, loss = 0.04850627
Iteration 80, loss = 0.04776609
Iteration 81, loss = 0.04798728
Iteration 82, loss = 0.04707550
Iteration 83, loss = 0.04691313
Iteration 84, loss = 0.04594691
Iteration 85, loss = 0.04575911
Iteration 86, loss = 0.04653068
Iteration 87, loss = 0.04637194
Iteration 88, loss = 0.04562378
Iteration 89, loss = 0.04589552
Iteration 90, loss = 0.04478917
Iteration 91, loss = 0.04535375
Iteration 92, loss = 0.04511938
Iteration 93, loss = 0.04430479
Iteration 94, loss = 0.04555329
Iteration 95, loss = 0.04435827
Iteration 96, loss = 0.04364678
Iteration 97, loss = 0.04360709
Iteration 98, loss = 0.04362255
Iteration 99, loss = 0.04368208
Iteration 100, loss = 0.04320960
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.64897593
Iteration 2, loss = 0.81975543
Iteration 3, loss = 0.38087477
Iteration 4, loss = 0.27909386
Iteration 5, loss = 0.22994017
Iteration 6, loss = 0.20062163
Iteration 7, loss = 0.18518249
Iteration 8, loss = 0.16889443
Iteration 9, loss = 0.15973776
Iteration 10, loss = 0.15033613
Iteration 11, loss = 0.14032831
Iteration 12, loss = 0.13504493
Iteration 13, loss = 0.12804213
Iteration 14, loss = 0.12272501
Iteration 15, loss = 0.11992817
Iteration 16, loss = 0.11403275
Iteration 17, loss = 0.11117440
Iteration 18, loss = 0.10694424
Iteration 19, loss = 0.10482551
Iteration 20, loss = 0.10223522
Iteration 21, loss = 0.10002135
Iteration 22, loss = 0.09620917
Iteration 23, loss = 0.09501419
Iteration 24, loss = 0.09227021
Iteration 25, loss = 0.09208538
Iteration 26, loss = 0.08927163
Iteration 27, loss = 0.08837318
Iteration 28, loss = 0.08693456
Iteration 29, loss = 0.08562405
Iteration 30, loss = 0.08389124
Iteration 31, loss = 0.08213392
Iteration 32, loss = 0.08216534
Iteration 33, loss = 0.08155407
Iteration 34, loss = 0.07905745
Iteration 35, loss = 0.07941896
Iteration 36, loss = 0.07683696
Iteration 37, loss = 0.07720381
Iteration 38, loss = 0.07646303
Iteration 39, loss = 0.07497041
Iteration 40, loss = 0.07369194
Iteration 41, loss = 0.07360791
Iteration 42, loss = 0.07258705
Iteration 43, loss = 0.07226169
Iteration 44, loss = 0.07096933
Iteration 45, loss = 0.07106527
Iteration 46, loss = 0.07002649
Iteration 47, loss = 0.06965836
Iteration 48, loss = 0.06853523
Iteration 49, loss = 0.06916452
Iteration 50, loss = 0.06756652
Iteration 51, loss = 0.06771443
Iteration 52, loss = 0.06756843
```

```
Iteration 53, loss = 0.06702429
Iteration 54, loss = 0.06564871
Iteration 55, loss = 0.06571685
Iteration 56, loss = 0.06490287
Iteration 57, loss = 0.06493541
Iteration 58, loss = 0.06463575
Iteration 59, loss = 0.06398117
Iteration 60, loss = 0.06398324
Iteration 61, loss = 0.06317435
Iteration 62, loss = 0.06325149
Iteration 63, loss = 0.06290125
Iteration 64, loss = 0.06191544
Iteration 65, loss = 0.06162727
Iteration 66, loss = 0.06191486
Iteration 67, loss = 0.06118495
Iteration 68, loss = 0.06126265
Iteration 69, loss = 0.06057063
Iteration 70, loss = 0.06039055
Iteration 71, loss = 0.06032236
Iteration 72, loss = 0.05982024
Iteration 73, loss = 0.06023420
Iteration 74, loss = 0.05886149
Iteration 75, loss = 0.05935031
Iteration 76, loss = 0.05890497
Iteration 77, loss = 0.05848685
Iteration 78, loss = 0.05887677
Iteration 79, loss = 0.05804514
Iteration 80, loss = 0.05815629
Iteration 81, loss = 0.05838694
Iteration 82, loss = 0.05631981
Iteration 83, loss = 0.05770404
Iteration 84, loss = 0.05730358
Iteration 85, loss = 0.05744220
Iteration 86, loss = 0.05671268
Iteration 87, loss = 0.05661542
Iteration 88, loss = 0.05687931
Iteration 89, loss = 0.05609705
Iteration 90, loss = 0.05582466
Iteration 91, loss = 0.05556953
Iteration 92, loss = 0.05630414
Iteration 93, loss = 0.05541134
Iteration 94, loss = 0.05544071
Iteration 95, loss = 0.05536456
Iteration 96, loss = 0.05467858
Iteration 97, loss = 0.05502075
Iteration 98, loss = 0.05471433
Iteration 99, loss = 0.05411578
Iteration 100, loss = 0.05442966
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.88797009
Iteration 2, loss = 0.43287085
Iteration 3, loss = 0.36058674
Iteration 4, loss = 0.32454685
Iteration 5, loss = 0.30169635
Iteration 6, loss = 0.28486656
Iteration 7, loss = 0.27193170
Iteration 8, loss = 0.26154220
Iteration 9, loss = 0.25241203
Iteration 10, loss = 0.24471950
Iteration 11, loss = 0.23730317
Iteration 12, loss = 0.23092047
Iteration 13, loss = 0.22560002
Iteration 14, loss = 0.22029951
Iteration 15, loss = 0.21568807
Iteration 16, loss = 0.21156222
Iteration 17, loss = 0.20737470
Iteration 18, loss = 0.20350055
Iteration 19, loss = 0.20053098
Iteration 20, loss = 0.19725659
Iteration 21, loss = 0.19402701
Iteration 22, loss = 0.19116883
Iteration 23, loss = 0.18809170
Iteration 24, loss = 0.18603633
Iteration 25, loss = 0.18385696
Iteration 26, loss = 0.18111435
Iteration 27, loss = 0.17839660
Iteration 28, loss = 0.17697629
Iteration 29, loss = 0.17484186
Iteration 30, loss = 0.17264853
Iteration 31, loss = 0.17057143
Iteration 32, loss = 0.16854508
Iteration 33, loss = 0.16731449
Iteration 34, loss = 0.16576512
Iteration 35, loss = 0.16367256
Iteration 36, loss = 0.16241157
Iteration 37, loss = 0.16067762
Iteration 38, loss = 0.15926214
Iteration 39, loss = 0.15791030
Iteration 40, loss = 0.15618079
Iteration 41, loss = 0.15522954
Iteration 42, loss = 0.15415332
Iteration 43, loss = 0.15296216
Iteration 44, loss = 0.15147150
Iteration 45, loss = 0.15074212
Iteration 46, loss = 0.14898486
Iteration 47, loss = 0.14828642
Iteration 48, loss = 0.14693314
Iteration 49, loss = 0.14552740
Iteration 50, loss = 0.14522462
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.70834157
Iteration 2, loss = 0.41664995
Iteration 3, loss = 0.35675968
Iteration 4, loss = 0.32290167
Iteration 5, loss = 0.30055594
Iteration 6, loss = 0.28297419
Iteration 7, loss = 0.26939022
Iteration 8, loss = 0.25823469
Iteration 9, loss = 0.24878514
Iteration 10, loss = 0.24084426
Iteration 11, loss = 0.23362374
Iteration 12, loss = 0.22735069
Iteration 13, loss = 0.22156620
Iteration 14, loss = 0.21609837
Iteration 15, loss = 0.21101247
Iteration 16, loss = 0.20669202
Iteration 17, loss = 0.20232124
Iteration 18, loss = 0.19853092
Iteration 19, loss = 0.19466281
Iteration 20, loss = 0.19168414
Iteration 21, loss = 0.18796198
Iteration 22, loss = 0.18503314
Iteration 23, loss = 0.18221174
Iteration 24, loss = 0.17938611
Iteration 25, loss = 0.17689382
Iteration 26, loss = 0.17462097
Iteration 27, loss = 0.17202355
Iteration 28, loss = 0.16989190
Iteration 29, loss = 0.16794146
Iteration 30, loss = 0.16581192
Iteration 31, loss = 0.16400897
Iteration 32, loss = 0.16211747
Iteration 33, loss = 0.16032609
Iteration 34, loss = 0.15853343
Iteration 35, loss = 0.15697586
Iteration 36, loss = 0.15503797
Iteration 37, loss = 0.15366920
Iteration 38, loss = 0.15230721
Iteration 39, loss = 0.15112761
Iteration 40, loss = 0.14960099
Iteration 41, loss = 0.14811787
Iteration 42, loss = 0.14710477
Iteration 43, loss = 0.14565775
Iteration 44, loss = 0.14458675
Iteration 45, loss = 0.14337422
Iteration 46, loss = 0.14217568
Iteration 47, loss = 0.14079204
Iteration 48, loss = 0.13994068
Iteration 49, loss = 0.13889693
Iteration 50, loss = 0.13799314
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.26863801
Iteration 2, loss = 0.59056517
Iteration 3, loss = 0.37714802
Iteration 4, loss = 0.30672242
Iteration 5, loss = 0.27237235
Iteration 6, loss = 0.25235259
Iteration 7, loss = 0.23470060
Iteration 8, loss = 0.22280554
Iteration 9, loss = 0.20981393
Iteration 10, loss = 0.20437984
Iteration 11, loss = 0.19767342
Iteration 12, loss = 0.18804227
Iteration 13, loss = 0.18813000
Iteration 14, loss = 0.17524795
Iteration 15, loss = 0.17174022
Iteration 16, loss = 0.16937590
Iteration 17, loss = 0.16626353
Iteration 18, loss = 0.16347058
Iteration 19, loss = 0.15792681
Iteration 20, loss = 0.15838514
Iteration 21, loss = 0.15477730
Iteration 22, loss = 0.15033649
Iteration 23, loss = 0.14491986
Iteration 24, loss = 0.14792431
Iteration 25, loss = 0.14371204
Iteration 26, loss = 0.13975868
Iteration 27, loss = 0.13867147
Iteration 28, loss = 0.13544684
Iteration 29, loss = 0.13650826
Iteration 30, loss = 0.13512938
Iteration 31, loss = 0.13323419
Iteration 32, loss = 0.13318884
Iteration 33, loss = 0.12981120
Iteration 34, loss = 0.12767587
Iteration 35, loss = 0.12931642
Iteration 36, loss = 0.12344085
Iteration 37, loss = 0.12647007
Iteration 38, loss = 0.12467689
Iteration 39, loss = 0.12675606
Iteration 40, loss = 0.12105306
Iteration 41, loss = 0.12359073
Iteration 42, loss = 0.11999800
Iteration 43, loss = 0.11945860
Iteration 44, loss = 0.11770416
Iteration 45, loss = 0.11985367
Iteration 46, loss = 0.11818552
Iteration 47, loss = 0.11497279
Iteration 48, loss = 0.11587529
Iteration 49, loss = 0.11420151
Iteration 50, loss = 0.11579757
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98333308
Iteration 2, loss = 0.51352558
Iteration 3, loss = 0.34910836
Iteration 4, loss = 0.29295713
Iteration 5, loss = 0.26071124
Iteration 6, loss = 0.24099502
Iteration 7, loss = 0.22837668
Iteration 8, loss = 0.21447187
Iteration 9, loss = 0.20667003
Iteration 10, loss = 0.19685586
Iteration 11, loss = 0.19207279
Iteration 12, loss = 0.18409908
Iteration 13, loss = 0.17966659
Iteration 14, loss = 0.17423779
Iteration 15, loss = 0.17232710
Iteration 16, loss = 0.16736804
Iteration 17, loss = 0.16238996
Iteration 18, loss = 0.16097865
Iteration 19, loss = 0.15709287
Iteration 20, loss = 0.15677148
Iteration 21, loss = 0.15268156
Iteration 22, loss = 0.14966075
Iteration 23, loss = 0.15039261
Iteration 24, loss = 0.14677656
Iteration 25, loss = 0.14522288
Iteration 26, loss = 0.14417400
Iteration 27, loss = 0.14390213
Iteration 28, loss = 0.14162425
Iteration 29, loss = 0.14063132
Iteration 30, loss = 0.13988025
Iteration 31, loss = 0.13848355
Iteration 32, loss = 0.13717634
Iteration 33, loss = 0.13640866
Iteration 34, loss = 0.13533597
Iteration 35, loss = 0.13525121
Iteration 36, loss = 0.13429891
Iteration 37, loss = 0.13357625
Iteration 38, loss = 0.13151110
Iteration 39, loss = 0.13154310
Iteration 40, loss = 0.13101724
Iteration 41, loss = 0.13204253
Iteration 42, loss = 0.13017499
Iteration 43, loss = 0.12828244
Iteration 44, loss = 0.12959821
Iteration 45, loss = 0.12849962
Iteration 46, loss = 0.12782304
Iteration 47, loss = 0.12761791
Iteration 48, loss = 0.12640237
Iteration 49, loss = 0.12750071
Iteration 50, loss = 0.12642591
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.88797009
Iteration 2, loss = 0.43287085
Iteration 3, loss = 0.36058674
Iteration 4, loss = 0.32454685
Iteration 5, loss = 0.30169635
Iteration 6, loss = 0.28486656
Iteration 7, loss = 0.27193170
Iteration 8, loss = 0.26154220
Iteration 9, loss = 0.25241203
Iteration 10, loss = 0.24471950
Iteration 11, loss = 0.23730317
Iteration 12, loss = 0.23092047
Iteration 13, loss = 0.22560002
Iteration 14, loss = 0.22029951
Iteration 15, loss = 0.21568807
Iteration 16, loss = 0.21156222
Iteration 17, loss = 0.20737470
Iteration 18, loss = 0.20350055
Iteration 19, loss = 0.20053098
Iteration 20, loss = 0.19725659
Iteration 21, loss = 0.19402701
Iteration 22, loss = 0.19116883
Iteration 23, loss = 0.18809170
Iteration 24, loss = 0.18603633
Iteration 25, loss = 0.18385696
Iteration 26, loss = 0.18111435
Iteration 27, loss = 0.17839660
Iteration 28, loss = 0.17697629
Iteration 29, loss = 0.17484186
Iteration 30, loss = 0.17264853
Iteration 31, loss = 0.17057143
Iteration 32, loss = 0.16854508
Iteration 33, loss = 0.16731449
Iteration 34, loss = 0.16576512
Iteration 35, loss = 0.16367256
Iteration 36, loss = 0.16241157
Iteration 37, loss = 0.16067762
Iteration 38, loss = 0.15926214
Iteration 39, loss = 0.15791030
Iteration 40, loss = 0.15618079
Iteration 41, loss = 0.15522954
Iteration 42, loss = 0.15415332
Iteration 43, loss = 0.15296216
Iteration 44, loss = 0.15147150
Iteration 45, loss = 0.15074212
Iteration 46, loss = 0.14898486
Iteration 47, loss = 0.14828642
Iteration 48, loss = 0.14693314
Iteration 49, loss = 0.14552740
Iteration 50, loss = 0.14522462
Iteration 51, loss = 0.14389260
Iteration 52, loss = 0.14265362
```

```
Iteration 53, loss = 0.14155191
Iteration 54, loss = 0.14111999
Iteration 55, loss = 0.13973465
Iteration 56, loss = 0.13919002
Iteration 57, loss = 0.13811414
Iteration 58, loss = 0.13711316
Iteration 59, loss = 0.13648046
Iteration 60, loss = 0.13538463
Iteration 61, loss = 0.13498347
Iteration 62, loss = 0.13365723
Iteration 63, loss = 0.13322658
Iteration 64, loss = 0.13199861
Iteration 65, loss = 0.13190317
Iteration 66, loss = 0.13079232
Iteration 67, loss = 0.13012630
Iteration 68, loss = 0.12966211
Iteration 69, loss = 0.12832944
Iteration 70, loss = 0.12760895
Iteration 71, loss = 0.12721572
Iteration 72, loss = 0.12697065
Iteration 73, loss = 0.12574925
Iteration 74, loss = 0.12550519
Iteration 75, loss = 0.12495856
Iteration 76, loss = 0.12428344
Iteration 77, loss = 0.12378325
Iteration 78, loss = 0.12278999
Iteration 79, loss = 0.12222004
Iteration 80, loss = 0.12210049
Iteration 81, loss = 0.12095821
Iteration 82, loss = 0.12070479
Iteration 83, loss = 0.12022943
Iteration 84, loss = 0.11961406
Iteration 85, loss = 0.11881970
Iteration 86, loss = 0.11868490
Iteration 87, loss = 0.11836678
Iteration 88, loss = 0.11755848
Iteration 89, loss = 0.11694964
Iteration 90, loss = 0.11702923
Iteration 91, loss = 0.11610476
Iteration 92, loss = 0.11589329
Iteration 93, loss = 0.11473101
Iteration 94, loss = 0.11430057
Iteration 95, loss = 0.11416568
Iteration 96, loss = 0.11368581
Iteration 97, loss = 0.11366254
Iteration 98, loss = 0.11301406
Iteration 99, loss = 0.11283031
Iteration 100, loss = 0.11217304
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.70834157
Iteration 2, loss = 0.41664995
Iteration 3, loss = 0.35675968
Iteration 4, loss = 0.32290167
Iteration 5, loss = 0.30055594
Iteration 6, loss = 0.28297419
Iteration 7, loss = 0.26939022
Iteration 8, loss = 0.25823469
Iteration 9, loss = 0.24878514
Iteration 10, loss = 0.24084426
Iteration 11, loss = 0.23362374
Iteration 12, loss = 0.22735069
Iteration 13, loss = 0.22156620
Iteration 14, loss = 0.21609837
Iteration 15, loss = 0.21101247
Iteration 16, loss = 0.20669202
Iteration 17, loss = 0.20232124
Iteration 18, loss = 0.19853092
Iteration 19, loss = 0.19466281
Iteration 20, loss = 0.19168414
Iteration 21, loss = 0.18796198
Iteration 22, loss = 0.18503314
Iteration 23, loss = 0.18221174
Iteration 24, loss = 0.17938611
Iteration 25, loss = 0.17689382
Iteration 26, loss = 0.17462097
Iteration 27, loss = 0.17202355
Iteration 28, loss = 0.16989190
Iteration 29, loss = 0.16794146
Iteration 30, loss = 0.16581192
Iteration 31, loss = 0.16400897
Iteration 32, loss = 0.16211747
Iteration 33, loss = 0.16032609
Iteration 34, loss = 0.15853343
Iteration 35, loss = 0.15697586
Iteration 36, loss = 0.15503797
Iteration 37, loss = 0.15366920
Iteration 38, loss = 0.15230721
Iteration 39, loss = 0.15112761
Iteration 40, loss = 0.14960099
Iteration 41, loss = 0.14811787
Iteration 42, loss = 0.14710477
Iteration 43, loss = 0.14565775
Iteration 44, loss = 0.14458675
Iteration 45, loss = 0.14337422
Iteration 46, loss = 0.14217568
Iteration 47, loss = 0.14079204
Iteration 48, loss = 0.13994068
Iteration 49, loss = 0.13889693
Iteration 50, loss = 0.13799314
Iteration 51, loss = 0.13676190
Iteration 52, loss = 0.13583445
```

```
Iteration 53, loss = 0.13499703
Iteration 54, loss = 0.13399130
Iteration 55, loss = 0.13289388
Iteration 56, loss = 0.13192216
Iteration 57, loss = 0.13124135
Iteration 58, loss = 0.13040945
Iteration 59, loss = 0.12946225
Iteration 60, loss = 0.12860959
Iteration 61, loss = 0.12755480
Iteration 62, loss = 0.12688224
Iteration 63, loss = 0.12644426
Iteration 64, loss = 0.12578549
Iteration 65, loss = 0.12479726
Iteration 66, loss = 0.12401675
Iteration 67, loss = 0.12322387
Iteration 68, loss = 0.12258537
Iteration 69, loss = 0.12195872
Iteration 70, loss = 0.12125151
Iteration 71, loss = 0.12064000
Iteration 72, loss = 0.11977844
Iteration 73, loss = 0.11938014
Iteration 74, loss = 0.11831559
Iteration 75, loss = 0.11800245
Iteration 76, loss = 0.11751668
Iteration 77, loss = 0.11691271
Iteration 78, loss = 0.11638578
Iteration 79, loss = 0.11547373
Iteration 80, loss = 0.11512910
Iteration 81, loss = 0.11446624
Iteration 82, loss = 0.11393622
Iteration 83, loss = 0.11349054
Iteration 84, loss = 0.11286204
Iteration 85, loss = 0.11236968
Iteration 86, loss = 0.11181904
Iteration 87, loss = 0.11138328
Iteration 88, loss = 0.11083219
Iteration 89, loss = 0.11031767
Iteration 90, loss = 0.10995526
Iteration 91, loss = 0.10945729
Iteration 92, loss = 0.10874106
Iteration 93, loss = 0.10863427
Iteration 94, loss = 0.10804986
Iteration 95, loss = 0.10733230
Iteration 96, loss = 0.10721880
Iteration 97, loss = 0.10674340
Iteration 98, loss = 0.10626984
Iteration 99, loss = 0.10596389
Iteration 100, loss = 0.10572157
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.26863801
Iteration 2, loss = 0.59056517
Iteration 3, loss = 0.37714802
Iteration 4, loss = 0.30672242
Iteration 5, loss = 0.27237235
Iteration 6, loss = 0.25235259
Iteration 7, loss = 0.23470060
Iteration 8, loss = 0.22280554
Iteration 9, loss = 0.20981393
Iteration 10, loss = 0.20437984
Iteration 11, loss = 0.19767342
Iteration 12, loss = 0.18804227
Iteration 13, loss = 0.18813000
Iteration 14, loss = 0.17524795
Iteration 15, loss = 0.17174022
Iteration 16, loss = 0.16937590
Iteration 17, loss = 0.16626353
Iteration 18, loss = 0.16347058
Iteration 19, loss = 0.15792681
Iteration 20, loss = 0.15838514
Iteration 21, loss = 0.15477730
Iteration 22, loss = 0.15033649
Iteration 23, loss = 0.14491986
Iteration 24, loss = 0.14792431
Iteration 25, loss = 0.14371204
Iteration 26, loss = 0.13975868
Iteration 27, loss = 0.13867147
Iteration 28, loss = 0.13544684
Iteration 29, loss = 0.13650826
Iteration 30, loss = 0.13512938
Iteration 31, loss = 0.13323419
Iteration 32, loss = 0.13318884
Iteration 33, loss = 0.12981120
Iteration 34, loss = 0.12767587
Iteration 35, loss = 0.12931642
Iteration 36, loss = 0.12344085
Iteration 37, loss = 0.12647007
Iteration 38, loss = 0.12467689
Iteration 39, loss = 0.12675606
Iteration 40, loss = 0.12105306
Iteration 41, loss = 0.12359073
Iteration 42, loss = 0.11999800
Iteration 43, loss = 0.11945860
Iteration 44, loss = 0.11770416
Iteration 45, loss = 0.11985367
Iteration 46, loss = 0.11818552
Iteration 47, loss = 0.11497279
Iteration 48, loss = 0.11587529
Iteration 49, loss = 0.11420151
Iteration 50, loss = 0.11579757
Iteration 51, loss = 0.11564477
Iteration 52, loss = 0.11592953
```

```
Iteration 53, loss = 0.11104524
Iteration 54, loss = 0.11407286
Iteration 55, loss = 0.11097654
Iteration 56, loss = 0.11298062
Iteration 57, loss = 0.11220704
Iteration 58, loss = 0.11039849
Iteration 59, loss = 0.11070897
Iteration 60, loss = 0.10945171
Iteration 61, loss = 0.10992844
Iteration 62, loss = 0.10870912
Iteration 63, loss = 0.10851859
Iteration 64, loss = 0.10695629
Iteration 65, loss = 0.10750967
Iteration 66, loss = 0.10814982
Iteration 67, loss = 0.11001525
Iteration 68, loss = 0.10513251
Iteration 69, loss = 0.10547060
Iteration 70, loss = 0.10555004
Iteration 71, loss = 0.10485228
Iteration 72, loss = 0.10798752
Iteration 73, loss = 0.10499459
Iteration 74, loss = 0.10592981
Iteration 75, loss = 0.10447341
Iteration 76, loss = 0.10709734
Iteration 77, loss = 0.10240722
Iteration 78, loss = 0.10495215
Iteration 79, loss = 0.10255960
Iteration 80, loss = 0.10432687
Iteration 81, loss = 0.10355702
Iteration 82, loss = 0.10261962
Iteration 83, loss = 0.10167392
Iteration 84, loss = 0.10136661
Iteration 85, loss = 0.10219884
Iteration 86, loss = 0.10151818
Iteration 87, loss = 0.10070566
Iteration 88, loss = 0.10183297
Iteration 89, loss = 0.10259296
Iteration 90, loss = 0.09963383
Iteration 91, loss = 0.10148052
Iteration 92, loss = 0.10196611
Iteration 93, loss = 0.09958430
Iteration 94, loss = 0.10016489
Iteration 95, loss = 0.09943811
Iteration 96, loss = 0.09948184
Iteration 97, loss = 0.09888652
Iteration 98, loss = 0.09883802
Iteration 99, loss = 0.09838283
Iteration 100, loss = 0.09812193
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98333308
Iteration 2, loss = 0.51352558
Iteration 3, loss = 0.34910836
Iteration 4, loss = 0.29295713
Iteration 5, loss = 0.26071124
Iteration 6, loss = 0.24099502
Iteration 7, loss = 0.22837668
Iteration 8, loss = 0.21447187
Iteration 9, loss = 0.20667003
Iteration 10, loss = 0.19685586
Iteration 11, loss = 0.19207279
Iteration 12, loss = 0.18409908
Iteration 13, loss = 0.17966659
Iteration 14, loss = 0.17423779
Iteration 15, loss = 0.17232710
Iteration 16, loss = 0.16736804
Iteration 17, loss = 0.16238996
Iteration 18, loss = 0.16097865
Iteration 19, loss = 0.15709287
Iteration 20, loss = 0.15677148
Iteration 21, loss = 0.15268156
Iteration 22, loss = 0.14966075
Iteration 23, loss = 0.15039261
Iteration 24, loss = 0.14677656
Iteration 25, loss = 0.14522288
Iteration 26, loss = 0.14417400
Iteration 27, loss = 0.14390213
Iteration 28, loss = 0.14162425
Iteration 29, loss = 0.14063132
Iteration 30, loss = 0.13988025
Iteration 31, loss = 0.13848355
Iteration 32, loss = 0.13717634
Iteration 33, loss = 0.13640866
Iteration 34, loss = 0.13533597
Iteration 35, loss = 0.13525121
Iteration 36, loss = 0.13429891
Iteration 37, loss = 0.13357625
Iteration 38, loss = 0.13151110
Iteration 39, loss = 0.13154310
Iteration 40, loss = 0.13101724
Iteration 41, loss = 0.13204253
Iteration 42, loss = 0.13017499
Iteration 43, loss = 0.12828244
Iteration 44, loss = 0.12959821
Iteration 45, loss = 0.12849962
Iteration 46, loss = 0.12782304
Iteration 47, loss = 0.12761791
Iteration 48, loss = 0.12640237
Iteration 49, loss = 0.12750071
Iteration 50, loss = 0.12642591
Iteration 51, loss = 0.12547329
Iteration 52, loss = 0.12498184
```

```
Iteration 53, loss = 0.12640292
Iteration 54, loss = 0.12361559
Iteration 55, loss = 0.12539609
Iteration 56, loss = 0.12305646
Iteration 57, loss = 0.12516036
Iteration 58, loss = 0.12380411
Iteration 59, loss = 0.12301564
Iteration 60, loss = 0.12249838
Iteration 61, loss = 0.12176402
Iteration 62, loss = 0.12170579
Iteration 63, loss = 0.12128212
Iteration 64, loss = 0.12175100
Iteration 65, loss = 0.12136277
Iteration 66, loss = 0.12097579
Iteration 67, loss = 0.12092329
Iteration 68, loss = 0.11992226
Iteration 69, loss = 0.12098226
Iteration 70, loss = 0.12009913
Iteration 71, loss = 0.11899435
Iteration 72, loss = 0.11811021
Iteration 73, loss = 0.11957464
Iteration 74, loss = 0.11987355
Iteration 75, loss = 0.11875374
Iteration 76, loss = 0.11864458
Iteration 77, loss = 0.11930846
Iteration 78, loss = 0.11795570
Iteration 79, loss = 0.11778611
Iteration 80, loss = 0.11846412
Iteration 81, loss = 0.11717941
Iteration 82, loss = 0.11836051
Iteration 83, loss = 0.11945823
Iteration 84, loss = 0.11688193
Iteration 85, loss = 0.11658763
Iteration 86, loss = 0.11708568
Iteration 87, loss = 0.11637632
Iteration 88, loss = 0.11573270
Iteration 89, loss = 0.11631380
Iteration 90, loss = 0.11413333
Iteration 91, loss = 0.11620884
Iteration 92, loss = 0.11578217
Iteration 93, loss = 0.11600406
Iteration 94, loss = 0.11475339
Iteration 95, loss = 0.11452428
Iteration 96, loss = 0.11557865
Iteration 97, loss = 0.11433510
Iteration 98, loss = 0.11448233
Iteration 99, loss = 0.11502757
Iteration 100, loss = 0.11426852
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.88797009
Iteration 2, loss = 0.43287085
Iteration 3, loss = 0.36058674
Iteration 4, loss = 0.32454685
Iteration 5, loss = 0.30169635
Iteration 6, loss = 0.28486656
Iteration 7, loss = 0.27193170
Iteration 8, loss = 0.26154220
Iteration 9, loss = 0.25241203
Iteration 10, loss = 0.24471950
Iteration 11, loss = 0.23730317
Iteration 12, loss = 0.23092047
Iteration 13, loss = 0.22560002
Iteration 14, loss = 0.22029951
Iteration 15, loss = 0.21568807
Iteration 16, loss = 0.21156222
Iteration 17, loss = 0.20737470
Iteration 18, loss = 0.20350055
Iteration 19, loss = 0.20053098
Iteration 20, loss = 0.19725659
Iteration 21, loss = 0.19402701
Iteration 22, loss = 0.19116883
Iteration 23, loss = 0.18809170
Iteration 24, loss = 0.18603633
Iteration 25, loss = 0.18385696
Iteration 26, loss = 0.18111435
Iteration 27, loss = 0.17839660
Iteration 28, loss = 0.17697629
Iteration 29, loss = 0.17484186
Iteration 30, loss = 0.17264853
Iteration 31, loss = 0.17057143
Iteration 32, loss = 0.16854508
Iteration 33, loss = 0.16731449
Iteration 34, loss = 0.16576512
Iteration 35, loss = 0.16367256
Iteration 36, loss = 0.16241157
Iteration 37, loss = 0.16067762
Iteration 38, loss = 0.15926214
Iteration 39, loss = 0.15791030
Iteration 40, loss = 0.15618079
Iteration 41, loss = 0.15522954
Iteration 42, loss = 0.15415332
Iteration 43, loss = 0.15296216
Iteration 44, loss = 0.15147150
Iteration 45, loss = 0.15074212
Iteration 46, loss = 0.14898486
Iteration 47, loss = 0.14828642
Iteration 48, loss = 0.14693314
Iteration 49, loss = 0.14552740
Iteration 50, loss = 0.14522462
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.70834157
Iteration 2, loss = 0.41664995
Iteration 3, loss = 0.35675968
Iteration 4, loss = 0.32290167
Iteration 5, loss = 0.30055594
Iteration 6, loss = 0.28297419
Iteration 7, loss = 0.26939022
Iteration 8, loss = 0.25823469
Iteration 9, loss = 0.24878514
Iteration 10, loss = 0.24084426
Iteration 11, loss = 0.23362374
Iteration 12, loss = 0.22735069
Iteration 13, loss = 0.22156620
Iteration 14, loss = 0.21609837
Iteration 15, loss = 0.21101247
Iteration 16, loss = 0.20669202
Iteration 17, loss = 0.20232124
Iteration 18, loss = 0.19853092
Iteration 19, loss = 0.19466281
Iteration 20, loss = 0.19168414
Iteration 21, loss = 0.18796198
Iteration 22, loss = 0.18503314
Iteration 23, loss = 0.18221174
Iteration 24, loss = 0.17938611
Iteration 25, loss = 0.17689382
Iteration 26, loss = 0.17462097
Iteration 27, loss = 0.17202355
Iteration 28, loss = 0.16989190
Iteration 29, loss = 0.16794146
Iteration 30, loss = 0.16581192
Iteration 31, loss = 0.16400897
Iteration 32, loss = 0.16211747
Iteration 33, loss = 0.16032609
Iteration 34, loss = 0.15853343
Iteration 35, loss = 0.15697586
Iteration 36, loss = 0.15503797
Iteration 37, loss = 0.15366920
Iteration 38, loss = 0.15230721
Iteration 39, loss = 0.15112761
Iteration 40, loss = 0.14960099
Iteration 41, loss = 0.14811787
Iteration 42, loss = 0.14710477
Iteration 43, loss = 0.14565775
Iteration 44, loss = 0.14458675
Iteration 45, loss = 0.14337422
Iteration 46, loss = 0.14217568
Iteration 47, loss = 0.14079204
Iteration 48, loss = 0.13994068
Iteration 49, loss = 0.13889693
Iteration 50, loss = 0.13799314
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.26863801
Iteration 2, loss = 0.59056517
Iteration 3, loss = 0.37714802
Iteration 4, loss = 0.30672242
Iteration 5, loss = 0.27237235
Iteration 6, loss = 0.25235259
Iteration 7, loss = 0.23470060
Iteration 8, loss = 0.22280554
Iteration 9, loss = 0.20981393
Iteration 10, loss = 0.20437984
Iteration 11, loss = 0.19767342
Iteration 12, loss = 0.18804227
Iteration 13, loss = 0.18813000
Iteration 14, loss = 0.17524795
Iteration 15, loss = 0.17174022
Iteration 16, loss = 0.16937590
Iteration 17, loss = 0.16626353
Iteration 18, loss = 0.16347058
Iteration 19, loss = 0.15792681
Iteration 20, loss = 0.15838514
Iteration 21, loss = 0.15477730
Iteration 22, loss = 0.15033649
Iteration 23, loss = 0.14491986
Iteration 24, loss = 0.14792431
Iteration 25, loss = 0.14371204
Iteration 26, loss = 0.13975868
Iteration 27, loss = 0.13867147
Iteration 28, loss = 0.13544684
Iteration 29, loss = 0.13650826
Iteration 30, loss = 0.13512938
Iteration 31, loss = 0.13323419
Iteration 32, loss = 0.13318884
Iteration 33, loss = 0.12981120
Iteration 34, loss = 0.12767587
Iteration 35, loss = 0.12931642
Iteration 36, loss = 0.12344085
Iteration 37, loss = 0.12647007
Iteration 38, loss = 0.12467689
Iteration 39, loss = 0.12675606
Iteration 40, loss = 0.12105306
Iteration 41, loss = 0.12359073
Iteration 42, loss = 0.11999800
Iteration 43, loss = 0.11945860
Iteration 44, loss = 0.11770416
Iteration 45, loss = 0.11985367
Iteration 46, loss = 0.11818552
Iteration 47, loss = 0.11497279
Iteration 48, loss = 0.11587529
Iteration 49, loss = 0.11420151
Iteration 50, loss = 0.11579757
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98333308
Iteration 2, loss = 0.51352558
Iteration 3, loss = 0.34910836
Iteration 4, loss = 0.29295713
Iteration 5, loss = 0.26071124
Iteration 6, loss = 0.24099502
Iteration 7, loss = 0.22837668
Iteration 8, loss = 0.21447187
Iteration 9, loss = 0.20667003
Iteration 10, loss = 0.19685586
Iteration 11, loss = 0.19207279
Iteration 12, loss = 0.18409908
Iteration 13, loss = 0.17966659
Iteration 14, loss = 0.17423779
Iteration 15, loss = 0.17232710
Iteration 16, loss = 0.16736804
Iteration 17, loss = 0.16238996
Iteration 18, loss = 0.16097865
Iteration 19, loss = 0.15709287
Iteration 20, loss = 0.15677148
Iteration 21, loss = 0.15268156
Iteration 22, loss = 0.14966075
Iteration 23, loss = 0.15039261
Iteration 24, loss = 0.14677656
Iteration 25, loss = 0.14522288
Iteration 26, loss = 0.14417400
Iteration 27, loss = 0.14390213
Iteration 28, loss = 0.14162425
Iteration 29, loss = 0.14063132
Iteration 30, loss = 0.13988025
Iteration 31, loss = 0.13848355
Iteration 32, loss = 0.13717634
Iteration 33, loss = 0.13640866
Iteration 34, loss = 0.13533597
Iteration 35, loss = 0.13525121
Iteration 36, loss = 0.13429891
Iteration 37, loss = 0.13357625
Iteration 38, loss = 0.13151110
Iteration 39, loss = 0.13154310
Iteration 40, loss = 0.13101724
Iteration 41, loss = 0.13204253
Iteration 42, loss = 0.13017499
Iteration 43, loss = 0.12828244
Iteration 44, loss = 0.12959821
Iteration 45, loss = 0.12849962
Iteration 46, loss = 0.12782304
Iteration 47, loss = 0.12761791
Iteration 48, loss = 0.12640237
Iteration 49, loss = 0.12750071
Iteration 50, loss = 0.12642591
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.88797009
Iteration 2, loss = 0.43287085
Iteration 3, loss = 0.36058674
Iteration 4, loss = 0.32454685
Iteration 5, loss = 0.30169635
Iteration 6, loss = 0.28486656
Iteration 7, loss = 0.27193170
Iteration 8, loss = 0.26154220
Iteration 9, loss = 0.25241203
Iteration 10, loss = 0.24471950
Iteration 11, loss = 0.23730317
Iteration 12, loss = 0.23092047
Iteration 13, loss = 0.22560002
Iteration 14, loss = 0.22029951
Iteration 15, loss = 0.21568807
Iteration 16, loss = 0.21156222
Iteration 17, loss = 0.20737470
Iteration 18, loss = 0.20350055
Iteration 19, loss = 0.20053098
Iteration 20, loss = 0.19725659
Iteration 21, loss = 0.19402701
Iteration 22, loss = 0.19116883
Iteration 23, loss = 0.18809170
Iteration 24, loss = 0.18603633
Iteration 25, loss = 0.18385696
Iteration 26, loss = 0.18111435
Iteration 27, loss = 0.17839660
Iteration 28, loss = 0.17697629
Iteration 29, loss = 0.17484186
Iteration 30, loss = 0.17264853
Iteration 31, loss = 0.17057143
Iteration 32, loss = 0.16854508
Iteration 33, loss = 0.16731449
Iteration 34, loss = 0.16576512
Iteration 35, loss = 0.16367256
Iteration 36, loss = 0.16241157
Iteration 37, loss = 0.16067762
Iteration 38, loss = 0.15926214
Iteration 39, loss = 0.15791030
Iteration 40, loss = 0.15618079
Iteration 41, loss = 0.15522954
Iteration 42, loss = 0.15415332
Iteration 43, loss = 0.15296216
Iteration 44, loss = 0.15147150
Iteration 45, loss = 0.15074212
Iteration 46, loss = 0.14898486
Iteration 47, loss = 0.14828642
Iteration 48, loss = 0.14693314
Iteration 49, loss = 0.14552740
Iteration 50, loss = 0.14522462
Iteration 51, loss = 0.14389260
Iteration 52, loss = 0.14265362
```

```
Iteration 53, loss = 0.14155191
Iteration 54, loss = 0.14111999
Iteration 55, loss = 0.13973465
Iteration 56, loss = 0.13919002
Iteration 57, loss = 0.13811414
Iteration 58, loss = 0.13711316
Iteration 59, loss = 0.13648046
Iteration 60, loss = 0.13538463
Iteration 61, loss = 0.13498347
Iteration 62, loss = 0.13365723
Iteration 63, loss = 0.13322658
Iteration 64, loss = 0.13199861
Iteration 65, loss = 0.13190317
Iteration 66, loss = 0.13079232
Iteration 67, loss = 0.13012630
Iteration 68, loss = 0.12966211
Iteration 69, loss = 0.12832944
Iteration 70, loss = 0.12760895
Iteration 71, loss = 0.12721572
Iteration 72, loss = 0.12697065
Iteration 73, loss = 0.12574925
Iteration 74, loss = 0.12550519
Iteration 75, loss = 0.12495856
Iteration 76, loss = 0.12428344
Iteration 77, loss = 0.12378325
Iteration 78, loss = 0.12278999
Iteration 79, loss = 0.12222004
Iteration 80, loss = 0.12210049
Iteration 81, loss = 0.12095821
Iteration 82, loss = 0.12070479
Iteration 83, loss = 0.12022943
Iteration 84, loss = 0.11961406
Iteration 85, loss = 0.11881970
Iteration 86, loss = 0.11868490
Iteration 87, loss = 0.11836678
Iteration 88, loss = 0.11755848
Iteration 89, loss = 0.11694964
Iteration 90, loss = 0.11702923
Iteration 91, loss = 0.11610476
Iteration 92, loss = 0.11589329
Iteration 93, loss = 0.11473101
Iteration 94, loss = 0.11430057
Iteration 95, loss = 0.11416568
Iteration 96, loss = 0.11368581
Iteration 97, loss = 0.11366254
Iteration 98, loss = 0.11301406
Iteration 99, loss = 0.11283031
Iteration 100, loss = 0.11217304
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.70834157
Iteration 2, loss = 0.41664995
Iteration 3, loss = 0.35675968
Iteration 4, loss = 0.32290167
Iteration 5, loss = 0.30055594
Iteration 6, loss = 0.28297419
Iteration 7, loss = 0.26939022
Iteration 8, loss = 0.25823469
Iteration 9, loss = 0.24878514
Iteration 10, loss = 0.24084426
Iteration 11, loss = 0.23362374
Iteration 12, loss = 0.22735069
Iteration 13, loss = 0.22156620
Iteration 14, loss = 0.21609837
Iteration 15, loss = 0.21101247
Iteration 16, loss = 0.20669202
Iteration 17, loss = 0.20232124
Iteration 18, loss = 0.19853092
Iteration 19, loss = 0.19466281
Iteration 20, loss = 0.19168414
Iteration 21, loss = 0.18796198
Iteration 22, loss = 0.18503314
Iteration 23, loss = 0.18221174
Iteration 24, loss = 0.17938611
Iteration 25, loss = 0.17689382
Iteration 26, loss = 0.17462097
Iteration 27, loss = 0.17202355
Iteration 28, loss = 0.16989190
Iteration 29, loss = 0.16794146
Iteration 30, loss = 0.16581192
Iteration 31, loss = 0.16400897
Iteration 32, loss = 0.16211747
Iteration 33, loss = 0.16032609
Iteration 34, loss = 0.15853343
Iteration 35, loss = 0.15697586
Iteration 36, loss = 0.15503797
Iteration 37, loss = 0.15366920
Iteration 38, loss = 0.15230721
Iteration 39, loss = 0.15112761
Iteration 40, loss = 0.14960099
Iteration 41, loss = 0.14811787
Iteration 42, loss = 0.14710477
Iteration 43, loss = 0.14565775
Iteration 44, loss = 0.14458675
Iteration 45, loss = 0.14337422
Iteration 46, loss = 0.14217568
Iteration 47, loss = 0.14079204
Iteration 48, loss = 0.13994068
Iteration 49, loss = 0.13889693
Iteration 50, loss = 0.13799314
Iteration 51, loss = 0.13676190
Iteration 52, loss = 0.13583445
```

```
Iteration 53, loss = 0.13499703
Iteration 54, loss = 0.13399130
Iteration 55, loss = 0.13289388
Iteration 56, loss = 0.13192216
Iteration 57, loss = 0.13124135
Iteration 58, loss = 0.13040945
Iteration 59, loss = 0.12946225
Iteration 60, loss = 0.12860959
Iteration 61, loss = 0.12755480
Iteration 62, loss = 0.12688224
Iteration 63, loss = 0.12644426
Iteration 64, loss = 0.12578549
Iteration 65, loss = 0.12479726
Iteration 66, loss = 0.12401675
Iteration 67, loss = 0.12322387
Iteration 68, loss = 0.12258537
Iteration 69, loss = 0.12195872
Iteration 70, loss = 0.12125151
Iteration 71, loss = 0.12064000
Iteration 72, loss = 0.11977844
Iteration 73, loss = 0.11938014
Iteration 74, loss = 0.11831559
Iteration 75, loss = 0.11800245
Iteration 76, loss = 0.11751668
Iteration 77, loss = 0.11691271
Iteration 78, loss = 0.11638578
Iteration 79, loss = 0.11547373
Iteration 80, loss = 0.11512910
Iteration 81, loss = 0.11446624
Iteration 82, loss = 0.11393622
Iteration 83, loss = 0.11349054
Iteration 84, loss = 0.11286204
Iteration 85, loss = 0.11236968
Iteration 86, loss = 0.11181904
Iteration 87, loss = 0.11138328
Iteration 88, loss = 0.11083219
Iteration 89, loss = 0.11031767
Iteration 90, loss = 0.10995526
Iteration 91, loss = 0.10945729
Iteration 92, loss = 0.10874106
Iteration 93, loss = 0.10863427
Iteration 94, loss = 0.10804986
Iteration 95, loss = 0.10733230
Iteration 96, loss = 0.10721880
Iteration 97, loss = 0.10674340
Iteration 98, loss = 0.10626984
Iteration 99, loss = 0.10596389
Iteration 100, loss = 0.10572157
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 4.26863801
Iteration 2, loss = 0.59056517
Iteration 3, loss = 0.37714802
Iteration 4, loss = 0.30672242
Iteration 5, loss = 0.27237235
Iteration 6, loss = 0.25235259
Iteration 7, loss = 0.23470060
Iteration 8, loss = 0.22280554
Iteration 9, loss = 0.20981393
Iteration 10, loss = 0.20437984
Iteration 11, loss = 0.19767342
Iteration 12, loss = 0.18804227
Iteration 13, loss = 0.18813000
Iteration 14, loss = 0.17524795
Iteration 15, loss = 0.17174022
Iteration 16, loss = 0.16937590
Iteration 17, loss = 0.16626353
Iteration 18, loss = 0.16347058
Iteration 19, loss = 0.15792681
Iteration 20, loss = 0.15838514
Iteration 21, loss = 0.15477730
Iteration 22, loss = 0.15033649
Iteration 23, loss = 0.14491986
Iteration 24, loss = 0.14792431
Iteration 25, loss = 0.14371204
Iteration 26, loss = 0.13975868
Iteration 27, loss = 0.13867147
Iteration 28, loss = 0.13544684
Iteration 29, loss = 0.13650826
Iteration 30, loss = 0.13512938
Iteration 31, loss = 0.13323419
Iteration 32, loss = 0.13318884
Iteration 33, loss = 0.12981120
Iteration 34, loss = 0.12767587
Iteration 35, loss = 0.12931642
Iteration 36, loss = 0.12344085
Iteration 37, loss = 0.12647007
Iteration 38, loss = 0.12467689
Iteration 39, loss = 0.12675606
Iteration 40, loss = 0.12105306
Iteration 41, loss = 0.12359073
Iteration 42, loss = 0.11999800
Iteration 43, loss = 0.11945860
Iteration 44, loss = 0.11770416
Iteration 45, loss = 0.11985367
Iteration 46, loss = 0.11818552
Iteration 47, loss = 0.11497279
Iteration 48, loss = 0.11587529
Iteration 49, loss = 0.11420151
Iteration 50, loss = 0.11579757
Iteration 51, loss = 0.11564477
Iteration 52, loss = 0.11592953
```

```
Iteration 53, loss = 0.11104524
Iteration 54, loss = 0.11407286
Iteration 55, loss = 0.11097654
Iteration 56, loss = 0.11298062
Iteration 57, loss = 0.11220704
Iteration 58, loss = 0.11039849
Iteration 59, loss = 0.11070897
Iteration 60, loss = 0.10945171
Iteration 61, loss = 0.10992844
Iteration 62, loss = 0.10870912
Iteration 63, loss = 0.10851859
Iteration 64, loss = 0.10695629
Iteration 65, loss = 0.10750967
Iteration 66, loss = 0.10814982
Iteration 67, loss = 0.11001525
Iteration 68, loss = 0.10513251
Iteration 69, loss = 0.10547060
Iteration 70, loss = 0.10555004
Iteration 71, loss = 0.10485228
Iteration 72, loss = 0.10798752
Iteration 73, loss = 0.10499459
Iteration 74, loss = 0.10592981
Iteration 75, loss = 0.10447341
Iteration 76, loss = 0.10709734
Iteration 77, loss = 0.10240722
Iteration 78, loss = 0.10495215
Iteration 79, loss = 0.10255960
Iteration 80, loss = 0.10432687
Iteration 81, loss = 0.10355702
Iteration 82, loss = 0.10261962
Iteration 83, loss = 0.10167392
Iteration 84, loss = 0.10136661
Iteration 85, loss = 0.10219884
Iteration 86, loss = 0.10151818
Iteration 87, loss = 0.10070566
Iteration 88, loss = 0.10183297
Iteration 89, loss = 0.10259296
Iteration 90, loss = 0.09963383
Iteration 91, loss = 0.10148052
Iteration 92, loss = 0.10196611
Iteration 93, loss = 0.09958430
Iteration 94, loss = 0.10016489
Iteration 95, loss = 0.09943811
Iteration 96, loss = 0.09948184
Iteration 97, loss = 0.09888652
Iteration 98, loss = 0.09883802
Iteration 99, loss = 0.09838283
Iteration 100, loss = 0.09812193
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98333308
Iteration 2, loss = 0.51352558
Iteration 3, loss = 0.34910836
Iteration 4, loss = 0.29295713
Iteration 5, loss = 0.26071124
Iteration 6, loss = 0.24099502
Iteration 7, loss = 0.22837668
Iteration 8, loss = 0.21447187
Iteration 9, loss = 0.20667003
Iteration 10, loss = 0.19685586
Iteration 11, loss = 0.19207279
Iteration 12, loss = 0.18409908
Iteration 13, loss = 0.17966659
Iteration 14, loss = 0.17423779
Iteration 15, loss = 0.17232710
Iteration 16, loss = 0.16736804
Iteration 17, loss = 0.16238996
Iteration 18, loss = 0.16097865
Iteration 19, loss = 0.15709287
Iteration 20, loss = 0.15677148
Iteration 21, loss = 0.15268156
Iteration 22, loss = 0.14966075
Iteration 23, loss = 0.15039261
Iteration 24, loss = 0.14677656
Iteration 25, loss = 0.14522288
Iteration 26, loss = 0.14417400
Iteration 27, loss = 0.14390213
Iteration 28, loss = 0.14162425
Iteration 29, loss = 0.14063132
Iteration 30, loss = 0.13988025
Iteration 31, loss = 0.13848355
Iteration 32, loss = 0.13717634
Iteration 33, loss = 0.13640866
Iteration 34, loss = 0.13533597
Iteration 35, loss = 0.13525121
Iteration 36, loss = 0.13429891
Iteration 37, loss = 0.13357625
Iteration 38, loss = 0.13151110
Iteration 39, loss = 0.13154310
Iteration 40, loss = 0.13101724
Iteration 41, loss = 0.13204253
Iteration 42, loss = 0.13017499
Iteration 43, loss = 0.12828244
Iteration 44, loss = 0.12959821
Iteration 45, loss = 0.12849962
Iteration 46, loss = 0.12782304
Iteration 47, loss = 0.12761791
Iteration 48, loss = 0.12640237
Iteration 49, loss = 0.12750071
Iteration 50, loss = 0.12642591
Iteration 51, loss = 0.12547329
Iteration 52, loss = 0.12498184
```

```
Iteration 53, loss = 0.12640292
Iteration 54, loss = 0.12361559
Iteration 55, loss = 0.12539609
Iteration 56, loss = 0.12305646
Iteration 57, loss = 0.12516036
Iteration 58, loss = 0.12380411
Iteration 59, loss = 0.12301564
Iteration 60, loss = 0.12249838
Iteration 61, loss = 0.12176402
Iteration 62, loss = 0.12170579
Iteration 63, loss = 0.12128212
Iteration 64, loss = 0.12175100
Iteration 65, loss = 0.12136277
Iteration 66, loss = 0.12097579
Iteration 67, loss = 0.12092329
Iteration 68, loss = 0.11992226
Iteration 69, loss = 0.12098226
Iteration 70, loss = 0.12009913
Iteration 71, loss = 0.11899435
Iteration 72, loss = 0.11811021
Iteration 73, loss = 0.11957464
Iteration 74, loss = 0.11987355
Iteration 75, loss = 0.11875374
Iteration 76, loss = 0.11864458
Iteration 77, loss = 0.11930846
Iteration 78, loss = 0.11795570
Iteration 79, loss = 0.11778611
Iteration 80, loss = 0.11846412
Iteration 81, loss = 0.11717941
Iteration 82, loss = 0.11836051
Iteration 83, loss = 0.11945823
Iteration 84, loss = 0.11688193
Iteration 85, loss = 0.11658763
Iteration 86, loss = 0.11708568
Iteration 87, loss = 0.11637632
Iteration 88, loss = 0.11573270
Iteration 89, loss = 0.11631380
Iteration 90, loss = 0.11413333
Iteration 91, loss = 0.11620884
Iteration 92, loss = 0.11578217
Iteration 93, loss = 0.11600406
Iteration 94, loss = 0.11475339
Iteration 95, loss = 0.11452428
Iteration 96, loss = 0.11557865
Iteration 97, loss = 0.11433510
Iteration 98, loss = 0.11448233
Iteration 99, loss = 0.11502757
Iteration 100, loss = 0.11426852
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.19752057
Iteration 2, loss = 0.43650590
Iteration 3, loss = 0.36216129
Iteration 4, loss = 0.32441851
Iteration 5, loss = 0.30158227
Iteration 6, loss = 0.28345746
Iteration 7, loss = 0.27004685
Iteration 8, loss = 0.25842920
Iteration 9, loss = 0.24958351
Iteration 10, loss = 0.24169340
Iteration 11, loss = 0.23408265
Iteration 12, loss = 0.22807291
Iteration 13, loss = 0.22256590
Iteration 14, loss = 0.21695335
Iteration 15, loss = 0.21276965
Iteration 16, loss = 0.20811459
Iteration 17, loss = 0.20422803
Iteration 18, loss = 0.20065775
Iteration 19, loss = 0.19697908
Iteration 20, loss = 0.19385274
Iteration 21, loss = 0.19081145
Iteration 22, loss = 0.18789919
Iteration 23, loss = 0.18531781
Iteration 24, loss = 0.18265735
Iteration 25, loss = 0.18046915
Iteration 26, loss = 0.17778713
Iteration 27, loss = 0.17570253
Iteration 28, loss = 0.17428555
Iteration 29, loss = 0.17160035
Iteration 30, loss = 0.17001892
Iteration 31, loss = 0.16780341
Iteration 32, loss = 0.16570046
Iteration 33, loss = 0.16395161
Iteration 34, loss = 0.16245635
Iteration 35, loss = 0.16097370
Iteration 36, loss = 0.15892561
Iteration 37, loss = 0.15785396
Iteration 38, loss = 0.15587247
Iteration 39, loss = 0.15458483
Iteration 40, loss = 0.15321224
Iteration 41, loss = 0.15176170
Iteration 42, loss = 0.15046791
Iteration 43, loss = 0.14903388
Iteration 44, loss = 0.14801681
Iteration 45, loss = 0.14668045
Iteration 46, loss = 0.14582054
Iteration 47, loss = 0.14442351
Iteration 48, loss = 0.14357629
Iteration 49, loss = 0.14220158
Iteration 50, loss = 0.14121877
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.91526055
Iteration 2, loss = 0.41437999
Iteration 3, loss = 0.35006933
Iteration 4, loss = 0.31510125
Iteration 5, loss = 0.29234452
Iteration 6, loss = 0.27572617
Iteration 7, loss = 0.26197714
Iteration 8, loss = 0.25159081
Iteration 9, loss = 0.24203576
Iteration 10, loss = 0.23363136
Iteration 11, loss = 0.22616482
Iteration 12, loss = 0.22001827
Iteration 13, loss = 0.21424818
Iteration 14, loss = 0.20927762
Iteration 15, loss = 0.20460235
Iteration 16, loss = 0.20015659
Iteration 17, loss = 0.19592191
Iteration 18, loss = 0.19236500
Iteration 19, loss = 0.18901421
Iteration 20, loss = 0.18577055
Iteration 21, loss = 0.18317043
Iteration 22, loss = 0.18034158
Iteration 23, loss = 0.17750086
Iteration 24, loss = 0.17518052
Iteration 25, loss = 0.17292300
Iteration 26, loss = 0.17057943
Iteration 27, loss = 0.16866444
Iteration 28, loss = 0.16686346
Iteration 29, loss = 0.16470974
Iteration 30, loss = 0.16296940
Iteration 31, loss = 0.16122061
Iteration 32, loss = 0.15943727
Iteration 33, loss = 0.15780154
Iteration 34, loss = 0.15615979
Iteration 35, loss = 0.15474013
Iteration 36, loss = 0.15335778
Iteration 37, loss = 0.15204309
Iteration 38, loss = 0.15067066
Iteration 39, loss = 0.14929221
Iteration 40, loss = 0.14795063
Iteration 41, loss = 0.14670448
Iteration 42, loss = 0.14590366
Iteration 43, loss = 0.14456318
Iteration 44, loss = 0.14318918
Iteration 45, loss = 0.14224109
Iteration 46, loss = 0.14119096
Iteration 47, loss = 0.14031432
Iteration 48, loss = 0.13906097
Iteration 49, loss = 0.13822514
Iteration 50, loss = 0.13738344
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.99273613
Iteration 2, loss = 0.94416238
Iteration 3, loss = 0.47832817
Iteration 4, loss = 0.34526336
Iteration 5, loss = 0.28871621
Iteration 6, loss = 0.25567405
Iteration 7, loss = 0.23948376
Iteration 8, loss = 0.21952559
Iteration 9, loss = 0.21198977
Iteration 10, loss = 0.20438833
Iteration 11, loss = 0.19307995
Iteration 12, loss = 0.18672140
Iteration 13, loss = 0.18387976
Iteration 14, loss = 0.17729944
Iteration 15, loss = 0.17241918
Iteration 16, loss = 0.16883258
Iteration 17, loss = 0.16357934
Iteration 18, loss = 0.16093528
Iteration 19, loss = 0.15723741
Iteration 20, loss = 0.15434191
Iteration 21, loss = 0.15328880
Iteration 22, loss = 0.15014220
Iteration 23, loss = 0.14739552
Iteration 24, loss = 0.14467506
Iteration 25, loss = 0.14468542
Iteration 26, loss = 0.14035390
Iteration 27, loss = 0.13958968
Iteration 28, loss = 0.13763586
Iteration 29, loss = 0.13771028
Iteration 30, loss = 0.13611173
Iteration 31, loss = 0.13226690
Iteration 32, loss = 0.13161740
Iteration 33, loss = 0.13357221
Iteration 34, loss = 0.13100903
Iteration 35, loss = 0.12650204
Iteration 36, loss = 0.12809260
Iteration 37, loss = 0.12630657
Iteration 38, loss = 0.12711144
Iteration 39, loss = 0.12470971
Iteration 40, loss = 0.12468861
Iteration 41, loss = 0.12218826
Iteration 42, loss = 0.12102687
Iteration 43, loss = 0.11970529
Iteration 44, loss = 0.12162161
Iteration 45, loss = 0.12085355
Iteration 46, loss = 0.11860018
Iteration 47, loss = 0.11942022
Iteration 48, loss = 0.11838877
Iteration 49, loss = 0.11622789
Iteration 50, loss = 0.11793442
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.34940845
Iteration 2, loss = 0.69678206
Iteration 3, loss = 0.38337223
Iteration 4, loss = 0.30364027
Iteration 5, loss = 0.26357662
Iteration 6, loss = 0.24186078
Iteration 7, loss = 0.22259698
Iteration 8, loss = 0.21121740
Iteration 9, loss = 0.20028035
Iteration 10, loss = 0.19397829
Iteration 11, loss = 0.18639175
Iteration 12, loss = 0.18162342
Iteration 13, loss = 0.17571535
Iteration 14, loss = 0.17107988
Iteration 15, loss = 0.16716617
Iteration 16, loss = 0.16505397
Iteration 17, loss = 0.16000325
Iteration 18, loss = 0.15742066
Iteration 19, loss = 0.15533558
Iteration 20, loss = 0.15281146
Iteration 21, loss = 0.15128399
Iteration 22, loss = 0.14959661
Iteration 23, loss = 0.14612884
Iteration 24, loss = 0.14706715
Iteration 25, loss = 0.14313202
Iteration 26, loss = 0.14258841
Iteration 27, loss = 0.14141872
Iteration 28, loss = 0.13943555
Iteration 29, loss = 0.13897427
Iteration 30, loss = 0.13887109
Iteration 31, loss = 0.13688722
Iteration 32, loss = 0.13551191
Iteration 33, loss = 0.13626682
Iteration 34, loss = 0.13314273
Iteration 35, loss = 0.13393123
Iteration 36, loss = 0.13291347
Iteration 37, loss = 0.13183118
Iteration 38, loss = 0.13034703
Iteration 39, loss = 0.13102813
Iteration 40, loss = 0.13093080
Iteration 41, loss = 0.12981843
Iteration 42, loss = 0.13000415
Iteration 43, loss = 0.13008236
Iteration 44, loss = 0.12937281
Iteration 45, loss = 0.12721784
Iteration 46, loss = 0.12735465
Iteration 47, loss = 0.12584254
Iteration 48, loss = 0.12620973
Iteration 49, loss = 0.12656476
Iteration 50, loss = 0.12665943
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.19752057
Iteration 2, loss = 0.43650590
Iteration 3, loss = 0.36216129
Iteration 4, loss = 0.32441851
Iteration 5, loss = 0.30158227
Iteration 6, loss = 0.28345746
Iteration 7, loss = 0.27004685
Iteration 8, loss = 0.25842920
Iteration 9, loss = 0.24958351
Iteration 10, loss = 0.24169340
Iteration 11, loss = 0.23408265
Iteration 12, loss = 0.22807291
Iteration 13, loss = 0.22256590
Iteration 14, loss = 0.21695335
Iteration 15, loss = 0.21276965
Iteration 16, loss = 0.20811459
Iteration 17, loss = 0.20422803
Iteration 18, loss = 0.20065775
Iteration 19, loss = 0.19697908
Iteration 20, loss = 0.19385274
Iteration 21, loss = 0.19081145
Iteration 22, loss = 0.18789919
Iteration 23, loss = 0.18531781
Iteration 24, loss = 0.18265735
Iteration 25, loss = 0.18046915
Iteration 26, loss = 0.17778713
Iteration 27, loss = 0.17570253
Iteration 28, loss = 0.17428555
Iteration 29, loss = 0.17160035
Iteration 30, loss = 0.17001892
Iteration 31, loss = 0.16780341
Iteration 32, loss = 0.16570046
Iteration 33, loss = 0.16395161
Iteration 34, loss = 0.16245635
Iteration 35, loss = 0.16097370
Iteration 36, loss = 0.15892561
Iteration 37, loss = 0.15785396
Iteration 38, loss = 0.15587247
Iteration 39, loss = 0.15458483
Iteration 40, loss = 0.15321224
Iteration 41, loss = 0.15176170
Iteration 42, loss = 0.15046791
Iteration 43, loss = 0.14903388
Iteration 44, loss = 0.14801681
Iteration 45, loss = 0.14668045
Iteration 46, loss = 0.14582054
Iteration 47, loss = 0.14442351
Iteration 48, loss = 0.14357629
Iteration 49, loss = 0.14220158
Iteration 50, loss = 0.14121877
Iteration 51, loss = 0.14002149
Iteration 52, loss = 0.13902780
```

```
Iteration 53, loss = 0.13783768
Iteration 54, loss = 0.13703490
Iteration 55, loss = 0.13627452
Iteration 56, loss = 0.13505738
Iteration 57, loss = 0.13426273
Iteration 58, loss = 0.13325061
Iteration 59, loss = 0.13261218
Iteration 60, loss = 0.13178356
Iteration 61, loss = 0.13087704
Iteration 62, loss = 0.13025348
Iteration 63, loss = 0.12929000
Iteration 64, loss = 0.12856435
Iteration 65, loss = 0.12757243
Iteration 66, loss = 0.12717817
Iteration 67, loss = 0.12613512
Iteration 68, loss = 0.12548217
Iteration 69, loss = 0.12472787
Iteration 70, loss = 0.12422749
Iteration 71, loss = 0.12335648
Iteration 72, loss = 0.12265726
Iteration 73, loss = 0.12244063
Iteration 74, loss = 0.12156670
Iteration 75, loss = 0.12108456
Iteration 76, loss = 0.12057083
Iteration 77, loss = 0.11968788
Iteration 78, loss = 0.11891563
Iteration 79, loss = 0.11857500
Iteration 80, loss = 0.11809162
Iteration 81, loss = 0.11739889
Iteration 82, loss = 0.11700783
Iteration 83, loss = 0.11659478
Iteration 84, loss = 0.11581971
Iteration 85, loss = 0.11500474
Iteration 86, loss = 0.11462671
Iteration 87, loss = 0.11411776
Iteration 88, loss = 0.11398683
Iteration 89, loss = 0.11308006
Iteration 90, loss = 0.11281485
Iteration 91, loss = 0.11238969
Iteration 92, loss = 0.11172284
Iteration 93, loss = 0.11142361
Iteration 94, loss = 0.11099765
Iteration 95, loss = 0.11079498
Iteration 96, loss = 0.11032575
Iteration 97, loss = 0.10968040
Iteration 98, loss = 0.10905570
Iteration 99, loss = 0.10846479
Iteration 100, loss = 0.10817695
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.91526055
Iteration 2, loss = 0.41437999
Iteration 3, loss = 0.35006933
Iteration 4, loss = 0.31510125
Iteration 5, loss = 0.29234452
Iteration 6, loss = 0.27572617
Iteration 7, loss = 0.26197714
Iteration 8, loss = 0.25159081
Iteration 9, loss = 0.24203576
Iteration 10, loss = 0.23363136
Iteration 11, loss = 0.22616482
Iteration 12, loss = 0.22001827
Iteration 13, loss = 0.21424818
Iteration 14, loss = 0.20927762
Iteration 15, loss = 0.20460235
Iteration 16, loss = 0.20015659
Iteration 17, loss = 0.19592191
Iteration 18, loss = 0.19236500
Iteration 19, loss = 0.18901421
Iteration 20, loss = 0.18577055
Iteration 21, loss = 0.18317043
Iteration 22, loss = 0.18034158
Iteration 23, loss = 0.17750086
Iteration 24, loss = 0.17518052
Iteration 25, loss = 0.17292300
Iteration 26, loss = 0.17057943
Iteration 27, loss = 0.16866444
Iteration 28, loss = 0.16686346
Iteration 29, loss = 0.16470974
Iteration 30, loss = 0.16296940
Iteration 31, loss = 0.16122061
Iteration 32, loss = 0.15943727
Iteration 33, loss = 0.15780154
Iteration 34, loss = 0.15615979
Iteration 35, loss = 0.15474013
Iteration 36, loss = 0.15335778
Iteration 37, loss = 0.15204309
Iteration 38, loss = 0.15067066
Iteration 39, loss = 0.14929221
Iteration 40, loss = 0.14795063
Iteration 41, loss = 0.14670448
Iteration 42, loss = 0.14590366
Iteration 43, loss = 0.14456318
Iteration 44, loss = 0.14318918
Iteration 45, loss = 0.14224109
Iteration 46, loss = 0.14119096
Iteration 47, loss = 0.14031432
Iteration 48, loss = 0.13906097
Iteration 49, loss = 0.13822514
Iteration 50, loss = 0.13738344
Iteration 51, loss = 0.13627948
Iteration 52, loss = 0.13528798
```

```
Iteration 53, loss = 0.13462751
Iteration 54, loss = 0.13356953
Iteration 55, loss = 0.13273444
Iteration 56, loss = 0.13200063
Iteration 57, loss = 0.13116002
Iteration 58, loss = 0.13054087
Iteration 59, loss = 0.12962506
Iteration 60, loss = 0.12861281
Iteration 61, loss = 0.12824842
Iteration 62, loss = 0.12729587
Iteration 63, loss = 0.12658787
Iteration 64, loss = 0.12580429
Iteration 65, loss = 0.12524593
Iteration 66, loss = 0.12430554
Iteration 67, loss = 0.12365528
Iteration 68, loss = 0.12313499
Iteration 69, loss = 0.12245516
Iteration 70, loss = 0.12205615
Iteration 71, loss = 0.12120436
Iteration 72, loss = 0.12066392
Iteration 73, loss = 0.11995968
Iteration 74, loss = 0.11951455
Iteration 75, loss = 0.11902257
Iteration 76, loss = 0.11820548
Iteration 77, loss = 0.11766906
Iteration 78, loss = 0.11716562
Iteration 79, loss = 0.11663798
Iteration 80, loss = 0.11625556
Iteration 81, loss = 0.11574332
Iteration 82, loss = 0.11520823
Iteration 83, loss = 0.11459792
Iteration 84, loss = 0.11416214
Iteration 85, loss = 0.11370953
Iteration 86, loss = 0.11331081
Iteration 87, loss = 0.11253578
Iteration 88, loss = 0.11247207
Iteration 89, loss = 0.11198747
Iteration 90, loss = 0.11139502
Iteration 91, loss = 0.11086285
Iteration 92, loss = 0.11042379
Iteration 93, loss = 0.11003364
Iteration 94, loss = 0.10945472
Iteration 95, loss = 0.10915873
Iteration 96, loss = 0.10883390
Iteration 97, loss = 0.10828028
Iteration 98, loss = 0.10827989
Iteration 99, loss = 0.10753939
Iteration 100, loss = 0.10723173
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.99273613
Iteration 2, loss = 0.94416238
Iteration 3, loss = 0.47832817
Iteration 4, loss = 0.34526336
Iteration 5, loss = 0.28871621
Iteration 6, loss = 0.25567405
Iteration 7, loss = 0.23948376
Iteration 8, loss = 0.21952559
Iteration 9, loss = 0.21198977
Iteration 10, loss = 0.20438833
Iteration 11, loss = 0.19307995
Iteration 12, loss = 0.18672140
Iteration 13, loss = 0.18387976
Iteration 14, loss = 0.17729944
Iteration 15, loss = 0.17241918
Iteration 16, loss = 0.16883258
Iteration 17, loss = 0.16357934
Iteration 18, loss = 0.16093528
Iteration 19, loss = 0.15723741
Iteration 20, loss = 0.15434191
Iteration 21, loss = 0.15328880
Iteration 22, loss = 0.15014220
Iteration 23, loss = 0.14739552
Iteration 24, loss = 0.14467506
Iteration 25, loss = 0.14468542
Iteration 26, loss = 0.14035390
Iteration 27, loss = 0.13958968
Iteration 28, loss = 0.13763586
Iteration 29, loss = 0.13771028
Iteration 30, loss = 0.13611173
Iteration 31, loss = 0.13226690
Iteration 32, loss = 0.13161740
Iteration 33, loss = 0.13357221
Iteration 34, loss = 0.13100903
Iteration 35, loss = 0.12650204
Iteration 36, loss = 0.12809260
Iteration 37, loss = 0.12630657
Iteration 38, loss = 0.12711144
Iteration 39, loss = 0.12470971
Iteration 40, loss = 0.12468861
Iteration 41, loss = 0.12218826
Iteration 42, loss = 0.12102687
Iteration 43, loss = 0.11970529
Iteration 44, loss = 0.12162161
Iteration 45, loss = 0.12085355
Iteration 46, loss = 0.11860018
Iteration 47, loss = 0.11942022
Iteration 48, loss = 0.11838877
Iteration 49, loss = 0.11622789
Iteration 50, loss = 0.11793442
Iteration 51, loss = 0.11475194
Iteration 52, loss = 0.11620370
```

```
Iteration 53, loss = 0.11498461
Iteration 54, loss = 0.11367444
Iteration 55, loss = 0.11471964
Iteration 56, loss = 0.11252666
Iteration 57, loss = 0.11200452
Iteration 58, loss = 0.11210611
Iteration 59, loss = 0.11206405
Iteration 60, loss = 0.11349318
Iteration 61, loss = 0.11014557
Iteration 62, loss = 0.11144671
Iteration 63, loss = 0.10899291
Iteration 64, loss = 0.10812678
Iteration 65, loss = 0.10924955
Iteration 66, loss = 0.10887365
Iteration 67, loss = 0.10865296
Iteration 68, loss = 0.10862152
Iteration 69, loss = 0.10801712
Iteration 70, loss = 0.10790558
Iteration 71, loss = 0.10907907
Iteration 72, loss = 0.10600409
Iteration 73, loss = 0.10888163
Iteration 74, loss = 0.10571192
Iteration 75, loss = 0.10706909
Iteration 76, loss = 0.10546160
Iteration 77, loss = 0.10619331
Iteration 78, loss = 0.10413387
Iteration 79, loss = 0.10618903
Iteration 80, loss = 0.10403017
Iteration 81, loss = 0.10371451
Iteration 82, loss = 0.10505001
Iteration 83, loss = 0.10350431
Iteration 84, loss = 0.10523942
Iteration 85, loss = 0.10363855
Iteration 86, loss = 0.10531750
Iteration 87, loss = 0.10198683
Iteration 88, loss = 0.10323193
Iteration 89, loss = 0.10370973
Iteration 90, loss = 0.10367910
Iteration 91, loss = 0.10129997
Iteration 92, loss = 0.10317309
Iteration 93, loss = 0.10265892
Iteration 94, loss = 0.10249940
Iteration 95, loss = 0.10298478
Iteration 96, loss = 0.10238679
Iteration 97, loss = 0.10017768
Iteration 98, loss = 0.10086845
Iteration 99, loss = 0.10369971
Iteration 100, loss = 0.10080547
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.34940845
Iteration 2, loss = 0.69678206
Iteration 3, loss = 0.38337223
Iteration 4, loss = 0.30364027
Iteration 5, loss = 0.26357662
Iteration 6, loss = 0.24186078
Iteration 7, loss = 0.22259698
Iteration 8, loss = 0.21121740
Iteration 9, loss = 0.20028035
Iteration 10, loss = 0.19397829
Iteration 11, loss = 0.18639175
Iteration 12, loss = 0.18162342
Iteration 13, loss = 0.17571535
Iteration 14, loss = 0.17107988
Iteration 15, loss = 0.16716617
Iteration 16, loss = 0.16505397
Iteration 17, loss = 0.16000325
Iteration 18, loss = 0.15742066
Iteration 19, loss = 0.15533558
Iteration 20, loss = 0.15281146
Iteration 21, loss = 0.15128399
Iteration 22, loss = 0.14959661
Iteration 23, loss = 0.14612884
Iteration 24, loss = 0.14706715
Iteration 25, loss = 0.14313202
Iteration 26, loss = 0.14258841
Iteration 27, loss = 0.14141872
Iteration 28, loss = 0.13943555
Iteration 29, loss = 0.13897427
Iteration 30, loss = 0.13887109
Iteration 31, loss = 0.13688722
Iteration 32, loss = 0.13551191
Iteration 33, loss = 0.13626682
Iteration 34, loss = 0.13314273
Iteration 35, loss = 0.13393123
Iteration 36, loss = 0.13291347
Iteration 37, loss = 0.13183118
Iteration 38, loss = 0.13034703
Iteration 39, loss = 0.13102813
Iteration 40, loss = 0.13093080
Iteration 41, loss = 0.12981843
Iteration 42, loss = 0.13000415
Iteration 43, loss = 0.13008236
Iteration 44, loss = 0.12937281
Iteration 45, loss = 0.12721784
Iteration 46, loss = 0.12735465
Iteration 47, loss = 0.12584254
Iteration 48, loss = 0.12620973
Iteration 49, loss = 0.12656476
Iteration 50, loss = 0.12665943
Iteration 51, loss = 0.12508486
Iteration 52, loss = 0.12371991
```

```
Iteration 53, loss = 0.12524351
Iteration 54, loss = 0.12293627
Iteration 55, loss = 0.12368177
Iteration 56, loss = 0.12306116
Iteration 57, loss = 0.12200684
Iteration 58, loss = 0.12395582
Iteration 59, loss = 0.12447696
Iteration 60, loss = 0.12123020
Iteration 61, loss = 0.12146108
Iteration 62, loss = 0.12090057
Iteration 63, loss = 0.12070081
Iteration 64, loss = 0.12056835
Iteration 65, loss = 0.11981051
Iteration 66, loss = 0.12090949
Iteration 67, loss = 0.11864294
Iteration 68, loss = 0.11988381
Iteration 69, loss = 0.12032687
Iteration 70, loss = 0.11990392
Iteration 71, loss = 0.11827205
Iteration 72, loss = 0.11903976
Iteration 73, loss = 0.11848323
Iteration 74, loss = 0.11771380
Iteration 75, loss = 0.11717762
Iteration 76, loss = 0.11867096
Iteration 77, loss = 0.11806373
Iteration 78, loss = 0.11743061
Iteration 79, loss = 0.11783092
Iteration 80, loss = 0.11563993
Iteration 81, loss = 0.11823012
Iteration 82, loss = 0.11497765
Iteration 83, loss = 0.11793621
Iteration 84, loss = 0.11639057
Iteration 85, loss = 0.11728108
Iteration 86, loss = 0.11600320
Iteration 87, loss = 0.11552909
Iteration 88, loss = 0.11566141
Iteration 89, loss = 0.11569000
Iteration 90, loss = 0.11600499
Iteration 91, loss = 0.11594604
Iteration 92, loss = 0.11398283
Iteration 93, loss = 0.11463311
Iteration 94, loss = 0.11465790
Iteration 95, loss = 0.11448524
Iteration 96, loss = 0.11357303
Iteration 97, loss = 0.11433403
Iteration 98, loss = 0.11456559
Iteration 99, loss = 0.11446041
Iteration 100, loss = 0.11321674
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.19752057
Iteration 2, loss = 0.43650590
Iteration 3, loss = 0.36216129
Iteration 4, loss = 0.32441851
Iteration 5, loss = 0.30158227
Iteration 6, loss = 0.28345746
Iteration 7, loss = 0.27004685
Iteration 8, loss = 0.25842920
Iteration 9, loss = 0.24958351
Iteration 10, loss = 0.24169340
Iteration 11, loss = 0.23408265
Iteration 12, loss = 0.22807291
Iteration 13, loss = 0.22256590
Iteration 14, loss = 0.21695335
Iteration 15, loss = 0.21276965
Iteration 16, loss = 0.20811459
Iteration 17, loss = 0.20422803
Iteration 18, loss = 0.20065775
Iteration 19, loss = 0.19697908
Iteration 20, loss = 0.19385274
Iteration 21, loss = 0.19081145
Iteration 22, loss = 0.18789919
Iteration 23, loss = 0.18531781
Iteration 24, loss = 0.18265735
Iteration 25, loss = 0.18046915
Iteration 26, loss = 0.17778713
Iteration 27, loss = 0.17570253
Iteration 28, loss = 0.17428555
Iteration 29, loss = 0.17160035
Iteration 30, loss = 0.17001892
Iteration 31, loss = 0.16780341
Iteration 32, loss = 0.16570046
Iteration 33, loss = 0.16395161
Iteration 34, loss = 0.16245635
Iteration 35, loss = 0.16097370
Iteration 36, loss = 0.15892561
Iteration 37, loss = 0.15785396
Iteration 38, loss = 0.15587247
Iteration 39, loss = 0.15458483
Iteration 40, loss = 0.15321224
Iteration 41, loss = 0.15176170
Iteration 42, loss = 0.15046791
Iteration 43, loss = 0.14903388
Iteration 44, loss = 0.14801681
Iteration 45, loss = 0.14668045
Iteration 46, loss = 0.14582054
Iteration 47, loss = 0.14442351
Iteration 48, loss = 0.14357629
Iteration 49, loss = 0.14220158
Iteration 50, loss = 0.14121877
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.91526055
Iteration 2, loss = 0.41437999
Iteration 3, loss = 0.35006933
Iteration 4, loss = 0.31510125
Iteration 5, loss = 0.29234452
Iteration 6, loss = 0.27572617
Iteration 7, loss = 0.26197714
Iteration 8, loss = 0.25159081
Iteration 9, loss = 0.24203576
Iteration 10, loss = 0.23363136
Iteration 11, loss = 0.22616482
Iteration 12, loss = 0.22001827
Iteration 13, loss = 0.21424818
Iteration 14, loss = 0.20927762
Iteration 15, loss = 0.20460235
Iteration 16, loss = 0.20015659
Iteration 17, loss = 0.19592191
Iteration 18, loss = 0.19236500
Iteration 19, loss = 0.18901421
Iteration 20, loss = 0.18577055
Iteration 21, loss = 0.18317043
Iteration 22, loss = 0.18034158
Iteration 23, loss = 0.17750086
Iteration 24, loss = 0.17518052
Iteration 25, loss = 0.17292300
Iteration 26, loss = 0.17057943
Iteration 27, loss = 0.16866444
Iteration 28, loss = 0.16686346
Iteration 29, loss = 0.16470974
Iteration 30, loss = 0.16296940
Iteration 31, loss = 0.16122061
Iteration 32, loss = 0.15943727
Iteration 33, loss = 0.15780154
Iteration 34, loss = 0.15615979
Iteration 35, loss = 0.15474013
Iteration 36, loss = 0.15335778
Iteration 37, loss = 0.15204309
Iteration 38, loss = 0.15067066
Iteration 39, loss = 0.14929221
Iteration 40, loss = 0.14795063
Iteration 41, loss = 0.14670448
Iteration 42, loss = 0.14590366
Iteration 43, loss = 0.14456318
Iteration 44, loss = 0.14318918
Iteration 45, loss = 0.14224109
Iteration 46, loss = 0.14119096
Iteration 47, loss = 0.14031432
Iteration 48, loss = 0.13906097
Iteration 49, loss = 0.13822514
Iteration 50, loss = 0.13738344
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.99273613
Iteration 2, loss = 0.94416238
Iteration 3, loss = 0.47832817
Iteration 4, loss = 0.34526336
Iteration 5, loss = 0.28871621
Iteration 6, loss = 0.25567405
Iteration 7, loss = 0.23948376
Iteration 8, loss = 0.21952559
Iteration 9, loss = 0.21198977
Iteration 10, loss = 0.20438833
Iteration 11, loss = 0.19307995
Iteration 12, loss = 0.18672140
Iteration 13, loss = 0.18387976
Iteration 14, loss = 0.17729944
Iteration 15, loss = 0.17241918
Iteration 16, loss = 0.16883258
Iteration 17, loss = 0.16357934
Iteration 18, loss = 0.16093528
Iteration 19, loss = 0.15723741
Iteration 20, loss = 0.15434191
Iteration 21, loss = 0.15328880
Iteration 22, loss = 0.15014220
Iteration 23, loss = 0.14739552
Iteration 24, loss = 0.14467506
Iteration 25, loss = 0.14468542
Iteration 26, loss = 0.14035390
Iteration 27, loss = 0.13958968
Iteration 28, loss = 0.13763586
Iteration 29, loss = 0.13771028
Iteration 30, loss = 0.13611173
Iteration 31, loss = 0.13226690
Iteration 32, loss = 0.13161740
Iteration 33, loss = 0.13357221
Iteration 34, loss = 0.13100903
Iteration 35, loss = 0.12650204
Iteration 36, loss = 0.12809260
Iteration 37, loss = 0.12630657
Iteration 38, loss = 0.12711144
Iteration 39, loss = 0.12470971
Iteration 40, loss = 0.12468861
Iteration 41, loss = 0.12218826
Iteration 42, loss = 0.12102687
Iteration 43, loss = 0.11970529
Iteration 44, loss = 0.12162161
Iteration 45, loss = 0.12085355
Iteration 46, loss = 0.11860018
Iteration 47, loss = 0.11942022
Iteration 48, loss = 0.11838877
Iteration 49, loss = 0.11622789
Iteration 50, loss = 0.11793442
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.34940845
Iteration 2, loss = 0.69678206
Iteration 3, loss = 0.38337223
Iteration 4, loss = 0.30364027
Iteration 5, loss = 0.26357662
Iteration 6, loss = 0.24186078
Iteration 7, loss = 0.22259698
Iteration 8, loss = 0.21121740
Iteration 9, loss = 0.20028035
Iteration 10, loss = 0.19397829
Iteration 11, loss = 0.18639175
Iteration 12, loss = 0.18162342
Iteration 13, loss = 0.17571535
Iteration 14, loss = 0.17107988
Iteration 15, loss = 0.16716617
Iteration 16, loss = 0.16505397
Iteration 17, loss = 0.16000325
Iteration 18, loss = 0.15742066
Iteration 19, loss = 0.15533558
Iteration 20, loss = 0.15281146
Iteration 21, loss = 0.15128399
Iteration 22, loss = 0.14959661
Iteration 23, loss = 0.14612884
Iteration 24, loss = 0.14706715
Iteration 25, loss = 0.14313202
Iteration 26, loss = 0.14258841
Iteration 27, loss = 0.14141872
Iteration 28, loss = 0.13943555
Iteration 29, loss = 0.13897427
Iteration 30, loss = 0.13887109
Iteration 31, loss = 0.13688722
Iteration 32, loss = 0.13551191
Iteration 33, loss = 0.13626682
Iteration 34, loss = 0.13314273
Iteration 35, loss = 0.13393123
Iteration 36, loss = 0.13291347
Iteration 37, loss = 0.13183118
Iteration 38, loss = 0.13034703
Iteration 39, loss = 0.13102813
Iteration 40, loss = 0.13093080
Iteration 41, loss = 0.12981843
Iteration 42, loss = 0.13000415
Iteration 43, loss = 0.13008236
Iteration 44, loss = 0.12937281
Iteration 45, loss = 0.12721784
Iteration 46, loss = 0.12735465
Iteration 47, loss = 0.12584254
Iteration 48, loss = 0.12620973
Iteration 49, loss = 0.12656476
Iteration 50, loss = 0.12665943
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.19752057
Iteration 2, loss = 0.43650590
Iteration 3, loss = 0.36216129
Iteration 4, loss = 0.32441851
Iteration 5, loss = 0.30158227
Iteration 6, loss = 0.28345746
Iteration 7, loss = 0.27004685
Iteration 8, loss = 0.25842920
Iteration 9, loss = 0.24958351
Iteration 10, loss = 0.24169340
Iteration 11, loss = 0.23408265
Iteration 12, loss = 0.22807291
Iteration 13, loss = 0.22256590
Iteration 14, loss = 0.21695335
Iteration 15, loss = 0.21276965
Iteration 16, loss = 0.20811459
Iteration 17, loss = 0.20422803
Iteration 18, loss = 0.20065775
Iteration 19, loss = 0.19697908
Iteration 20, loss = 0.19385274
Iteration 21, loss = 0.19081145
Iteration 22, loss = 0.18789919
Iteration 23, loss = 0.18531781
Iteration 24, loss = 0.18265735
Iteration 25, loss = 0.18046915
Iteration 26, loss = 0.17778713
Iteration 27, loss = 0.17570253
Iteration 28, loss = 0.17428555
Iteration 29, loss = 0.17160035
Iteration 30, loss = 0.17001892
Iteration 31, loss = 0.16780341
Iteration 32, loss = 0.16570046
Iteration 33, loss = 0.16395161
Iteration 34, loss = 0.16245635
Iteration 35, loss = 0.16097370
Iteration 36, loss = 0.15892561
Iteration 37, loss = 0.15785396
Iteration 38, loss = 0.15587247
Iteration 39, loss = 0.15458483
Iteration 40, loss = 0.15321224
Iteration 41, loss = 0.15176170
Iteration 42, loss = 0.15046791
Iteration 43, loss = 0.14903388
Iteration 44, loss = 0.14801681
Iteration 45, loss = 0.14668045
Iteration 46, loss = 0.14582054
Iteration 47, loss = 0.14442351
Iteration 48, loss = 0.14357629
Iteration 49, loss = 0.14220158
Iteration 50, loss = 0.14121877
Iteration 51, loss = 0.14002149
Iteration 52, loss = 0.13902780
```

```
Iteration 53, loss = 0.13783768
Iteration 54, loss = 0.13703490
Iteration 55, loss = 0.13627452
Iteration 56, loss = 0.13505738
Iteration 57, loss = 0.13426273
Iteration 58, loss = 0.13325061
Iteration 59, loss = 0.13261218
Iteration 60, loss = 0.13178356
Iteration 61, loss = 0.13087704
Iteration 62, loss = 0.13025348
Iteration 63, loss = 0.12929000
Iteration 64, loss = 0.12856435
Iteration 65, loss = 0.12757243
Iteration 66, loss = 0.12717817
Iteration 67, loss = 0.12613512
Iteration 68, loss = 0.12548217
Iteration 69, loss = 0.12472787
Iteration 70, loss = 0.12422749
Iteration 71, loss = 0.12335648
Iteration 72, loss = 0.12265726
Iteration 73, loss = 0.12244063
Iteration 74, loss = 0.12156670
Iteration 75, loss = 0.12108456
Iteration 76, loss = 0.12057083
Iteration 77, loss = 0.11968788
Iteration 78, loss = 0.11891563
Iteration 79, loss = 0.11857500
Iteration 80, loss = 0.11809162
Iteration 81, loss = 0.11739889
Iteration 82, loss = 0.11700783
Iteration 83, loss = 0.11659478
Iteration 84, loss = 0.11581971
Iteration 85, loss = 0.11500474
Iteration 86, loss = 0.11462671
Iteration 87, loss = 0.11411776
Iteration 88, loss = 0.11398683
Iteration 89, loss = 0.11308006
Iteration 90, loss = 0.11281485
Iteration 91, loss = 0.11238969
Iteration 92, loss = 0.11172284
Iteration 93, loss = 0.11142361
Iteration 94, loss = 0.11099765
Iteration 95, loss = 0.11079498
Iteration 96, loss = 0.11032575
Iteration 97, loss = 0.10968040
Iteration 98, loss = 0.10905570
Iteration 99, loss = 0.10846479
Iteration 100, loss = 0.10817695
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.91526055
Iteration 2, loss = 0.41437999
Iteration 3, loss = 0.35006933
Iteration 4, loss = 0.31510125
Iteration 5, loss = 0.29234452
Iteration 6, loss = 0.27572617
Iteration 7, loss = 0.26197714
Iteration 8, loss = 0.25159081
Iteration 9, loss = 0.24203576
Iteration 10, loss = 0.23363136
Iteration 11, loss = 0.22616482
Iteration 12, loss = 0.22001827
Iteration 13, loss = 0.21424818
Iteration 14, loss = 0.20927762
Iteration 15, loss = 0.20460235
Iteration 16, loss = 0.20015659
Iteration 17, loss = 0.19592191
Iteration 18, loss = 0.19236500
Iteration 19, loss = 0.18901421
Iteration 20, loss = 0.18577055
Iteration 21, loss = 0.18317043
Iteration 22, loss = 0.18034158
Iteration 23, loss = 0.17750086
Iteration 24, loss = 0.17518052
Iteration 25, loss = 0.17292300
Iteration 26, loss = 0.17057943
Iteration 27, loss = 0.16866444
Iteration 28, loss = 0.16686346
Iteration 29, loss = 0.16470974
Iteration 30, loss = 0.16296940
Iteration 31, loss = 0.16122061
Iteration 32, loss = 0.15943727
Iteration 33, loss = 0.15780154
Iteration 34, loss = 0.15615979
Iteration 35, loss = 0.15474013
Iteration 36, loss = 0.15335778
Iteration 37, loss = 0.15204309
Iteration 38, loss = 0.15067066
Iteration 39, loss = 0.14929221
Iteration 40, loss = 0.14795063
Iteration 41, loss = 0.14670448
Iteration 42, loss = 0.14590366
Iteration 43, loss = 0.14456318
Iteration 44, loss = 0.14318918
Iteration 45, loss = 0.14224109
Iteration 46, loss = 0.14119096
Iteration 47, loss = 0.14031432
Iteration 48, loss = 0.13906097
Iteration 49, loss = 0.13822514
Iteration 50, loss = 0.13738344
Iteration 51, loss = 0.13627948
Iteration 52, loss = 0.13528798
```

```
Iteration 53, loss = 0.13462751
Iteration 54, loss = 0.13356953
Iteration 55, loss = 0.13273444
Iteration 56, loss = 0.13200063
Iteration 57, loss = 0.13116002
Iteration 58, loss = 0.13054087
Iteration 59, loss = 0.12962506
Iteration 60, loss = 0.12861281
Iteration 61, loss = 0.12824842
Iteration 62, loss = 0.12729587
Iteration 63, loss = 0.12658787
Iteration 64, loss = 0.12580429
Iteration 65, loss = 0.12524593
Iteration 66, loss = 0.12430554
Iteration 67, loss = 0.12365528
Iteration 68, loss = 0.12313499
Iteration 69, loss = 0.12245516
Iteration 70, loss = 0.12205615
Iteration 71, loss = 0.12120436
Iteration 72, loss = 0.12066392
Iteration 73, loss = 0.11995968
Iteration 74, loss = 0.11951455
Iteration 75, loss = 0.11902257
Iteration 76, loss = 0.11820548
Iteration 77, loss = 0.11766906
Iteration 78, loss = 0.11716562
Iteration 79, loss = 0.11663798
Iteration 80, loss = 0.11625556
Iteration 81, loss = 0.11574332
Iteration 82, loss = 0.11520823
Iteration 83, loss = 0.11459792
Iteration 84, loss = 0.11416214
Iteration 85, loss = 0.11370953
Iteration 86, loss = 0.11331081
Iteration 87, loss = 0.11253578
Iteration 88, loss = 0.11247207
Iteration 89, loss = 0.11198747
Iteration 90, loss = 0.11139502
Iteration 91, loss = 0.11086285
Iteration 92, loss = 0.11042379
Iteration 93, loss = 0.11003364
Iteration 94, loss = 0.10945472
Iteration 95, loss = 0.10915873
Iteration 96, loss = 0.10883390
Iteration 97, loss = 0.10828028
Iteration 98, loss = 0.10827989
Iteration 99, loss = 0.10753939
Iteration 100, loss = 0.10723173
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.99273613
Iteration 2, loss = 0.94416238
Iteration 3, loss = 0.47832817
Iteration 4, loss = 0.34526336
Iteration 5, loss = 0.28871621
Iteration 6, loss = 0.25567405
Iteration 7, loss = 0.23948376
Iteration 8, loss = 0.21952559
Iteration 9, loss = 0.21198977
Iteration 10, loss = 0.20438833
Iteration 11, loss = 0.19307995
Iteration 12, loss = 0.18672140
Iteration 13, loss = 0.18387976
Iteration 14, loss = 0.17729944
Iteration 15, loss = 0.17241918
Iteration 16, loss = 0.16883258
Iteration 17, loss = 0.16357934
Iteration 18, loss = 0.16093528
Iteration 19, loss = 0.15723741
Iteration 20, loss = 0.15434191
Iteration 21, loss = 0.15328880
Iteration 22, loss = 0.15014220
Iteration 23, loss = 0.14739552
Iteration 24, loss = 0.14467506
Iteration 25, loss = 0.14468542
Iteration 26, loss = 0.14035390
Iteration 27, loss = 0.13958968
Iteration 28, loss = 0.13763586
Iteration 29, loss = 0.13771028
Iteration 30, loss = 0.13611173
Iteration 31, loss = 0.13226690
Iteration 32, loss = 0.13161740
Iteration 33, loss = 0.13357221
Iteration 34, loss = 0.13100903
Iteration 35, loss = 0.12650204
Iteration 36, loss = 0.12809260
Iteration 37, loss = 0.12630657
Iteration 38, loss = 0.12711144
Iteration 39, loss = 0.12470971
Iteration 40, loss = 0.12468861
Iteration 41, loss = 0.12218826
Iteration 42, loss = 0.12102687
Iteration 43, loss = 0.11970529
Iteration 44, loss = 0.12162161
Iteration 45, loss = 0.12085355
Iteration 46, loss = 0.11860018
Iteration 47, loss = 0.11942022
Iteration 48, loss = 0.11838877
Iteration 49, loss = 0.11622789
Iteration 50, loss = 0.11793442
Iteration 51, loss = 0.11475194
Iteration 52, loss = 0.11620370
```

```
Iteration 53, loss = 0.11498461
Iteration 54, loss = 0.11367444
Iteration 55, loss = 0.11471964
Iteration 56, loss = 0.11252666
Iteration 57, loss = 0.11200452
Iteration 58, loss = 0.11210611
Iteration 59, loss = 0.11206405
Iteration 60, loss = 0.11349318
Iteration 61, loss = 0.11014557
Iteration 62, loss = 0.11144671
Iteration 63, loss = 0.10899291
Iteration 64, loss = 0.10812678
Iteration 65, loss = 0.10924955
Iteration 66, loss = 0.10887365
Iteration 67, loss = 0.10865296
Iteration 68, loss = 0.10862152
Iteration 69, loss = 0.10801712
Iteration 70, loss = 0.10790558
Iteration 71, loss = 0.10907907
Iteration 72, loss = 0.10600409
Iteration 73, loss = 0.10888163
Iteration 74, loss = 0.10571192
Iteration 75, loss = 0.10706909
Iteration 76, loss = 0.10546160
Iteration 77, loss = 0.10619331
Iteration 78, loss = 0.10413387
Iteration 79, loss = 0.10618903
Iteration 80, loss = 0.10403017
Iteration 81, loss = 0.10371451
Iteration 82, loss = 0.10505001
Iteration 83, loss = 0.10350431
Iteration 84, loss = 0.10523942
Iteration 85, loss = 0.10363855
Iteration 86, loss = 0.10531750
Iteration 87, loss = 0.10198683
Iteration 88, loss = 0.10323193
Iteration 89, loss = 0.10370973
Iteration 90, loss = 0.10367910
Iteration 91, loss = 0.10129997
Iteration 92, loss = 0.10317309
Iteration 93, loss = 0.10265892
Iteration 94, loss = 0.10249940
Iteration 95, loss = 0.10298478
Iteration 96, loss = 0.10238679
Iteration 97, loss = 0.10017768
Iteration 98, loss = 0.10086845
Iteration 99, loss = 0.10369971
Iteration 100, loss = 0.10080547
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.34940845
Iteration 2, loss = 0.69678206
Iteration 3, loss = 0.38337223
Iteration 4, loss = 0.30364027
Iteration 5, loss = 0.26357662
Iteration 6, loss = 0.24186078
Iteration 7, loss = 0.22259698
Iteration 8, loss = 0.21121740
Iteration 9, loss = 0.20028035
Iteration 10, loss = 0.19397829
Iteration 11, loss = 0.18639175
Iteration 12, loss = 0.18162342
Iteration 13, loss = 0.17571535
Iteration 14, loss = 0.17107988
Iteration 15, loss = 0.16716617
Iteration 16, loss = 0.16505397
Iteration 17, loss = 0.16000325
Iteration 18, loss = 0.15742066
Iteration 19, loss = 0.15533558
Iteration 20, loss = 0.15281146
Iteration 21, loss = 0.15128399
Iteration 22, loss = 0.14959661
Iteration 23, loss = 0.14612884
Iteration 24, loss = 0.14706715
Iteration 25, loss = 0.14313202
Iteration 26, loss = 0.14258841
Iteration 27, loss = 0.14141872
Iteration 28, loss = 0.13943555
Iteration 29, loss = 0.13897427
Iteration 30, loss = 0.13887109
Iteration 31, loss = 0.13688722
Iteration 32, loss = 0.13551191
Iteration 33, loss = 0.13626682
Iteration 34, loss = 0.13314273
Iteration 35, loss = 0.13393123
Iteration 36, loss = 0.13291347
Iteration 37, loss = 0.13183118
Iteration 38, loss = 0.13034703
Iteration 39, loss = 0.13102813
Iteration 40, loss = 0.13093080
Iteration 41, loss = 0.12981843
Iteration 42, loss = 0.13000415
Iteration 43, loss = 0.13008236
Iteration 44, loss = 0.12937281
Iteration 45, loss = 0.12721784
Iteration 46, loss = 0.12735465
Iteration 47, loss = 0.12584254
Iteration 48, loss = 0.12620973
Iteration 49, loss = 0.12656476
Iteration 50, loss = 0.12665943
Iteration 51, loss = 0.12508486
Iteration 52, loss = 0.12371991
```

```
Iteration 53, loss = 0.12524351
Iteration 54, loss = 0.12293627
Iteration 55, loss = 0.12368177
Iteration 56, loss = 0.12306116
Iteration 57, loss = 0.12200684
Iteration 58, loss = 0.12395582
Iteration 59, loss = 0.12447696
Iteration 60, loss = 0.12123020
Iteration 61, loss = 0.12146108
Iteration 62, loss = 0.12090057
Iteration 63, loss = 0.12070081
Iteration 64, loss = 0.12056835
Iteration 65, loss = 0.11981051
Iteration 66, loss = 0.12090949
Iteration 67, loss = 0.11864294
Iteration 68, loss = 0.11988381
Iteration 69, loss = 0.12032687
Iteration 70, loss = 0.11990392
Iteration 71, loss = 0.11827205
Iteration 72, loss = 0.11903976
Iteration 73, loss = 0.11848323
Iteration 74, loss = 0.11771380
Iteration 75, loss = 0.11717762
Iteration 76, loss = 0.11867096
Iteration 77, loss = 0.11806373
Iteration 78, loss = 0.11743061
Iteration 79, loss = 0.11783092
Iteration 80, loss = 0.11563993
Iteration 81, loss = 0.11823012
Iteration 82, loss = 0.11497765
Iteration 83, loss = 0.11793621
Iteration 84, loss = 0.11639057
Iteration 85, loss = 0.11728108
Iteration 86, loss = 0.11600320
Iteration 87, loss = 0.11552909
Iteration 88, loss = 0.11566141
Iteration 89, loss = 0.11569000
Iteration 90, loss = 0.11600499
Iteration 91, loss = 0.11594604
Iteration 92, loss = 0.11398283
Iteration 93, loss = 0.11463311
Iteration 94, loss = 0.11465790
Iteration 95, loss = 0.11448524
Iteration 96, loss = 0.11357303
Iteration 97, loss = 0.11433403
Iteration 98, loss = 0.11456559
Iteration 99, loss = 0.11446041
Iteration 100, loss = 0.11321674
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.17091317
Iteration 2, loss = 0.44715546
Iteration 3, loss = 0.36665842
Iteration 4, loss = 0.32682710
Iteration 5, loss = 0.30225080
Iteration 6, loss = 0.28434705
Iteration 7, loss = 0.27057564
Iteration 8, loss = 0.25844814
Iteration 9, loss = 0.24978782
Iteration 10, loss = 0.24092335
Iteration 11, loss = 0.23363347
Iteration 12, loss = 0.22723987
Iteration 13, loss = 0.22103620
Iteration 14, loss = 0.21710365
Iteration 15, loss = 0.21142134
Iteration 16, loss = 0.20779956
Iteration 17, loss = 0.20341972
Iteration 18, loss = 0.20031112
Iteration 19, loss = 0.19652311
Iteration 20, loss = 0.19332581
Iteration 21, loss = 0.19065675
Iteration 22, loss = 0.18742792
Iteration 23, loss = 0.18449249
Iteration 24, loss = 0.18229404
Iteration 25, loss = 0.17949034
Iteration 26, loss = 0.17738587
Iteration 27, loss = 0.17482308
Iteration 28, loss = 0.17271337
Iteration 29, loss = 0.17098257
Iteration 30, loss = 0.16874480
Iteration 31, loss = 0.16674596
Iteration 32, loss = 0.16510179
Iteration 33, loss = 0.16304945
Iteration 34, loss = 0.16143951
Iteration 35, loss = 0.15954429
Iteration 36, loss = 0.15831962
Iteration 37, loss = 0.15666389
Iteration 38, loss = 0.15497863
Iteration 39, loss = 0.15411023
Iteration 40, loss = 0.15230788
Iteration 41, loss = 0.15107513
Iteration 42, loss = 0.14953404
Iteration 43, loss = 0.14851418
Iteration 44, loss = 0.14739592
Iteration 45, loss = 0.14630817
Iteration 46, loss = 0.14457343
Iteration 47, loss = 0.14372020
Iteration 48, loss = 0.14228512
Iteration 49, loss = 0.14169287
Iteration 50, loss = 0.14081788
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.93167199
Iteration 2, loss = 0.43170030
Iteration 3, loss = 0.36665183
Iteration 4, loss = 0.33049613
Iteration 5, loss = 0.30550774
Iteration 6, loss = 0.28745741
Iteration 7, loss = 0.27315135
Iteration 8, loss = 0.26092461
Iteration 9, loss = 0.25102035
Iteration 10, loss = 0.24245806
Iteration 11, loss = 0.23538834
Iteration 12, loss = 0.22850863
Iteration 13, loss = 0.22246222
Iteration 14, loss = 0.21733597
Iteration 15, loss = 0.21217596
Iteration 16, loss = 0.20799271
Iteration 17, loss = 0.20390671
Iteration 18, loss = 0.20027888
Iteration 19, loss = 0.19655087
Iteration 20, loss = 0.19340329
Iteration 21, loss = 0.19021605
Iteration 22, loss = 0.18730186
Iteration 23, loss = 0.18454325
Iteration 24, loss = 0.18164614
Iteration 25, loss = 0.17948260
Iteration 26, loss = 0.17744485
Iteration 27, loss = 0.17519554
Iteration 28, loss = 0.17295257
Iteration 29, loss = 0.17087773
Iteration 30, loss = 0.16909029
Iteration 31, loss = 0.16700837
Iteration 32, loss = 0.16532820
Iteration 33, loss = 0.16355630
Iteration 34, loss = 0.16207388
Iteration 35, loss = 0.16028048
Iteration 36, loss = 0.15883988
Iteration 37, loss = 0.15758577
Iteration 38, loss = 0.15608244
Iteration 39, loss = 0.15434781
Iteration 40, loss = 0.15314872
Iteration 41, loss = 0.15187258
Iteration 42, loss = 0.15066906
Iteration 43, loss = 0.14943159
Iteration 44, loss = 0.14813789
Iteration 45, loss = 0.14704906
Iteration 46, loss = 0.14594481
Iteration 47, loss = 0.14492434
Iteration 48, loss = 0.14401352
Iteration 49, loss = 0.14269918
Iteration 50, loss = 0.14167848
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98253107
Iteration 2, loss = 1.14105725
Iteration 3, loss = 0.55126996
Iteration 4, loss = 0.37982531
Iteration 5, loss = 0.30739993
Iteration 6, loss = 0.26883662
Iteration 7, loss = 0.24769664
Iteration 8, loss = 0.22369946
Iteration 9, loss = 0.21574839
Iteration 10, loss = 0.20066239
Iteration 11, loss = 0.19158193
Iteration 12, loss = 0.18345692
Iteration 13, loss = 0.18010065
Iteration 14, loss = 0.17744574
Iteration 15, loss = 0.17046573
Iteration 16, loss = 0.16501234
Iteration 17, loss = 0.16124659
Iteration 18, loss = 0.15774010
Iteration 19, loss = 0.15656237
Iteration 20, loss = 0.15306920
Iteration 21, loss = 0.14748937
Iteration 22, loss = 0.14602192
Iteration 23, loss = 0.14475378
Iteration 24, loss = 0.14333990
Iteration 25, loss = 0.13892598
Iteration 26, loss = 0.14130017
Iteration 27, loss = 0.13640069
Iteration 28, loss = 0.13585363
Iteration 29, loss = 0.13515654
Iteration 30, loss = 0.13123488
Iteration 31, loss = 0.13142846
Iteration 32, loss = 0.12922290
Iteration 33, loss = 0.12908529
Iteration 34, loss = 0.12819550
Iteration 35, loss = 0.12677518
Iteration 36, loss = 0.12662864
Iteration 37, loss = 0.12210078
Iteration 38, loss = 0.12181733
Iteration 39, loss = 0.12328973
Iteration 40, loss = 0.11994025
Iteration 41, loss = 0.12150622
Iteration 42, loss = 0.12238894
Iteration 43, loss = 0.11827533
Iteration 44, loss = 0.11730697
Iteration 45, loss = 0.11785123
Iteration 46, loss = 0.11939737
Iteration 47, loss = 0.11684709
Iteration 48, loss = 0.11538637
Iteration 49, loss = 0.11693054
Iteration 50, loss = 0.11391842
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.68442137
Iteration 2, loss = 0.85883739
Iteration 3, loss = 0.42269262
Iteration 4, loss = 0.32294083
Iteration 5, loss = 0.27518707
Iteration 6, loss = 0.24733385
Iteration 7, loss = 0.23313061
Iteration 8, loss = 0.21780595
Iteration 9, loss = 0.21011978
Iteration 10, loss = 0.20054928
Iteration 11, loss = 0.19384522
Iteration 12, loss = 0.18785827
Iteration 13, loss = 0.18205514
Iteration 14, loss = 0.17766492
Iteration 15, loss = 0.17483755
Iteration 16, loss = 0.17048636
Iteration 17, loss = 0.16832747
Iteration 18, loss = 0.16402842
Iteration 19, loss = 0.16192566
Iteration 20, loss = 0.15939669
Iteration 21, loss = 0.15763727
Iteration 22, loss = 0.15456262
Iteration 23, loss = 0.15362877
Iteration 24, loss = 0.15114165
Iteration 25, loss = 0.15166371
Iteration 26, loss = 0.14914778
Iteration 27, loss = 0.14770489
Iteration 28, loss = 0.14671632
Iteration 29, loss = 0.14652924
Iteration 30, loss = 0.14477481
Iteration 31, loss = 0.14407324
Iteration 32, loss = 0.14144224
Iteration 33, loss = 0.14225874
Iteration 34, loss = 0.14162645
Iteration 35, loss = 0.13996731
Iteration 36, loss = 0.13968942
Iteration 37, loss = 0.13776435
Iteration 38, loss = 0.13749950
Iteration 39, loss = 0.13649268
Iteration 40, loss = 0.13650406
Iteration 41, loss = 0.13631028
Iteration 42, loss = 0.13578265
Iteration 43, loss = 0.13405042
Iteration 44, loss = 0.13328874
Iteration 45, loss = 0.13365832
Iteration 46, loss = 0.13231020
Iteration 47, loss = 0.13194850
Iteration 48, loss = 0.13195776
Iteration 49, loss = 0.13176695
Iteration 50, loss = 0.12982282
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.17091317
Iteration 2, loss = 0.44715546
Iteration 3, loss = 0.36665842
Iteration 4, loss = 0.32682710
Iteration 5, loss = 0.30225080
Iteration 6, loss = 0.28434705
Iteration 7, loss = 0.27057564
Iteration 8, loss = 0.25844814
Iteration 9, loss = 0.24978782
Iteration 10, loss = 0.24092335
Iteration 11, loss = 0.23363347
Iteration 12, loss = 0.22723987
Iteration 13, loss = 0.22103620
Iteration 14, loss = 0.21710365
Iteration 15, loss = 0.21142134
Iteration 16, loss = 0.20779956
Iteration 17, loss = 0.20341972
Iteration 18, loss = 0.20031112
Iteration 19, loss = 0.19652311
Iteration 20, loss = 0.19332581
Iteration 21, loss = 0.19065675
Iteration 22, loss = 0.18742792
Iteration 23, loss = 0.18449249
Iteration 24, loss = 0.18229404
Iteration 25, loss = 0.17949034
Iteration 26, loss = 0.17738587
Iteration 27, loss = 0.17482308
Iteration 28, loss = 0.17271337
Iteration 29, loss = 0.17098257
Iteration 30, loss = 0.16874480
Iteration 31, loss = 0.16674596
Iteration 32, loss = 0.16510179
Iteration 33, loss = 0.16304945
Iteration 34, loss = 0.16143951
Iteration 35, loss = 0.15954429
Iteration 36, loss = 0.15831962
Iteration 37, loss = 0.15666389
Iteration 38, loss = 0.15497863
Iteration 39, loss = 0.15411023
Iteration 40, loss = 0.15230788
Iteration 41, loss = 0.15107513
Iteration 42, loss = 0.14953404
Iteration 43, loss = 0.14851418
Iteration 44, loss = 0.14739592
Iteration 45, loss = 0.14630817
Iteration 46, loss = 0.14457343
Iteration 47, loss = 0.14372020
Iteration 48, loss = 0.14228512
Iteration 49, loss = 0.14169287
Iteration 50, loss = 0.14081788
Iteration 51, loss = 0.13949019
Iteration 52, loss = 0.13831685
```

```
Iteration 53, loss = 0.13751506
Iteration 54, loss = 0.13645962
Iteration 55, loss = 0.13559662
Iteration 56, loss = 0.13495113
Iteration 57, loss = 0.13399948
Iteration 58, loss = 0.13312839
Iteration 59, loss = 0.13203945
Iteration 60, loss = 0.13140651
Iteration 61, loss = 0.13067053
Iteration 62, loss = 0.13014505
Iteration 63, loss = 0.12924753
Iteration 64, loss = 0.12833089
Iteration 65, loss = 0.12763665
Iteration 66, loss = 0.12679479
Iteration 67, loss = 0.12597071
Iteration 68, loss = 0.12564620
Iteration 69, loss = 0.12509310
Iteration 70, loss = 0.12431096
Iteration 71, loss = 0.12347993
Iteration 72, loss = 0.12299989
Iteration 73, loss = 0.12261431
Iteration 74, loss = 0.12200493
Iteration 75, loss = 0.12091195
Iteration 76, loss = 0.12032386
Iteration 77, loss = 0.11966124
Iteration 78, loss = 0.11952612
Iteration 79, loss = 0.11864101
Iteration 80, loss = 0.11806320
Iteration 81, loss = 0.11763820
Iteration 82, loss = 0.11710332
Iteration 83, loss = 0.11660080
Iteration 84, loss = 0.11610440
Iteration 85, loss = 0.11578500
Iteration 86, loss = 0.11505758
Iteration 87, loss = 0.11439681
Iteration 88, loss = 0.11407402
Iteration 89, loss = 0.11383887
Iteration 90, loss = 0.11298723
Iteration 91, loss = 0.11287021
Iteration 92, loss = 0.11201269
Iteration 93, loss = 0.11202689
Iteration 94, loss = 0.11141182
Iteration 95, loss = 0.11045833
Iteration 96, loss = 0.11041926
Iteration 97, loss = 0.11027051
Iteration 98, loss = 0.10953043
Iteration 99, loss = 0.10902811
Iteration 100, loss = 0.10870820
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.93167199
Iteration 2, loss = 0.43170030
Iteration 3, loss = 0.36665183
Iteration 4, loss = 0.33049613
Iteration 5, loss = 0.30550774
Iteration 6, loss = 0.28745741
Iteration 7, loss = 0.27315135
Iteration 8, loss = 0.26092461
Iteration 9, loss = 0.25102035
Iteration 10, loss = 0.24245806
Iteration 11, loss = 0.23538834
Iteration 12, loss = 0.22850863
Iteration 13, loss = 0.22246222
Iteration 14, loss = 0.21733597
Iteration 15, loss = 0.21217596
Iteration 16, loss = 0.20799271
Iteration 17, loss = 0.20390671
Iteration 18, loss = 0.20027888
Iteration 19, loss = 0.19655087
Iteration 20, loss = 0.19340329
Iteration 21, loss = 0.19021605
Iteration 22, loss = 0.18730186
Iteration 23, loss = 0.18454325
Iteration 24, loss = 0.18164614
Iteration 25, loss = 0.17948260
Iteration 26, loss = 0.17744485
Iteration 27, loss = 0.17519554
Iteration 28, loss = 0.17295257
Iteration 29, loss = 0.17087773
Iteration 30, loss = 0.16909029
Iteration 31, loss = 0.16700837
Iteration 32, loss = 0.16532820
Iteration 33, loss = 0.16355630
Iteration 34, loss = 0.16207388
Iteration 35, loss = 0.16028048
Iteration 36, loss = 0.15883988
Iteration 37, loss = 0.15758577
Iteration 38, loss = 0.15608244
Iteration 39, loss = 0.15434781
Iteration 40, loss = 0.15314872
Iteration 41, loss = 0.15187258
Iteration 42, loss = 0.15066906
Iteration 43, loss = 0.14943159
Iteration 44, loss = 0.14813789
Iteration 45, loss = 0.14704906
Iteration 46, loss = 0.14594481
Iteration 47, loss = 0.14492434
Iteration 48, loss = 0.14401352
Iteration 49, loss = 0.14269918
Iteration 50, loss = 0.14167848
Iteration 51, loss = 0.14087515
Iteration 52, loss = 0.13981987
```

```
Iteration 53, loss = 0.13886121
Iteration 54, loss = 0.13785948
Iteration 55, loss = 0.13702506
Iteration 56, loss = 0.13646990
Iteration 57, loss = 0.13539027
Iteration 58, loss = 0.13457509
Iteration 59, loss = 0.13371068
Iteration 60, loss = 0.13296251
Iteration 61, loss = 0.13203791
Iteration 62, loss = 0.13165230
Iteration 63, loss = 0.13052908
Iteration 64, loss = 0.12984960
Iteration 65, loss = 0.12908596
Iteration 66, loss = 0.12836723
Iteration 67, loss = 0.12778307
Iteration 68, loss = 0.12714712
Iteration 69, loss = 0.12647435
Iteration 70, loss = 0.12566405
Iteration 71, loss = 0.12513290
Iteration 72, loss = 0.12458146
Iteration 73, loss = 0.12399246
Iteration 74, loss = 0.12316342
Iteration 75, loss = 0.12260041
Iteration 76, loss = 0.12205276
Iteration 77, loss = 0.12123316
Iteration 78, loss = 0.12085881
Iteration 79, loss = 0.12040770
Iteration 80, loss = 0.11986652
Iteration 81, loss = 0.11928286
Iteration 82, loss = 0.11871963
Iteration 83, loss = 0.11801830
Iteration 84, loss = 0.11767732
Iteration 85, loss = 0.11712119
Iteration 86, loss = 0.11674333
Iteration 87, loss = 0.11610753
Iteration 88, loss = 0.11577468
Iteration 89, loss = 0.11519391
Iteration 90, loss = 0.11467231
Iteration 91, loss = 0.11441656
Iteration 92, loss = 0.11387045
Iteration 93, loss = 0.11329732
Iteration 94, loss = 0.11291547
Iteration 95, loss = 0.11264047
Iteration 96, loss = 0.11212394
Iteration 97, loss = 0.11162961
Iteration 98, loss = 0.11136881
Iteration 99, loss = 0.11073191
Iteration 100, loss = 0.11058756
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98253107
Iteration 2, loss = 1.14105725
Iteration 3, loss = 0.55126996
Iteration 4, loss = 0.37982531
Iteration 5, loss = 0.30739993
Iteration 6, loss = 0.26883662
Iteration 7, loss = 0.24769664
Iteration 8, loss = 0.22369946
Iteration 9, loss = 0.21574839
Iteration 10, loss = 0.20066239
Iteration 11, loss = 0.19158193
Iteration 12, loss = 0.18345692
Iteration 13, loss = 0.18010065
Iteration 14, loss = 0.17744574
Iteration 15, loss = 0.17046573
Iteration 16, loss = 0.16501234
Iteration 17, loss = 0.16124659
Iteration 18, loss = 0.15774010
Iteration 19, loss = 0.15656237
Iteration 20, loss = 0.15306920
Iteration 21, loss = 0.14748937
Iteration 22, loss = 0.14602192
Iteration 23, loss = 0.14475378
Iteration 24, loss = 0.14333990
Iteration 25, loss = 0.13892598
Iteration 26, loss = 0.14130017
Iteration 27, loss = 0.13640069
Iteration 28, loss = 0.13585363
Iteration 29, loss = 0.13515654
Iteration 30, loss = 0.13123488
Iteration 31, loss = 0.13142846
Iteration 32, loss = 0.12922290
Iteration 33, loss = 0.12908529
Iteration 34, loss = 0.12819550
Iteration 35, loss = 0.12677518
Iteration 36, loss = 0.12662864
Iteration 37, loss = 0.12210078
Iteration 38, loss = 0.12181733
Iteration 39, loss = 0.12328973
Iteration 40, loss = 0.11994025
Iteration 41, loss = 0.12150622
Iteration 42, loss = 0.12238894
Iteration 43, loss = 0.11827533
Iteration 44, loss = 0.11730697
Iteration 45, loss = 0.11785123
Iteration 46, loss = 0.11939737
Iteration 47, loss = 0.11684709
Iteration 48, loss = 0.11538637
Iteration 49, loss = 0.11693054
Iteration 50, loss = 0.11391842
Iteration 51, loss = 0.11555623
Iteration 52, loss = 0.11239270
```

```
Iteration 53, loss = 0.11268506
Iteration 54, loss = 0.11170902
Iteration 55, loss = 0.11445788
Iteration 56, loss = 0.11076627
Iteration 57, loss = 0.11145296
Iteration 58, loss = 0.11288083
Iteration 59, loss = 0.11041173
Iteration 60, loss = 0.10855477
Iteration 61, loss = 0.10986650
Iteration 62, loss = 0.10956314
Iteration 63, loss = 0.10775506
Iteration 64, loss = 0.11060942
Iteration 65, loss = 0.10743082
Iteration 66, loss = 0.10683299
Iteration 67, loss = 0.10856422
Iteration 68, loss = 0.10669222
Iteration 69, loss = 0.10667175
Iteration 70, loss = 0.10886790
Iteration 71, loss = 0.10662388
Iteration 72, loss = 0.10512924
Iteration 73, loss = 0.10742012
Iteration 74, loss = 0.10668094
Iteration 75, loss = 0.10514585
Iteration 76, loss = 0.10388760
Iteration 77, loss = 0.10476820
Iteration 78, loss = 0.10343687
Iteration 79, loss = 0.10657804
Iteration 80, loss = 0.10444375
Iteration 81, loss = 0.10443100
Iteration 82, loss = 0.10506328
Iteration 83, loss = 0.10447174
Iteration 84, loss = 0.10268250
Iteration 85, loss = 0.10417707
Iteration 86, loss = 0.10287719
Iteration 87, loss = 0.10130080
Iteration 88, loss = 0.10160617
Iteration 89, loss = 0.10207482
Iteration 90, loss = 0.10270242
Iteration 91, loss = 0.10066608
Iteration 92, loss = 0.10307815
Iteration 93, loss = 0.10084391
Iteration 94, loss = 0.10188822
Iteration 95, loss = 0.10100521
Iteration 96, loss = 0.10292746
Iteration 97, loss = 0.09892223
Iteration 98, loss = 0.09984723
Iteration 99, loss = 0.10031103
Iteration 100, loss = 0.10074124
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.68442137
Iteration 2, loss = 0.85883739
Iteration 3, loss = 0.42269262
Iteration 4, loss = 0.32294083
Iteration 5, loss = 0.27518707
Iteration 6, loss = 0.24733385
Iteration 7, loss = 0.23313061
Iteration 8, loss = 0.21780595
Iteration 9, loss = 0.21011978
Iteration 10, loss = 0.20054928
Iteration 11, loss = 0.19384522
Iteration 12, loss = 0.18785827
Iteration 13, loss = 0.18205514
Iteration 14, loss = 0.17766492
Iteration 15, loss = 0.17483755
Iteration 16, loss = 0.17048636
Iteration 17, loss = 0.16832747
Iteration 18, loss = 0.16402842
Iteration 19, loss = 0.16192566
Iteration 20, loss = 0.15939669
Iteration 21, loss = 0.15763727
Iteration 22, loss = 0.15456262
Iteration 23, loss = 0.15362877
Iteration 24, loss = 0.15114165
Iteration 25, loss = 0.15166371
Iteration 26, loss = 0.14914778
Iteration 27, loss = 0.14770489
Iteration 28, loss = 0.14671632
Iteration 29, loss = 0.14652924
Iteration 30, loss = 0.14477481
Iteration 31, loss = 0.14407324
Iteration 32, loss = 0.14144224
Iteration 33, loss = 0.14225874
Iteration 34, loss = 0.14162645
Iteration 35, loss = 0.13996731
Iteration 36, loss = 0.13968942
Iteration 37, loss = 0.13776435
Iteration 38, loss = 0.13749950
Iteration 39, loss = 0.13649268
Iteration 40, loss = 0.13650406
Iteration 41, loss = 0.13631028
Iteration 42, loss = 0.13578265
Iteration 43, loss = 0.13405042
Iteration 44, loss = 0.13328874
Iteration 45, loss = 0.13365832
Iteration 46, loss = 0.13231020
Iteration 47, loss = 0.13194850
Iteration 48, loss = 0.13195776
Iteration 49, loss = 0.13176695
Iteration 50, loss = 0.12982282
Iteration 51, loss = 0.13175520
Iteration 52, loss = 0.12931917
```

```
Iteration 53, loss = 0.13044708
Iteration 54, loss = 0.12840693
Iteration 55, loss = 0.12852077
Iteration 56, loss = 0.13039083
Iteration 57, loss = 0.12740084
Iteration 58, loss = 0.12718870
Iteration 59, loss = 0.12712265
Iteration 60, loss = 0.12707250
Iteration 61, loss = 0.12569360
Iteration 62, loss = 0.12755444
Iteration 63, loss = 0.12557557
Iteration 64, loss = 0.12439675
Iteration 65, loss = 0.12539638
Iteration 66, loss = 0.12442049
Iteration 67, loss = 0.12440429
Iteration 68, loss = 0.12316941
Iteration 69, loss = 0.12439271
Iteration 70, loss = 0.12419698
Iteration 71, loss = 0.12398311
Iteration 72, loss = 0.12293541
Iteration 73, loss = 0.12497202
Iteration 74, loss = 0.12208329
Iteration 75, loss = 0.12274603
Iteration 76, loss = 0.12193599
Iteration 77, loss = 0.12195553
Iteration 78, loss = 0.12209867
Iteration 79, loss = 0.12228527
Iteration 80, loss = 0.12148632
Iteration 81, loss = 0.12168102
Iteration 82, loss = 0.12053949
Iteration 83, loss = 0.12052531
Iteration 84, loss = 0.12103296
Iteration 85, loss = 0.11898507
Iteration 86, loss = 0.12198556
Iteration 87, loss = 0.11981834
Iteration 88, loss = 0.11942500
Iteration 89, loss = 0.11931654
Iteration 90, loss = 0.12018737
Iteration 91, loss = 0.12020190
Iteration 92, loss = 0.11932074
Iteration 93, loss = 0.11936609
Iteration 94, loss = 0.11906018
Iteration 95, loss = 0.11893520
Iteration 96, loss = 0.11975986
Training loss did not improve more than tol=0.000100 for 10 consecutive epoch
s. Stopping.
Iteration 1, loss = 2.17091317
Iteration 2, loss = 0.44715546
Iteration 3, loss = 0.36665842
Iteration 4, loss = 0.32682710
Iteration 5, loss = 0.30225080
Iteration 6, loss = 0.28434705
```

```
Iteration 7, loss = 0.27057564
Iteration 8, loss = 0.25844814
Iteration 9, loss = 0.24978782
Iteration 10, loss = 0.24092335
Iteration 11, loss = 0.23363347
Iteration 12, loss = 0.22723987
Iteration 13, loss = 0.22103620
Iteration 14, loss = 0.21710365
Iteration 15, loss = 0.21142134
Iteration 16, loss = 0.20779956
Iteration 17, loss = 0.20341972
Iteration 18, loss = 0.20031112
Iteration 19, loss = 0.19652311
Iteration 20, loss = 0.19332581
Iteration 21, loss = 0.19065675
Iteration 22, loss = 0.18742792
Iteration 23, loss = 0.18449249
Iteration 24, loss = 0.18229404
Iteration 25, loss = 0.17949034
Iteration 26, loss = 0.17738587
Iteration 27, loss = 0.17482308
Iteration 28, loss = 0.17271337
Iteration 29, loss = 0.17098257
Iteration 30, loss = 0.16874480
Iteration 31, loss = 0.16674596
Iteration 32, loss = 0.16510179
Iteration 33, loss = 0.16304945
Iteration 34, loss = 0.16143951
Iteration 35, loss = 0.15954429
Iteration 36, loss = 0.15831962
Iteration 37, loss = 0.15666389
Iteration 38, loss = 0.15497863
Iteration 39, loss = 0.15411023
Iteration 40, loss = 0.15230788
Iteration 41, loss = 0.15107513
Iteration 42, loss = 0.14953404
Iteration 43, loss = 0.14851418
Iteration 44, loss = 0.14739592
Iteration 45, loss = 0.14630817
Iteration 46, loss = 0.14457343
Iteration 47, loss = 0.14372020
Iteration 48, loss = 0.14228512
Iteration 49, loss = 0.14169287
Iteration 50, loss = 0.14081788
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.93167199
Iteration 2, loss = 0.43170030
Iteration 3, loss = 0.36665183
Iteration 4, loss = 0.33049613
Iteration 5, loss = 0.30550774
Iteration 6, loss = 0.28745741
Iteration 7, loss = 0.27315135
Iteration 8, loss = 0.26092461
Iteration 9, loss = 0.25102035
Iteration 10, loss = 0.24245806
Iteration 11, loss = 0.23538834
Iteration 12, loss = 0.22850863
Iteration 13, loss = 0.22246222
Iteration 14, loss = 0.21733597
Iteration 15, loss = 0.21217596
Iteration 16, loss = 0.20799271
Iteration 17, loss = 0.20390671
Iteration 18, loss = 0.20027888
Iteration 19, loss = 0.19655087
Iteration 20, loss = 0.19340329
Iteration 21, loss = 0.19021605
Iteration 22, loss = 0.18730186
Iteration 23, loss = 0.18454325
Iteration 24, loss = 0.18164614
Iteration 25, loss = 0.17948260
Iteration 26, loss = 0.17744485
Iteration 27, loss = 0.17519554
Iteration 28, loss = 0.17295257
Iteration 29, loss = 0.17087773
Iteration 30, loss = 0.16909029
Iteration 31, loss = 0.16700837
Iteration 32, loss = 0.16532820
Iteration 33, loss = 0.16355630
Iteration 34, loss = 0.16207388
Iteration 35, loss = 0.16028048
Iteration 36, loss = 0.15883988
Iteration 37, loss = 0.15758577
Iteration 38, loss = 0.15608244
Iteration 39, loss = 0.15434781
Iteration 40, loss = 0.15314872
Iteration 41, loss = 0.15187258
Iteration 42, loss = 0.15066906
Iteration 43, loss = 0.14943159
Iteration 44, loss = 0.14813789
Iteration 45, loss = 0.14704906
Iteration 46, loss = 0.14594481
Iteration 47, loss = 0.14492434
Iteration 48, loss = 0.14401352
Iteration 49, loss = 0.14269918
Iteration 50, loss = 0.14167848
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98253107
Iteration 2, loss = 1.14105725
Iteration 3, loss = 0.55126996
Iteration 4, loss = 0.37982531
Iteration 5, loss = 0.30739993
Iteration 6, loss = 0.26883662
Iteration 7, loss = 0.24769664
Iteration 8, loss = 0.22369946
Iteration 9, loss = 0.21574839
Iteration 10, loss = 0.20066239
Iteration 11, loss = 0.19158193
Iteration 12, loss = 0.18345692
Iteration 13, loss = 0.18010065
Iteration 14, loss = 0.17744574
Iteration 15, loss = 0.17046573
Iteration 16, loss = 0.16501234
Iteration 17, loss = 0.16124659
Iteration 18, loss = 0.15774010
Iteration 19, loss = 0.15656237
Iteration 20, loss = 0.15306920
Iteration 21, loss = 0.14748937
Iteration 22, loss = 0.14602192
Iteration 23, loss = 0.14475378
Iteration 24, loss = 0.14333990
Iteration 25, loss = 0.13892598
Iteration 26, loss = 0.14130017
Iteration 27, loss = 0.13640069
Iteration 28, loss = 0.13585363
Iteration 29, loss = 0.13515654
Iteration 30, loss = 0.13123488
Iteration 31, loss = 0.13142846
Iteration 32, loss = 0.12922290
Iteration 33, loss = 0.12908529
Iteration 34, loss = 0.12819550
Iteration 35, loss = 0.12677518
Iteration 36, loss = 0.12662864
Iteration 37, loss = 0.12210078
Iteration 38, loss = 0.12181733
Iteration 39, loss = 0.12328973
Iteration 40, loss = 0.11994025
Iteration 41, loss = 0.12150622
Iteration 42, loss = 0.12238894
Iteration 43, loss = 0.11827533
Iteration 44, loss = 0.11730697
Iteration 45, loss = 0.11785123
Iteration 46, loss = 0.11939737
Iteration 47, loss = 0.11684709
Iteration 48, loss = 0.11538637
Iteration 49, loss = 0.11693054
Iteration 50, loss = 0.11391842
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.68442137
Iteration 2, loss = 0.85883739
Iteration 3, loss = 0.42269262
Iteration 4, loss = 0.32294083
Iteration 5, loss = 0.27518707
Iteration 6, loss = 0.24733385
Iteration 7, loss = 0.23313061
Iteration 8, loss = 0.21780595
Iteration 9, loss = 0.21011978
Iteration 10, loss = 0.20054928
Iteration 11, loss = 0.19384522
Iteration 12, loss = 0.18785827
Iteration 13, loss = 0.18205514
Iteration 14, loss = 0.17766492
Iteration 15, loss = 0.17483755
Iteration 16, loss = 0.17048636
Iteration 17, loss = 0.16832747
Iteration 18, loss = 0.16402842
Iteration 19, loss = 0.16192566
Iteration 20, loss = 0.15939669
Iteration 21, loss = 0.15763727
Iteration 22, loss = 0.15456262
Iteration 23, loss = 0.15362877
Iteration 24, loss = 0.15114165
Iteration 25, loss = 0.15166371
Iteration 26, loss = 0.14914778
Iteration 27, loss = 0.14770489
Iteration 28, loss = 0.14671632
Iteration 29, loss = 0.14652924
Iteration 30, loss = 0.14477481
Iteration 31, loss = 0.14407324
Iteration 32, loss = 0.14144224
Iteration 33, loss = 0.14225874
Iteration 34, loss = 0.14162645
Iteration 35, loss = 0.13996731
Iteration 36, loss = 0.13968942
Iteration 37, loss = 0.13776435
Iteration 38, loss = 0.13749950
Iteration 39, loss = 0.13649268
Iteration 40, loss = 0.13650406
Iteration 41, loss = 0.13631028
Iteration 42, loss = 0.13578265
Iteration 43, loss = 0.13405042
Iteration 44, loss = 0.13328874
Iteration 45, loss = 0.13365832
Iteration 46, loss = 0.13231020
Iteration 47, loss = 0.13194850
Iteration 48, loss = 0.13195776
Iteration 49, loss = 0.13176695
Iteration 50, loss = 0.12982282
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 2.17091317
Iteration 2, loss = 0.44715546
Iteration 3, loss = 0.36665842
Iteration 4, loss = 0.32682710
Iteration 5, loss = 0.30225080
Iteration 6, loss = 0.28434705
Iteration 7, loss = 0.27057564
Iteration 8, loss = 0.25844814
Iteration 9, loss = 0.24978782
Iteration 10, loss = 0.24092335
Iteration 11, loss = 0.23363347
Iteration 12, loss = 0.22723987
Iteration 13, loss = 0.22103620
Iteration 14, loss = 0.21710365
Iteration 15, loss = 0.21142134
Iteration 16, loss = 0.20779956
Iteration 17, loss = 0.20341972
Iteration 18, loss = 0.20031112
Iteration 19, loss = 0.19652311
Iteration 20, loss = 0.19332581
Iteration 21, loss = 0.19065675
Iteration 22, loss = 0.18742792
Iteration 23, loss = 0.18449249
Iteration 24, loss = 0.18229404
Iteration 25, loss = 0.17949034
Iteration 26, loss = 0.17738587
Iteration 27, loss = 0.17482308
Iteration 28, loss = 0.17271337
Iteration 29, loss = 0.17098257
Iteration 30, loss = 0.16874480
Iteration 31, loss = 0.16674596
Iteration 32, loss = 0.16510179
Iteration 33, loss = 0.16304945
Iteration 34, loss = 0.16143951
Iteration 35, loss = 0.15954429
Iteration 36, loss = 0.15831962
Iteration 37, loss = 0.15666389
Iteration 38, loss = 0.15497863
Iteration 39, loss = 0.15411023
Iteration 40, loss = 0.15230788
Iteration 41, loss = 0.15107513
Iteration 42, loss = 0.14953404
Iteration 43, loss = 0.14851418
Iteration 44, loss = 0.14739592
Iteration 45, loss = 0.14630817
Iteration 46, loss = 0.14457343
Iteration 47, loss = 0.14372020
Iteration 48, loss = 0.14228512
Iteration 49, loss = 0.14169287
Iteration 50, loss = 0.14081788
Iteration 51, loss = 0.13949019
Iteration 52, loss = 0.13831685
```

```
Iteration 53, loss = 0.13751506
Iteration 54, loss = 0.13645962
Iteration 55, loss = 0.13559662
Iteration 56, loss = 0.13495113
Iteration 57, loss = 0.13399948
Iteration 58, loss = 0.13312839
Iteration 59, loss = 0.13203945
Iteration 60, loss = 0.13140651
Iteration 61, loss = 0.13067053
Iteration 62, loss = 0.13014505
Iteration 63, loss = 0.12924753
Iteration 64, loss = 0.12833089
Iteration 65, loss = 0.12763665
Iteration 66, loss = 0.12679479
Iteration 67, loss = 0.12597071
Iteration 68, loss = 0.12564620
Iteration 69, loss = 0.12509310
Iteration 70, loss = 0.12431096
Iteration 71, loss = 0.12347993
Iteration 72, loss = 0.12299989
Iteration 73, loss = 0.12261431
Iteration 74, loss = 0.12200493
Iteration 75, loss = 0.12091195
Iteration 76, loss = 0.12032386
Iteration 77, loss = 0.11966124
Iteration 78, loss = 0.11952612
Iteration 79, loss = 0.11864101
Iteration 80, loss = 0.11806320
Iteration 81, loss = 0.11763820
Iteration 82, loss = 0.11710332
Iteration 83, loss = 0.11660080
Iteration 84, loss = 0.11610440
Iteration 85, loss = 0.11578500
Iteration 86, loss = 0.11505758
Iteration 87, loss = 0.11439681
Iteration 88, loss = 0.11407402
Iteration 89, loss = 0.11383887
Iteration 90, loss = 0.11298723
Iteration 91, loss = 0.11287021
Iteration 92, loss = 0.11201269
Iteration 93, loss = 0.11202689
Iteration 94, loss = 0.11141182
Iteration 95, loss = 0.11045833
Iteration 96, loss = 0.11041926
Iteration 97, loss = 0.11027051
Iteration 98, loss = 0.10953043
Iteration 99, loss = 0.10902811
Iteration 100, loss = 0.10870820
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.93167199
Iteration 2, loss = 0.43170030
Iteration 3, loss = 0.36665183
Iteration 4, loss = 0.33049613
Iteration 5, loss = 0.30550774
Iteration 6, loss = 0.28745741
Iteration 7, loss = 0.27315135
Iteration 8, loss = 0.26092461
Iteration 9, loss = 0.25102035
Iteration 10, loss = 0.24245806
Iteration 11, loss = 0.23538834
Iteration 12, loss = 0.22850863
Iteration 13, loss = 0.22246222
Iteration 14, loss = 0.21733597
Iteration 15, loss = 0.21217596
Iteration 16, loss = 0.20799271
Iteration 17, loss = 0.20390671
Iteration 18, loss = 0.20027888
Iteration 19, loss = 0.19655087
Iteration 20, loss = 0.19340329
Iteration 21, loss = 0.19021605
Iteration 22, loss = 0.18730186
Iteration 23, loss = 0.18454325
Iteration 24, loss = 0.18164614
Iteration 25, loss = 0.17948260
Iteration 26, loss = 0.17744485
Iteration 27, loss = 0.17519554
Iteration 28, loss = 0.17295257
Iteration 29, loss = 0.17087773
Iteration 30, loss = 0.16909029
Iteration 31, loss = 0.16700837
Iteration 32, loss = 0.16532820
Iteration 33, loss = 0.16355630
Iteration 34, loss = 0.16207388
Iteration 35, loss = 0.16028048
Iteration 36, loss = 0.15883988
Iteration 37, loss = 0.15758577
Iteration 38, loss = 0.15608244
Iteration 39, loss = 0.15434781
Iteration 40, loss = 0.15314872
Iteration 41, loss = 0.15187258
Iteration 42, loss = 0.15066906
Iteration 43, loss = 0.14943159
Iteration 44, loss = 0.14813789
Iteration 45, loss = 0.14704906
Iteration 46, loss = 0.14594481
Iteration 47, loss = 0.14492434
Iteration 48, loss = 0.14401352
Iteration 49, loss = 0.14269918
Iteration 50, loss = 0.14167848
Iteration 51, loss = 0.14087515
Iteration 52, loss = 0.13981987
```

```
Iteration 53, loss = 0.13886121
Iteration 54, loss = 0.13785948
Iteration 55, loss = 0.13702506
Iteration 56, loss = 0.13646990
Iteration 57, loss = 0.13539027
Iteration 58, loss = 0.13457509
Iteration 59, loss = 0.13371068
Iteration 60, loss = 0.13296251
Iteration 61, loss = 0.13203791
Iteration 62, loss = 0.13165230
Iteration 63, loss = 0.13052908
Iteration 64, loss = 0.12984960
Iteration 65, loss = 0.12908596
Iteration 66, loss = 0.12836723
Iteration 67, loss = 0.12778307
Iteration 68, loss = 0.12714712
Iteration 69, loss = 0.12647435
Iteration 70, loss = 0.12566405
Iteration 71, loss = 0.12513290
Iteration 72, loss = 0.12458146
Iteration 73, loss = 0.12399246
Iteration 74, loss = 0.12316342
Iteration 75, loss = 0.12260041
Iteration 76, loss = 0.12205276
Iteration 77, loss = 0.12123316
Iteration 78, loss = 0.12085881
Iteration 79, loss = 0.12040770
Iteration 80, loss = 0.11986652
Iteration 81, loss = 0.11928286
Iteration 82, loss = 0.11871963
Iteration 83, loss = 0.11801830
Iteration 84, loss = 0.11767732
Iteration 85, loss = 0.11712119
Iteration 86, loss = 0.11674333
Iteration 87, loss = 0.11610753
Iteration 88, loss = 0.11577468
Iteration 89, loss = 0.11519391
Iteration 90, loss = 0.11467231
Iteration 91, loss = 0.11441656
Iteration 92, loss = 0.11387045
Iteration 93, loss = 0.11329732
Iteration 94, loss = 0.11291547
Iteration 95, loss = 0.11264047
Iteration 96, loss = 0.11212394
Iteration 97, loss = 0.11162961
Iteration 98, loss = 0.11136881
Iteration 99, loss = 0.11073191
Iteration 100, loss = 0.11058756
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 6.98253107
Iteration 2, loss = 1.14105725
Iteration 3, loss = 0.55126996
Iteration 4, loss = 0.37982531
Iteration 5, loss = 0.30739993
Iteration 6, loss = 0.26883662
Iteration 7, loss = 0.24769664
Iteration 8, loss = 0.22369946
Iteration 9, loss = 0.21574839
Iteration 10, loss = 0.20066239
Iteration 11, loss = 0.19158193
Iteration 12, loss = 0.18345692
Iteration 13, loss = 0.18010065
Iteration 14, loss = 0.17744574
Iteration 15, loss = 0.17046573
Iteration 16, loss = 0.16501234
Iteration 17, loss = 0.16124659
Iteration 18, loss = 0.15774010
Iteration 19, loss = 0.15656237
Iteration 20, loss = 0.15306920
Iteration 21, loss = 0.14748937
Iteration 22, loss = 0.14602192
Iteration 23, loss = 0.14475378
Iteration 24, loss = 0.14333990
Iteration 25, loss = 0.13892598
Iteration 26, loss = 0.14130017
Iteration 27, loss = 0.13640069
Iteration 28, loss = 0.13585363
Iteration 29, loss = 0.13515654
Iteration 30, loss = 0.13123488
Iteration 31, loss = 0.13142846
Iteration 32, loss = 0.12922290
Iteration 33, loss = 0.12908529
Iteration 34, loss = 0.12819550
Iteration 35, loss = 0.12677518
Iteration 36, loss = 0.12662864
Iteration 37, loss = 0.12210078
Iteration 38, loss = 0.12181733
Iteration 39, loss = 0.12328973
Iteration 40, loss = 0.11994025
Iteration 41, loss = 0.12150622
Iteration 42, loss = 0.12238894
Iteration 43, loss = 0.11827533
Iteration 44, loss = 0.11730697
Iteration 45, loss = 0.11785123
Iteration 46, loss = 0.11939737
Iteration 47, loss = 0.11684709
Iteration 48, loss = 0.11538637
Iteration 49, loss = 0.11693054
Iteration 50, loss = 0.11391842
Iteration 51, loss = 0.11555623
Iteration 52, loss = 0.11239270
```

```
Iteration 53, loss = 0.11268506
Iteration 54, loss = 0.11170902
Iteration 55, loss = 0.11445788
Iteration 56, loss = 0.11076627
Iteration 57, loss = 0.11145296
Iteration 58, loss = 0.11288083
Iteration 59, loss = 0.11041173
Iteration 60, loss = 0.10855477
Iteration 61, loss = 0.10986650
Iteration 62, loss = 0.10956314
Iteration 63, loss = 0.10775506
Iteration 64, loss = 0.11060942
Iteration 65, loss = 0.10743082
Iteration 66, loss = 0.10683299
Iteration 67, loss = 0.10856422
Iteration 68, loss = 0.10669222
Iteration 69, loss = 0.10667175
Iteration 70, loss = 0.10886790
Iteration 71, loss = 0.10662388
Iteration 72, loss = 0.10512924
Iteration 73, loss = 0.10742012
Iteration 74, loss = 0.10668094
Iteration 75, loss = 0.10514585
Iteration 76, loss = 0.10388760
Iteration 77, loss = 0.10476820
Iteration 78, loss = 0.10343687
Iteration 79, loss = 0.10657804
Iteration 80, loss = 0.10444375
Iteration 81, loss = 0.10443100
Iteration 82, loss = 0.10506328
Iteration 83, loss = 0.10447174
Iteration 84, loss = 0.10268250
Iteration 85, loss = 0.10417707
Iteration 86, loss = 0.10287719
Iteration 87, loss = 0.10130080
Iteration 88, loss = 0.10160617
Iteration 89, loss = 0.10207482
Iteration 90, loss = 0.10270242
Iteration 91, loss = 0.10066608
Iteration 92, loss = 0.10307815
Iteration 93, loss = 0.10084391
Iteration 94, loss = 0.10188822
Iteration 95, loss = 0.10100521
Iteration 96, loss = 0.10292746
Iteration 97, loss = 0.09892223
Iteration 98, loss = 0.09984723
Iteration 99, loss = 0.10031103
Iteration 100, loss = 0.10074124
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 11.68442137
Iteration 2, loss = 0.85883739
Iteration 3, loss = 0.42269262
Iteration 4, loss = 0.32294083
Iteration 5, loss = 0.27518707
Iteration 6, loss = 0.24733385
Iteration 7, loss = 0.23313061
Iteration 8, loss = 0.21780595
Iteration 9, loss = 0.21011978
Iteration 10, loss = 0.20054928
Iteration 11, loss = 0.19384522
Iteration 12, loss = 0.18785827
Iteration 13, loss = 0.18205514
Iteration 14, loss = 0.17766492
Iteration 15, loss = 0.17483755
Iteration 16, loss = 0.17048636
Iteration 17, loss = 0.16832747
Iteration 18, loss = 0.16402842
Iteration 19, loss = 0.16192566
Iteration 20, loss = 0.15939669
Iteration 21, loss = 0.15763727
Iteration 22, loss = 0.15456262
Iteration 23, loss = 0.15362877
Iteration 24, loss = 0.15114165
Iteration 25, loss = 0.15166371
Iteration 26, loss = 0.14914778
Iteration 27, loss = 0.14770489
Iteration 28, loss = 0.14671632
Iteration 29, loss = 0.14652924
Iteration 30, loss = 0.14477481
Iteration 31, loss = 0.14407324
Iteration 32, loss = 0.14144224
Iteration 33, loss = 0.14225874
Iteration 34, loss = 0.14162645
Iteration 35, loss = 0.13996731
Iteration 36, loss = 0.13968942
Iteration 37, loss = 0.13776435
Iteration 38, loss = 0.13749950
Iteration 39, loss = 0.13649268
Iteration 40, loss = 0.13650406
Iteration 41, loss = 0.13631028
Iteration 42, loss = 0.13578265
Iteration 43, loss = 0.13405042
Iteration 44, loss = 0.13328874
Iteration 45, loss = 0.13365832
Iteration 46, loss = 0.13231020
Iteration 47, loss = 0.13194850
Iteration 48, loss = 0.13195776
Iteration 49, loss = 0.13176695
Iteration 50, loss = 0.12982282
Iteration 51, loss = 0.13175520
Iteration 52, loss = 0.12931917
```

```
Iteration 53, loss = 0.13044708
Iteration 54, loss = 0.12840693
Iteration 55, loss = 0.12852077
Iteration 56, loss = 0.13039083
Iteration 57, loss = 0.12740084
Iteration 58, loss = 0.12718870
Iteration 59, loss = 0.12712265
Iteration 60, loss = 0.12707250
Iteration 61, loss = 0.12569360
Iteration 62, loss = 0.12755444
Iteration 63, loss = 0.12557557
Iteration 64, loss = 0.12439675
Iteration 65, loss = 0.12539638
Iteration 66, loss = 0.12442049
Iteration 67, loss = 0.12440429
Iteration 68, loss = 0.12316941
Iteration 69, loss = 0.12439271
Iteration 70, loss = 0.12419698
Iteration 71, loss = 0.12398311
Iteration 72, loss = 0.12293541
Iteration 73, loss = 0.12497202
Iteration 74, loss = 0.12208329
Iteration 75, loss = 0.12274603
Iteration 76, loss = 0.12193599
Iteration 77, loss = 0.12195553
Iteration 78, loss = 0.12209867
Iteration 79, loss = 0.12228527
Iteration 80, loss = 0.12148632
Iteration 81, loss = 0.12168102
Iteration 82, loss = 0.12053949
Iteration 83, loss = 0.12052531
Iteration 84, loss = 0.12103296
Iteration 85, loss = 0.11898507
Iteration 86, loss = 0.12198556
Iteration 87, loss = 0.11981834
Iteration 88, loss = 0.11942500
Iteration 89, loss = 0.11931654
Iteration 90, loss = 0.12018737
Iteration 91, loss = 0.12020190
Iteration 92, loss = 0.11932074
Iteration 93, loss = 0.11936609
Iteration 94, loss = 0.11906018
Iteration 95, loss = 0.11893520
Iteration 96, loss = 0.11975986
Training loss did not improve more than tol=0.000100 for 10 consecutive epoch
s. Stopping.
Iteration 1, loss = 1.45338063
Iteration 2, loss = 0.38391235
Iteration 3, loss = 0.31473299
Iteration 4, loss = 0.28012899
Iteration 5, loss = 0.25735495
Iteration 6, loss = 0.23904773
```

```
Iteration 7, loss = 0.22527027
Iteration 8, loss = 0.21489632
Iteration 9, loss = 0.20499844
Iteration 10, loss = 0.19724269
Iteration 11, loss = 0.18969387
Iteration 12, loss = 0.18410539
Iteration 13, loss = 0.17832236
Iteration 14, loss = 0.17220591
Iteration 15, loss = 0.16703508
Iteration 16, loss = 0.16402862
Iteration 17, loss = 0.16016243
Iteration 18, loss = 0.15551689
Iteration 19, loss = 0.15321766
Iteration 20, loss = 0.14916037
Iteration 21, loss = 0.14659568
Iteration 22, loss = 0.14284147
Iteration 23, loss = 0.13976623
Iteration 24, loss = 0.13806411
Iteration 25, loss = 0.13551059
Iteration 26, loss = 0.13272509
Iteration 27, loss = 0.12970475
Iteration 28, loss = 0.12842388
Iteration 29, loss = 0.12609827
Iteration 30, loss = 0.12457055
Iteration 31, loss = 0.12113476
Iteration 32, loss = 0.11954105
Iteration 33, loss = 0.11771151
Iteration 34, loss = 0.11706178
Iteration 35, loss = 0.11461389
Iteration 36, loss = 0.11378253
Iteration 37, loss = 0.11179982
Iteration 38, loss = 0.10987637
Iteration 39, loss = 0.10818740
Iteration 40, loss = 0.10726265
Iteration 41, loss = 0.10620064
Iteration 42, loss = 0.10461453
Iteration 43, loss = 0.10411031
Iteration 44, loss = 0.10162422
Iteration 45, loss = 0.10130558
Iteration 46, loss = 0.09940882
Iteration 47, loss = 0.09919038
Iteration 48, loss = 0.09715612
Iteration 49, loss = 0.09607360
Iteration 50, loss = 0.09592956
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.13302478
Iteration 2, loss = 0.37303979
Iteration 3, loss = 0.31677272
Iteration 4, loss = 0.28340208
Iteration 5, loss = 0.26037920
Iteration 6, loss = 0.24212492
Iteration 7, loss = 0.22767110
Iteration 8, loss = 0.21581160
Iteration 9, loss = 0.20553427
Iteration 10, loss = 0.19712104
Iteration 11, loss = 0.18938974
Iteration 12, loss = 0.18243195
Iteration 13, loss = 0.17673267
Iteration 14, loss = 0.17118242
Iteration 15, loss = 0.16546337
Iteration 16, loss = 0.16064789
Iteration 17, loss = 0.15572878
Iteration 18, loss = 0.15221019
Iteration 19, loss = 0.14802034
Iteration 20, loss = 0.14522766
Iteration 21, loss = 0.14154119
Iteration 22, loss = 0.13832699
Iteration 23, loss = 0.13540068
Iteration 24, loss = 0.13300605
Iteration 25, loss = 0.13049088
Iteration 26, loss = 0.12859740
Iteration 27, loss = 0.12579631
Iteration 28, loss = 0.12374159
Iteration 29, loss = 0.12131471
Iteration 30, loss = 0.11941692
Iteration 31, loss = 0.11754700
Iteration 32, loss = 0.11569703
Iteration 33, loss = 0.11372123
Iteration 34, loss = 0.11192642
Iteration 35, loss = 0.10998768
Iteration 36, loss = 0.10867747
Iteration 37, loss = 0.10707246
Iteration 38, loss = 0.10568200
Iteration 39, loss = 0.10450544
Iteration 40, loss = 0.10312971
Iteration 41, loss = 0.10130528
Iteration 42, loss = 0.10016568
Iteration 43, loss = 0.09896173
Iteration 44, loss = 0.09779283
Iteration 45, loss = 0.09629557
Iteration 46, loss = 0.09524696
Iteration 47, loss = 0.09424295
Iteration 48, loss = 0.09313566
Iteration 49, loss = 0.09236478
Iteration 50, loss = 0.09129581
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.58111654
Iteration 2, loss = 0.31851691
Iteration 3, loss = 0.25343646
Iteration 4, loss = 0.22185343
Iteration 5, loss = 0.20201506
Iteration 6, loss = 0.18743743
Iteration 7, loss = 0.16922282
Iteration 8, loss = 0.16092229
Iteration 9, loss = 0.15575909
Iteration 10, loss = 0.14483664
Iteration 11, loss = 0.13627238
Iteration 12, loss = 0.13149719
Iteration 13, loss = 0.12539791
Iteration 14, loss = 0.11616881
Iteration 15, loss = 0.11203527
Iteration 16, loss = 0.10686851
Iteration 17, loss = 0.10552265
Iteration 18, loss = 0.10048521
Iteration 19, loss = 0.09543827
Iteration 20, loss = 0.09586289
Iteration 21, loss = 0.09019389
Iteration 22, loss = 0.08581433
Iteration 23, loss = 0.08849903
Iteration 24, loss = 0.08610830
Iteration 25, loss = 0.07915110
Iteration 26, loss = 0.07747108
Iteration 27, loss = 0.07516655
Iteration 28, loss = 0.07490685
Iteration 29, loss = 0.07372384
Iteration 30, loss = 0.07196165
Iteration 31, loss = 0.06889322
Iteration 32, loss = 0.06714344
Iteration 33, loss = 0.06529591
Iteration 34, loss = 0.06320735
Iteration 35, loss = 0.06323640
Iteration 36, loss = 0.06038880
Iteration 37, loss = 0.06365006
Iteration 38, loss = 0.05786159
Iteration 39, loss = 0.05642215
Iteration 40, loss = 0.05540536
Iteration 41, loss = 0.05865224
Iteration 42, loss = 0.05242827
Iteration 43, loss = 0.05447825
Iteration 44, loss = 0.05402387
Iteration 45, loss = 0.05343717
Iteration 46, loss = 0.04989339
Iteration 47, loss = 0.05173414
Iteration 48, loss = 0.04891058
Iteration 49, loss = 0.04900123
Iteration 50, loss = 0.04754306
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.69207889
Iteration 2, loss = 0.32301710
Iteration 3, loss = 0.26544210
Iteration 4, loss = 0.23315930
Iteration 5, loss = 0.20728109
Iteration 6, loss = 0.19072516
Iteration 7, loss = 0.17381974
Iteration 8, loss = 0.16077154
Iteration 9, loss = 0.14803279
Iteration 10, loss = 0.14027003
Iteration 11, loss = 0.13392599
Iteration 12, loss = 0.12365962
Iteration 13, loss = 0.11820976
Iteration 14, loss = 0.11363940
Iteration 15, loss = 0.10719395
Iteration 16, loss = 0.10348134
Iteration 17, loss = 0.09933128
Iteration 18, loss = 0.09379409
Iteration 19, loss = 0.09115370
Iteration 20, loss = 0.08727851
Iteration 21, loss = 0.08380845
Iteration 22, loss = 0.08230260
Iteration 23, loss = 0.07893760
Iteration 24, loss = 0.07761256
Iteration 25, loss = 0.07549364
Iteration 26, loss = 0.07159868
Iteration 27, loss = 0.07014051
Iteration 28, loss = 0.07017781
Iteration 29, loss = 0.06781407
Iteration 30, loss = 0.06570494
Iteration 31, loss = 0.06480767
Iteration 32, loss = 0.06220086
Iteration 33, loss = 0.06176892
Iteration 34, loss = 0.06161880
Iteration 35, loss = 0.05956090
Iteration 36, loss = 0.05780417
Iteration 37, loss = 0.05604947
Iteration 38, loss = 0.05691712
Iteration 39, loss = 0.05494065
Iteration 40, loss = 0.05343968
Iteration 41, loss = 0.05526452
Iteration 42, loss = 0.05281836
Iteration 43, loss = 0.05100603
Iteration 44, loss = 0.05080522
Iteration 45, loss = 0.05067996
Iteration 46, loss = 0.04873251
Iteration 47, loss = 0.04941696
Iteration 48, loss = 0.04816024
Iteration 49, loss = 0.04753554
Iteration 50, loss = 0.04669290
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.45338063
Iteration 2, loss = 0.38391235
Iteration 3, loss = 0.31473299
Iteration 4, loss = 0.28012899
Iteration 5, loss = 0.25735495
Iteration 6, loss = 0.23904773
Iteration 7, loss = 0.22527027
Iteration 8, loss = 0.21489632
Iteration 9, loss = 0.20499844
Iteration 10, loss = 0.19724269
Iteration 11, loss = 0.18969387
Iteration 12, loss = 0.18410539
Iteration 13, loss = 0.17832236
Iteration 14, loss = 0.17220591
Iteration 15, loss = 0.16703508
Iteration 16, loss = 0.16402862
Iteration 17, loss = 0.16016243
Iteration 18, loss = 0.15551689
Iteration 19, loss = 0.15321766
Iteration 20, loss = 0.14916037
Iteration 21, loss = 0.14659568
Iteration 22, loss = 0.14284147
Iteration 23, loss = 0.13976623
Iteration 24, loss = 0.13806411
Iteration 25, loss = 0.13551059
Iteration 26, loss = 0.13272509
Iteration 27, loss = 0.12970475
Iteration 28, loss = 0.12842388
Iteration 29, loss = 0.12609827
Iteration 30, loss = 0.12457055
Iteration 31, loss = 0.12113476
Iteration 32, loss = 0.11954105
Iteration 33, loss = 0.11771151
Iteration 34, loss = 0.11706178
Iteration 35, loss = 0.11461389
Iteration 36, loss = 0.11378253
Iteration 37, loss = 0.11179982
Iteration 38, loss = 0.10987637
Iteration 39, loss = 0.10818740
Iteration 40, loss = 0.10726265
Iteration 41, loss = 0.10620064
Iteration 42, loss = 0.10461453
Iteration 43, loss = 0.10411031
Iteration 44, loss = 0.10162422
Iteration 45, loss = 0.10130558
Iteration 46, loss = 0.09940882
Iteration 47, loss = 0.09919038
Iteration 48, loss = 0.09715612
Iteration 49, loss = 0.09607360
Iteration 50, loss = 0.09592956
Iteration 51, loss = 0.09460906
Iteration 52, loss = 0.09374562
```

```
Iteration 53, loss = 0.09227425
Iteration 54, loss = 0.09127842
Iteration 55, loss = 0.09112570
Iteration 56, loss = 0.09018870
Iteration 57, loss = 0.08832949
Iteration 58, loss = 0.08802702
Iteration 59, loss = 0.08726715
Iteration 60, loss = 0.08563408
Iteration 61, loss = 0.08581973
Iteration 62, loss = 0.08483833
Iteration 63, loss = 0.08422714
Iteration 64, loss = 0.08332970
Iteration 65, loss = 0.08223280
Iteration 66, loss = 0.08209588
Iteration 67, loss = 0.08140096
Iteration 68, loss = 0.08062616
Iteration 69, loss = 0.07923871
Iteration 70, loss = 0.07880287
Iteration 71, loss = 0.07826281
Iteration 72, loss = 0.07778521
Iteration 73, loss = 0.07699210
Iteration 74, loss = 0.07661580
Iteration 75, loss = 0.07654835
Iteration 76, loss = 0.07569708
Iteration 77, loss = 0.07489573
Iteration 78, loss = 0.07404361
Iteration 79, loss = 0.07305905
Iteration 80, loss = 0.07410530
Iteration 81, loss = 0.07233418
Iteration 82, loss = 0.07193672
Iteration 83, loss = 0.07154808
Iteration 84, loss = 0.07182149
Iteration 85, loss = 0.07050553
Iteration 86, loss = 0.06979444
Iteration 87, loss = 0.06942979
Iteration 88, loss = 0.06893566
Iteration 89, loss = 0.06838566
Iteration 90, loss = 0.06863119
Iteration 91, loss = 0.06771838
Iteration 92, loss = 0.06743942
Iteration 93, loss = 0.06660408
Iteration 94, loss = 0.06597139
Iteration 95, loss = 0.06689008
Iteration 96, loss = 0.06557197
Iteration 97, loss = 0.06556378
Iteration 98, loss = 0.06476250
Iteration 99, loss = 0.06404818
Iteration 100, loss = 0.06384188
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.13302478
Iteration 2, loss = 0.37303979
Iteration 3, loss = 0.31677272
Iteration 4, loss = 0.28340208
Iteration 5, loss = 0.26037920
Iteration 6, loss = 0.24212492
Iteration 7, loss = 0.22767110
Iteration 8, loss = 0.21581160
Iteration 9, loss = 0.20553427
Iteration 10, loss = 0.19712104
Iteration 11, loss = 0.18938974
Iteration 12, loss = 0.18243195
Iteration 13, loss = 0.17673267
Iteration 14, loss = 0.17118242
Iteration 15, loss = 0.16546337
Iteration 16, loss = 0.16064789
Iteration 17, loss = 0.15572878
Iteration 18, loss = 0.15221019
Iteration 19, loss = 0.14802034
Iteration 20, loss = 0.14522766
Iteration 21, loss = 0.14154119
Iteration 22, loss = 0.13832699
Iteration 23, loss = 0.13540068
Iteration 24, loss = 0.13300605
Iteration 25, loss = 0.13049088
Iteration 26, loss = 0.12859740
Iteration 27, loss = 0.12579631
Iteration 28, loss = 0.12374159
Iteration 29, loss = 0.12131471
Iteration 30, loss = 0.11941692
Iteration 31, loss = 0.11754700
Iteration 32, loss = 0.11569703
Iteration 33, loss = 0.11372123
Iteration 34, loss = 0.11192642
Iteration 35, loss = 0.10998768
Iteration 36, loss = 0.10867747
Iteration 37, loss = 0.10707246
Iteration 38, loss = 0.10568200
Iteration 39, loss = 0.10450544
Iteration 40, loss = 0.10312971
Iteration 41, loss = 0.10130528
Iteration 42, loss = 0.10016568
Iteration 43, loss = 0.09896173
Iteration 44, loss = 0.09779283
Iteration 45, loss = 0.09629557
Iteration 46, loss = 0.09524696
Iteration 47, loss = 0.09424295
Iteration 48, loss = 0.09313566
Iteration 49, loss = 0.09236478
Iteration 50, loss = 0.09129581
Iteration 51, loss = 0.09025521
Iteration 52, loss = 0.08933760
```

```
Iteration 53, loss = 0.08852804
Iteration 54, loss = 0.08722348
Iteration 55, loss = 0.08656141
Iteration 56, loss = 0.08553347
Iteration 57, loss = 0.08477023
Iteration 58, loss = 0.08400872
Iteration 59, loss = 0.08335596
Iteration 60, loss = 0.08232087
Iteration 61, loss = 0.08154203
Iteration 62, loss = 0.08094537
Iteration 63, loss = 0.08056253
Iteration 64, loss = 0.07972185
Iteration 65, loss = 0.07914405
Iteration 66, loss = 0.07820288
Iteration 67, loss = 0.07760151
Iteration 68, loss = 0.07667745
Iteration 69, loss = 0.07625259
Iteration 70, loss = 0.07547637
Iteration 71, loss = 0.07521990
Iteration 72, loss = 0.07426017
Iteration 73, loss = 0.07367662
Iteration 74, loss = 0.07312701
Iteration 75, loss = 0.07266976
Iteration 76, loss = 0.07188878
Iteration 77, loss = 0.07156068
Iteration 78, loss = 0.07101122
Iteration 79, loss = 0.07014970
Iteration 80, loss = 0.06988912
Iteration 81, loss = 0.06942304
Iteration 82, loss = 0.06877957
Iteration 83, loss = 0.06841663
Iteration 84, loss = 0.06781291
Iteration 85, loss = 0.06738716
Iteration 86, loss = 0.06690501
Iteration 87, loss = 0.06638393
Iteration 88, loss = 0.06569233
Iteration 89, loss = 0.06548021
Iteration 90, loss = 0.06502859
Iteration 91, loss = 0.06452518
Iteration 92, loss = 0.06413430
Iteration 93, loss = 0.06388564
Iteration 94, loss = 0.06330742
Iteration 95, loss = 0.06295088
Iteration 96, loss = 0.06257414
Iteration 97, loss = 0.06236681
Iteration 98, loss = 0.06202745
Iteration 99, loss = 0.06132183
Iteration 100, loss = 0.06103564
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.58111654
Iteration 2, loss = 0.31851691
Iteration 3, loss = 0.25343646
Iteration 4, loss = 0.22185343
Iteration 5, loss = 0.20201506
Iteration 6, loss = 0.18743743
Iteration 7, loss = 0.16922282
Iteration 8, loss = 0.16092229
Iteration 9, loss = 0.15575909
Iteration 10, loss = 0.14483664
Iteration 11, loss = 0.13627238
Iteration 12, loss = 0.13149719
Iteration 13, loss = 0.12539791
Iteration 14, loss = 0.11616881
Iteration 15, loss = 0.11203527
Iteration 16, loss = 0.10686851
Iteration 17, loss = 0.10552265
Iteration 18, loss = 0.10048521
Iteration 19, loss = 0.09543827
Iteration 20, loss = 0.09586289
Iteration 21, loss = 0.09019389
Iteration 22, loss = 0.08581433
Iteration 23, loss = 0.08849903
Iteration 24, loss = 0.08610830
Iteration 25, loss = 0.07915110
Iteration 26, loss = 0.07747108
Iteration 27, loss = 0.07516655
Iteration 28, loss = 0.07490685
Iteration 29, loss = 0.07372384
Iteration 30, loss = 0.07196165
Iteration 31, loss = 0.06889322
Iteration 32, loss = 0.06714344
Iteration 33, loss = 0.06529591
Iteration 34, loss = 0.06320735
Iteration 35, loss = 0.06323640
Iteration 36, loss = 0.06038880
Iteration 37, loss = 0.06365006
Iteration 38, loss = 0.05786159
Iteration 39, loss = 0.05642215
Iteration 40, loss = 0.05540536
Iteration 41, loss = 0.05865224
Iteration 42, loss = 0.05242827
Iteration 43, loss = 0.05447825
Iteration 44, loss = 0.05402387
Iteration 45, loss = 0.05343717
Iteration 46, loss = 0.04989339
Iteration 47, loss = 0.05173414
Iteration 48, loss = 0.04891058
Iteration 49, loss = 0.04900123
Iteration 50, loss = 0.04754306
Iteration 51, loss = 0.04768123
Iteration 52, loss = 0.04719951
```

```
Iteration 53, loss = 0.04552938
Iteration 54, loss = 0.04619427
Iteration 55, loss = 0.04502908
Iteration 56, loss = 0.04503762
Iteration 57, loss = 0.04346065
Iteration 58, loss = 0.04410892
Iteration 59, loss = 0.04347929
Iteration 60, loss = 0.04257567
Iteration 61, loss = 0.04209916
Iteration 62, loss = 0.04078102
Iteration 63, loss = 0.04156999
Iteration 64, loss = 0.04018867
Iteration 65, loss = 0.03953219
Iteration 66, loss = 0.04048102
Iteration 67, loss = 0.03970935
Iteration 68, loss = 0.03902828
Iteration 69, loss = 0.03903646
Iteration 70, loss = 0.03859932
Iteration 71, loss = 0.03699940
Iteration 72, loss = 0.03829739
Iteration 73, loss = 0.03736966
Iteration 74, loss = 0.03632447
Iteration 75, loss = 0.03662347
Iteration 76, loss = 0.03656138
Iteration 77, loss = 0.03478029
Iteration 78, loss = 0.03618492
Iteration 79, loss = 0.03512752
Iteration 80, loss = 0.03539945
Iteration 81, loss = 0.03570312
Iteration 82, loss = 0.03367528
Iteration 83, loss = 0.03396642
Iteration 84, loss = 0.03362125
Iteration 85, loss = 0.03366934
Iteration 86, loss = 0.03412865
Iteration 87, loss = 0.03340200
Iteration 88, loss = 0.03265785
Iteration 89, loss = 0.03179022
Iteration 90, loss = 0.03194262
Iteration 91, loss = 0.03379056
Iteration 92, loss = 0.03149235
Iteration 93, loss = 0.03198228
Iteration 94, loss = 0.03089518
Iteration 95, loss = 0.03121227
Iteration 96, loss = 0.03175890
Iteration 97, loss = 0.02993526
Iteration 98, loss = 0.03081227
Iteration 99, loss = 0.03092180
Iteration 100, loss = 0.03029315
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.69207889
Iteration 2, loss = 0.32301710
Iteration 3, loss = 0.26544210
Iteration 4, loss = 0.23315930
Iteration 5, loss = 0.20728109
Iteration 6, loss = 0.19072516
Iteration 7, loss = 0.17381974
Iteration 8, loss = 0.16077154
Iteration 9, loss = 0.14803279
Iteration 10, loss = 0.14027003
Iteration 11, loss = 0.13392599
Iteration 12, loss = 0.12365962
Iteration 13, loss = 0.11820976
Iteration 14, loss = 0.11363940
Iteration 15, loss = 0.10719395
Iteration 16, loss = 0.10348134
Iteration 17, loss = 0.09933128
Iteration 18, loss = 0.09379409
Iteration 19, loss = 0.09115370
Iteration 20, loss = 0.08727851
Iteration 21, loss = 0.08380845
Iteration 22, loss = 0.08230260
Iteration 23, loss = 0.07893760
Iteration 24, loss = 0.07761256
Iteration 25, loss = 0.07549364
Iteration 26, loss = 0.07159868
Iteration 27, loss = 0.07014051
Iteration 28, loss = 0.07017781
Iteration 29, loss = 0.06781407
Iteration 30, loss = 0.06570494
Iteration 31, loss = 0.06480767
Iteration 32, loss = 0.06220086
Iteration 33, loss = 0.06176892
Iteration 34, loss = 0.06161880
Iteration 35, loss = 0.05956090
Iteration 36, loss = 0.05780417
Iteration 37, loss = 0.05604947
Iteration 38, loss = 0.05691712
Iteration 39, loss = 0.05494065
Iteration 40, loss = 0.05343968
Iteration 41, loss = 0.05526452
Iteration 42, loss = 0.05281836
Iteration 43, loss = 0.05100603
Iteration 44, loss = 0.05080522
Iteration 45, loss = 0.05067996
Iteration 46, loss = 0.04873251
Iteration 47, loss = 0.04941696
Iteration 48, loss = 0.04816024
Iteration 49, loss = 0.04753554
Iteration 50, loss = 0.04669290
Iteration 51, loss = 0.04645205
Iteration 52, loss = 0.04567125
```

```
Iteration 53, loss = 0.04580998
Iteration 54, loss = 0.04409186
Iteration 55, loss = 0.04409336
Iteration 56, loss = 0.04342063
Iteration 57, loss = 0.04310619
Iteration 58, loss = 0.04293405
Iteration 59, loss = 0.04234464
Iteration 60, loss = 0.04201304
Iteration 61, loss = 0.04137259
Iteration 62, loss = 0.04051388
Iteration 63, loss = 0.04093313
Iteration 64, loss = 0.04071249
Iteration 65, loss = 0.03953651
Iteration 66, loss = 0.03908024
Iteration 67, loss = 0.03849701
Iteration 68, loss = 0.03850678
Iteration 69, loss = 0.03875589
Iteration 70, loss = 0.03889405
Iteration 71, loss = 0.03725556
Iteration 72, loss = 0.03737525
Iteration 73, loss = 0.03708508
Iteration 74, loss = 0.03631942
Iteration 75, loss = 0.03682797
Iteration 76, loss = 0.03632685
Iteration 77, loss = 0.03624097
Iteration 78, loss = 0.03661757
Iteration 79, loss = 0.03501009
Iteration 80, loss = 0.03475613
Iteration 81, loss = 0.03538901
Iteration 82, loss = 0.03451835
Iteration 83, loss = 0.03456433
Iteration 84, loss = 0.03511033
Iteration 85, loss = 0.03436189
Iteration 86, loss = 0.03364419
Iteration 87, loss = 0.03372789
Iteration 88, loss = 0.03354349
Iteration 89, loss = 0.03325212
Iteration 90, loss = 0.03344580
Iteration 91, loss = 0.03269307
Iteration 92, loss = 0.03314798
Iteration 93, loss = 0.03253125
Iteration 94, loss = 0.03261305
Iteration 95, loss = 0.03182714
Iteration 96, loss = 0.03189320
Iteration 97, loss = 0.03206128
Iteration 98, loss = 0.03223576
Iteration 99, loss = 0.03188111
Iteration 100, loss = 0.03109391
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.45338063
Iteration 2, loss = 0.38391235
Iteration 3, loss = 0.31473299
Iteration 4, loss = 0.28012899
Iteration 5, loss = 0.25735495
Iteration 6, loss = 0.23904773
Iteration 7, loss = 0.22527027
Iteration 8, loss = 0.21489632
Iteration 9, loss = 0.20499844
Iteration 10, loss = 0.19724269
Iteration 11, loss = 0.18969387
Iteration 12, loss = 0.18410539
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Iteration 14, loss = 0.17220591
Iteration 15, loss = 0.16703508
Iteration 16, loss = 0.16402862
Iteration 17, loss = 0.16016243
Iteration 18, loss = 0.15551689
Iteration 19, loss = 0.15321766
Iteration 20, loss = 0.14916037
Iteration 21, loss = 0.14659568
Iteration 22, loss = 0.14284147
Iteration 23, loss = 0.13976623
Iteration 24, loss = 0.13806411
Iteration 25, loss = 0.13551059
Iteration 26, loss = 0.13272509
Iteration 27, loss = 0.12970475
Iteration 28, loss = 0.12842388
Iteration 29, loss = 0.12609827
Iteration 30, loss = 0.12457055
Iteration 31, loss = 0.12113476
Iteration 32, loss = 0.11954105
Iteration 33, loss = 0.11771151
Iteration 34, loss = 0.11706178
Iteration 35, loss = 0.11461389
Iteration 36, loss = 0.11378253
Iteration 37, loss = 0.11179982
Iteration 38, loss = 0.10987637
Iteration 39, loss = 0.10818740
Iteration 40, loss = 0.10726265
Iteration 41, loss = 0.10620064
Iteration 42, loss = 0.10461453
Iteration 43, loss = 0.10411031
Iteration 44, loss = 0.10162422
Iteration 45, loss = 0.10130558
Iteration 46, loss = 0.09940882
Iteration 47, loss = 0.09919038
Iteration 48, loss = 0.09715612
Iteration 49, loss = 0.09607360
Iteration 50, loss = 0.09592956
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.13302478
Iteration 2, loss = 0.37303979
Iteration 3, loss = 0.31677272
Iteration 4, loss = 0.28340208
Iteration 5, loss = 0.26037920
Iteration 6, loss = 0.24212492
Iteration 7, loss = 0.22767110
Iteration 8, loss = 0.21581160
Iteration 9, loss = 0.20553427
Iteration 10, loss = 0.19712104
Iteration 11, loss = 0.18938974
Iteration 12, loss = 0.18243195
Iteration 13, loss = 0.17673267
Iteration 14, loss = 0.17118242
Iteration 15, loss = 0.16546337
Iteration 16, loss = 0.16064789
Iteration 17, loss = 0.15572878
Iteration 18, loss = 0.15221019
Iteration 19, loss = 0.14802034
Iteration 20, loss = 0.14522766
Iteration 21, loss = 0.14154119
Iteration 22, loss = 0.13832699
Iteration 23, loss = 0.13540068
Iteration 24, loss = 0.13300605
Iteration 25, loss = 0.13049088
Iteration 26, loss = 0.12859740
Iteration 27, loss = 0.12579631
Iteration 28, loss = 0.12374159
Iteration 29, loss = 0.12131471
Iteration 30, loss = 0.11941692
Iteration 31, loss = 0.11754700
Iteration 32, loss = 0.11569703
Iteration 33, loss = 0.11372123
Iteration 34, loss = 0.11192642
Iteration 35, loss = 0.10998768
Iteration 36, loss = 0.10867747
Iteration 37, loss = 0.10707246
Iteration 38, loss = 0.10568200
Iteration 39, loss = 0.10450544
Iteration 40, loss = 0.10312971
Iteration 41, loss = 0.10130528
Iteration 42, loss = 0.10016568
Iteration 43, loss = 0.09896173
Iteration 44, loss = 0.09779283
Iteration 45, loss = 0.09629557
Iteration 46, loss = 0.09524696
Iteration 47, loss = 0.09424295
Iteration 48, loss = 0.09313566
Iteration 49, loss = 0.09236478
Iteration 50, loss = 0.09129581
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.58111654
Iteration 2, loss = 0.31851691
Iteration 3, loss = 0.25343646
Iteration 4, loss = 0.22185343
Iteration 5, loss = 0.20201506
Iteration 6, loss = 0.18743743
Iteration 7, loss = 0.16922282
Iteration 8, loss = 0.16092229
Iteration 9, loss = 0.15575909
Iteration 10, loss = 0.14483664
Iteration 11, loss = 0.13627238
Iteration 12, loss = 0.13149719
Iteration 13, loss = 0.12539791
Iteration 14, loss = 0.11616881
Iteration 15, loss = 0.11203527
Iteration 16, loss = 0.10686851
Iteration 17, loss = 0.10552265
Iteration 18, loss = 0.10048521
Iteration 19, loss = 0.09543827
Iteration 20, loss = 0.09586289
Iteration 21, loss = 0.09019389
Iteration 22, loss = 0.08581433
Iteration 23, loss = 0.08849903
Iteration 24, loss = 0.08610830
Iteration 25, loss = 0.07915110
Iteration 26, loss = 0.07747108
Iteration 27, loss = 0.07516655
Iteration 28, loss = 0.07490685
Iteration 29, loss = 0.07372384
Iteration 30, loss = 0.07196165
Iteration 31, loss = 0.06889322
Iteration 32, loss = 0.06714344
Iteration 33, loss = 0.06529591
Iteration 34, loss = 0.06320735
Iteration 35, loss = 0.06323640
Iteration 36, loss = 0.06038880
Iteration 37, loss = 0.06365006
Iteration 38, loss = 0.05786159
Iteration 39, loss = 0.05642215
Iteration 40, loss = 0.05540536
Iteration 41, loss = 0.05865224
Iteration 42, loss = 0.05242827
Iteration 43, loss = 0.05447825
Iteration 44, loss = 0.05402387
Iteration 45, loss = 0.05343717
Iteration 46, loss = 0.04989339
Iteration 47, loss = 0.05173414
Iteration 48, loss = 0.04891058
Iteration 49, loss = 0.04900123
Iteration 50, loss = 0.04754306
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.69207889
Iteration 2, loss = 0.32301710
Iteration 3, loss = 0.26544210
Iteration 4, loss = 0.23315930
Iteration 5, loss = 0.20728109
Iteration 6, loss = 0.19072516
Iteration 7, loss = 0.17381974
Iteration 8, loss = 0.16077154
Iteration 9, loss = 0.14803279
Iteration 10, loss = 0.14027003
Iteration 11, loss = 0.13392599
Iteration 12, loss = 0.12365962
Iteration 13, loss = 0.11820976
Iteration 14, loss = 0.11363940
Iteration 15, loss = 0.10719395
Iteration 16, loss = 0.10348134
Iteration 17, loss = 0.09933128
Iteration 18, loss = 0.09379409
Iteration 19, loss = 0.09115370
Iteration 20, loss = 0.08727851
Iteration 21, loss = 0.08380845
Iteration 22, loss = 0.08230260
Iteration 23, loss = 0.07893760
Iteration 24, loss = 0.07761256
Iteration 25, loss = 0.07549364
Iteration 26, loss = 0.07159868
Iteration 27, loss = 0.07014051
Iteration 28, loss = 0.07017781
Iteration 29, loss = 0.06781407
Iteration 30, loss = 0.06570494
Iteration 31, loss = 0.06480767
Iteration 32, loss = 0.06220086
Iteration 33, loss = 0.06176892
Iteration 34, loss = 0.06161880
Iteration 35, loss = 0.05956090
Iteration 36, loss = 0.05780417
Iteration 37, loss = 0.05604947
Iteration 38, loss = 0.05691712
Iteration 39, loss = 0.05494065
Iteration 40, loss = 0.05343968
Iteration 41, loss = 0.05526452
Iteration 42, loss = 0.05281836
Iteration 43, loss = 0.05100603
Iteration 44, loss = 0.05080522
Iteration 45, loss = 0.05067996
Iteration 46, loss = 0.04873251
Iteration 47, loss = 0.04941696
Iteration 48, loss = 0.04816024
Iteration 49, loss = 0.04753554
Iteration 50, loss = 0.04669290
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.45338063
Iteration 2, loss = 0.38391235
Iteration 3, loss = 0.31473299
Iteration 4, loss = 0.28012899
Iteration 5, loss = 0.25735495
Iteration 6, loss = 0.23904773
Iteration 7, loss = 0.22527027
Iteration 8, loss = 0.21489632
Iteration 9, loss = 0.20499844
Iteration 10, loss = 0.19724269
Iteration 11, loss = 0.18969387
Iteration 12, loss = 0.18410539
Iteration 13, loss = 0.17832236
Iteration 14, loss = 0.17220591
Iteration 15, loss = 0.16703508
Iteration 16, loss = 0.16402862
Iteration 17, loss = 0.16016243
Iteration 18, loss = 0.15551689
Iteration 19, loss = 0.15321766
Iteration 20, loss = 0.14916037
Iteration 21, loss = 0.14659568
Iteration 22, loss = 0.14284147
Iteration 23, loss = 0.13976623
Iteration 24, loss = 0.13806411
Iteration 25, loss = 0.13551059
Iteration 26, loss = 0.13272509
Iteration 27, loss = 0.12970475
Iteration 28, loss = 0.12842388
Iteration 29, loss = 0.12609827
Iteration 30, loss = 0.12457055
Iteration 31, loss = 0.12113476
Iteration 32, loss = 0.11954105
Iteration 33, loss = 0.11771151
Iteration 34, loss = 0.11706178
Iteration 35, loss = 0.11461389
Iteration 36, loss = 0.11378253
Iteration 37, loss = 0.11179982
Iteration 38, loss = 0.10987637
Iteration 39, loss = 0.10818740
Iteration 40, loss = 0.10726265
Iteration 41, loss = 0.10620064
Iteration 42, loss = 0.10461453
Iteration 43, loss = 0.10411031
Iteration 44, loss = 0.10162422
Iteration 45, loss = 0.10130558
Iteration 46, loss = 0.09940882
Iteration 47, loss = 0.09919038
Iteration 48, loss = 0.09715612
Iteration 49, loss = 0.09607360
Iteration 50, loss = 0.09592956
Iteration 51, loss = 0.09460906
Iteration 52, loss = 0.09374562
```

```
Iteration 53, loss = 0.09227425
Iteration 54, loss = 0.09127842
Iteration 55, loss = 0.09112570
Iteration 56, loss = 0.09018870
Iteration 57, loss = 0.08832949
Iteration 58, loss = 0.08802702
Iteration 59, loss = 0.08726715
Iteration 60, loss = 0.08563408
Iteration 61, loss = 0.08581973
Iteration 62, loss = 0.08483833
Iteration 63, loss = 0.08422714
Iteration 64, loss = 0.08332970
Iteration 65, loss = 0.08223280
Iteration 66, loss = 0.08209588
Iteration 67, loss = 0.08140096
Iteration 68, loss = 0.08062616
Iteration 69, loss = 0.07923871
Iteration 70, loss = 0.07880287
Iteration 71, loss = 0.07826281
Iteration 72, loss = 0.07778521
Iteration 73, loss = 0.07699210
Iteration 74, loss = 0.07661580
Iteration 75, loss = 0.07654835
Iteration 76, loss = 0.07569708
Iteration 77, loss = 0.07489573
Iteration 78, loss = 0.07404361
Iteration 79, loss = 0.07305905
Iteration 80, loss = 0.07410530
Iteration 81, loss = 0.07233418
Iteration 82, loss = 0.07193672
Iteration 83, loss = 0.07154808
Iteration 84, loss = 0.07182149
Iteration 85, loss = 0.07050553
Iteration 86, loss = 0.06979444
Iteration 87, loss = 0.06942979
Iteration 88, loss = 0.06893566
Iteration 89, loss = 0.06838566
Iteration 90, loss = 0.06863119
Iteration 91, loss = 0.06771838
Iteration 92, loss = 0.06743942
Iteration 93, loss = 0.06660408
Iteration 94, loss = 0.06597139
Iteration 95, loss = 0.06689008
Iteration 96, loss = 0.06557197
Iteration 97, loss = 0.06556378
Iteration 98, loss = 0.06476250
Iteration 99, loss = 0.06404818
Iteration 100, loss = 0.06384188
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.13302478
Iteration 2, loss = 0.37303979
Iteration 3, loss = 0.31677272
Iteration 4, loss = 0.28340208
Iteration 5, loss = 0.26037920
Iteration 6, loss = 0.24212492
Iteration 7, loss = 0.22767110
Iteration 8, loss = 0.21581160
Iteration 9, loss = 0.20553427
Iteration 10, loss = 0.19712104
Iteration 11, loss = 0.18938974
Iteration 12, loss = 0.18243195
Iteration 13, loss = 0.17673267
Iteration 14, loss = 0.17118242
Iteration 15, loss = 0.16546337
Iteration 16, loss = 0.16064789
Iteration 17, loss = 0.15572878
Iteration 18, loss = 0.15221019
Iteration 19, loss = 0.14802034
Iteration 20, loss = 0.14522766
Iteration 21, loss = 0.14154119
Iteration 22, loss = 0.13832699
Iteration 23, loss = 0.13540068
Iteration 24, loss = 0.13300605
Iteration 25, loss = 0.13049088
Iteration 26, loss = 0.12859740
Iteration 27, loss = 0.12579631
Iteration 28, loss = 0.12374159
Iteration 29, loss = 0.12131471
Iteration 30, loss = 0.11941692
Iteration 31, loss = 0.11754700
Iteration 32, loss = 0.11569703
Iteration 33, loss = 0.11372123
Iteration 34, loss = 0.11192642
Iteration 35, loss = 0.10998768
Iteration 36, loss = 0.10867747
Iteration 37, loss = 0.10707246
Iteration 38, loss = 0.10568200
Iteration 39, loss = 0.10450544
Iteration 40, loss = 0.10312971
Iteration 41, loss = 0.10130528
Iteration 42, loss = 0.10016568
Iteration 43, loss = 0.09896173
Iteration 44, loss = 0.09779283
Iteration 45, loss = 0.09629557
Iteration 46, loss = 0.09524696
Iteration 47, loss = 0.09424295
Iteration 48, loss = 0.09313566
Iteration 49, loss = 0.09236478
Iteration 50, loss = 0.09129581
Iteration 51, loss = 0.09025521
Iteration 52, loss = 0.08933760
```

```
Iteration 53, loss = 0.08852804
Iteration 54, loss = 0.08722348
Iteration 55, loss = 0.08656141
Iteration 56, loss = 0.08553347
Iteration 57, loss = 0.08477023
Iteration 58, loss = 0.08400872
Iteration 59, loss = 0.08335596
Iteration 60, loss = 0.08232087
Iteration 61, loss = 0.08154203
Iteration 62, loss = 0.08094537
Iteration 63, loss = 0.08056253
Iteration 64, loss = 0.07972185
Iteration 65, loss = 0.07914405
Iteration 66, loss = 0.07820288
Iteration 67, loss = 0.07760151
Iteration 68, loss = 0.07667745
Iteration 69, loss = 0.07625259
Iteration 70, loss = 0.07547637
Iteration 71, loss = 0.07521990
Iteration 72, loss = 0.07426017
Iteration 73, loss = 0.07367662
Iteration 74, loss = 0.07312701
Iteration 75, loss = 0.07266976
Iteration 76, loss = 0.07188878
Iteration 77, loss = 0.07156068
Iteration 78, loss = 0.07101122
Iteration 79, loss = 0.07014970
Iteration 80, loss = 0.06988912
Iteration 81, loss = 0.06942304
Iteration 82, loss = 0.06877957
Iteration 83, loss = 0.06841663
Iteration 84, loss = 0.06781291
Iteration 85, loss = 0.06738716
Iteration 86, loss = 0.06690501
Iteration 87, loss = 0.06638393
Iteration 88, loss = 0.06569233
Iteration 89, loss = 0.06548021
Iteration 90, loss = 0.06502859
Iteration 91, loss = 0.06452518
Iteration 92, loss = 0.06413430
Iteration 93, loss = 0.06388564
Iteration 94, loss = 0.06330742
Iteration 95, loss = 0.06295088
Iteration 96, loss = 0.06257414
Iteration 97, loss = 0.06236681
Iteration 98, loss = 0.06202745
Iteration 99, loss = 0.06132183
Iteration 100, loss = 0.06103564
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.58111654
Iteration 2, loss = 0.31851691
Iteration 3, loss = 0.25343646
Iteration 4, loss = 0.22185343
Iteration 5, loss = 0.20201506
Iteration 6, loss = 0.18743743
Iteration 7, loss = 0.16922282
Iteration 8, loss = 0.16092229
Iteration 9, loss = 0.15575909
Iteration 10, loss = 0.14483664
Iteration 11, loss = 0.13627238
Iteration 12, loss = 0.13149719
Iteration 13, loss = 0.12539791
Iteration 14, loss = 0.11616881
Iteration 15, loss = 0.11203527
Iteration 16, loss = 0.10686851
Iteration 17, loss = 0.10552265
Iteration 18, loss = 0.10048521
Iteration 19, loss = 0.09543827
Iteration 20, loss = 0.09586289
Iteration 21, loss = 0.09019389
Iteration 22, loss = 0.08581433
Iteration 23, loss = 0.08849903
Iteration 24, loss = 0.08610830
Iteration 25, loss = 0.07915110
Iteration 26, loss = 0.07747108
Iteration 27, loss = 0.07516655
Iteration 28, loss = 0.07490685
Iteration 29, loss = 0.07372384
Iteration 30, loss = 0.07196165
Iteration 31, loss = 0.06889322
Iteration 32, loss = 0.06714344
Iteration 33, loss = 0.06529591
Iteration 34, loss = 0.06320735
Iteration 35, loss = 0.06323640
Iteration 36, loss = 0.06038880
Iteration 37, loss = 0.06365006
Iteration 38, loss = 0.05786159
Iteration 39, loss = 0.05642215
Iteration 40, loss = 0.05540536
Iteration 41, loss = 0.05865224
Iteration 42, loss = 0.05242827
Iteration 43, loss = 0.05447825
Iteration 44, loss = 0.05402387
Iteration 45, loss = 0.05343717
Iteration 46, loss = 0.04989339
Iteration 47, loss = 0.05173414
Iteration 48, loss = 0.04891058
Iteration 49, loss = 0.04900123
Iteration 50, loss = 0.04754306
Iteration 51, loss = 0.04768123
Iteration 52, loss = 0.04719951
```

```
Iteration 53, loss = 0.04552938
Iteration 54, loss = 0.04619427
Iteration 55, loss = 0.04502908
Iteration 56, loss = 0.04503762
Iteration 57, loss = 0.04346065
Iteration 58, loss = 0.04410892
Iteration 59, loss = 0.04347929
Iteration 60, loss = 0.04257567
Iteration 61, loss = 0.04209916
Iteration 62, loss = 0.04078102
Iteration 63, loss = 0.04156999
Iteration 64, loss = 0.04018867
Iteration 65, loss = 0.03953219
Iteration 66, loss = 0.04048102
Iteration 67, loss = 0.03970935
Iteration 68, loss = 0.03902828
Iteration 69, loss = 0.03903646
Iteration 70, loss = 0.03859932
Iteration 71, loss = 0.03699940
Iteration 72, loss = 0.03829739
Iteration 73, loss = 0.03736966
Iteration 74, loss = 0.03632447
Iteration 75, loss = 0.03662347
Iteration 76, loss = 0.03656138
Iteration 77, loss = 0.03478029
Iteration 78, loss = 0.03618492
Iteration 79, loss = 0.03512752
Iteration 80, loss = 0.03539945
Iteration 81, loss = 0.03570312
Iteration 82, loss = 0.03367528
Iteration 83, loss = 0.03396642
Iteration 84, loss = 0.03362125
Iteration 85, loss = 0.03366934
Iteration 86, loss = 0.03412865
Iteration 87, loss = 0.03340200
Iteration 88, loss = 0.03265785
Iteration 89, loss = 0.03179022
Iteration 90, loss = 0.03194262
Iteration 91, loss = 0.03379056
Iteration 92, loss = 0.03149235
Iteration 93, loss = 0.03198228
Iteration 94, loss = 0.03089518
Iteration 95, loss = 0.03121227
Iteration 96, loss = 0.03175890
Iteration 97, loss = 0.02993526
Iteration 98, loss = 0.03081227
Iteration 99, loss = 0.03092180
Iteration 100, loss = 0.03029315
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.69207889
Iteration 2, loss = 0.32301710
Iteration 3, loss = 0.26544210
Iteration 4, loss = 0.23315930
Iteration 5, loss = 0.20728109
Iteration 6, loss = 0.19072516
Iteration 7, loss = 0.17381974
Iteration 8, loss = 0.16077154
Iteration 9, loss = 0.14803279
Iteration 10, loss = 0.14027003
Iteration 11, loss = 0.13392599
Iteration 12, loss = 0.12365962
Iteration 13, loss = 0.11820976
Iteration 14, loss = 0.11363940
Iteration 15, loss = 0.10719395
Iteration 16, loss = 0.10348134
Iteration 17, loss = 0.09933128
Iteration 18, loss = 0.09379409
Iteration 19, loss = 0.09115370
Iteration 20, loss = 0.08727851
Iteration 21, loss = 0.08380845
Iteration 22, loss = 0.08230260
Iteration 23, loss = 0.07893760
Iteration 24, loss = 0.07761256
Iteration 25, loss = 0.07549364
Iteration 26, loss = 0.07159868
Iteration 27, loss = 0.07014051
Iteration 28, loss = 0.07017781
Iteration 29, loss = 0.06781407
Iteration 30, loss = 0.06570494
Iteration 31, loss = 0.06480767
Iteration 32, loss = 0.06220086
Iteration 33, loss = 0.06176892
Iteration 34, loss = 0.06161880
Iteration 35, loss = 0.05956090
Iteration 36, loss = 0.05780417
Iteration 37, loss = 0.05604947
Iteration 38, loss = 0.05691712
Iteration 39, loss = 0.05494065
Iteration 40, loss = 0.05343968
Iteration 41, loss = 0.05526452
Iteration 42, loss = 0.05281836
Iteration 43, loss = 0.05100603
Iteration 44, loss = 0.05080522
Iteration 45, loss = 0.05067996
Iteration 46, loss = 0.04873251
Iteration 47, loss = 0.04941696
Iteration 48, loss = 0.04816024
Iteration 49, loss = 0.04753554
Iteration 50, loss = 0.04669290
Iteration 51, loss = 0.04645205
Iteration 52, loss = 0.04567125
```

```
Iteration 53, loss = 0.04580998
Iteration 54, loss = 0.04409186
Iteration 55, loss = 0.04409336
Iteration 56, loss = 0.04342063
Iteration 57, loss = 0.04310619
Iteration 58, loss = 0.04293405
Iteration 59, loss = 0.04234464
Iteration 60, loss = 0.04201304
Iteration 61, loss = 0.04137259
Iteration 62, loss = 0.04051388
Iteration 63, loss = 0.04093313
Iteration 64, loss = 0.04071249
Iteration 65, loss = 0.03953651
Iteration 66, loss = 0.03908024
Iteration 67, loss = 0.03849701
Iteration 68, loss = 0.03850678
Iteration 69, loss = 0.03875589
Iteration 70, loss = 0.03889405
Iteration 71, loss = 0.03725556
Iteration 72, loss = 0.03737525
Iteration 73, loss = 0.03708508
Iteration 74, loss = 0.03631942
Iteration 75, loss = 0.03682797
Iteration 76, loss = 0.03632685
Iteration 77, loss = 0.03624097
Iteration 78, loss = 0.03661757
Iteration 79, loss = 0.03501009
Iteration 80, loss = 0.03475613
Iteration 81, loss = 0.03538901
Iteration 82, loss = 0.03451835
Iteration 83, loss = 0.03456433
Iteration 84, loss = 0.03511033
Iteration 85, loss = 0.03436189
Iteration 86, loss = 0.03364419
Iteration 87, loss = 0.03372789
Iteration 88, loss = 0.03354349
Iteration 89, loss = 0.03325212
Iteration 90, loss = 0.03344580
Iteration 91, loss = 0.03269307
Iteration 92, loss = 0.03314798
Iteration 93, loss = 0.03253125
Iteration 94, loss = 0.03261305
Iteration 95, loss = 0.03182714
Iteration 96, loss = 0.03189320
Iteration 97, loss = 0.03206128
Iteration 98, loss = 0.03223576
Iteration 99, loss = 0.03188111
Iteration 100, loss = 0.03109391
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.60295431
Iteration 2, loss = 0.40671617
Iteration 3, loss = 0.33380716
Iteration 4, loss = 0.29419694
Iteration 5, loss = 0.26877158
Iteration 6, loss = 0.25007124
Iteration 7, loss = 0.23634425
Iteration 8, loss = 0.22515378
Iteration 9, loss = 0.21606987
Iteration 10, loss = 0.20796691
Iteration 11, loss = 0.20082626
Iteration 12, loss = 0.19463396
Iteration 13, loss = 0.18864694
Iteration 14, loss = 0.18360918
Iteration 15, loss = 0.17966730
Iteration 16, loss = 0.17409531
Iteration 17, loss = 0.17028509
Iteration 18, loss = 0.16615929
Iteration 19, loss = 0.16230008
Iteration 20, loss = 0.15851811
Iteration 21, loss = 0.15536006
Iteration 22, loss = 0.15238620
Iteration 23, loss = 0.14899116
Iteration 24, loss = 0.14672116
Iteration 25, loss = 0.14411764
Iteration 26, loss = 0.14105240
Iteration 27, loss = 0.13877460
Iteration 28, loss = 0.13739149
Iteration 29, loss = 0.13463821
Iteration 30, loss = 0.13257596
Iteration 31, loss = 0.13067789
Iteration 32, loss = 0.12866029
Iteration 33, loss = 0.12709274
Iteration 34, loss = 0.12512690
Iteration 35, loss = 0.12359941
Iteration 36, loss = 0.12177539
Iteration 37, loss = 0.11981742
Iteration 38, loss = 0.11872007
Iteration 39, loss = 0.11689265
Iteration 40, loss = 0.11606466
Iteration 41, loss = 0.11427654
Iteration 42, loss = 0.11265955
Iteration 43, loss = 0.11154899
Iteration 44, loss = 0.11032811
Iteration 45, loss = 0.10941192
Iteration 46, loss = 0.10800362
Iteration 47, loss = 0.10673537
Iteration 48, loss = 0.10568475
Iteration 49, loss = 0.10453486
Iteration 50, loss = 0.10345947
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.22573392
Iteration 2, loss = 0.38931056
Iteration 3, loss = 0.33174881
Iteration 4, loss = 0.29887941
Iteration 5, loss = 0.27491607
Iteration 6, loss = 0.25685442
Iteration 7, loss = 0.24208261
Iteration 8, loss = 0.22999136
Iteration 9, loss = 0.21963169
Iteration 10, loss = 0.21028474
Iteration 11, loss = 0.20263824
Iteration 12, loss = 0.19558763
Iteration 13, loss = 0.18894601
Iteration 14, loss = 0.18343216
Iteration 15, loss = 0.17765175
Iteration 16, loss = 0.17274996
Iteration 17, loss = 0.16807657
Iteration 18, loss = 0.16382116
Iteration 19, loss = 0.15975389
Iteration 20, loss = 0.15636464
Iteration 21, loss = 0.15299031
Iteration 22, loss = 0.14960710
Iteration 23, loss = 0.14658472
Iteration 24, loss = 0.14363363
Iteration 25, loss = 0.14116148
Iteration 26, loss = 0.13885385
Iteration 27, loss = 0.13620612
Iteration 28, loss = 0.13419484
Iteration 29, loss = 0.13169559
Iteration 30, loss = 0.12971828
Iteration 31, loss = 0.12766208
Iteration 32, loss = 0.12543829
Iteration 33, loss = 0.12376512
Iteration 34, loss = 0.12203893
Iteration 35, loss = 0.12004813
Iteration 36, loss = 0.11879152
Iteration 37, loss = 0.11735319
Iteration 38, loss = 0.11554428
Iteration 39, loss = 0.11442245
Iteration 40, loss = 0.11288728
Iteration 41, loss = 0.11125734
Iteration 42, loss = 0.11010576
Iteration 43, loss = 0.10899481
Iteration 44, loss = 0.10730293
Iteration 45, loss = 0.10607493
Iteration 46, loss = 0.10509363
Iteration 47, loss = 0.10405984
Iteration 48, loss = 0.10306537
Iteration 49, loss = 0.10213501
Iteration 50, loss = 0.10086361
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.86549242
Iteration 2, loss = 0.33339977
Iteration 3, loss = 0.26706902
Iteration 4, loss = 0.23596067
Iteration 5, loss = 0.20484092
Iteration 6, loss = 0.18941699
Iteration 7, loss = 0.17989739
Iteration 8, loss = 0.16566869
Iteration 9, loss = 0.15831923
Iteration 10, loss = 0.15025322
Iteration 11, loss = 0.14304365
Iteration 12, loss = 0.13549413
Iteration 13, loss = 0.13229708
Iteration 14, loss = 0.12503592
Iteration 15, loss = 0.12078036
Iteration 16, loss = 0.11469771
Iteration 17, loss = 0.11239382
Iteration 18, loss = 0.10790414
Iteration 19, loss = 0.10471148
Iteration 20, loss = 0.10219866
Iteration 21, loss = 0.09697674
Iteration 22, loss = 0.09458249
Iteration 23, loss = 0.09442796
Iteration 24, loss = 0.09263628
Iteration 25, loss = 0.08926552
Iteration 26, loss = 0.08548748
Iteration 27, loss = 0.08656813
Iteration 28, loss = 0.08225488
Iteration 29, loss = 0.08204768
Iteration 30, loss = 0.08027059
Iteration 31, loss = 0.07770675
Iteration 32, loss = 0.07553244
Iteration 33, loss = 0.07556178
Iteration 34, loss = 0.07259852
Iteration 35, loss = 0.07284546
Iteration 36, loss = 0.07129528
Iteration 37, loss = 0.06885676
Iteration 38, loss = 0.06918874
Iteration 39, loss = 0.06709593
Iteration 40, loss = 0.06622294
Iteration 41, loss = 0.06516714
Iteration 42, loss = 0.06238640
Iteration 43, loss = 0.06431879
Iteration 44, loss = 0.06222340
Iteration 45, loss = 0.06202202
Iteration 46, loss = 0.06305549
Iteration 47, loss = 0.05972790
Iteration 48, loss = 0.05808523
Iteration 49, loss = 0.05652438
Iteration 50, loss = 0.05729282
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.94387579
Iteration 2, loss = 0.34068089
Iteration 3, loss = 0.27648870
Iteration 4, loss = 0.24107712
Iteration 5, loss = 0.21219089
Iteration 6, loss = 0.19149125
Iteration 7, loss = 0.17788320
Iteration 8, loss = 0.16510264
Iteration 9, loss = 0.15409484
Iteration 10, loss = 0.14888843
Iteration 11, loss = 0.13655268
Iteration 12, loss = 0.13351511
Iteration 13, loss = 0.12492345
Iteration 14, loss = 0.11917601
Iteration 15, loss = 0.11624154
Iteration 16, loss = 0.11165290
Iteration 17, loss = 0.10731599
Iteration 18, loss = 0.10253138
Iteration 19, loss = 0.10096505
Iteration 20, loss = 0.09789561
Iteration 21, loss = 0.09259976
Iteration 22, loss = 0.09196727
Iteration 23, loss = 0.08833999
Iteration 24, loss = 0.08846699
Iteration 25, loss = 0.08355995
Iteration 26, loss = 0.08268814
Iteration 27, loss = 0.08088953
Iteration 28, loss = 0.07921305
Iteration 29, loss = 0.07653826
Iteration 30, loss = 0.07670052
Iteration 31, loss = 0.07460169
Iteration 32, loss = 0.07325099
Iteration 33, loss = 0.07120896
Iteration 34, loss = 0.07017538
Iteration 35, loss = 0.06896567
Iteration 36, loss = 0.06761540
Iteration 37, loss = 0.06728626
Iteration 38, loss = 0.06534170
Iteration 39, loss = 0.06417898
Iteration 40, loss = 0.06383937
Iteration 41, loss = 0.06291154
Iteration 42, loss = 0.06168710
Iteration 43, loss = 0.06022897
Iteration 44, loss = 0.05986157
Iteration 45, loss = 0.05794373
Iteration 46, loss = 0.06007479
Iteration 47, loss = 0.05761878
Iteration 48, loss = 0.05664265
Iteration 49, loss = 0.05656948
Iteration 50, loss = 0.05655428
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.60295431
Iteration 2, loss = 0.40671617
Iteration 3, loss = 0.33380716
Iteration 4, loss = 0.29419694
Iteration 5, loss = 0.26877158
Iteration 6, loss = 0.25007124
Iteration 7, loss = 0.23634425
Iteration 8, loss = 0.22515378
Iteration 9, loss = 0.21606987
Iteration 10, loss = 0.20796691
Iteration 11, loss = 0.20082626
Iteration 12, loss = 0.19463396
Iteration 13, loss = 0.18864694
Iteration 14, loss = 0.18360918
Iteration 15, loss = 0.17966730
Iteration 16, loss = 0.17409531
Iteration 17, loss = 0.17028509
Iteration 18, loss = 0.16615929
Iteration 19, loss = 0.16230008
Iteration 20, loss = 0.15851811
Iteration 21, loss = 0.15536006
Iteration 22, loss = 0.15238620
Iteration 23, loss = 0.14899116
Iteration 24, loss = 0.14672116
Iteration 25, loss = 0.14411764
Iteration 26, loss = 0.14105240
Iteration 27, loss = 0.13877460
Iteration 28, loss = 0.13739149
Iteration 29, loss = 0.13463821
Iteration 30, loss = 0.13257596
Iteration 31, loss = 0.13067789
Iteration 32, loss = 0.12866029
Iteration 33, loss = 0.12709274
Iteration 34, loss = 0.12512690
Iteration 35, loss = 0.12359941
Iteration 36, loss = 0.12177539
Iteration 37, loss = 0.11981742
Iteration 38, loss = 0.11872007
Iteration 39, loss = 0.11689265
Iteration 40, loss = 0.11606466
Iteration 41, loss = 0.11427654
Iteration 42, loss = 0.11265955
Iteration 43, loss = 0.11154899
Iteration 44, loss = 0.11032811
Iteration 45, loss = 0.10941192
Iteration 46, loss = 0.10800362
Iteration 47, loss = 0.10673537
Iteration 48, loss = 0.10568475
Iteration 49, loss = 0.10453486
Iteration 50, loss = 0.10345947
Iteration 51, loss = 0.10225684
Iteration 52, loss = 0.10094671
```

```
Iteration 53, loss = 0.10002507
Iteration 54, loss = 0.09913258
Iteration 55, loss = 0.09827959
Iteration 56, loss = 0.09712081
Iteration 57, loss = 0.09623791
Iteration 58, loss = 0.09541099
Iteration 59, loss = 0.09484700
Iteration 60, loss = 0.09348496
Iteration 61, loss = 0.09249324
Iteration 62, loss = 0.09201165
Iteration 63, loss = 0.09076011
Iteration 64, loss = 0.09019318
Iteration 65, loss = 0.08878885
Iteration 66, loss = 0.08848696
Iteration 67, loss = 0.08769138
Iteration 68, loss = 0.08739248
Iteration 69, loss = 0.08663055
Iteration 70, loss = 0.08585805
Iteration 71, loss = 0.08494419
Iteration 72, loss = 0.08425809
Iteration 73, loss = 0.08371521
Iteration 74, loss = 0.08271945
Iteration 75, loss = 0.08261502
Iteration 76, loss = 0.08191166
Iteration 77, loss = 0.08124714
Iteration 78, loss = 0.08102311
Iteration 79, loss = 0.07995484
Iteration 80, loss = 0.07935654
Iteration 81, loss = 0.07897526
Iteration 82, loss = 0.07806485
Iteration 83, loss = 0.07795590
Iteration 84, loss = 0.07746545
Iteration 85, loss = 0.07624402
Iteration 86, loss = 0.07625668
Iteration 87, loss = 0.07553168
Iteration 88, loss = 0.07535639
Iteration 89, loss = 0.07442174
Iteration 90, loss = 0.07446864
Iteration 91, loss = 0.07396518
Iteration 92, loss = 0.07389366
Iteration 93, loss = 0.07316913
Iteration 94, loss = 0.07285308
Iteration 95, loss = 0.07216395
Iteration 96, loss = 0.07195419
Iteration 97, loss = 0.07107147
Iteration 98, loss = 0.07082477
Iteration 99, loss = 0.07030152
Iteration 100, loss = 0.07015159
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
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```

```
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Iteration 2, loss = 0.38931056
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Iteration 5, loss = 0.27491607
Iteration 6, loss = 0.25685442
Iteration 7, loss = 0.24208261
Iteration 8, loss = 0.22999136
Iteration 9, loss = 0.21963169
Iteration 10, loss = 0.21028474
Iteration 11, loss = 0.20263824
Iteration 12, loss = 0.19558763
Iteration 13, loss = 0.18894601
Iteration 14, loss = 0.18343216
Iteration 15, loss = 0.17765175
Iteration 16, loss = 0.17274996
Iteration 17, loss = 0.16807657
Iteration 18, loss = 0.16382116
Iteration 19, loss = 0.15975389
Iteration 20, loss = 0.15636464
Iteration 21, loss = 0.15299031
Iteration 22, loss = 0.14960710
Iteration 23, loss = 0.14658472
Iteration 24, loss = 0.14363363
Iteration 25, loss = 0.14116148
Iteration 26, loss = 0.13885385
Iteration 27, loss = 0.13620612
Iteration 28, loss = 0.13419484
Iteration 29, loss = 0.13169559
Iteration 30, loss = 0.12971828
Iteration 31, loss = 0.12766208
Iteration 32, loss = 0.12543829
Iteration 33, loss = 0.12376512
Iteration 34, loss = 0.12203893
Iteration 35, loss = 0.12004813
Iteration 36, loss = 0.11879152
Iteration 37, loss = 0.11735319
Iteration 38, loss = 0.11554428
Iteration 39, loss = 0.11442245
Iteration 40, loss = 0.11288728
Iteration 41, loss = 0.11125734
Iteration 42, loss = 0.11010576
Iteration 43, loss = 0.10899481
Iteration 44, loss = 0.10730293
Iteration 45, loss = 0.10607493
Iteration 46, loss = 0.10509363
Iteration 47, loss = 0.10405984
Iteration 48, loss = 0.10306537
Iteration 49, loss = 0.10213501
Iteration 50, loss = 0.10086361
Iteration 51, loss = 0.10013621
Iteration 52, loss = 0.09879570
```

```
Iteration 53, loss = 0.09822717
Iteration 54, loss = 0.09737817
Iteration 55, loss = 0.09632476
Iteration 56, loss = 0.09556218
Iteration 57, loss = 0.09445759
Iteration 58, loss = 0.09384971
Iteration 59, loss = 0.09302364
Iteration 60, loss = 0.09197843
Iteration 61, loss = 0.09121116
Iteration 62, loss = 0.09067606
Iteration 63, loss = 0.08967580
Iteration 64, loss = 0.08895107
Iteration 65, loss = 0.08835306
Iteration 66, loss = 0.08758680
Iteration 67, loss = 0.08661738
Iteration 68, loss = 0.08611297
Iteration 69, loss = 0.08561911
Iteration 70, loss = 0.08506854
Iteration 71, loss = 0.08408204
Iteration 72, loss = 0.08373268
Iteration 73, loss = 0.08271049
Iteration 74, loss = 0.08205552
Iteration 75, loss = 0.08181523
Iteration 76, loss = 0.08103587
Iteration 77, loss = 0.08057800
Iteration 78, loss = 0.07981207
Iteration 79, loss = 0.07949133
Iteration 80, loss = 0.07877330
Iteration 81, loss = 0.07830289
Iteration 82, loss = 0.07776469
Iteration 83, loss = 0.07723927
Iteration 84, loss = 0.07693225
Iteration 85, loss = 0.07646202
Iteration 86, loss = 0.07562227
Iteration 87, loss = 0.07539997
Iteration 88, loss = 0.07472372
Iteration 89, loss = 0.07450868
Iteration 90, loss = 0.07428958
Iteration 91, loss = 0.07337960
Iteration 92, loss = 0.07304578
Iteration 93, loss = 0.07258490
Iteration 94, loss = 0.07194511
Iteration 95, loss = 0.07177103
Iteration 96, loss = 0.07131035
Iteration 97, loss = 0.07078070
Iteration 98, loss = 0.07062996
Iteration 99, loss = 0.07002603
Iteration 100, loss = 0.06947035
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.86549242
Iteration 2, loss = 0.33339977
Iteration 3, loss = 0.26706902
Iteration 4, loss = 0.23596067
Iteration 5, loss = 0.20484092
Iteration 6, loss = 0.18941699
Iteration 7, loss = 0.17989739
Iteration 8, loss = 0.16566869
Iteration 9, loss = 0.15831923
Iteration 10, loss = 0.15025322
Iteration 11, loss = 0.14304365
Iteration 12, loss = 0.13549413
Iteration 13, loss = 0.13229708
Iteration 14, loss = 0.12503592
Iteration 15, loss = 0.12078036
Iteration 16, loss = 0.11469771
Iteration 17, loss = 0.11239382
Iteration 18, loss = 0.10790414
Iteration 19, loss = 0.10471148
Iteration 20, loss = 0.10219866
Iteration 21, loss = 0.09697674
Iteration 22, loss = 0.09458249
Iteration 23, loss = 0.09442796
Iteration 24, loss = 0.09263628
Iteration 25, loss = 0.08926552
Iteration 26, loss = 0.08548748
Iteration 27, loss = 0.08656813
Iteration 28, loss = 0.08225488
Iteration 29, loss = 0.08204768
Iteration 30, loss = 0.08027059
Iteration 31, loss = 0.07770675
Iteration 32, loss = 0.07553244
Iteration 33, loss = 0.07556178
Iteration 34, loss = 0.07259852
Iteration 35, loss = 0.07284546
Iteration 36, loss = 0.07129528
Iteration 37, loss = 0.06885676
Iteration 38, loss = 0.06918874
Iteration 39, loss = 0.06709593
Iteration 40, loss = 0.06622294
Iteration 41, loss = 0.06516714
Iteration 42, loss = 0.06238640
Iteration 43, loss = 0.06431879
Iteration 44, loss = 0.06222340
Iteration 45, loss = 0.06202202
Iteration 46, loss = 0.06305549
Iteration 47, loss = 0.05972790
Iteration 48, loss = 0.05808523
Iteration 49, loss = 0.05652438
Iteration 50, loss = 0.05729282
Iteration 51, loss = 0.05565622
Iteration 52, loss = 0.05796799
```

```
Iteration 53, loss = 0.05629684
Iteration 54, loss = 0.05595208
Iteration 55, loss = 0.05330597
Iteration 56, loss = 0.05349645
Iteration 57, loss = 0.05244369
Iteration 58, loss = 0.05261063
Iteration 59, loss = 0.05138813
Iteration 60, loss = 0.05189190
Iteration 61, loss = 0.05036085
Iteration 62, loss = 0.05045366
Iteration 63, loss = 0.04914347
Iteration 64, loss = 0.05061806
Iteration 65, loss = 0.04771308
Iteration 66, loss = 0.04784301
Iteration 67, loss = 0.04788998
Iteration 68, loss = 0.04732257
Iteration 69, loss = 0.04712506
Iteration 70, loss = 0.04617195
Iteration 71, loss = 0.04668606
Iteration 72, loss = 0.04658727
Iteration 73, loss = 0.04457674
Iteration 74, loss = 0.04487378
Iteration 75, loss = 0.04474491
Iteration 76, loss = 0.04443139
Iteration 77, loss = 0.04406673
Iteration 78, loss = 0.04460548
Iteration 79, loss = 0.04209773
Iteration 80, loss = 0.04196006
Iteration 81, loss = 0.04268562
Iteration 82, loss = 0.04160769
Iteration 83, loss = 0.04231372
Iteration 84, loss = 0.04085942
Iteration 85, loss = 0.04111906
Iteration 86, loss = 0.04141635
Iteration 87, loss = 0.03994245
Iteration 88, loss = 0.04074934
Iteration 89, loss = 0.03969979
Iteration 90, loss = 0.03974406
Iteration 91, loss = 0.03959085
Iteration 92, loss = 0.03839601
Iteration 93, loss = 0.04037773
Iteration 94, loss = 0.03827742
Iteration 95, loss = 0.03812884
Iteration 96, loss = 0.04009286
Iteration 97, loss = 0.03619125
Iteration 98, loss = 0.03728905
Iteration 99, loss = 0.03734180
Iteration 100, loss = 0.03662989
```

```
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ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
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```

```
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Iteration 2, loss = 0.34068089
Iteration 3, loss = 0.27648870
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Iteration 8, loss = 0.16510264
Iteration 9, loss = 0.15409484
Iteration 10, loss = 0.14888843
Iteration 11, loss = 0.13655268
Iteration 12, loss = 0.13351511
Iteration 13, loss = 0.12492345
Iteration 14, loss = 0.11917601
Iteration 15, loss = 0.11624154
Iteration 16, loss = 0.11165290
Iteration 17, loss = 0.10731599
Iteration 18, loss = 0.10253138
Iteration 19, loss = 0.10096505
Iteration 20, loss = 0.09789561
Iteration 21, loss = 0.09259976
Iteration 22, loss = 0.09196727
Iteration 23, loss = 0.08833999
Iteration 24, loss = 0.08846699
Iteration 25, loss = 0.08355995
Iteration 26, loss = 0.08268814
Iteration 27, loss = 0.08088953
Iteration 28, loss = 0.07921305
Iteration 29, loss = 0.07653826
Iteration 30, loss = 0.07670052
Iteration 31, loss = 0.07460169
Iteration 32, loss = 0.07325099
Iteration 33, loss = 0.07120896
Iteration 34, loss = 0.07017538
Iteration 35, loss = 0.06896567
Iteration 36, loss = 0.06761540
Iteration 37, loss = 0.06728626
Iteration 38, loss = 0.06534170
Iteration 39, loss = 0.06417898
Iteration 40, loss = 0.06383937
Iteration 41, loss = 0.06291154
Iteration 42, loss = 0.06168710
Iteration 43, loss = 0.06022897
Iteration 44, loss = 0.05986157
Iteration 45, loss = 0.05794373
Iteration 46, loss = 0.06007479
Iteration 47, loss = 0.05761878
Iteration 48, loss = 0.05664265
Iteration 49, loss = 0.05656948
Iteration 50, loss = 0.05655428
Iteration 51, loss = 0.05412188
Iteration 52, loss = 0.05296805
```

```
Iteration 53, loss = 0.05338880
Iteration 54, loss = 0.05297252
Iteration 55, loss = 0.05249656
Iteration 56, loss = 0.05240320
Iteration 57, loss = 0.05208648
Iteration 58, loss = 0.05010442
Iteration 59, loss = 0.05087728
Iteration 60, loss = 0.05022008
Iteration 61, loss = 0.04916962
Iteration 62, loss = 0.04916266
Iteration 63, loss = 0.04803641
Iteration 64, loss = 0.04787025
Iteration 65, loss = 0.04789879
Iteration 66, loss = 0.04737697
Iteration 67, loss = 0.04671794
Iteration 68, loss = 0.04607679
Iteration 69, loss = 0.04686306
Iteration 70, loss = 0.04554341
Iteration 71, loss = 0.04546001
Iteration 72, loss = 0.04555499
Iteration 73, loss = 0.04490529
Iteration 74, loss = 0.04434546
Iteration 75, loss = 0.04381980
Iteration 76, loss = 0.04491479
Iteration 77, loss = 0.04355824
Iteration 78, loss = 0.04303459
Iteration 79, loss = 0.04324332
Iteration 80, loss = 0.04284999
Iteration 81, loss = 0.04290003
Iteration 82, loss = 0.04217358
Iteration 83, loss = 0.04172415
Iteration 84, loss = 0.04184897
Iteration 85, loss = 0.04130623
Iteration 86, loss = 0.04157495
Iteration 87, loss = 0.04070564
Iteration 88, loss = 0.04095159
Iteration 89, loss = 0.04026835
Iteration 90, loss = 0.04118779
Iteration 91, loss = 0.04014345
Iteration 92, loss = 0.03937140
Iteration 93, loss = 0.03977644
Iteration 94, loss = 0.03945955
Iteration 95, loss = 0.03958956
Iteration 96, loss = 0.03881036
Iteration 97, loss = 0.03872920
Iteration 98, loss = 0.03894394
Iteration 99, loss = 0.03851590
Iteration 100, loss = 0.03840433
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.60295431
Iteration 2, loss = 0.40671617
Iteration 3, loss = 0.33380716
Iteration 4, loss = 0.29419694
Iteration 5, loss = 0.26877158
Iteration 6, loss = 0.25007124
Iteration 7, loss = 0.23634425
Iteration 8, loss = 0.22515378
Iteration 9, loss = 0.21606987
Iteration 10, loss = 0.20796691
Iteration 11, loss = 0.20082626
Iteration 12, loss = 0.19463396
Iteration 13, loss = 0.18864694
Iteration 14, loss = 0.18360918
Iteration 15, loss = 0.17966730
Iteration 16, loss = 0.17409531
Iteration 17, loss = 0.17028509
Iteration 18, loss = 0.16615929
Iteration 19, loss = 0.16230008
Iteration 20, loss = 0.15851811
Iteration 21, loss = 0.15536006
Iteration 22, loss = 0.15238620
Iteration 23, loss = 0.14899116
Iteration 24, loss = 0.14672116
Iteration 25, loss = 0.14411764
Iteration 26, loss = 0.14105240
Iteration 27, loss = 0.13877460
Iteration 28, loss = 0.13739149
Iteration 29, loss = 0.13463821
Iteration 30, loss = 0.13257596
Iteration 31, loss = 0.13067789
Iteration 32, loss = 0.12866029
Iteration 33, loss = 0.12709274
Iteration 34, loss = 0.12512690
Iteration 35, loss = 0.12359941
Iteration 36, loss = 0.12177539
Iteration 37, loss = 0.11981742
Iteration 38, loss = 0.11872007
Iteration 39, loss = 0.11689265
Iteration 40, loss = 0.11606466
Iteration 41, loss = 0.11427654
Iteration 42, loss = 0.11265955
Iteration 43, loss = 0.11154899
Iteration 44, loss = 0.11032811
Iteration 45, loss = 0.10941192
Iteration 46, loss = 0.10800362
Iteration 47, loss = 0.10673537
Iteration 48, loss = 0.10568475
Iteration 49, loss = 0.10453486
Iteration 50, loss = 0.10345947
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.22573392
Iteration 2, loss = 0.38931056
Iteration 3, loss = 0.33174881
Iteration 4, loss = 0.29887941
Iteration 5, loss = 0.27491607
Iteration 6, loss = 0.25685442
Iteration 7, loss = 0.24208261
Iteration 8, loss = 0.22999136
Iteration 9, loss = 0.21963169
Iteration 10, loss = 0.21028474
Iteration 11, loss = 0.20263824
Iteration 12, loss = 0.19558763
Iteration 13, loss = 0.18894601
Iteration 14, loss = 0.18343216
Iteration 15, loss = 0.17765175
Iteration 16, loss = 0.17274996
Iteration 17, loss = 0.16807657
Iteration 18, loss = 0.16382116
Iteration 19, loss = 0.15975389
Iteration 20, loss = 0.15636464
Iteration 21, loss = 0.15299031
Iteration 22, loss = 0.14960710
Iteration 23, loss = 0.14658472
Iteration 24, loss = 0.14363363
Iteration 25, loss = 0.14116148
Iteration 26, loss = 0.13885385
Iteration 27, loss = 0.13620612
Iteration 28, loss = 0.13419484
Iteration 29, loss = 0.13169559
Iteration 30, loss = 0.12971828
Iteration 31, loss = 0.12766208
Iteration 32, loss = 0.12543829
Iteration 33, loss = 0.12376512
Iteration 34, loss = 0.12203893
Iteration 35, loss = 0.12004813
Iteration 36, loss = 0.11879152
Iteration 37, loss = 0.11735319
Iteration 38, loss = 0.11554428
Iteration 39, loss = 0.11442245
Iteration 40, loss = 0.11288728
Iteration 41, loss = 0.11125734
Iteration 42, loss = 0.11010576
Iteration 43, loss = 0.10899481
Iteration 44, loss = 0.10730293
Iteration 45, loss = 0.10607493
Iteration 46, loss = 0.10509363
Iteration 47, loss = 0.10405984
Iteration 48, loss = 0.10306537
Iteration 49, loss = 0.10213501
Iteration 50, loss = 0.10086361
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.86549242
Iteration 2, loss = 0.33339977
Iteration 3, loss = 0.26706902
Iteration 4, loss = 0.23596067
Iteration 5, loss = 0.20484092
Iteration 6, loss = 0.18941699
Iteration 7, loss = 0.17989739
Iteration 8, loss = 0.16566869
Iteration 9, loss = 0.15831923
Iteration 10, loss = 0.15025322
Iteration 11, loss = 0.14304365
Iteration 12, loss = 0.13549413
Iteration 13, loss = 0.13229708
Iteration 14, loss = 0.12503592
Iteration 15, loss = 0.12078036
Iteration 16, loss = 0.11469771
Iteration 17, loss = 0.11239382
Iteration 18, loss = 0.10790414
Iteration 19, loss = 0.10471148
Iteration 20, loss = 0.10219866
Iteration 21, loss = 0.09697674
Iteration 22, loss = 0.09458249
Iteration 23, loss = 0.09442796
Iteration 24, loss = 0.09263628
Iteration 25, loss = 0.08926552
Iteration 26, loss = 0.08548748
Iteration 27, loss = 0.08656813
Iteration 28, loss = 0.08225488
Iteration 29, loss = 0.08204768
Iteration 30, loss = 0.08027059
Iteration 31, loss = 0.07770675
Iteration 32, loss = 0.07553244
Iteration 33, loss = 0.07556178
Iteration 34, loss = 0.07259852
Iteration 35, loss = 0.07284546
Iteration 36, loss = 0.07129528
Iteration 37, loss = 0.06885676
Iteration 38, loss = 0.06918874
Iteration 39, loss = 0.06709593
Iteration 40, loss = 0.06622294
Iteration 41, loss = 0.06516714
Iteration 42, loss = 0.06238640
Iteration 43, loss = 0.06431879
Iteration 44, loss = 0.06222340
Iteration 45, loss = 0.06202202
Iteration 46, loss = 0.06305549
Iteration 47, loss = 0.05972790
Iteration 48, loss = 0.05808523
Iteration 49, loss = 0.05652438
Iteration 50, loss = 0.05729282
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.94387579
Iteration 2, loss = 0.34068089
Iteration 3, loss = 0.27648870
Iteration 4, loss = 0.24107712
Iteration 5, loss = 0.21219089
Iteration 6, loss = 0.19149125
Iteration 7, loss = 0.17788320
Iteration 8, loss = 0.16510264
Iteration 9, loss = 0.15409484
Iteration 10, loss = 0.14888843
Iteration 11, loss = 0.13655268
Iteration 12, loss = 0.13351511
Iteration 13, loss = 0.12492345
Iteration 14, loss = 0.11917601
Iteration 15, loss = 0.11624154
Iteration 16, loss = 0.11165290
Iteration 17, loss = 0.10731599
Iteration 18, loss = 0.10253138
Iteration 19, loss = 0.10096505
Iteration 20, loss = 0.09789561
Iteration 21, loss = 0.09259976
Iteration 22, loss = 0.09196727
Iteration 23, loss = 0.08833999
Iteration 24, loss = 0.08846699
Iteration 25, loss = 0.08355995
Iteration 26, loss = 0.08268814
Iteration 27, loss = 0.08088953
Iteration 28, loss = 0.07921305
Iteration 29, loss = 0.07653826
Iteration 30, loss = 0.07670052
Iteration 31, loss = 0.07460169
Iteration 32, loss = 0.07325099
Iteration 33, loss = 0.07120896
Iteration 34, loss = 0.07017538
Iteration 35, loss = 0.06896567
Iteration 36, loss = 0.06761540
Iteration 37, loss = 0.06728626
Iteration 38, loss = 0.06534170
Iteration 39, loss = 0.06417898
Iteration 40, loss = 0.06383937
Iteration 41, loss = 0.06291154
Iteration 42, loss = 0.06168710
Iteration 43, loss = 0.06022897
Iteration 44, loss = 0.05986157
Iteration 45, loss = 0.05794373
Iteration 46, loss = 0.06007479
Iteration 47, loss = 0.05761878
Iteration 48, loss = 0.05664265
Iteration 49, loss = 0.05656948
Iteration 50, loss = 0.05655428
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.60295431
Iteration 2, loss = 0.40671617
Iteration 3, loss = 0.33380716
Iteration 4, loss = 0.29419694
Iteration 5, loss = 0.26877158
Iteration 6, loss = 0.25007124
Iteration 7, loss = 0.23634425
Iteration 8, loss = 0.22515378
Iteration 9, loss = 0.21606987
Iteration 10, loss = 0.20796691
Iteration 11, loss = 0.20082626
Iteration 12, loss = 0.19463396
Iteration 13, loss = 0.18864694
Iteration 14, loss = 0.18360918
Iteration 15, loss = 0.17966730
Iteration 16, loss = 0.17409531
Iteration 17, loss = 0.17028509
Iteration 18, loss = 0.16615929
Iteration 19, loss = 0.16230008
Iteration 20, loss = 0.15851811
Iteration 21, loss = 0.15536006
Iteration 22, loss = 0.15238620
Iteration 23, loss = 0.14899116
Iteration 24, loss = 0.14672116
Iteration 25, loss = 0.14411764
Iteration 26, loss = 0.14105240
Iteration 27, loss = 0.13877460
Iteration 28, loss = 0.13739149
Iteration 29, loss = 0.13463821
Iteration 30, loss = 0.13257596
Iteration 31, loss = 0.13067789
Iteration 32, loss = 0.12866029
Iteration 33, loss = 0.12709274
Iteration 34, loss = 0.12512690
Iteration 35, loss = 0.12359941
Iteration 36, loss = 0.12177539
Iteration 37, loss = 0.11981742
Iteration 38, loss = 0.11872007
Iteration 39, loss = 0.11689265
Iteration 40, loss = 0.11606466
Iteration 41, loss = 0.11427654
Iteration 42, loss = 0.11265955
Iteration 43, loss = 0.11154899
Iteration 44, loss = 0.11032811
Iteration 45, loss = 0.10941192
Iteration 46, loss = 0.10800362
Iteration 47, loss = 0.10673537
Iteration 48, loss = 0.10568475
Iteration 49, loss = 0.10453486
Iteration 50, loss = 0.10345947
Iteration 51, loss = 0.10225684
Iteration 52, loss = 0.10094671
```

```
Iteration 53, loss = 0.10002507
Iteration 54, loss = 0.09913258
Iteration 55, loss = 0.09827959
Iteration 56, loss = 0.09712081
Iteration 57, loss = 0.09623791
Iteration 58, loss = 0.09541099
Iteration 59, loss = 0.09484700
Iteration 60, loss = 0.09348496
Iteration 61, loss = 0.09249324
Iteration 62, loss = 0.09201165
Iteration 63, loss = 0.09076011
Iteration 64, loss = 0.09019318
Iteration 65, loss = 0.08878885
Iteration 66, loss = 0.08848696
Iteration 67, loss = 0.08769138
Iteration 68, loss = 0.08739248
Iteration 69, loss = 0.08663055
Iteration 70, loss = 0.08585805
Iteration 71, loss = 0.08494419
Iteration 72, loss = 0.08425809
Iteration 73, loss = 0.08371521
Iteration 74, loss = 0.08271945
Iteration 75, loss = 0.08261502
Iteration 76, loss = 0.08191166
Iteration 77, loss = 0.08124714
Iteration 78, loss = 0.08102311
Iteration 79, loss = 0.07995484
Iteration 80, loss = 0.07935654
Iteration 81, loss = 0.07897526
Iteration 82, loss = 0.07806485
Iteration 83, loss = 0.07795590
Iteration 84, loss = 0.07746545
Iteration 85, loss = 0.07624402
Iteration 86, loss = 0.07625668
Iteration 87, loss = 0.07553168
Iteration 88, loss = 0.07535639
Iteration 89, loss = 0.07442174
Iteration 90, loss = 0.07446864
Iteration 91, loss = 0.07396518
Iteration 92, loss = 0.07389366
Iteration 93, loss = 0.07316913
Iteration 94, loss = 0.07285308
Iteration 95, loss = 0.07216395
Iteration 96, loss = 0.07195419
Iteration 97, loss = 0.07107147
Iteration 98, loss = 0.07082477
Iteration 99, loss = 0.07030152
Iteration 100, loss = 0.07015159
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.22573392
Iteration 2, loss = 0.38931056
Iteration 3, loss = 0.33174881
Iteration 4, loss = 0.29887941
Iteration 5, loss = 0.27491607
Iteration 6, loss = 0.25685442
Iteration 7, loss = 0.24208261
Iteration 8, loss = 0.22999136
Iteration 9, loss = 0.21963169
Iteration 10, loss = 0.21028474
Iteration 11, loss = 0.20263824
Iteration 12, loss = 0.19558763
Iteration 13, loss = 0.18894601
Iteration 14, loss = 0.18343216
Iteration 15, loss = 0.17765175
Iteration 16, loss = 0.17274996
Iteration 17, loss = 0.16807657
Iteration 18, loss = 0.16382116
Iteration 19, loss = 0.15975389
Iteration 20, loss = 0.15636464
Iteration 21, loss = 0.15299031
Iteration 22, loss = 0.14960710
Iteration 23, loss = 0.14658472
Iteration 24, loss = 0.14363363
Iteration 25, loss = 0.14116148
Iteration 26, loss = 0.13885385
Iteration 27, loss = 0.13620612
Iteration 28, loss = 0.13419484
Iteration 29, loss = 0.13169559
Iteration 30, loss = 0.12971828
Iteration 31, loss = 0.12766208
Iteration 32, loss = 0.12543829
Iteration 33, loss = 0.12376512
Iteration 34, loss = 0.12203893
Iteration 35, loss = 0.12004813
Iteration 36, loss = 0.11879152
Iteration 37, loss = 0.11735319
Iteration 38, loss = 0.11554428
Iteration 39, loss = 0.11442245
Iteration 40, loss = 0.11288728
Iteration 41, loss = 0.11125734
Iteration 42, loss = 0.11010576
Iteration 43, loss = 0.10899481
Iteration 44, loss = 0.10730293
Iteration 45, loss = 0.10607493
Iteration 46, loss = 0.10509363
Iteration 47, loss = 0.10405984
Iteration 48, loss = 0.10306537
Iteration 49, loss = 0.10213501
Iteration 50, loss = 0.10086361
Iteration 51, loss = 0.10013621
Iteration 52, loss = 0.09879570
```

```
Iteration 53, loss = 0.09822717
Iteration 54, loss = 0.09737817
Iteration 55, loss = 0.09632476
Iteration 56, loss = 0.09556218
Iteration 57, loss = 0.09445759
Iteration 58, loss = 0.09384971
Iteration 59, loss = 0.09302364
Iteration 60, loss = 0.09197843
Iteration 61, loss = 0.09121116
Iteration 62, loss = 0.09067606
Iteration 63, loss = 0.08967580
Iteration 64, loss = 0.08895107
Iteration 65, loss = 0.08835306
Iteration 66, loss = 0.08758680
Iteration 67, loss = 0.08661738
Iteration 68, loss = 0.08611297
Iteration 69, loss = 0.08561911
Iteration 70, loss = 0.08506854
Iteration 71, loss = 0.08408204
Iteration 72, loss = 0.08373268
Iteration 73, loss = 0.08271049
Iteration 74, loss = 0.08205552
Iteration 75, loss = 0.08181523
Iteration 76, loss = 0.08103587
Iteration 77, loss = 0.08057800
Iteration 78, loss = 0.07981207
Iteration 79, loss = 0.07949133
Iteration 80, loss = 0.07877330
Iteration 81, loss = 0.07830289
Iteration 82, loss = 0.07776469
Iteration 83, loss = 0.07723927
Iteration 84, loss = 0.07693225
Iteration 85, loss = 0.07646202
Iteration 86, loss = 0.07562227
Iteration 87, loss = 0.07539997
Iteration 88, loss = 0.07472372
Iteration 89, loss = 0.07450868
Iteration 90, loss = 0.07428958
Iteration 91, loss = 0.07337960
Iteration 92, loss = 0.07304578
Iteration 93, loss = 0.07258490
Iteration 94, loss = 0.07194511
Iteration 95, loss = 0.07177103
Iteration 96, loss = 0.07131035
Iteration 97, loss = 0.07078070
Iteration 98, loss = 0.07062996
Iteration 99, loss = 0.07002603
Iteration 100, loss = 0.06947035
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.86549242
Iteration 2, loss = 0.33339977
Iteration 3, loss = 0.26706902
Iteration 4, loss = 0.23596067
Iteration 5, loss = 0.20484092
Iteration 6, loss = 0.18941699
Iteration 7, loss = 0.17989739
Iteration 8, loss = 0.16566869
Iteration 9, loss = 0.15831923
Iteration 10, loss = 0.15025322
Iteration 11, loss = 0.14304365
Iteration 12, loss = 0.13549413
Iteration 13, loss = 0.13229708
Iteration 14, loss = 0.12503592
Iteration 15, loss = 0.12078036
Iteration 16, loss = 0.11469771
Iteration 17, loss = 0.11239382
Iteration 18, loss = 0.10790414
Iteration 19, loss = 0.10471148
Iteration 20, loss = 0.10219866
Iteration 21, loss = 0.09697674
Iteration 22, loss = 0.09458249
Iteration 23, loss = 0.09442796
Iteration 24, loss = 0.09263628
Iteration 25, loss = 0.08926552
Iteration 26, loss = 0.08548748
Iteration 27, loss = 0.08656813
Iteration 28, loss = 0.08225488
Iteration 29, loss = 0.08204768
Iteration 30, loss = 0.08027059
Iteration 31, loss = 0.07770675
Iteration 32, loss = 0.07553244
Iteration 33, loss = 0.07556178
Iteration 34, loss = 0.07259852
Iteration 35, loss = 0.07284546
Iteration 36, loss = 0.07129528
Iteration 37, loss = 0.06885676
Iteration 38, loss = 0.06918874
Iteration 39, loss = 0.06709593
Iteration 40, loss = 0.06622294
Iteration 41, loss = 0.06516714
Iteration 42, loss = 0.06238640
Iteration 43, loss = 0.06431879
Iteration 44, loss = 0.06222340
Iteration 45, loss = 0.06202202
Iteration 46, loss = 0.06305549
Iteration 47, loss = 0.05972790
Iteration 48, loss = 0.05808523
Iteration 49, loss = 0.05652438
Iteration 50, loss = 0.05729282
Iteration 51, loss = 0.05565622
Iteration 52, loss = 0.05796799
```

```
Iteration 53, loss = 0.05629684
Iteration 54, loss = 0.05595208
Iteration 55, loss = 0.05330597
Iteration 56, loss = 0.05349645
Iteration 57, loss = 0.05244369
Iteration 58, loss = 0.05261063
Iteration 59, loss = 0.05138813
Iteration 60, loss = 0.05189190
Iteration 61, loss = 0.05036085
Iteration 62, loss = 0.05045366
Iteration 63, loss = 0.04914347
Iteration 64, loss = 0.05061806
Iteration 65, loss = 0.04771308
Iteration 66, loss = 0.04784301
Iteration 67, loss = 0.04788998
Iteration 68, loss = 0.04732257
Iteration 69, loss = 0.04712506
Iteration 70, loss = 0.04617195
Iteration 71, loss = 0.04668606
Iteration 72, loss = 0.04658727
Iteration 73, loss = 0.04457674
Iteration 74, loss = 0.04487378
Iteration 75, loss = 0.04474491
Iteration 76, loss = 0.04443139
Iteration 77, loss = 0.04406673
Iteration 78, loss = 0.04460548
Iteration 79, loss = 0.04209773
Iteration 80, loss = 0.04196006
Iteration 81, loss = 0.04268562
Iteration 82, loss = 0.04160769
Iteration 83, loss = 0.04231372
Iteration 84, loss = 0.04085942
Iteration 85, loss = 0.04111906
Iteration 86, loss = 0.04141635
Iteration 87, loss = 0.03994245
Iteration 88, loss = 0.04074934
Iteration 89, loss = 0.03969979
Iteration 90, loss = 0.03974406
Iteration 91, loss = 0.03959085
Iteration 92, loss = 0.03839601
Iteration 93, loss = 0.04037773
Iteration 94, loss = 0.03827742
Iteration 95, loss = 0.03812884
Iteration 96, loss = 0.04009286
Iteration 97, loss = 0.03619125
Iteration 98, loss = 0.03728905
Iteration 99, loss = 0.03734180
Iteration 100, loss = 0.03662989
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.94387579
Iteration 2, loss = 0.34068089
Iteration 3, loss = 0.27648870
Iteration 4, loss = 0.24107712
Iteration 5, loss = 0.21219089
Iteration 6, loss = 0.19149125
Iteration 7, loss = 0.17788320
Iteration 8, loss = 0.16510264
Iteration 9, loss = 0.15409484
Iteration 10, loss = 0.14888843
Iteration 11, loss = 0.13655268
Iteration 12, loss = 0.13351511
Iteration 13, loss = 0.12492345
Iteration 14, loss = 0.11917601
Iteration 15, loss = 0.11624154
Iteration 16, loss = 0.11165290
Iteration 17, loss = 0.10731599
Iteration 18, loss = 0.10253138
Iteration 19, loss = 0.10096505
Iteration 20, loss = 0.09789561
Iteration 21, loss = 0.09259976
Iteration 22, loss = 0.09196727
Iteration 23, loss = 0.08833999
Iteration 24, loss = 0.08846699
Iteration 25, loss = 0.08355995
Iteration 26, loss = 0.08268814
Iteration 27, loss = 0.08088953
Iteration 28, loss = 0.07921305
Iteration 29, loss = 0.07653826
Iteration 30, loss = 0.07670052
Iteration 31, loss = 0.07460169
Iteration 32, loss = 0.07325099
Iteration 33, loss = 0.07120896
Iteration 34, loss = 0.07017538
Iteration 35, loss = 0.06896567
Iteration 36, loss = 0.06761540
Iteration 37, loss = 0.06728626
Iteration 38, loss = 0.06534170
Iteration 39, loss = 0.06417898
Iteration 40, loss = 0.06383937
Iteration 41, loss = 0.06291154
Iteration 42, loss = 0.06168710
Iteration 43, loss = 0.06022897
Iteration 44, loss = 0.05986157
Iteration 45, loss = 0.05794373
Iteration 46, loss = 0.06007479
Iteration 47, loss = 0.05761878
Iteration 48, loss = 0.05664265
Iteration 49, loss = 0.05656948
Iteration 50, loss = 0.05655428
Iteration 51, loss = 0.05412188
Iteration 52, loss = 0.05296805
```

```
Iteration 53, loss = 0.05338880
Iteration 54, loss = 0.05297252
Iteration 55, loss = 0.05249656
Iteration 56, loss = 0.05240320
Iteration 57, loss = 0.05208648
Iteration 58, loss = 0.05010442
Iteration 59, loss = 0.05087728
Iteration 60, loss = 0.05022008
Iteration 61, loss = 0.04916962
Iteration 62, loss = 0.04916266
Iteration 63, loss = 0.04803641
Iteration 64, loss = 0.04787025
Iteration 65, loss = 0.04789879
Iteration 66, loss = 0.04737697
Iteration 67, loss = 0.04671794
Iteration 68, loss = 0.04607679
Iteration 69, loss = 0.04686306
Iteration 70, loss = 0.04554341
Iteration 71, loss = 0.04546001
Iteration 72, loss = 0.04555499
Iteration 73, loss = 0.04490529
Iteration 74, loss = 0.04434546
Iteration 75, loss = 0.04381980
Iteration 76, loss = 0.04491479
Iteration 77, loss = 0.04355824
Iteration 78, loss = 0.04303459
Iteration 79, loss = 0.04324332
Iteration 80, loss = 0.04284999
Iteration 81, loss = 0.04290003
Iteration 82, loss = 0.04217358
Iteration 83, loss = 0.04172415
Iteration 84, loss = 0.04184897
Iteration 85, loss = 0.04130623
Iteration 86, loss = 0.04157495
Iteration 87, loss = 0.04070564
Iteration 88, loss = 0.04095159
Iteration 89, loss = 0.04026835
Iteration 90, loss = 0.04118779
Iteration 91, loss = 0.04014345
Iteration 92, loss = 0.03937140
Iteration 93, loss = 0.03977644
Iteration 94, loss = 0.03945955
Iteration 95, loss = 0.03958956
Iteration 96, loss = 0.03881036
Iteration 97, loss = 0.03872920
Iteration 98, loss = 0.03894394
Iteration 99, loss = 0.03851590
Iteration 100, loss = 0.03840433
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.52268951
Iteration 2, loss = 0.41956230
Iteration 3, loss = 0.34384592
Iteration 4, loss = 0.30650088
Iteration 5, loss = 0.28199576
Iteration 6, loss = 0.26380468
Iteration 7, loss = 0.24947227
Iteration 8, loss = 0.23740323
Iteration 9, loss = 0.22738911
Iteration 10, loss = 0.21879583
Iteration 11, loss = 0.21199860
Iteration 12, loss = 0.20529802
Iteration 13, loss = 0.19903034
Iteration 14, loss = 0.19451262
Iteration 15, loss = 0.18869610
Iteration 16, loss = 0.18452067
Iteration 17, loss = 0.18106083
Iteration 18, loss = 0.17740916
Iteration 19, loss = 0.17318312
Iteration 20, loss = 0.17034845
Iteration 21, loss = 0.16699599
Iteration 22, loss = 0.16410226
Iteration 23, loss = 0.16147813
Iteration 24, loss = 0.15879815
Iteration 25, loss = 0.15683370
Iteration 26, loss = 0.15410066
Iteration 27, loss = 0.15145825
Iteration 28, loss = 0.14940328
Iteration 29, loss = 0.14726271
Iteration 30, loss = 0.14532382
Iteration 31, loss = 0.14314101
Iteration 32, loss = 0.14197686
Iteration 33, loss = 0.13992171
Iteration 34, loss = 0.13862846
Iteration 35, loss = 0.13668243
Iteration 36, loss = 0.13567522
Iteration 37, loss = 0.13407963
Iteration 38, loss = 0.13236110
Iteration 39, loss = 0.13183047
Iteration 40, loss = 0.13030065
Iteration 41, loss = 0.12814604
Iteration 42, loss = 0.12696856
Iteration 43, loss = 0.12585552
Iteration 44, loss = 0.12499302
Iteration 45, loss = 0.12397075
Iteration 46, loss = 0.12276055
Iteration 47, loss = 0.12119400
Iteration 48, loss = 0.11968581
Iteration 49, loss = 0.11892045
Iteration 50, loss = 0.11786256
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.15146347
Iteration 2, loss = 0.40209014
Iteration 3, loss = 0.34393833
Iteration 4, loss = 0.31087211
Iteration 5, loss = 0.28751635
Iteration 6, loss = 0.27003127
Iteration 7, loss = 0.25609219
Iteration 8, loss = 0.24330564
Iteration 9, loss = 0.23263102
Iteration 10, loss = 0.22326464
Iteration 11, loss = 0.21517074
Iteration 12, loss = 0.20776664
Iteration 13, loss = 0.20113692
Iteration 14, loss = 0.19535123
Iteration 15, loss = 0.19052177
Iteration 16, loss = 0.18583759
Iteration 17, loss = 0.18150438
Iteration 18, loss = 0.17758882
Iteration 19, loss = 0.17393098
Iteration 20, loss = 0.17024657
Iteration 21, loss = 0.16724215
Iteration 22, loss = 0.16429068
Iteration 23, loss = 0.16160023
Iteration 24, loss = 0.15879805
Iteration 25, loss = 0.15633439
Iteration 26, loss = 0.15430977
Iteration 27, loss = 0.15211231
Iteration 28, loss = 0.14970110
Iteration 29, loss = 0.14790230
Iteration 30, loss = 0.14564309
Iteration 31, loss = 0.14380834
Iteration 32, loss = 0.14252307
Iteration 33, loss = 0.14014247
Iteration 34, loss = 0.13888672
Iteration 35, loss = 0.13708398
Iteration 36, loss = 0.13566989
Iteration 37, loss = 0.13432020
Iteration 38, loss = 0.13274637
Iteration 39, loss = 0.13132882
Iteration 40, loss = 0.13009561
Iteration 41, loss = 0.12896247
Iteration 42, loss = 0.12718475
Iteration 43, loss = 0.12613637
Iteration 44, loss = 0.12502263
Iteration 45, loss = 0.12386003
Iteration 46, loss = 0.12281989
Iteration 47, loss = 0.12153941
Iteration 48, loss = 0.12069112
Iteration 49, loss = 0.11943591
Iteration 50, loss = 0.11826720
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.79537804
Iteration 2, loss = 0.35569750
Iteration 3, loss = 0.27735984
Iteration 4, loss = 0.24005826
Iteration 5, loss = 0.22367936
Iteration 6, loss = 0.20595972
Iteration 7, loss = 0.19279201
Iteration 8, loss = 0.18129671
Iteration 9, loss = 0.16938469
Iteration 10, loss = 0.15986086
Iteration 11, loss = 0.15530806
Iteration 12, loss = 0.14911715
Iteration 13, loss = 0.14219342
Iteration 14, loss = 0.13823590
Iteration 15, loss = 0.13335924
Iteration 16, loss = 0.12708641
Iteration 17, loss = 0.12732609
Iteration 18, loss = 0.11905568
Iteration 19, loss = 0.11778210
Iteration 20, loss = 0.11666455
Iteration 21, loss = 0.10984433
Iteration 22, loss = 0.10835154
Iteration 23, loss = 0.10361951
Iteration 24, loss = 0.10298653
Iteration 25, loss = 0.10011717
Iteration 26, loss = 0.10509650
Iteration 27, loss = 0.09731059
Iteration 28, loss = 0.09426926
Iteration 29, loss = 0.09410761
Iteration 30, loss = 0.08945032
Iteration 31, loss = 0.08996209
Iteration 32, loss = 0.09067854
Iteration 33, loss = 0.08677973
Iteration 34, loss = 0.08682311
Iteration 35, loss = 0.08192895
Iteration 36, loss = 0.08340829
Iteration 37, loss = 0.07882493
Iteration 38, loss = 0.07960748
Iteration 39, loss = 0.07968499
Iteration 40, loss = 0.07715934
Iteration 41, loss = 0.07503981
Iteration 42, loss = 0.07601929
Iteration 43, loss = 0.07573892
Iteration 44, loss = 0.07399484
Iteration 45, loss = 0.07150400
Iteration 46, loss = 0.07239814
Iteration 47, loss = 0.07080609
Iteration 48, loss = 0.06912387
Iteration 49, loss = 0.07047483
Iteration 50, loss = 0.06854873
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.82055208
Iteration 2, loss = 0.35375178
Iteration 3, loss = 0.28792564
Iteration 4, loss = 0.25491667
Iteration 5, loss = 0.22810535
Iteration 6, loss = 0.20780574
Iteration 7, loss = 0.19655253
Iteration 8, loss = 0.18190261
Iteration 9, loss = 0.17301074
Iteration 10, loss = 0.16354680
Iteration 11, loss = 0.15581673
Iteration 12, loss = 0.14787600
Iteration 13, loss = 0.14411010
Iteration 14, loss = 0.13676072
Iteration 15, loss = 0.13331820
Iteration 16, loss = 0.12766885
Iteration 17, loss = 0.12667783
Iteration 18, loss = 0.12127837
Iteration 19, loss = 0.11803146
Iteration 20, loss = 0.11650837
Iteration 21, loss = 0.11150647
Iteration 22, loss = 0.10964145
Iteration 23, loss = 0.10709935
Iteration 24, loss = 0.10477919
Iteration 25, loss = 0.10314670
Iteration 26, loss = 0.10091271
Iteration 27, loss = 0.09912004
Iteration 28, loss = 0.09668267
Iteration 29, loss = 0.09541126
Iteration 30, loss = 0.09379228
Iteration 31, loss = 0.09225530
Iteration 32, loss = 0.09044663
Iteration 33, loss = 0.08932181
Iteration 34, loss = 0.08734218
Iteration 35, loss = 0.08657005
Iteration 36, loss = 0.08525521
Iteration 37, loss = 0.08286328
Iteration 38, loss = 0.08245075
Iteration 39, loss = 0.08181355
Iteration 40, loss = 0.08060334
Iteration 41, loss = 0.08088245
Iteration 42, loss = 0.07917943
Iteration 43, loss = 0.07806691
Iteration 44, loss = 0.07699744
Iteration 45, loss = 0.07573095
Iteration 46, loss = 0.07595266
Iteration 47, loss = 0.07433728
Iteration 48, loss = 0.07440755
Iteration 49, loss = 0.07279722
Iteration 50, loss = 0.07309599
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
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```

```
Iteration 1, loss = 1.52268951
Iteration 2, loss = 0.41956230
Iteration 3, loss = 0.34384592
Iteration 4, loss = 0.30650088
Iteration 5, loss = 0.28199576
Iteration 6, loss = 0.26380468
Iteration 7, loss = 0.24947227
Iteration 8, loss = 0.23740323
Iteration 9, loss = 0.22738911
Iteration 10, loss = 0.21879583
Iteration 11, loss = 0.21199860
Iteration 12, loss = 0.20529802
Iteration 13, loss = 0.19903034
Iteration 14, loss = 0.19451262
Iteration 15, loss = 0.18869610
Iteration 16, loss = 0.18452067
Iteration 17, loss = 0.18106083
Iteration 18, loss = 0.17740916
Iteration 19, loss = 0.17318312
Iteration 20, loss = 0.17034845
Iteration 21, loss = 0.16699599
Iteration 22, loss = 0.16410226
Iteration 23, loss = 0.16147813
Iteration 24, loss = 0.15879815
Iteration 25, loss = 0.15683370
Iteration 26, loss = 0.15410066
Iteration 27, loss = 0.15145825
Iteration 28, loss = 0.14940328
Iteration 29, loss = 0.14726271
Iteration 30, loss = 0.14532382
Iteration 31, loss = 0.14314101
Iteration 32, loss = 0.14197686
Iteration 33, loss = 0.13992171
Iteration 34, loss = 0.13862846
Iteration 35, loss = 0.13668243
Iteration 36, loss = 0.13567522
Iteration 37, loss = 0.13407963
Iteration 38, loss = 0.13236110
Iteration 39, loss = 0.13183047
Iteration 40, loss = 0.13030065
Iteration 41, loss = 0.12814604
Iteration 42, loss = 0.12696856
Iteration 43, loss = 0.12585552
Iteration 44, loss = 0.12499302
Iteration 45, loss = 0.12397075
Iteration 46, loss = 0.12276055
Iteration 47, loss = 0.12119400
Iteration 48, loss = 0.11968581
Iteration 49, loss = 0.11892045
Iteration 50, loss = 0.11786256
Iteration 51, loss = 0.11758596
Iteration 52, loss = 0.11567055
```

```
Iteration 53, loss = 0.11517030
Iteration 54, loss = 0.11365810
Iteration 55, loss = 0.11361076
Iteration 56, loss = 0.11259153
Iteration 57, loss = 0.11197355
Iteration 58, loss = 0.11063299
Iteration 59, loss = 0.11051180
Iteration 60, loss = 0.10900965
Iteration 61, loss = 0.10830782
Iteration 62, loss = 0.10775083
Iteration 63, loss = 0.10674999
Iteration 64, loss = 0.10576233
Iteration 65, loss = 0.10501496
Iteration 66, loss = 0.10501097
Iteration 67, loss = 0.10383758
Iteration 68, loss = 0.10357395
Iteration 69, loss = 0.10267623
Iteration 70, loss = 0.10210891
Iteration 71, loss = 0.10118100
Iteration 72, loss = 0.10038325
Iteration 73, loss = 0.10026924
Iteration 74, loss = 0.09999167
Iteration 75, loss = 0.09821317
Iteration 76, loss = 0.09773510
Iteration 77, loss = 0.09728523
Iteration 78, loss = 0.09704601
Iteration 79, loss = 0.09674299
Iteration 80, loss = 0.09576108
Iteration 81, loss = 0.09510827
Iteration 82, loss = 0.09491011
Iteration 83, loss = 0.09432515
Iteration 84, loss = 0.09392071
Iteration 85, loss = 0.09321445
Iteration 86, loss = 0.09264843
Iteration 87, loss = 0.09167773
Iteration 88, loss = 0.09171813
Iteration 89, loss = 0.09145679
Iteration 90, loss = 0.09096515
Iteration 91, loss = 0.09081475
Iteration 92, loss = 0.08973413
Iteration 93, loss = 0.08930879
Iteration 94, loss = 0.08924039
Iteration 95, loss = 0.08793903
Iteration 96, loss = 0.08810975
Iteration 97, loss = 0.08821030
Iteration 98, loss = 0.08718044
Iteration 99, loss = 0.08624960
Iteration 100, loss = 0.08605742
```

```
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  warnings.warn(
```

```
Iteration 1, loss = 1.15146347
Iteration 2, loss = 0.40209014
Iteration 3, loss = 0.34393833
Iteration 4, loss = 0.31087211
Iteration 5, loss = 0.28751635
Iteration 6, loss = 0.27003127
Iteration 7, loss = 0.25609219
Iteration 8, loss = 0.24330564
Iteration 9, loss = 0.23263102
Iteration 10, loss = 0.22326464
Iteration 11, loss = 0.21517074
Iteration 12, loss = 0.20776664
Iteration 13, loss = 0.20113692
Iteration 14, loss = 0.19535123
Iteration 15, loss = 0.19052177
Iteration 16, loss = 0.18583759
Iteration 17, loss = 0.18150438
Iteration 18, loss = 0.17758882
Iteration 19, loss = 0.17393098
Iteration 20, loss = 0.17024657
Iteration 21, loss = 0.16724215
Iteration 22, loss = 0.16429068
Iteration 23, loss = 0.16160023
Iteration 24, loss = 0.15879805
Iteration 25, loss = 0.15633439
Iteration 26, loss = 0.15430977
Iteration 27, loss = 0.15211231
Iteration 28, loss = 0.14970110
Iteration 29, loss = 0.14790230
Iteration 30, loss = 0.14564309
Iteration 31, loss = 0.14380834
Iteration 32, loss = 0.14252307
Iteration 33, loss = 0.14014247
Iteration 34, loss = 0.13888672
Iteration 35, loss = 0.13708398
Iteration 36, loss = 0.13566989
Iteration 37, loss = 0.13432020
Iteration 38, loss = 0.13274637
Iteration 39, loss = 0.13132882
Iteration 40, loss = 0.13009561
Iteration 41, loss = 0.12896247
Iteration 42, loss = 0.12718475
Iteration 43, loss = 0.12613637
Iteration 44, loss = 0.12502263
Iteration 45, loss = 0.12386003
Iteration 46, loss = 0.12281989
Iteration 47, loss = 0.12153941
Iteration 48, loss = 0.12069112
Iteration 49, loss = 0.11943591
Iteration 50, loss = 0.11826720
Iteration 51, loss = 0.11733946
Iteration 52, loss = 0.11609366
```

```
Iteration 53, loss = 0.11537866
Iteration 54, loss = 0.11423339
Iteration 55, loss = 0.11333455
Iteration 56, loss = 0.11270729
Iteration 57, loss = 0.11143688
Iteration 58, loss = 0.11059052
Iteration 59, loss = 0.10983559
Iteration 60, loss = 0.10887590
Iteration 61, loss = 0.10846296
Iteration 62, loss = 0.10762884
Iteration 63, loss = 0.10661766
Iteration 64, loss = 0.10574325
Iteration 65, loss = 0.10491461
Iteration 66, loss = 0.10434610
Iteration 67, loss = 0.10346694
Iteration 68, loss = 0.10272283
Iteration 69, loss = 0.10233000
Iteration 70, loss = 0.10137213
Iteration 71, loss = 0.10053517
Iteration 72, loss = 0.09980476
Iteration 73, loss = 0.09925630
Iteration 74, loss = 0.09840893
Iteration 75, loss = 0.09746460
Iteration 76, loss = 0.09713257
Iteration 77, loss = 0.09657343
Iteration 78, loss = 0.09599908
Iteration 79, loss = 0.09547769
Iteration 80, loss = 0.09496898
Iteration 81, loss = 0.09412728
Iteration 82, loss = 0.09386887
Iteration 83, loss = 0.09301486
Iteration 84, loss = 0.09229895
Iteration 85, loss = 0.09217955
Iteration 86, loss = 0.09134132
Iteration 87, loss = 0.09064872
Iteration 88, loss = 0.09047040
Iteration 89, loss = 0.09015247
Iteration 90, loss = 0.08940419
Iteration 91, loss = 0.08884301
Iteration 92, loss = 0.08849517
Iteration 93, loss = 0.08780405
Iteration 94, loss = 0.08738943
Iteration 95, loss = 0.08711571
Iteration 96, loss = 0.08653424
Iteration 97, loss = 0.08599748
Iteration 98, loss = 0.08555007
Iteration 99, loss = 0.08489437
Iteration 100, loss = 0.08465627
```

```
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ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.79537804
Iteration 2, loss = 0.35569750
Iteration 3, loss = 0.27735984
Iteration 4, loss = 0.24005826
Iteration 5, loss = 0.22367936
Iteration 6, loss = 0.20595972
Iteration 7, loss = 0.19279201
Iteration 8, loss = 0.18129671
Iteration 9, loss = 0.16938469
Iteration 10, loss = 0.15986086
Iteration 11, loss = 0.15530806
Iteration 12, loss = 0.14911715
Iteration 13, loss = 0.14219342
Iteration 14, loss = 0.13823590
Iteration 15, loss = 0.13335924
Iteration 16, loss = 0.12708641
Iteration 17, loss = 0.12732609
Iteration 18, loss = 0.11905568
Iteration 19, loss = 0.11778210
Iteration 20, loss = 0.11666455
Iteration 21, loss = 0.10984433
Iteration 22, loss = 0.10835154
Iteration 23, loss = 0.10361951
Iteration 24, loss = 0.10298653
Iteration 25, loss = 0.10011717
Iteration 26, loss = 0.10509650
Iteration 27, loss = 0.09731059
Iteration 28, loss = 0.09426926
Iteration 29, loss = 0.09410761
Iteration 30, loss = 0.08945032
Iteration 31, loss = 0.08996209
Iteration 32, loss = 0.09067854
Iteration 33, loss = 0.08677973
Iteration 34, loss = 0.08682311
Iteration 35, loss = 0.08192895
Iteration 36, loss = 0.08340829
Iteration 37, loss = 0.07882493
Iteration 38, loss = 0.07960748
Iteration 39, loss = 0.07968499
Iteration 40, loss = 0.07715934
Iteration 41, loss = 0.07503981
Iteration 42, loss = 0.07601929
Iteration 43, loss = 0.07573892
Iteration 44, loss = 0.07399484
Iteration 45, loss = 0.07150400
Iteration 46, loss = 0.07239814
Iteration 47, loss = 0.07080609
Iteration 48, loss = 0.06912387
Iteration 49, loss = 0.07047483
Iteration 50, loss = 0.06854873
Iteration 51, loss = 0.06906241
Iteration 52, loss = 0.06484602
```

```
Iteration 53, loss = 0.06589741
Iteration 54, loss = 0.06600969
Iteration 55, loss = 0.06517885
Iteration 56, loss = 0.06278128
Iteration 57, loss = 0.06171216
Iteration 58, loss = 0.06413221
Iteration 59, loss = 0.06241286
Iteration 60, loss = 0.06026483
Iteration 61, loss = 0.06071468
Iteration 62, loss = 0.06038451
Iteration 63, loss = 0.05912760
Iteration 64, loss = 0.05839417
Iteration 65, loss = 0.05913665
Iteration 66, loss = 0.05746514
Iteration 67, loss = 0.05736507
Iteration 68, loss = 0.05711984
Iteration 69, loss = 0.05676827
Iteration 70, loss = 0.05646317
Iteration 71, loss = 0.05583898
Iteration 72, loss = 0.05587802
Iteration 73, loss = 0.05567334
Iteration 74, loss = 0.05392670
Iteration 75, loss = 0.05432131
Iteration 76, loss = 0.05316275
Iteration 77, loss = 0.05183486
Iteration 78, loss = 0.05247515
Iteration 79, loss = 0.05340240
Iteration 80, loss = 0.05254519
Iteration 81, loss = 0.05079238
Iteration 82, loss = 0.05102039
Iteration 83, loss = 0.05088187
Iteration 84, loss = 0.04987148
Iteration 85, loss = 0.05178653
Iteration 86, loss = 0.04980135
Iteration 87, loss = 0.04911498
Iteration 88, loss = 0.04972424
Iteration 89, loss = 0.04896578
Iteration 90, loss = 0.04888881
Iteration 91, loss = 0.04831240
Iteration 92, loss = 0.04896802
Iteration 93, loss = 0.04711544
Iteration 94, loss = 0.04837178
Iteration 95, loss = 0.04699043
Iteration 96, loss = 0.04629151
Iteration 97, loss = 0.04745532
Iteration 98, loss = 0.04572501
Iteration 99, loss = 0.04636623
Iteration 100, loss = 0.04439801
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.82055208
Iteration 2, loss = 0.35375178
Iteration 3, loss = 0.28792564
Iteration 4, loss = 0.25491667
Iteration 5, loss = 0.22810535
Iteration 6, loss = 0.20780574
Iteration 7, loss = 0.19655253
Iteration 8, loss = 0.18190261
Iteration 9, loss = 0.17301074
Iteration 10, loss = 0.16354680
Iteration 11, loss = 0.15581673
Iteration 12, loss = 0.14787600
Iteration 13, loss = 0.14411010
Iteration 14, loss = 0.13676072
Iteration 15, loss = 0.13331820
Iteration 16, loss = 0.12766885
Iteration 17, loss = 0.12667783
Iteration 18, loss = 0.12127837
Iteration 19, loss = 0.11803146
Iteration 20, loss = 0.11650837
Iteration 21, loss = 0.11150647
Iteration 22, loss = 0.10964145
Iteration 23, loss = 0.10709935
Iteration 24, loss = 0.10477919
Iteration 25, loss = 0.10314670
Iteration 26, loss = 0.10091271
Iteration 27, loss = 0.09912004
Iteration 28, loss = 0.09668267
Iteration 29, loss = 0.09541126
Iteration 30, loss = 0.09379228
Iteration 31, loss = 0.09225530
Iteration 32, loss = 0.09044663
Iteration 33, loss = 0.08932181
Iteration 34, loss = 0.08734218
Iteration 35, loss = 0.08657005
Iteration 36, loss = 0.08525521
Iteration 37, loss = 0.08286328
Iteration 38, loss = 0.08245075
Iteration 39, loss = 0.08181355
Iteration 40, loss = 0.08060334
Iteration 41, loss = 0.08088245
Iteration 42, loss = 0.07917943
Iteration 43, loss = 0.07806691
Iteration 44, loss = 0.07699744
Iteration 45, loss = 0.07573095
Iteration 46, loss = 0.07595266
Iteration 47, loss = 0.07433728
Iteration 48, loss = 0.07440755
Iteration 49, loss = 0.07279722
Iteration 50, loss = 0.07309599
Iteration 51, loss = 0.07204954
Iteration 52, loss = 0.07122810
```

```
Iteration 53, loss = 0.07030596
Iteration 54, loss = 0.07008697
Iteration 55, loss = 0.06889575
Iteration 56, loss = 0.06937613
Iteration 57, loss = 0.06778512
Iteration 58, loss = 0.06716843
Iteration 59, loss = 0.06718004
Iteration 60, loss = 0.06664804
Iteration 61, loss = 0.06579025
Iteration 62, loss = 0.06520318
Iteration 63, loss = 0.06459295
Iteration 64, loss = 0.06501089
Iteration 65, loss = 0.06452231
Iteration 66, loss = 0.06322740
Iteration 67, loss = 0.06379505
Iteration 68, loss = 0.06197806
Iteration 69, loss = 0.06319014
Iteration 70, loss = 0.06245737
Iteration 71, loss = 0.06072136
Iteration 72, loss = 0.06098321
Iteration 73, loss = 0.06223373
Iteration 74, loss = 0.05989467
Iteration 75, loss = 0.06006740
Iteration 76, loss = 0.05905619
Iteration 77, loss = 0.05933904
Iteration 78, loss = 0.05911846
Iteration 79, loss = 0.05921713
Iteration 80, loss = 0.05819134
Iteration 81, loss = 0.05788982
Iteration 82, loss = 0.05770271
Iteration 83, loss = 0.05759591
Iteration 84, loss = 0.05691926
Iteration 85, loss = 0.05671552
Iteration 86, loss = 0.05730146
Iteration 87, loss = 0.05521768
Iteration 88, loss = 0.05607367
Iteration 89, loss = 0.05521348
Iteration 90, loss = 0.05555705
Iteration 91, loss = 0.05461693
Iteration 92, loss = 0.05479120
Iteration 93, loss = 0.05446193
Iteration 94, loss = 0.05372125
Iteration 95, loss = 0.05331411
Iteration 96, loss = 0.05437827
Iteration 97, loss = 0.05365237
Iteration 98, loss = 0.05340795
Iteration 99, loss = 0.05297588
Iteration 100, loss = 0.05302534
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.52268951
Iteration 2, loss = 0.41956230
Iteration 3, loss = 0.34384592
Iteration 4, loss = 0.30650088
Iteration 5, loss = 0.28199576
Iteration 6, loss = 0.26380468
Iteration 7, loss = 0.24947227
Iteration 8, loss = 0.23740323
Iteration 9, loss = 0.22738911
Iteration 10, loss = 0.21879583
Iteration 11, loss = 0.21199860
Iteration 12, loss = 0.20529802
Iteration 13, loss = 0.19903034
Iteration 14, loss = 0.19451262
Iteration 15, loss = 0.18869610
Iteration 16, loss = 0.18452067
Iteration 17, loss = 0.18106083
Iteration 18, loss = 0.17740916
Iteration 19, loss = 0.17318312
Iteration 20, loss = 0.17034845
Iteration 21, loss = 0.16699599
Iteration 22, loss = 0.16410226
Iteration 23, loss = 0.16147813
Iteration 24, loss = 0.15879815
Iteration 25, loss = 0.15683370
Iteration 26, loss = 0.15410066
Iteration 27, loss = 0.15145825
Iteration 28, loss = 0.14940328
Iteration 29, loss = 0.14726271
Iteration 30, loss = 0.14532382
Iteration 31, loss = 0.14314101
Iteration 32, loss = 0.14197686
Iteration 33, loss = 0.13992171
Iteration 34, loss = 0.13862846
Iteration 35, loss = 0.13668243
Iteration 36, loss = 0.13567522
Iteration 37, loss = 0.13407963
Iteration 38, loss = 0.13236110
Iteration 39, loss = 0.13183047
Iteration 40, loss = 0.13030065
Iteration 41, loss = 0.12814604
Iteration 42, loss = 0.12696856
Iteration 43, loss = 0.12585552
Iteration 44, loss = 0.12499302
Iteration 45, loss = 0.12397075
Iteration 46, loss = 0.12276055
Iteration 47, loss = 0.12119400
Iteration 48, loss = 0.11968581
Iteration 49, loss = 0.11892045
Iteration 50, loss = 0.11786256
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.15146347
Iteration 2, loss = 0.40209014
Iteration 3, loss = 0.34393833
Iteration 4, loss = 0.31087211
Iteration 5, loss = 0.28751635
Iteration 6, loss = 0.27003127
Iteration 7, loss = 0.25609219
Iteration 8, loss = 0.24330564
Iteration 9, loss = 0.23263102
Iteration 10, loss = 0.22326464
Iteration 11, loss = 0.21517074
Iteration 12, loss = 0.20776664
Iteration 13, loss = 0.20113692
Iteration 14, loss = 0.19535123
Iteration 15, loss = 0.19052177
Iteration 16, loss = 0.18583759
Iteration 17, loss = 0.18150438
Iteration 18, loss = 0.17758882
Iteration 19, loss = 0.17393098
Iteration 20, loss = 0.17024657
Iteration 21, loss = 0.16724215
Iteration 22, loss = 0.16429068
Iteration 23, loss = 0.16160023
Iteration 24, loss = 0.15879805
Iteration 25, loss = 0.15633439
Iteration 26, loss = 0.15430977
Iteration 27, loss = 0.15211231
Iteration 28, loss = 0.14970110
Iteration 29, loss = 0.14790230
Iteration 30, loss = 0.14564309
Iteration 31, loss = 0.14380834
Iteration 32, loss = 0.14252307
Iteration 33, loss = 0.14014247
Iteration 34, loss = 0.13888672
Iteration 35, loss = 0.13708398
Iteration 36, loss = 0.13566989
Iteration 37, loss = 0.13432020
Iteration 38, loss = 0.13274637
Iteration 39, loss = 0.13132882
Iteration 40, loss = 0.13009561
Iteration 41, loss = 0.12896247
Iteration 42, loss = 0.12718475
Iteration 43, loss = 0.12613637
Iteration 44, loss = 0.12502263
Iteration 45, loss = 0.12386003
Iteration 46, loss = 0.12281989
Iteration 47, loss = 0.12153941
Iteration 48, loss = 0.12069112
Iteration 49, loss = 0.11943591
Iteration 50, loss = 0.11826720
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.79537804
Iteration 2, loss = 0.35569750
Iteration 3, loss = 0.27735984
Iteration 4, loss = 0.24005826
Iteration 5, loss = 0.22367936
Iteration 6, loss = 0.20595972
Iteration 7, loss = 0.19279201
Iteration 8, loss = 0.18129671
Iteration 9, loss = 0.16938469
Iteration 10, loss = 0.15986086
Iteration 11, loss = 0.15530806
Iteration 12, loss = 0.14911715
Iteration 13, loss = 0.14219342
Iteration 14, loss = 0.13823590
Iteration 15, loss = 0.13335924
Iteration 16, loss = 0.12708641
Iteration 17, loss = 0.12732609
Iteration 18, loss = 0.11905568
Iteration 19, loss = 0.11778210
Iteration 20, loss = 0.11666455
Iteration 21, loss = 0.10984433
Iteration 22, loss = 0.10835154
Iteration 23, loss = 0.10361951
Iteration 24, loss = 0.10298653
Iteration 25, loss = 0.10011717
Iteration 26, loss = 0.10509650
Iteration 27, loss = 0.09731059
Iteration 28, loss = 0.09426926
Iteration 29, loss = 0.09410761
Iteration 30, loss = 0.08945032
Iteration 31, loss = 0.08996209
Iteration 32, loss = 0.09067854
Iteration 33, loss = 0.08677973
Iteration 34, loss = 0.08682311
Iteration 35, loss = 0.08192895
Iteration 36, loss = 0.08340829
Iteration 37, loss = 0.07882493
Iteration 38, loss = 0.07960748
Iteration 39, loss = 0.07968499
Iteration 40, loss = 0.07715934
Iteration 41, loss = 0.07503981
Iteration 42, loss = 0.07601929
Iteration 43, loss = 0.07573892
Iteration 44, loss = 0.07399484
Iteration 45, loss = 0.07150400
Iteration 46, loss = 0.07239814
Iteration 47, loss = 0.07080609
Iteration 48, loss = 0.06912387
Iteration 49, loss = 0.07047483
Iteration 50, loss = 0.06854873
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
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```

```
Iteration 1, loss = 1.82055208
Iteration 2, loss = 0.35375178
Iteration 3, loss = 0.28792564
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Iteration 5, loss = 0.22810535
Iteration 6, loss = 0.20780574
Iteration 7, loss = 0.19655253
Iteration 8, loss = 0.18190261
Iteration 9, loss = 0.17301074
Iteration 10, loss = 0.16354680
Iteration 11, loss = 0.15581673
Iteration 12, loss = 0.14787600
Iteration 13, loss = 0.14411010
Iteration 14, loss = 0.13676072
Iteration 15, loss = 0.13331820
Iteration 16, loss = 0.12766885
Iteration 17, loss = 0.12667783
Iteration 18, loss = 0.12127837
Iteration 19, loss = 0.11803146
Iteration 20, loss = 0.11650837
Iteration 21, loss = 0.11150647
Iteration 22, loss = 0.10964145
Iteration 23, loss = 0.10709935
Iteration 24, loss = 0.10477919
Iteration 25, loss = 0.10314670
Iteration 26, loss = 0.10091271
Iteration 27, loss = 0.09912004
Iteration 28, loss = 0.09668267
Iteration 29, loss = 0.09541126
Iteration 30, loss = 0.09379228
Iteration 31, loss = 0.09225530
Iteration 32, loss = 0.09044663
Iteration 33, loss = 0.08932181
Iteration 34, loss = 0.08734218
Iteration 35, loss = 0.08657005
Iteration 36, loss = 0.08525521
Iteration 37, loss = 0.08286328
Iteration 38, loss = 0.08245075
Iteration 39, loss = 0.08181355
Iteration 40, loss = 0.08060334
Iteration 41, loss = 0.08088245
Iteration 42, loss = 0.07917943
Iteration 43, loss = 0.07806691
Iteration 44, loss = 0.07699744
Iteration 45, loss = 0.07573095
Iteration 46, loss = 0.07595266
Iteration 47, loss = 0.07433728
Iteration 48, loss = 0.07440755
Iteration 49, loss = 0.07279722
Iteration 50, loss = 0.07309599
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
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```

```
Iteration 1, loss = 1.52268951
Iteration 2, loss = 0.41956230
Iteration 3, loss = 0.34384592
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Iteration 5, loss = 0.28199576
Iteration 6, loss = 0.26380468
Iteration 7, loss = 0.24947227
Iteration 8, loss = 0.23740323
Iteration 9, loss = 0.22738911
Iteration 10, loss = 0.21879583
Iteration 11, loss = 0.21199860
Iteration 12, loss = 0.20529802
Iteration 13, loss = 0.19903034
Iteration 14, loss = 0.19451262
Iteration 15, loss = 0.18869610
Iteration 16, loss = 0.18452067
Iteration 17, loss = 0.18106083
Iteration 18, loss = 0.17740916
Iteration 19, loss = 0.17318312
Iteration 20, loss = 0.17034845
Iteration 21, loss = 0.16699599
Iteration 22, loss = 0.16410226
Iteration 23, loss = 0.16147813
Iteration 24, loss = 0.15879815
Iteration 25, loss = 0.15683370
Iteration 26, loss = 0.15410066
Iteration 27, loss = 0.15145825
Iteration 28, loss = 0.14940328
Iteration 29, loss = 0.14726271
Iteration 30, loss = 0.14532382
Iteration 31, loss = 0.14314101
Iteration 32, loss = 0.14197686
Iteration 33, loss = 0.13992171
Iteration 34, loss = 0.13862846
Iteration 35, loss = 0.13668243
Iteration 36, loss = 0.13567522
Iteration 37, loss = 0.13407963
Iteration 38, loss = 0.13236110
Iteration 39, loss = 0.13183047
Iteration 40, loss = 0.13030065
Iteration 41, loss = 0.12814604
Iteration 42, loss = 0.12696856
Iteration 43, loss = 0.12585552
Iteration 44, loss = 0.12499302
Iteration 45, loss = 0.12397075
Iteration 46, loss = 0.12276055
Iteration 47, loss = 0.12119400
Iteration 48, loss = 0.11968581
Iteration 49, loss = 0.11892045
Iteration 50, loss = 0.11786256
Iteration 51, loss = 0.11758596
Iteration 52, loss = 0.11567055
```

```
Iteration 53, loss = 0.11517030
Iteration 54, loss = 0.11365810
Iteration 55, loss = 0.11361076
Iteration 56, loss = 0.11259153
Iteration 57, loss = 0.11197355
Iteration 58, loss = 0.11063299
Iteration 59, loss = 0.11051180
Iteration 60, loss = 0.10900965
Iteration 61, loss = 0.10830782
Iteration 62, loss = 0.10775083
Iteration 63, loss = 0.10674999
Iteration 64, loss = 0.10576233
Iteration 65, loss = 0.10501496
Iteration 66, loss = 0.10501097
Iteration 67, loss = 0.10383758
Iteration 68, loss = 0.10357395
Iteration 69, loss = 0.10267623
Iteration 70, loss = 0.10210891
Iteration 71, loss = 0.10118100
Iteration 72, loss = 0.10038325
Iteration 73, loss = 0.10026924
Iteration 74, loss = 0.09999167
Iteration 75, loss = 0.09821317
Iteration 76, loss = 0.09773510
Iteration 77, loss = 0.09728523
Iteration 78, loss = 0.09704601
Iteration 79, loss = 0.09674299
Iteration 80, loss = 0.09576108
Iteration 81, loss = 0.09510827
Iteration 82, loss = 0.09491011
Iteration 83, loss = 0.09432515
Iteration 84, loss = 0.09392071
Iteration 85, loss = 0.09321445
Iteration 86, loss = 0.09264843
Iteration 87, loss = 0.09167773
Iteration 88, loss = 0.09171813
Iteration 89, loss = 0.09145679
Iteration 90, loss = 0.09096515
Iteration 91, loss = 0.09081475
Iteration 92, loss = 0.08973413
Iteration 93, loss = 0.08930879
Iteration 94, loss = 0.08924039
Iteration 95, loss = 0.08793903
Iteration 96, loss = 0.08810975
Iteration 97, loss = 0.08821030
Iteration 98, loss = 0.08718044
Iteration 99, loss = 0.08624960
Iteration 100, loss = 0.08605742
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.15146347
Iteration 2, loss = 0.40209014
Iteration 3, loss = 0.34393833
Iteration 4, loss = 0.31087211
Iteration 5, loss = 0.28751635
Iteration 6, loss = 0.27003127
Iteration 7, loss = 0.25609219
Iteration 8, loss = 0.24330564
Iteration 9, loss = 0.23263102
Iteration 10, loss = 0.22326464
Iteration 11, loss = 0.21517074
Iteration 12, loss = 0.20776664
Iteration 13, loss = 0.20113692
Iteration 14, loss = 0.19535123
Iteration 15, loss = 0.19052177
Iteration 16, loss = 0.18583759
Iteration 17, loss = 0.18150438
Iteration 18, loss = 0.17758882
Iteration 19, loss = 0.17393098
Iteration 20, loss = 0.17024657
Iteration 21, loss = 0.16724215
Iteration 22, loss = 0.16429068
Iteration 23, loss = 0.16160023
Iteration 24, loss = 0.15879805
Iteration 25, loss = 0.15633439
Iteration 26, loss = 0.15430977
Iteration 27, loss = 0.15211231
Iteration 28, loss = 0.14970110
Iteration 29, loss = 0.14790230
Iteration 30, loss = 0.14564309
Iteration 31, loss = 0.14380834
Iteration 32, loss = 0.14252307
Iteration 33, loss = 0.14014247
Iteration 34, loss = 0.13888672
Iteration 35, loss = 0.13708398
Iteration 36, loss = 0.13566989
Iteration 37, loss = 0.13432020
Iteration 38, loss = 0.13274637
Iteration 39, loss = 0.13132882
Iteration 40, loss = 0.13009561
Iteration 41, loss = 0.12896247
Iteration 42, loss = 0.12718475
Iteration 43, loss = 0.12613637
Iteration 44, loss = 0.12502263
Iteration 45, loss = 0.12386003
Iteration 46, loss = 0.12281989
Iteration 47, loss = 0.12153941
Iteration 48, loss = 0.12069112
Iteration 49, loss = 0.11943591
Iteration 50, loss = 0.11826720
Iteration 51, loss = 0.11733946
Iteration 52, loss = 0.11609366
```

```
Iteration 53, loss = 0.11537866
Iteration 54, loss = 0.11423339
Iteration 55, loss = 0.11333455
Iteration 56, loss = 0.11270729
Iteration 57, loss = 0.11143688
Iteration 58, loss = 0.11059052
Iteration 59, loss = 0.10983559
Iteration 60, loss = 0.10887590
Iteration 61, loss = 0.10846296
Iteration 62, loss = 0.10762884
Iteration 63, loss = 0.10661766
Iteration 64, loss = 0.10574325
Iteration 65, loss = 0.10491461
Iteration 66, loss = 0.10434610
Iteration 67, loss = 0.10346694
Iteration 68, loss = 0.10272283
Iteration 69, loss = 0.10233000
Iteration 70, loss = 0.10137213
Iteration 71, loss = 0.10053517
Iteration 72, loss = 0.09980476
Iteration 73, loss = 0.09925630
Iteration 74, loss = 0.09840893
Iteration 75, loss = 0.09746460
Iteration 76, loss = 0.09713257
Iteration 77, loss = 0.09657343
Iteration 78, loss = 0.09599908
Iteration 79, loss = 0.09547769
Iteration 80, loss = 0.09496898
Iteration 81, loss = 0.09412728
Iteration 82, loss = 0.09386887
Iteration 83, loss = 0.09301486
Iteration 84, loss = 0.09229895
Iteration 85, loss = 0.09217955
Iteration 86, loss = 0.09134132
Iteration 87, loss = 0.09064872
Iteration 88, loss = 0.09047040
Iteration 89, loss = 0.09015247
Iteration 90, loss = 0.08940419
Iteration 91, loss = 0.08884301
Iteration 92, loss = 0.08849517
Iteration 93, loss = 0.08780405
Iteration 94, loss = 0.08738943
Iteration 95, loss = 0.08711571
Iteration 96, loss = 0.08653424
Iteration 97, loss = 0.08599748
Iteration 98, loss = 0.08555007
Iteration 99, loss = 0.08489437
Iteration 100, loss = 0.08465627
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.79537804
Iteration 2, loss = 0.35569750
Iteration 3, loss = 0.27735984
Iteration 4, loss = 0.24005826
Iteration 5, loss = 0.22367936
Iteration 6, loss = 0.20595972
Iteration 7, loss = 0.19279201
Iteration 8, loss = 0.18129671
Iteration 9, loss = 0.16938469
Iteration 10, loss = 0.15986086
Iteration 11, loss = 0.15530806
Iteration 12, loss = 0.14911715
Iteration 13, loss = 0.14219342
Iteration 14, loss = 0.13823590
Iteration 15, loss = 0.13335924
Iteration 16, loss = 0.12708641
Iteration 17, loss = 0.12732609
Iteration 18, loss = 0.11905568
Iteration 19, loss = 0.11778210
Iteration 20, loss = 0.11666455
Iteration 21, loss = 0.10984433
Iteration 22, loss = 0.10835154
Iteration 23, loss = 0.10361951
Iteration 24, loss = 0.10298653
Iteration 25, loss = 0.10011717
Iteration 26, loss = 0.10509650
Iteration 27, loss = 0.09731059
Iteration 28, loss = 0.09426926
Iteration 29, loss = 0.09410761
Iteration 30, loss = 0.08945032
Iteration 31, loss = 0.08996209
Iteration 32, loss = 0.09067854
Iteration 33, loss = 0.08677973
Iteration 34, loss = 0.08682311
Iteration 35, loss = 0.08192895
Iteration 36, loss = 0.08340829
Iteration 37, loss = 0.07882493
Iteration 38, loss = 0.07960748
Iteration 39, loss = 0.07968499
Iteration 40, loss = 0.07715934
Iteration 41, loss = 0.07503981
Iteration 42, loss = 0.07601929
Iteration 43, loss = 0.07573892
Iteration 44, loss = 0.07399484
Iteration 45, loss = 0.07150400
Iteration 46, loss = 0.07239814
Iteration 47, loss = 0.07080609
Iteration 48, loss = 0.06912387
Iteration 49, loss = 0.07047483
Iteration 50, loss = 0.06854873
Iteration 51, loss = 0.06906241
Iteration 52, loss = 0.06484602
```

```
Iteration 53, loss = 0.06589741
Iteration 54, loss = 0.06600969
Iteration 55, loss = 0.06517885
Iteration 56, loss = 0.06278128
Iteration 57, loss = 0.06171216
Iteration 58, loss = 0.06413221
Iteration 59, loss = 0.06241286
Iteration 60, loss = 0.06026483
Iteration 61, loss = 0.06071468
Iteration 62, loss = 0.06038451
Iteration 63, loss = 0.05912760
Iteration 64, loss = 0.05839417
Iteration 65, loss = 0.05913665
Iteration 66, loss = 0.05746514
Iteration 67, loss = 0.05736507
Iteration 68, loss = 0.05711984
Iteration 69, loss = 0.05676827
Iteration 70, loss = 0.05646317
Iteration 71, loss = 0.05583898
Iteration 72, loss = 0.05587802
Iteration 73, loss = 0.05567334
Iteration 74, loss = 0.05392670
Iteration 75, loss = 0.05432131
Iteration 76, loss = 0.05316275
Iteration 77, loss = 0.05183486
Iteration 78, loss = 0.05247515
Iteration 79, loss = 0.05340240
Iteration 80, loss = 0.05254519
Iteration 81, loss = 0.05079238
Iteration 82, loss = 0.05102039
Iteration 83, loss = 0.05088187
Iteration 84, loss = 0.04987148
Iteration 85, loss = 0.05178653
Iteration 86, loss = 0.04980135
Iteration 87, loss = 0.04911498
Iteration 88, loss = 0.04972424
Iteration 89, loss = 0.04896578
Iteration 90, loss = 0.04888881
Iteration 91, loss = 0.04831240
Iteration 92, loss = 0.04896802
Iteration 93, loss = 0.04711544
Iteration 94, loss = 0.04837178
Iteration 95, loss = 0.04699043
Iteration 96, loss = 0.04629151
Iteration 97, loss = 0.04745532
Iteration 98, loss = 0.04572501
Iteration 99, loss = 0.04636623
Iteration 100, loss = 0.04439801
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.82055208
Iteration 2, loss = 0.35375178
Iteration 3, loss = 0.28792564
Iteration 4, loss = 0.25491667
Iteration 5, loss = 0.22810535
Iteration 6, loss = 0.20780574
Iteration 7, loss = 0.19655253
Iteration 8, loss = 0.18190261
Iteration 9, loss = 0.17301074
Iteration 10, loss = 0.16354680
Iteration 11, loss = 0.15581673
Iteration 12, loss = 0.14787600
Iteration 13, loss = 0.14411010
Iteration 14, loss = 0.13676072
Iteration 15, loss = 0.13331820
Iteration 16, loss = 0.12766885
Iteration 17, loss = 0.12667783
Iteration 18, loss = 0.12127837
Iteration 19, loss = 0.11803146
Iteration 20, loss = 0.11650837
Iteration 21, loss = 0.11150647
Iteration 22, loss = 0.10964145
Iteration 23, loss = 0.10709935
Iteration 24, loss = 0.10477919
Iteration 25, loss = 0.10314670
Iteration 26, loss = 0.10091271
Iteration 27, loss = 0.09912004
Iteration 28, loss = 0.09668267
Iteration 29, loss = 0.09541126
Iteration 30, loss = 0.09379228
Iteration 31, loss = 0.09225530
Iteration 32, loss = 0.09044663
Iteration 33, loss = 0.08932181
Iteration 34, loss = 0.08734218
Iteration 35, loss = 0.08657005
Iteration 36, loss = 0.08525521
Iteration 37, loss = 0.08286328
Iteration 38, loss = 0.08245075
Iteration 39, loss = 0.08181355
Iteration 40, loss = 0.08060334
Iteration 41, loss = 0.08088245
Iteration 42, loss = 0.07917943
Iteration 43, loss = 0.07806691
Iteration 44, loss = 0.07699744
Iteration 45, loss = 0.07573095
Iteration 46, loss = 0.07595266
Iteration 47, loss = 0.07433728
Iteration 48, loss = 0.07440755
Iteration 49, loss = 0.07279722
Iteration 50, loss = 0.07309599
Iteration 51, loss = 0.07204954
Iteration 52, loss = 0.07122810
```

```
Iteration 53, loss = 0.07030596
Iteration 54, loss = 0.07008697
Iteration 55, loss = 0.06889575
Iteration 56, loss = 0.06937613
Iteration 57, loss = 0.06778512
Iteration 58, loss = 0.06716843
Iteration 59, loss = 0.06718004
Iteration 60, loss = 0.06664804
Iteration 61, loss = 0.06579025
Iteration 62, loss = 0.06520318
Iteration 63, loss = 0.06459295
Iteration 64, loss = 0.06501089
Iteration 65, loss = 0.06452231
Iteration 66, loss = 0.06322740
Iteration 67, loss = 0.06379505
Iteration 68, loss = 0.06197806
Iteration 69, loss = 0.06319014
Iteration 70, loss = 0.06245737
Iteration 71, loss = 0.06072136
Iteration 72, loss = 0.06098321
Iteration 73, loss = 0.06223373
Iteration 74, loss = 0.05989467
Iteration 75, loss = 0.06006740
Iteration 76, loss = 0.05905619
Iteration 77, loss = 0.05933904
Iteration 78, loss = 0.05911846
Iteration 79, loss = 0.05921713
Iteration 80, loss = 0.05819134
Iteration 81, loss = 0.05788982
Iteration 82, loss = 0.05770271
Iteration 83, loss = 0.05759591
Iteration 84, loss = 0.05691926
Iteration 85, loss = 0.05671552
Iteration 86, loss = 0.05730146
Iteration 87, loss = 0.05521768
Iteration 88, loss = 0.05607367
Iteration 89, loss = 0.05521348
Iteration 90, loss = 0.05555705
Iteration 91, loss = 0.05461693
Iteration 92, loss = 0.05479120
Iteration 93, loss = 0.05446193
Iteration 94, loss = 0.05372125
Iteration 95, loss = 0.05331411
Iteration 96, loss = 0.05437827
Iteration 97, loss = 0.05365237
Iteration 98, loss = 0.05340795
Iteration 99, loss = 0.05297588
Iteration 100, loss = 0.05302534
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.50163740
Iteration 2, loss = 0.43194306
Iteration 3, loss = 0.36275147
Iteration 4, loss = 0.32858425
Iteration 5, loss = 0.30588348
Iteration 6, loss = 0.28794729
Iteration 7, loss = 0.27387550
Iteration 8, loss = 0.26350600
Iteration 9, loss = 0.25356447
Iteration 10, loss = 0.24567120
Iteration 11, loss = 0.23830783
Iteration 12, loss = 0.23254144
Iteration 13, loss = 0.22670626
Iteration 14, loss = 0.22051237
Iteration 15, loss = 0.21557155
Iteration 16, loss = 0.21245853
Iteration 17, loss = 0.20855779
Iteration 18, loss = 0.20378095
Iteration 19, loss = 0.20136033
Iteration 20, loss = 0.19735238
Iteration 21, loss = 0.19500617
Iteration 22, loss = 0.19139177
Iteration 23, loss = 0.18831765
Iteration 24, loss = 0.18656088
Iteration 25, loss = 0.18393233
Iteration 26, loss = 0.18134463
Iteration 27, loss = 0.17813908
Iteration 28, loss = 0.17691717
Iteration 29, loss = 0.17468771
Iteration 30, loss = 0.17343200
Iteration 31, loss = 0.17005520
Iteration 32, loss = 0.16827957
Iteration 33, loss = 0.16665268
Iteration 34, loss = 0.16594784
Iteration 35, loss = 0.16307640
Iteration 36, loss = 0.16255913
Iteration 37, loss = 0.16038146
Iteration 38, loss = 0.15847857
Iteration 39, loss = 0.15647380
Iteration 40, loss = 0.15586585
Iteration 41, loss = 0.15463716
Iteration 42, loss = 0.15335859
Iteration 43, loss = 0.15260235
Iteration 44, loss = 0.15019665
Iteration 45, loss = 0.14947418
Iteration 46, loss = 0.14745086
Iteration 47, loss = 0.14762990
Iteration 48, loss = 0.14562610
Iteration 49, loss = 0.14434446
Iteration 50, loss = 0.14399398
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18105933
Iteration 2, loss = 0.42112866
Iteration 3, loss = 0.36483488
Iteration 4, loss = 0.33166615
Iteration 5, loss = 0.30880972
Iteration 6, loss = 0.29089494
Iteration 7, loss = 0.27649669
Iteration 8, loss = 0.26455232
Iteration 9, loss = 0.25445677
Iteration 10, loss = 0.24582540
Iteration 11, loss = 0.23804374
Iteration 12, loss = 0.23104544
Iteration 13, loss = 0.22546150
Iteration 14, loss = 0.21970918
Iteration 15, loss = 0.21408651
Iteration 16, loss = 0.20933101
Iteration 17, loss = 0.20430557
Iteration 18, loss = 0.20089827
Iteration 19, loss = 0.19646189
Iteration 20, loss = 0.19375971
Iteration 21, loss = 0.18993085
Iteration 22, loss = 0.18676812
Iteration 23, loss = 0.18374805
Iteration 24, loss = 0.18126931
Iteration 25, loss = 0.17857049
Iteration 26, loss = 0.17653620
Iteration 27, loss = 0.17357805
Iteration 28, loss = 0.17142093
Iteration 29, loss = 0.16886621
Iteration 30, loss = 0.16712429
Iteration 31, loss = 0.16511738
Iteration 32, loss = 0.16302588
Iteration 33, loss = 0.16102342
Iteration 34, loss = 0.15907785
Iteration 35, loss = 0.15707843
Iteration 36, loss = 0.15574682
Iteration 37, loss = 0.15385871
Iteration 38, loss = 0.15248506
Iteration 39, loss = 0.15115892
Iteration 40, loss = 0.14983040
Iteration 41, loss = 0.14796682
Iteration 42, loss = 0.14684532
Iteration 43, loss = 0.14558816
Iteration 44, loss = 0.14403687
Iteration 45, loss = 0.14239654
Iteration 46, loss = 0.14141237
Iteration 47, loss = 0.14026808
Iteration 48, loss = 0.13915421
Iteration 49, loss = 0.13819331
Iteration 50, loss = 0.13710067
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.63053224
Iteration 2, loss = 0.36800377
Iteration 3, loss = 0.30434566
Iteration 4, loss = 0.27091582
Iteration 5, loss = 0.25337828
Iteration 6, loss = 0.23906900
Iteration 7, loss = 0.22113058
Iteration 8, loss = 0.21162049
Iteration 9, loss = 0.20897136
Iteration 10, loss = 0.19671928
Iteration 11, loss = 0.19026307
Iteration 12, loss = 0.18284757
Iteration 13, loss = 0.18075690
Iteration 14, loss = 0.16857505
Iteration 15, loss = 0.16717012
Iteration 16, loss = 0.16492217
Iteration 17, loss = 0.15860898
Iteration 18, loss = 0.15514787
Iteration 19, loss = 0.15292264
Iteration 20, loss = 0.15226593
Iteration 21, loss = 0.14724660
Iteration 22, loss = 0.14374080
Iteration 23, loss = 0.14543107
Iteration 24, loss = 0.14263647
Iteration 25, loss = 0.13485942
Iteration 26, loss = 0.13589177
Iteration 27, loss = 0.13230521
Iteration 28, loss = 0.13171851
Iteration 29, loss = 0.13151257
Iteration 30, loss = 0.12932776
Iteration 31, loss = 0.12812941
Iteration 32, loss = 0.12924596
Iteration 33, loss = 0.12591246
Iteration 34, loss = 0.12169248
Iteration 35, loss = 0.12310255
Iteration 36, loss = 0.11892190
Iteration 37, loss = 0.12145258
Iteration 38, loss = 0.11675366
Iteration 39, loss = 0.11689659
Iteration 40, loss = 0.11529379
Iteration 41, loss = 0.11947577
Iteration 42, loss = 0.11417094
Iteration 43, loss = 0.11215659
Iteration 44, loss = 0.11159535
Iteration 45, loss = 0.11408417
Iteration 46, loss = 0.11238297
Iteration 47, loss = 0.10986600
Iteration 48, loss = 0.10939612
Iteration 49, loss = 0.10998866
Iteration 50, loss = 0.10851730
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.74118647
Iteration 2, loss = 0.37346328
Iteration 3, loss = 0.31744032
Iteration 4, loss = 0.28624224
Iteration 5, loss = 0.26069538
Iteration 6, loss = 0.24696759
Iteration 7, loss = 0.23067661
Iteration 8, loss = 0.21830264
Iteration 9, loss = 0.20815838
Iteration 10, loss = 0.20184503
Iteration 11, loss = 0.19484426
Iteration 12, loss = 0.18572701
Iteration 13, loss = 0.18070792
Iteration 14, loss = 0.17683941
Iteration 15, loss = 0.17122998
Iteration 16, loss = 0.16639477
Iteration 17, loss = 0.16410691
Iteration 18, loss = 0.16003912
Iteration 19, loss = 0.15776427
Iteration 20, loss = 0.15466355
Iteration 21, loss = 0.14972406
Iteration 22, loss = 0.14974723
Iteration 23, loss = 0.14842463
Iteration 24, loss = 0.14525655
Iteration 25, loss = 0.14281596
Iteration 26, loss = 0.14151314
Iteration 27, loss = 0.13833748
Iteration 28, loss = 0.13796811
Iteration 29, loss = 0.13654175
Iteration 30, loss = 0.13419818
Iteration 31, loss = 0.13373789
Iteration 32, loss = 0.13105485
Iteration 33, loss = 0.13044854
Iteration 34, loss = 0.13042268
Iteration 35, loss = 0.12912243
Iteration 36, loss = 0.12601125
Iteration 37, loss = 0.12606218
Iteration 38, loss = 0.12570914
Iteration 39, loss = 0.12559008
Iteration 40, loss = 0.12430057
Iteration 41, loss = 0.12406255
Iteration 42, loss = 0.12311675
Iteration 43, loss = 0.12077518
Iteration 44, loss = 0.12096347
Iteration 45, loss = 0.12112998
Iteration 46, loss = 0.11943321
Iteration 47, loss = 0.11866679
Iteration 48, loss = 0.11907931
Iteration 49, loss = 0.11663937
Iteration 50, loss = 0.11882034
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.50163740
Iteration 2, loss = 0.43194306
Iteration 3, loss = 0.36275147
Iteration 4, loss = 0.32858425
Iteration 5, loss = 0.30588348
Iteration 6, loss = 0.28794729
Iteration 7, loss = 0.27387550
Iteration 8, loss = 0.26350600
Iteration 9, loss = 0.25356447
Iteration 10, loss = 0.24567120
Iteration 11, loss = 0.23830783
Iteration 12, loss = 0.23254144
Iteration 13, loss = 0.22670626
Iteration 14, loss = 0.22051237
Iteration 15, loss = 0.21557155
Iteration 16, loss = 0.21245853
Iteration 17, loss = 0.20855779
Iteration 18, loss = 0.20378095
Iteration 19, loss = 0.20136033
Iteration 20, loss = 0.19735238
Iteration 21, loss = 0.19500617
Iteration 22, loss = 0.19139177
Iteration 23, loss = 0.18831765
Iteration 24, loss = 0.18656088
Iteration 25, loss = 0.18393233
Iteration 26, loss = 0.18134463
Iteration 27, loss = 0.17813908
Iteration 28, loss = 0.17691717
Iteration 29, loss = 0.17468771
Iteration 30, loss = 0.17343200
Iteration 31, loss = 0.17005520
Iteration 32, loss = 0.16827957
Iteration 33, loss = 0.16665268
Iteration 34, loss = 0.16594784
Iteration 35, loss = 0.16307640
Iteration 36, loss = 0.16255913
Iteration 37, loss = 0.16038146
Iteration 38, loss = 0.15847857
Iteration 39, loss = 0.15647380
Iteration 40, loss = 0.15586585
Iteration 41, loss = 0.15463716
Iteration 42, loss = 0.15335859
Iteration 43, loss = 0.15260235
Iteration 44, loss = 0.15019665
Iteration 45, loss = 0.14947418
Iteration 46, loss = 0.14745086
Iteration 47, loss = 0.14762990
Iteration 48, loss = 0.14562610
Iteration 49, loss = 0.14434446
Iteration 50, loss = 0.14399398
Iteration 51, loss = 0.14251023
Iteration 52, loss = 0.14168763
```

```
Iteration 53, loss = 0.14050537
Iteration 54, loss = 0.13885746
Iteration 55, loss = 0.13873806
Iteration 56, loss = 0.13796665
Iteration 57, loss = 0.13619154
Iteration 58, loss = 0.13578349
Iteration 59, loss = 0.13470402
Iteration 60, loss = 0.13277033
Iteration 61, loss = 0.13328575
Iteration 62, loss = 0.13198289
Iteration 63, loss = 0.13126597
Iteration 64, loss = 0.13033243
Iteration 65, loss = 0.12931378
Iteration 66, loss = 0.12919149
Iteration 67, loss = 0.12865559
Iteration 68, loss = 0.12772290
Iteration 69, loss = 0.12595904
Iteration 70, loss = 0.12558107
Iteration 71, loss = 0.12511022
Iteration 72, loss = 0.12463153
Iteration 73, loss = 0.12349932
Iteration 74, loss = 0.12360631
Iteration 75, loss = 0.12346391
Iteration 76, loss = 0.12243166
Iteration 77, loss = 0.12158274
Iteration 78, loss = 0.12040569
Iteration 79, loss = 0.11916232
Iteration 80, loss = 0.12117703
Iteration 81, loss = 0.11866389
Iteration 82, loss = 0.11765341
Iteration 83, loss = 0.11748000
Iteration 84, loss = 0.11804290
Iteration 85, loss = 0.11649995
Iteration 86, loss = 0.11594722
Iteration 87, loss = 0.11541189
Iteration 88, loss = 0.11497729
Iteration 89, loss = 0.11398550
Iteration 90, loss = 0.11460425
Iteration 91, loss = 0.11332116
Iteration 92, loss = 0.11335277
Iteration 93, loss = 0.11198592
Iteration 94, loss = 0.11162032
Iteration 95, loss = 0.11214682
Iteration 96, loss = 0.11122425
Iteration 97, loss = 0.11140464
Iteration 98, loss = 0.10985026
Iteration 99, loss = 0.10925814
Iteration 100, loss = 0.10898448
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18105933
Iteration 2, loss = 0.42112866
Iteration 3, loss = 0.36483488
Iteration 4, loss = 0.33166615
Iteration 5, loss = 0.30880972
Iteration 6, loss = 0.29089494
Iteration 7, loss = 0.27649669
Iteration 8, loss = 0.26455232
Iteration 9, loss = 0.25445677
Iteration 10, loss = 0.24582540
Iteration 11, loss = 0.23804374
Iteration 12, loss = 0.23104544
Iteration 13, loss = 0.22546150
Iteration 14, loss = 0.21970918
Iteration 15, loss = 0.21408651
Iteration 16, loss = 0.20933101
Iteration 17, loss = 0.20430557
Iteration 18, loss = 0.20089827
Iteration 19, loss = 0.19646189
Iteration 20, loss = 0.19375971
Iteration 21, loss = 0.18993085
Iteration 22, loss = 0.18676812
Iteration 23, loss = 0.18374805
Iteration 24, loss = 0.18126931
Iteration 25, loss = 0.17857049
Iteration 26, loss = 0.17653620
Iteration 27, loss = 0.17357805
Iteration 28, loss = 0.17142093
Iteration 29, loss = 0.16886621
Iteration 30, loss = 0.16712429
Iteration 31, loss = 0.16511738
Iteration 32, loss = 0.16302588
Iteration 33, loss = 0.16102342
Iteration 34, loss = 0.15907785
Iteration 35, loss = 0.15707843
Iteration 36, loss = 0.15574682
Iteration 37, loss = 0.15385871
Iteration 38, loss = 0.15248506
Iteration 39, loss = 0.15115892
Iteration 40, loss = 0.14983040
Iteration 41, loss = 0.14796682
Iteration 42, loss = 0.14684532
Iteration 43, loss = 0.14558816
Iteration 44, loss = 0.14403687
Iteration 45, loss = 0.14239654
Iteration 46, loss = 0.14141237
Iteration 47, loss = 0.14026808
Iteration 48, loss = 0.13915421
Iteration 49, loss = 0.13819331
Iteration 50, loss = 0.13710067
Iteration 51, loss = 0.13594493
Iteration 52, loss = 0.13461776
```

```
Iteration 53, loss = 0.13403627
Iteration 54, loss = 0.13249313
Iteration 55, loss = 0.13177895
Iteration 56, loss = 0.13037836
Iteration 57, loss = 0.12939024
Iteration 58, loss = 0.12864977
Iteration 59, loss = 0.12793250
Iteration 60, loss = 0.12659073
Iteration 61, loss = 0.12574432
Iteration 62, loss = 0.12499077
Iteration 63, loss = 0.12463465
Iteration 64, loss = 0.12350785
Iteration 65, loss = 0.12271521
Iteration 66, loss = 0.12190912
Iteration 67, loss = 0.12105701
Iteration 68, loss = 0.12004038
Iteration 69, loss = 0.11941497
Iteration 70, loss = 0.11861874
Iteration 71, loss = 0.11820188
Iteration 72, loss = 0.11723044
Iteration 73, loss = 0.11634512
Iteration 74, loss = 0.11578905
Iteration 75, loss = 0.11522691
Iteration 76, loss = 0.11438532
Iteration 77, loss = 0.11352666
Iteration 78, loss = 0.11323904
Iteration 79, loss = 0.11208109
Iteration 80, loss = 0.11205429
Iteration 81, loss = 0.11120927
Iteration 82, loss = 0.11036984
Iteration 83, loss = 0.11013549
Iteration 84, loss = 0.10908400
Iteration 85, loss = 0.10883019
Iteration 86, loss = 0.10819511
Iteration 87, loss = 0.10759605
Iteration 88, loss = 0.10652232
Iteration 89, loss = 0.10643424
Iteration 90, loss = 0.10584851
Iteration 91, loss = 0.10542608
Iteration 92, loss = 0.10466555
Iteration 93, loss = 0.10442939
Iteration 94, loss = 0.10365984
Iteration 95, loss = 0.10316269
Iteration 96, loss = 0.10250505
Iteration 97, loss = 0.10221863
Iteration 98, loss = 0.10203616
Iteration 99, loss = 0.10115041
Iteration 100, loss = 0.10101427
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.63053224
Iteration 2, loss = 0.36800377
Iteration 3, loss = 0.30434566
Iteration 4, loss = 0.27091582
Iteration 5, loss = 0.25337828
Iteration 6, loss = 0.23906900
Iteration 7, loss = 0.22113058
Iteration 8, loss = 0.21162049
Iteration 9, loss = 0.20897136
Iteration 10, loss = 0.19671928
Iteration 11, loss = 0.19026307
Iteration 12, loss = 0.18284757
Iteration 13, loss = 0.18075690
Iteration 14, loss = 0.16857505
Iteration 15, loss = 0.16717012
Iteration 16, loss = 0.16492217
Iteration 17, loss = 0.15860898
Iteration 18, loss = 0.15514787
Iteration 19, loss = 0.15292264
Iteration 20, loss = 0.15226593
Iteration 21, loss = 0.14724660
Iteration 22, loss = 0.14374080
Iteration 23, loss = 0.14543107
Iteration 24, loss = 0.14263647
Iteration 25, loss = 0.13485942
Iteration 26, loss = 0.13589177
Iteration 27, loss = 0.13230521
Iteration 28, loss = 0.13171851
Iteration 29, loss = 0.13151257
Iteration 30, loss = 0.12932776
Iteration 31, loss = 0.12812941
Iteration 32, loss = 0.12924596
Iteration 33, loss = 0.12591246
Iteration 34, loss = 0.12169248
Iteration 35, loss = 0.12310255
Iteration 36, loss = 0.11892190
Iteration 37, loss = 0.12145258
Iteration 38, loss = 0.11675366
Iteration 39, loss = 0.11689659
Iteration 40, loss = 0.11529379
Iteration 41, loss = 0.11947577
Iteration 42, loss = 0.11417094
Iteration 43, loss = 0.11215659
Iteration 44, loss = 0.11159535
Iteration 45, loss = 0.11408417
Iteration 46, loss = 0.11238297
Iteration 47, loss = 0.10986600
Iteration 48, loss = 0.10939612
Iteration 49, loss = 0.10998866
Iteration 50, loss = 0.10851730
Iteration 51, loss = 0.10876386
Iteration 52, loss = 0.10794998
```

```
Iteration 53, loss = 0.10570979
Iteration 54, loss = 0.10603867
Iteration 55, loss = 0.10659256
Iteration 56, loss = 0.10679533
Iteration 57, loss = 0.10365312
Iteration 58, loss = 0.10585303
Iteration 59, loss = 0.10391812
Iteration 60, loss = 0.10437027
Iteration 61, loss = 0.10754719
Iteration 62, loss = 0.10172431
Iteration 63, loss = 0.10190850
Iteration 64, loss = 0.10105322
Iteration 65, loss = 0.10209199
Iteration 66, loss = 0.10188718
Iteration 67, loss = 0.10248065
Iteration 68, loss = 0.10146889
Iteration 69, loss = 0.10061162
Iteration 70, loss = 0.10042604
Iteration 71, loss = 0.09900922
Iteration 72, loss = 0.10084689
Iteration 73, loss = 0.09769134
Iteration 74, loss = 0.09943000
Iteration 75, loss = 0.09715785
Iteration 76, loss = 0.09746215
Iteration 77, loss = 0.09640787
Iteration 78, loss = 0.09902508
Iteration 79, loss = 0.09713241
Iteration 80, loss = 0.09678748
Iteration 81, loss = 0.09786190
Iteration 82, loss = 0.09402564
Iteration 83, loss = 0.09763573
Iteration 84, loss = 0.09724111
Iteration 85, loss = 0.09582293
Iteration 86, loss = 0.09474450
Iteration 87, loss = 0.09562231
Iteration 88, loss = 0.09590602
Iteration 89, loss = 0.09354726
Iteration 90, loss = 0.09247104
Iteration 91, loss = 0.09694007
Iteration 92, loss = 0.09376177
Iteration 93, loss = 0.09533974
Iteration 94, loss = 0.09166855
Iteration 95, loss = 0.09347854
Iteration 96, loss = 0.09462972
Iteration 97, loss = 0.09182904
Iteration 98, loss = 0.09143512
Iteration 99, loss = 0.09172267
Iteration 100, loss = 0.09291215
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.74118647
Iteration 2, loss = 0.37346328
Iteration 3, loss = 0.31744032
Iteration 4, loss = 0.28624224
Iteration 5, loss = 0.26069538
Iteration 6, loss = 0.24696759
Iteration 7, loss = 0.23067661
Iteration 8, loss = 0.21830264
Iteration 9, loss = 0.20815838
Iteration 10, loss = 0.20184503
Iteration 11, loss = 0.19484426
Iteration 12, loss = 0.18572701
Iteration 13, loss = 0.18070792
Iteration 14, loss = 0.17683941
Iteration 15, loss = 0.17122998
Iteration 16, loss = 0.16639477
Iteration 17, loss = 0.16410691
Iteration 18, loss = 0.16003912
Iteration 19, loss = 0.15776427
Iteration 20, loss = 0.15466355
Iteration 21, loss = 0.14972406
Iteration 22, loss = 0.14974723
Iteration 23, loss = 0.14842463
Iteration 24, loss = 0.14525655
Iteration 25, loss = 0.14281596
Iteration 26, loss = 0.14151314
Iteration 27, loss = 0.13833748
Iteration 28, loss = 0.13796811
Iteration 29, loss = 0.13654175
Iteration 30, loss = 0.13419818
Iteration 31, loss = 0.13373789
Iteration 32, loss = 0.13105485
Iteration 33, loss = 0.13044854
Iteration 34, loss = 0.13042268
Iteration 35, loss = 0.12912243
Iteration 36, loss = 0.12601125
Iteration 37, loss = 0.12606218
Iteration 38, loss = 0.12570914
Iteration 39, loss = 0.12559008
Iteration 40, loss = 0.12430057
Iteration 41, loss = 0.12406255
Iteration 42, loss = 0.12311675
Iteration 43, loss = 0.12077518
Iteration 44, loss = 0.12096347
Iteration 45, loss = 0.12112998
Iteration 46, loss = 0.11943321
Iteration 47, loss = 0.11866679
Iteration 48, loss = 0.11907931
Iteration 49, loss = 0.11663937
Iteration 50, loss = 0.11882034
Iteration 51, loss = 0.11638867
Iteration 52, loss = 0.11698529
```

```
Iteration 53, loss = 0.11732050
Iteration 54, loss = 0.11466869
Iteration 55, loss = 0.11505154
Iteration 56, loss = 0.11426684
Iteration 57, loss = 0.11395603
Iteration 58, loss = 0.11329393
Iteration 59, loss = 0.11356173
Iteration 60, loss = 0.11355365
Iteration 61, loss = 0.11027543
Iteration 62, loss = 0.11199928
Iteration 63, loss = 0.11160752
Iteration 64, loss = 0.11243251
Iteration 65, loss = 0.10992905
Iteration 66, loss = 0.11063020
Iteration 67, loss = 0.11077747
Iteration 68, loss = 0.11008915
Iteration 69, loss = 0.11085177
Iteration 70, loss = 0.10893044
Iteration 71, loss = 0.10957467
Iteration 72, loss = 0.10766492
Iteration 73, loss = 0.10862409
Iteration 74, loss = 0.10974297
Iteration 75, loss = 0.10740849
Iteration 76, loss = 0.10826660
Iteration 77, loss = 0.10768752
Iteration 78, loss = 0.10719273
Iteration 79, loss = 0.10666771
Iteration 80, loss = 0.10662075
Iteration 81, loss = 0.10568341
Iteration 82, loss = 0.10727333
Iteration 83, loss = 0.10666030
Iteration 84, loss = 0.10575713
Iteration 85, loss = 0.10574702
Iteration 86, loss = 0.10524766
Iteration 87, loss = 0.10563374
Iteration 88, loss = 0.10685063
Iteration 89, loss = 0.10493245
Iteration 90, loss = 0.10313256
Iteration 91, loss = 0.10419775
Iteration 92, loss = 0.10503940
Iteration 93, loss = 0.10379157
Iteration 94, loss = 0.10329629
Iteration 95, loss = 0.10345229
Iteration 96, loss = 0.10436617
Iteration 97, loss = 0.10360320
Iteration 98, loss = 0.10507953
Iteration 99, loss = 0.10351619
Iteration 100, loss = 0.10446143
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.50163740
Iteration 2, loss = 0.43194306
Iteration 3, loss = 0.36275147
Iteration 4, loss = 0.32858425
Iteration 5, loss = 0.30588348
Iteration 6, loss = 0.28794729
Iteration 7, loss = 0.27387550
Iteration 8, loss = 0.26350600
Iteration 9, loss = 0.25356447
Iteration 10, loss = 0.24567120
Iteration 11, loss = 0.23830783
Iteration 12, loss = 0.23254144
Iteration 13, loss = 0.22670626
Iteration 14, loss = 0.22051237
Iteration 15, loss = 0.21557155
Iteration 16, loss = 0.21245853
Iteration 17, loss = 0.20855779
Iteration 18, loss = 0.20378095
Iteration 19, loss = 0.20136033
Iteration 20, loss = 0.19735238
Iteration 21, loss = 0.19500617
Iteration 22, loss = 0.19139177
Iteration 23, loss = 0.18831765
Iteration 24, loss = 0.18656088
Iteration 25, loss = 0.18393233
Iteration 26, loss = 0.18134463
Iteration 27, loss = 0.17813908
Iteration 28, loss = 0.17691717
Iteration 29, loss = 0.17468771
Iteration 30, loss = 0.17343200
Iteration 31, loss = 0.17005520
Iteration 32, loss = 0.16827957
Iteration 33, loss = 0.16665268
Iteration 34, loss = 0.16594784
Iteration 35, loss = 0.16307640
Iteration 36, loss = 0.16255913
Iteration 37, loss = 0.16038146
Iteration 38, loss = 0.15847857
Iteration 39, loss = 0.15647380
Iteration 40, loss = 0.15586585
Iteration 41, loss = 0.15463716
Iteration 42, loss = 0.15335859
Iteration 43, loss = 0.15260235
Iteration 44, loss = 0.15019665
Iteration 45, loss = 0.14947418
Iteration 46, loss = 0.14745086
Iteration 47, loss = 0.14762990
Iteration 48, loss = 0.14562610
Iteration 49, loss = 0.14434446
Iteration 50, loss = 0.14399398
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18105933
Iteration 2, loss = 0.42112866
Iteration 3, loss = 0.36483488
Iteration 4, loss = 0.33166615
Iteration 5, loss = 0.30880972
Iteration 6, loss = 0.29089494
Iteration 7, loss = 0.27649669
Iteration 8, loss = 0.26455232
Iteration 9, loss = 0.25445677
Iteration 10, loss = 0.24582540
Iteration 11, loss = 0.23804374
Iteration 12, loss = 0.23104544
Iteration 13, loss = 0.22546150
Iteration 14, loss = 0.21970918
Iteration 15, loss = 0.21408651
Iteration 16, loss = 0.20933101
Iteration 17, loss = 0.20430557
Iteration 18, loss = 0.20089827
Iteration 19, loss = 0.19646189
Iteration 20, loss = 0.19375971
Iteration 21, loss = 0.18993085
Iteration 22, loss = 0.18676812
Iteration 23, loss = 0.18374805
Iteration 24, loss = 0.18126931
Iteration 25, loss = 0.17857049
Iteration 26, loss = 0.17653620
Iteration 27, loss = 0.17357805
Iteration 28, loss = 0.17142093
Iteration 29, loss = 0.16886621
Iteration 30, loss = 0.16712429
Iteration 31, loss = 0.16511738
Iteration 32, loss = 0.16302588
Iteration 33, loss = 0.16102342
Iteration 34, loss = 0.15907785
Iteration 35, loss = 0.15707843
Iteration 36, loss = 0.15574682
Iteration 37, loss = 0.15385871
Iteration 38, loss = 0.15248506
Iteration 39, loss = 0.15115892
Iteration 40, loss = 0.14983040
Iteration 41, loss = 0.14796682
Iteration 42, loss = 0.14684532
Iteration 43, loss = 0.14558816
Iteration 44, loss = 0.14403687
Iteration 45, loss = 0.14239654
Iteration 46, loss = 0.14141237
Iteration 47, loss = 0.14026808
Iteration 48, loss = 0.13915421
Iteration 49, loss = 0.13819331
Iteration 50, loss = 0.13710067
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.63053224
Iteration 2, loss = 0.36800377
Iteration 3, loss = 0.30434566
Iteration 4, loss = 0.27091582
Iteration 5, loss = 0.25337828
Iteration 6, loss = 0.23906900
Iteration 7, loss = 0.22113058
Iteration 8, loss = 0.21162049
Iteration 9, loss = 0.20897136
Iteration 10, loss = 0.19671928
Iteration 11, loss = 0.19026307
Iteration 12, loss = 0.18284757
Iteration 13, loss = 0.18075690
Iteration 14, loss = 0.16857505
Iteration 15, loss = 0.16717012
Iteration 16, loss = 0.16492217
Iteration 17, loss = 0.15860898
Iteration 18, loss = 0.15514787
Iteration 19, loss = 0.15292264
Iteration 20, loss = 0.15226593
Iteration 21, loss = 0.14724660
Iteration 22, loss = 0.14374080
Iteration 23, loss = 0.14543107
Iteration 24, loss = 0.14263647
Iteration 25, loss = 0.13485942
Iteration 26, loss = 0.13589177
Iteration 27, loss = 0.13230521
Iteration 28, loss = 0.13171851
Iteration 29, loss = 0.13151257
Iteration 30, loss = 0.12932776
Iteration 31, loss = 0.12812941
Iteration 32, loss = 0.12924596
Iteration 33, loss = 0.12591246
Iteration 34, loss = 0.12169248
Iteration 35, loss = 0.12310255
Iteration 36, loss = 0.11892190
Iteration 37, loss = 0.12145258
Iteration 38, loss = 0.11675366
Iteration 39, loss = 0.11689659
Iteration 40, loss = 0.11529379
Iteration 41, loss = 0.11947577
Iteration 42, loss = 0.11417094
Iteration 43, loss = 0.11215659
Iteration 44, loss = 0.11159535
Iteration 45, loss = 0.11408417
Iteration 46, loss = 0.11238297
Iteration 47, loss = 0.10986600
Iteration 48, loss = 0.10939612
Iteration 49, loss = 0.10998866
Iteration 50, loss = 0.10851730
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.74118647
Iteration 2, loss = 0.37346328
Iteration 3, loss = 0.31744032
Iteration 4, loss = 0.28624224
Iteration 5, loss = 0.26069538
Iteration 6, loss = 0.24696759
Iteration 7, loss = 0.23067661
Iteration 8, loss = 0.21830264
Iteration 9, loss = 0.20815838
Iteration 10, loss = 0.20184503
Iteration 11, loss = 0.19484426
Iteration 12, loss = 0.18572701
Iteration 13, loss = 0.18070792
Iteration 14, loss = 0.17683941
Iteration 15, loss = 0.17122998
Iteration 16, loss = 0.16639477
Iteration 17, loss = 0.16410691
Iteration 18, loss = 0.16003912
Iteration 19, loss = 0.15776427
Iteration 20, loss = 0.15466355
Iteration 21, loss = 0.14972406
Iteration 22, loss = 0.14974723
Iteration 23, loss = 0.14842463
Iteration 24, loss = 0.14525655
Iteration 25, loss = 0.14281596
Iteration 26, loss = 0.14151314
Iteration 27, loss = 0.13833748
Iteration 28, loss = 0.13796811
Iteration 29, loss = 0.13654175
Iteration 30, loss = 0.13419818
Iteration 31, loss = 0.13373789
Iteration 32, loss = 0.13105485
Iteration 33, loss = 0.13044854
Iteration 34, loss = 0.13042268
Iteration 35, loss = 0.12912243
Iteration 36, loss = 0.12601125
Iteration 37, loss = 0.12606218
Iteration 38, loss = 0.12570914
Iteration 39, loss = 0.12559008
Iteration 40, loss = 0.12430057
Iteration 41, loss = 0.12406255
Iteration 42, loss = 0.12311675
Iteration 43, loss = 0.12077518
Iteration 44, loss = 0.12096347
Iteration 45, loss = 0.12112998
Iteration 46, loss = 0.11943321
Iteration 47, loss = 0.11866679
Iteration 48, loss = 0.11907931
Iteration 49, loss = 0.11663937
Iteration 50, loss = 0.11882034
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.50163740
Iteration 2, loss = 0.43194306
Iteration 3, loss = 0.36275147
Iteration 4, loss = 0.32858425
Iteration 5, loss = 0.30588348
Iteration 6, loss = 0.28794729
Iteration 7, loss = 0.27387550
Iteration 8, loss = 0.26350600
Iteration 9, loss = 0.25356447
Iteration 10, loss = 0.24567120
Iteration 11, loss = 0.23830783
Iteration 12, loss = 0.23254144
Iteration 13, loss = 0.22670626
Iteration 14, loss = 0.22051237
Iteration 15, loss = 0.21557155
Iteration 16, loss = 0.21245853
Iteration 17, loss = 0.20855779
Iteration 18, loss = 0.20378095
Iteration 19, loss = 0.20136033
Iteration 20, loss = 0.19735238
Iteration 21, loss = 0.19500617
Iteration 22, loss = 0.19139177
Iteration 23, loss = 0.18831765
Iteration 24, loss = 0.18656088
Iteration 25, loss = 0.18393233
Iteration 26, loss = 0.18134463
Iteration 27, loss = 0.17813908
Iteration 28, loss = 0.17691717
Iteration 29, loss = 0.17468771
Iteration 30, loss = 0.17343200
Iteration 31, loss = 0.17005520
Iteration 32, loss = 0.16827957
Iteration 33, loss = 0.16665268
Iteration 34, loss = 0.16594784
Iteration 35, loss = 0.16307640
Iteration 36, loss = 0.16255913
Iteration 37, loss = 0.16038146
Iteration 38, loss = 0.15847857
Iteration 39, loss = 0.15647380
Iteration 40, loss = 0.15586585
Iteration 41, loss = 0.15463716
Iteration 42, loss = 0.15335859
Iteration 43, loss = 0.15260235
Iteration 44, loss = 0.15019665
Iteration 45, loss = 0.14947418
Iteration 46, loss = 0.14745086
Iteration 47, loss = 0.14762990
Iteration 48, loss = 0.14562610
Iteration 49, loss = 0.14434446
Iteration 50, loss = 0.14399398
Iteration 51, loss = 0.14251023
Iteration 52, loss = 0.14168763
```

```
Iteration 53, loss = 0.14050537
Iteration 54, loss = 0.13885746
Iteration 55, loss = 0.13873806
Iteration 56, loss = 0.13796665
Iteration 57, loss = 0.13619154
Iteration 58, loss = 0.13578349
Iteration 59, loss = 0.13470402
Iteration 60, loss = 0.13277033
Iteration 61, loss = 0.13328575
Iteration 62, loss = 0.13198289
Iteration 63, loss = 0.13126597
Iteration 64, loss = 0.13033243
Iteration 65, loss = 0.12931378
Iteration 66, loss = 0.12919149
Iteration 67, loss = 0.12865559
Iteration 68, loss = 0.12772290
Iteration 69, loss = 0.12595904
Iteration 70, loss = 0.12558107
Iteration 71, loss = 0.12511022
Iteration 72, loss = 0.12463153
Iteration 73, loss = 0.12349932
Iteration 74, loss = 0.12360631
Iteration 75, loss = 0.12346391
Iteration 76, loss = 0.12243166
Iteration 77, loss = 0.12158274
Iteration 78, loss = 0.12040569
Iteration 79, loss = 0.11916232
Iteration 80, loss = 0.12117703
Iteration 81, loss = 0.11866389
Iteration 82, loss = 0.11765341
Iteration 83, loss = 0.11748000
Iteration 84, loss = 0.11804290
Iteration 85, loss = 0.11649995
Iteration 86, loss = 0.11594722
Iteration 87, loss = 0.11541189
Iteration 88, loss = 0.11497729
Iteration 89, loss = 0.11398550
Iteration 90, loss = 0.11460425
Iteration 91, loss = 0.11332116
Iteration 92, loss = 0.11335277
Iteration 93, loss = 0.11198592
Iteration 94, loss = 0.11162032
Iteration 95, loss = 0.11214682
Iteration 96, loss = 0.11122425
Iteration 97, loss = 0.11140464
Iteration 98, loss = 0.10985026
Iteration 99, loss = 0.10925814
Iteration 100, loss = 0.10898448
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18105933
Iteration 2, loss = 0.42112866
Iteration 3, loss = 0.36483488
Iteration 4, loss = 0.33166615
Iteration 5, loss = 0.30880972
Iteration 6, loss = 0.29089494
Iteration 7, loss = 0.27649669
Iteration 8, loss = 0.26455232
Iteration 9, loss = 0.25445677
Iteration 10, loss = 0.24582540
Iteration 11, loss = 0.23804374
Iteration 12, loss = 0.23104544
Iteration 13, loss = 0.22546150
Iteration 14, loss = 0.21970918
Iteration 15, loss = 0.21408651
Iteration 16, loss = 0.20933101
Iteration 17, loss = 0.20430557
Iteration 18, loss = 0.20089827
Iteration 19, loss = 0.19646189
Iteration 20, loss = 0.19375971
Iteration 21, loss = 0.18993085
Iteration 22, loss = 0.18676812
Iteration 23, loss = 0.18374805
Iteration 24, loss = 0.18126931
Iteration 25, loss = 0.17857049
Iteration 26, loss = 0.17653620
Iteration 27, loss = 0.17357805
Iteration 28, loss = 0.17142093
Iteration 29, loss = 0.16886621
Iteration 30, loss = 0.16712429
Iteration 31, loss = 0.16511738
Iteration 32, loss = 0.16302588
Iteration 33, loss = 0.16102342
Iteration 34, loss = 0.15907785
Iteration 35, loss = 0.15707843
Iteration 36, loss = 0.15574682
Iteration 37, loss = 0.15385871
Iteration 38, loss = 0.15248506
Iteration 39, loss = 0.15115892
Iteration 40, loss = 0.14983040
Iteration 41, loss = 0.14796682
Iteration 42, loss = 0.14684532
Iteration 43, loss = 0.14558816
Iteration 44, loss = 0.14403687
Iteration 45, loss = 0.14239654
Iteration 46, loss = 0.14141237
Iteration 47, loss = 0.14026808
Iteration 48, loss = 0.13915421
Iteration 49, loss = 0.13819331
Iteration 50, loss = 0.13710067
Iteration 51, loss = 0.13594493
Iteration 52, loss = 0.13461776
```

```
Iteration 53, loss = 0.13403627
Iteration 54, loss = 0.13249313
Iteration 55, loss = 0.13177895
Iteration 56, loss = 0.13037836
Iteration 57, loss = 0.12939024
Iteration 58, loss = 0.12864977
Iteration 59, loss = 0.12793250
Iteration 60, loss = 0.12659073
Iteration 61, loss = 0.12574432
Iteration 62, loss = 0.12499077
Iteration 63, loss = 0.12463465
Iteration 64, loss = 0.12350785
Iteration 65, loss = 0.12271521
Iteration 66, loss = 0.12190912
Iteration 67, loss = 0.12105701
Iteration 68, loss = 0.12004038
Iteration 69, loss = 0.11941497
Iteration 70, loss = 0.11861874
Iteration 71, loss = 0.11820188
Iteration 72, loss = 0.11723044
Iteration 73, loss = 0.11634512
Iteration 74, loss = 0.11578905
Iteration 75, loss = 0.11522691
Iteration 76, loss = 0.11438532
Iteration 77, loss = 0.11352666
Iteration 78, loss = 0.11323904
Iteration 79, loss = 0.11208109
Iteration 80, loss = 0.11205429
Iteration 81, loss = 0.11120927
Iteration 82, loss = 0.11036984
Iteration 83, loss = 0.11013549
Iteration 84, loss = 0.10908400
Iteration 85, loss = 0.10883019
Iteration 86, loss = 0.10819511
Iteration 87, loss = 0.10759605
Iteration 88, loss = 0.10652232
Iteration 89, loss = 0.10643424
Iteration 90, loss = 0.10584851
Iteration 91, loss = 0.10542608
Iteration 92, loss = 0.10466555
Iteration 93, loss = 0.10442939
Iteration 94, loss = 0.10365984
Iteration 95, loss = 0.10316269
Iteration 96, loss = 0.10250505
Iteration 97, loss = 0.10221863
Iteration 98, loss = 0.10203616
Iteration 99, loss = 0.10115041
Iteration 100, loss = 0.10101427
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.63053224
Iteration 2, loss = 0.36800377
Iteration 3, loss = 0.30434566
Iteration 4, loss = 0.27091582
Iteration 5, loss = 0.25337828
Iteration 6, loss = 0.23906900
Iteration 7, loss = 0.22113058
Iteration 8, loss = 0.21162049
Iteration 9, loss = 0.20897136
Iteration 10, loss = 0.19671928
Iteration 11, loss = 0.19026307
Iteration 12, loss = 0.18284757
Iteration 13, loss = 0.18075690
Iteration 14, loss = 0.16857505
Iteration 15, loss = 0.16717012
Iteration 16, loss = 0.16492217
Iteration 17, loss = 0.15860898
Iteration 18, loss = 0.15514787
Iteration 19, loss = 0.15292264
Iteration 20, loss = 0.15226593
Iteration 21, loss = 0.14724660
Iteration 22, loss = 0.14374080
Iteration 23, loss = 0.14543107
Iteration 24, loss = 0.14263647
Iteration 25, loss = 0.13485942
Iteration 26, loss = 0.13589177
Iteration 27, loss = 0.13230521
Iteration 28, loss = 0.13171851
Iteration 29, loss = 0.13151257
Iteration 30, loss = 0.12932776
Iteration 31, loss = 0.12812941
Iteration 32, loss = 0.12924596
Iteration 33, loss = 0.12591246
Iteration 34, loss = 0.12169248
Iteration 35, loss = 0.12310255
Iteration 36, loss = 0.11892190
Iteration 37, loss = 0.12145258
Iteration 38, loss = 0.11675366
Iteration 39, loss = 0.11689659
Iteration 40, loss = 0.11529379
Iteration 41, loss = 0.11947577
Iteration 42, loss = 0.11417094
Iteration 43, loss = 0.11215659
Iteration 44, loss = 0.11159535
Iteration 45, loss = 0.11408417
Iteration 46, loss = 0.11238297
Iteration 47, loss = 0.10986600
Iteration 48, loss = 0.10939612
Iteration 49, loss = 0.10998866
Iteration 50, loss = 0.10851730
Iteration 51, loss = 0.10876386
Iteration 52, loss = 0.10794998
```

```
Iteration 53, loss = 0.10570979
Iteration 54, loss = 0.10603867
Iteration 55, loss = 0.10659256
Iteration 56, loss = 0.10679533
Iteration 57, loss = 0.10365312
Iteration 58, loss = 0.10585303
Iteration 59, loss = 0.10391812
Iteration 60, loss = 0.10437027
Iteration 61, loss = 0.10754719
Iteration 62, loss = 0.10172431
Iteration 63, loss = 0.10190850
Iteration 64, loss = 0.10105322
Iteration 65, loss = 0.10209199
Iteration 66, loss = 0.10188718
Iteration 67, loss = 0.10248065
Iteration 68, loss = 0.10146889
Iteration 69, loss = 0.10061162
Iteration 70, loss = 0.10042604
Iteration 71, loss = 0.09900922
Iteration 72, loss = 0.10084689
Iteration 73, loss = 0.09769134
Iteration 74, loss = 0.09943000
Iteration 75, loss = 0.09715785
Iteration 76, loss = 0.09746215
Iteration 77, loss = 0.09640787
Iteration 78, loss = 0.09902508
Iteration 79, loss = 0.09713241
Iteration 80, loss = 0.09678748
Iteration 81, loss = 0.09786190
Iteration 82, loss = 0.09402564
Iteration 83, loss = 0.09763573
Iteration 84, loss = 0.09724111
Iteration 85, loss = 0.09582293
Iteration 86, loss = 0.09474450
Iteration 87, loss = 0.09562231
Iteration 88, loss = 0.09590602
Iteration 89, loss = 0.09354726
Iteration 90, loss = 0.09247104
Iteration 91, loss = 0.09694007
Iteration 92, loss = 0.09376177
Iteration 93, loss = 0.09533974
Iteration 94, loss = 0.09166855
Iteration 95, loss = 0.09347854
Iteration 96, loss = 0.09462972
Iteration 97, loss = 0.09182904
Iteration 98, loss = 0.09143512
Iteration 99, loss = 0.09172267
Iteration 100, loss = 0.09291215
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.74118647
Iteration 2, loss = 0.37346328
Iteration 3, loss = 0.31744032
Iteration 4, loss = 0.28624224
Iteration 5, loss = 0.26069538
Iteration 6, loss = 0.24696759
Iteration 7, loss = 0.23067661
Iteration 8, loss = 0.21830264
Iteration 9, loss = 0.20815838
Iteration 10, loss = 0.20184503
Iteration 11, loss = 0.19484426
Iteration 12, loss = 0.18572701
Iteration 13, loss = 0.18070792
Iteration 14, loss = 0.17683941
Iteration 15, loss = 0.17122998
Iteration 16, loss = 0.16639477
Iteration 17, loss = 0.16410691
Iteration 18, loss = 0.16003912
Iteration 19, loss = 0.15776427
Iteration 20, loss = 0.15466355
Iteration 21, loss = 0.14972406
Iteration 22, loss = 0.14974723
Iteration 23, loss = 0.14842463
Iteration 24, loss = 0.14525655
Iteration 25, loss = 0.14281596
Iteration 26, loss = 0.14151314
Iteration 27, loss = 0.13833748
Iteration 28, loss = 0.13796811
Iteration 29, loss = 0.13654175
Iteration 30, loss = 0.13419818
Iteration 31, loss = 0.13373789
Iteration 32, loss = 0.13105485
Iteration 33, loss = 0.13044854
Iteration 34, loss = 0.13042268
Iteration 35, loss = 0.12912243
Iteration 36, loss = 0.12601125
Iteration 37, loss = 0.12606218
Iteration 38, loss = 0.12570914
Iteration 39, loss = 0.12559008
Iteration 40, loss = 0.12430057
Iteration 41, loss = 0.12406255
Iteration 42, loss = 0.12311675
Iteration 43, loss = 0.12077518
Iteration 44, loss = 0.12096347
Iteration 45, loss = 0.12112998
Iteration 46, loss = 0.11943321
Iteration 47, loss = 0.11866679
Iteration 48, loss = 0.11907931
Iteration 49, loss = 0.11663937
Iteration 50, loss = 0.11882034
Iteration 51, loss = 0.11638867
Iteration 52, loss = 0.11698529
```

```
Iteration 53, loss = 0.11732050
Iteration 54, loss = 0.11466869
Iteration 55, loss = 0.11505154
Iteration 56, loss = 0.11426684
Iteration 57, loss = 0.11395603
Iteration 58, loss = 0.11329393
Iteration 59, loss = 0.11356173
Iteration 60, loss = 0.11355365
Iteration 61, loss = 0.11027543
Iteration 62, loss = 0.11199928
Iteration 63, loss = 0.11160752
Iteration 64, loss = 0.11243251
Iteration 65, loss = 0.10992905
Iteration 66, loss = 0.11063020
Iteration 67, loss = 0.11077747
Iteration 68, loss = 0.11008915
Iteration 69, loss = 0.11085177
Iteration 70, loss = 0.10893044
Iteration 71, loss = 0.10957467
Iteration 72, loss = 0.10766492
Iteration 73, loss = 0.10862409
Iteration 74, loss = 0.10974297
Iteration 75, loss = 0.10740849
Iteration 76, loss = 0.10826660
Iteration 77, loss = 0.10768752
Iteration 78, loss = 0.10719273
Iteration 79, loss = 0.10666771
Iteration 80, loss = 0.10662075
Iteration 81, loss = 0.10568341
Iteration 82, loss = 0.10727333
Iteration 83, loss = 0.10666030
Iteration 84, loss = 0.10575713
Iteration 85, loss = 0.10574702
Iteration 86, loss = 0.10524766
Iteration 87, loss = 0.10563374
Iteration 88, loss = 0.10685063
Iteration 89, loss = 0.10493245
Iteration 90, loss = 0.10313256
Iteration 91, loss = 0.10419775
Iteration 92, loss = 0.10503940
Iteration 93, loss = 0.10379157
Iteration 94, loss = 0.10329629
Iteration 95, loss = 0.10345229
Iteration 96, loss = 0.10436617
Iteration 97, loss = 0.10360320
Iteration 98, loss = 0.10507953
Iteration 99, loss = 0.10351619
Iteration 100, loss = 0.10446143
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.64322664
Iteration 2, loss = 0.44746643
Iteration 3, loss = 0.37450110
Iteration 4, loss = 0.33467731
Iteration 5, loss = 0.30922241
Iteration 6, loss = 0.28992445
Iteration 7, loss = 0.27602028
Iteration 8, loss = 0.26471115
Iteration 9, loss = 0.25566856
Iteration 10, loss = 0.24799532
Iteration 11, loss = 0.24082625
Iteration 12, loss = 0.23490535
Iteration 13, loss = 0.22912135
Iteration 14, loss = 0.22442114
Iteration 15, loss = 0.22076153
Iteration 16, loss = 0.21502665
Iteration 17, loss = 0.21174468
Iteration 18, loss = 0.20783571
Iteration 19, loss = 0.20421765
Iteration 20, loss = 0.20075690
Iteration 21, loss = 0.19766248
Iteration 22, loss = 0.19496926
Iteration 23, loss = 0.19175108
Iteration 24, loss = 0.18949907
Iteration 25, loss = 0.18666581
Iteration 26, loss = 0.18351921
Iteration 27, loss = 0.18155440
Iteration 28, loss = 0.18001129
Iteration 29, loss = 0.17754644
Iteration 30, loss = 0.17528988
Iteration 31, loss = 0.17319418
Iteration 32, loss = 0.17103927
Iteration 33, loss = 0.16929301
Iteration 34, loss = 0.16739986
Iteration 35, loss = 0.16578732
Iteration 36, loss = 0.16367016
Iteration 37, loss = 0.16177293
Iteration 38, loss = 0.16032338
Iteration 39, loss = 0.15863906
Iteration 40, loss = 0.15746635
Iteration 41, loss = 0.15599692
Iteration 42, loss = 0.15416761
Iteration 43, loss = 0.15303841
Iteration 44, loss = 0.15180767
Iteration 45, loss = 0.15095752
Iteration 46, loss = 0.14922837
Iteration 47, loss = 0.14788922
Iteration 48, loss = 0.14664290
Iteration 49, loss = 0.14557348
Iteration 50, loss = 0.14448091
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.26619637
Iteration 2, loss = 0.43010658
Iteration 3, loss = 0.37237972
Iteration 4, loss = 0.33948552
Iteration 5, loss = 0.31537574
Iteration 6, loss = 0.29737138
Iteration 7, loss = 0.28240031
Iteration 8, loss = 0.27019941
Iteration 9, loss = 0.25956831
Iteration 10, loss = 0.25018250
Iteration 11, loss = 0.24255834
Iteration 12, loss = 0.23539079
Iteration 13, loss = 0.22892956
Iteration 14, loss = 0.22345561
Iteration 15, loss = 0.21762290
Iteration 16, loss = 0.21276581
Iteration 17, loss = 0.20813587
Iteration 18, loss = 0.20395972
Iteration 19, loss = 0.19969025
Iteration 20, loss = 0.19625815
Iteration 21, loss = 0.19291887
Iteration 22, loss = 0.18952097
Iteration 23, loss = 0.18642931
Iteration 24, loss = 0.18348038
Iteration 25, loss = 0.18083983
Iteration 26, loss = 0.17845766
Iteration 27, loss = 0.17581545
Iteration 28, loss = 0.17335249
Iteration 29, loss = 0.17094619
Iteration 30, loss = 0.16887728
Iteration 31, loss = 0.16677904
Iteration 32, loss = 0.16457697
Iteration 33, loss = 0.16290385
Iteration 34, loss = 0.16092416
Iteration 35, loss = 0.15897972
Iteration 36, loss = 0.15742261
Iteration 37, loss = 0.15612651
Iteration 38, loss = 0.15438482
Iteration 39, loss = 0.15301872
Iteration 40, loss = 0.15132209
Iteration 41, loss = 0.14963545
Iteration 42, loss = 0.14847591
Iteration 43, loss = 0.14732351
Iteration 44, loss = 0.14538429
Iteration 45, loss = 0.14413536
Iteration 46, loss = 0.14282435
Iteration 47, loss = 0.14169314
Iteration 48, loss = 0.14048913
Iteration 49, loss = 0.13948997
Iteration 50, loss = 0.13819137
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.90801609
Iteration 2, loss = 0.37494441
Iteration 3, loss = 0.30816777
Iteration 4, loss = 0.27855064
Iteration 5, loss = 0.24904203
Iteration 6, loss = 0.23433588
Iteration 7, loss = 0.22536205
Iteration 8, loss = 0.21173230
Iteration 9, loss = 0.20416988
Iteration 10, loss = 0.19667186
Iteration 11, loss = 0.19017231
Iteration 12, loss = 0.18234959
Iteration 13, loss = 0.17893628
Iteration 14, loss = 0.17316408
Iteration 15, loss = 0.16880705
Iteration 16, loss = 0.16214421
Iteration 17, loss = 0.16283087
Iteration 18, loss = 0.15724344
Iteration 19, loss = 0.15450249
Iteration 20, loss = 0.15072334
Iteration 21, loss = 0.14853088
Iteration 22, loss = 0.14708482
Iteration 23, loss = 0.14538225
Iteration 24, loss = 0.14344123
Iteration 25, loss = 0.14005907
Iteration 26, loss = 0.13677439
Iteration 27, loss = 0.13779788
Iteration 28, loss = 0.13575139
Iteration 29, loss = 0.13447395
Iteration 30, loss = 0.13154300
Iteration 31, loss = 0.12980352
Iteration 32, loss = 0.12768152
Iteration 33, loss = 0.12947904
Iteration 34, loss = 0.12541091
Iteration 35, loss = 0.12542418
Iteration 36, loss = 0.12206853
Iteration 37, loss = 0.12200497
Iteration 38, loss = 0.12215906
Iteration 39, loss = 0.12052731
Iteration 40, loss = 0.12248923
Iteration 41, loss = 0.11889548
Iteration 42, loss = 0.11747579
Iteration 43, loss = 0.11566241
Iteration 44, loss = 0.11687125
Iteration 45, loss = 0.11501880
Iteration 46, loss = 0.11625048
Iteration 47, loss = 0.11454541
Iteration 48, loss = 0.11273017
Iteration 49, loss = 0.11163151
Iteration 50, loss = 0.11476994
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.98476072
Iteration 2, loss = 0.38426120
Iteration 3, loss = 0.31914079
Iteration 4, loss = 0.28544621
Iteration 5, loss = 0.25674064
Iteration 6, loss = 0.23719356
Iteration 7, loss = 0.22404787
Iteration 8, loss = 0.21262287
Iteration 9, loss = 0.20459224
Iteration 10, loss = 0.20039339
Iteration 11, loss = 0.18981523
Iteration 12, loss = 0.18702486
Iteration 13, loss = 0.17995987
Iteration 14, loss = 0.17523674
Iteration 15, loss = 0.17249480
Iteration 16, loss = 0.16759119
Iteration 17, loss = 0.16440300
Iteration 18, loss = 0.16031837
Iteration 19, loss = 0.15861235
Iteration 20, loss = 0.15683644
Iteration 21, loss = 0.15214493
Iteration 22, loss = 0.15036911
Iteration 23, loss = 0.14791825
Iteration 24, loss = 0.14850451
Iteration 25, loss = 0.14411924
Iteration 26, loss = 0.14393850
Iteration 27, loss = 0.14085959
Iteration 28, loss = 0.14012863
Iteration 29, loss = 0.13780677
Iteration 30, loss = 0.13793248
Iteration 31, loss = 0.13483363
Iteration 32, loss = 0.13366160
Iteration 33, loss = 0.13386033
Iteration 34, loss = 0.13082299
Iteration 35, loss = 0.13129747
Iteration 36, loss = 0.12982309
Iteration 37, loss = 0.13043302
Iteration 38, loss = 0.12802628
Iteration 39, loss = 0.12681994
Iteration 40, loss = 0.12644513
Iteration 41, loss = 0.12611327
Iteration 42, loss = 0.12448570
Iteration 43, loss = 0.12625916
Iteration 44, loss = 0.12438938
Iteration 45, loss = 0.12255480
Iteration 46, loss = 0.12286736
Iteration 47, loss = 0.12111008
Iteration 48, loss = 0.12112961
Iteration 49, loss = 0.12021411
Iteration 50, loss = 0.12009079
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.64322664
Iteration 2, loss = 0.44746643
Iteration 3, loss = 0.37450110
Iteration 4, loss = 0.33467731
Iteration 5, loss = 0.30922241
Iteration 6, loss = 0.28992445
Iteration 7, loss = 0.27602028
Iteration 8, loss = 0.26471115
Iteration 9, loss = 0.25566856
Iteration 10, loss = 0.24799532
Iteration 11, loss = 0.24082625
Iteration 12, loss = 0.23490535
Iteration 13, loss = 0.22912135
Iteration 14, loss = 0.22442114
Iteration 15, loss = 0.22076153
Iteration 16, loss = 0.21502665
Iteration 17, loss = 0.21174468
Iteration 18, loss = 0.20783571
Iteration 19, loss = 0.20421765
Iteration 20, loss = 0.20075690
Iteration 21, loss = 0.19766248
Iteration 22, loss = 0.19496926
Iteration 23, loss = 0.19175108
Iteration 24, loss = 0.18949907
Iteration 25, loss = 0.18666581
Iteration 26, loss = 0.18351921
Iteration 27, loss = 0.18155440
Iteration 28, loss = 0.18001129
Iteration 29, loss = 0.17754644
Iteration 30, loss = 0.17528988
Iteration 31, loss = 0.17319418
Iteration 32, loss = 0.17103927
Iteration 33, loss = 0.16929301
Iteration 34, loss = 0.16739986
Iteration 35, loss = 0.16578732
Iteration 36, loss = 0.16367016
Iteration 37, loss = 0.16177293
Iteration 38, loss = 0.16032338
Iteration 39, loss = 0.15863906
Iteration 40, loss = 0.15746635
Iteration 41, loss = 0.15599692
Iteration 42, loss = 0.15416761
Iteration 43, loss = 0.15303841
Iteration 44, loss = 0.15180767
Iteration 45, loss = 0.15095752
Iteration 46, loss = 0.14922837
Iteration 47, loss = 0.14788922
Iteration 48, loss = 0.14664290
Iteration 49, loss = 0.14557348
Iteration 50, loss = 0.14448091
Iteration 51, loss = 0.14302138
Iteration 52, loss = 0.14176147
```

```
Iteration 53, loss = 0.14105746
Iteration 54, loss = 0.13990190
Iteration 55, loss = 0.13894293
Iteration 56, loss = 0.13745161
Iteration 57, loss = 0.13658078
Iteration 58, loss = 0.13590397
Iteration 59, loss = 0.13510442
Iteration 60, loss = 0.13392564
Iteration 61, loss = 0.13276611
Iteration 62, loss = 0.13217636
Iteration 63, loss = 0.13115416
Iteration 64, loss = 0.13055297
Iteration 65, loss = 0.12902752
Iteration 66, loss = 0.12822503
Iteration 67, loss = 0.12759875
Iteration 68, loss = 0.12737123
Iteration 69, loss = 0.12646941
Iteration 70, loss = 0.12579975
Iteration 71, loss = 0.12488459
Iteration 72, loss = 0.12400456
Iteration 73, loss = 0.12320072
Iteration 74, loss = 0.12232627
Iteration 75, loss = 0.12218563
Iteration 76, loss = 0.12162755
Iteration 77, loss = 0.12049422
Iteration 78, loss = 0.12040819
Iteration 79, loss = 0.11933545
Iteration 80, loss = 0.11858780
Iteration 81, loss = 0.11806873
Iteration 82, loss = 0.11755653
Iteration 83, loss = 0.11724612
Iteration 84, loss = 0.11629744
Iteration 85, loss = 0.11554210
Iteration 86, loss = 0.11517589
Iteration 87, loss = 0.11467441
Iteration 88, loss = 0.11404625
Iteration 89, loss = 0.11288524
Iteration 90, loss = 0.11297298
Iteration 91, loss = 0.11266455
Iteration 92, loss = 0.11246941
Iteration 93, loss = 0.11154873
Iteration 94, loss = 0.11100713
Iteration 95, loss = 0.11046631
Iteration 96, loss = 0.11033158
Iteration 97, loss = 0.10940870
Iteration 98, loss = 0.10910531
Iteration 99, loss = 0.10864226
Iteration 100, loss = 0.10808699
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.26619637
Iteration 2, loss = 0.43010658
Iteration 3, loss = 0.37237972
Iteration 4, loss = 0.33948552
Iteration 5, loss = 0.31537574
Iteration 6, loss = 0.29737138
Iteration 7, loss = 0.28240031
Iteration 8, loss = 0.27019941
Iteration 9, loss = 0.25956831
Iteration 10, loss = 0.25018250
Iteration 11, loss = 0.24255834
Iteration 12, loss = 0.23539079
Iteration 13, loss = 0.22892956
Iteration 14, loss = 0.22345561
Iteration 15, loss = 0.21762290
Iteration 16, loss = 0.21276581
Iteration 17, loss = 0.20813587
Iteration 18, loss = 0.20395972
Iteration 19, loss = 0.19969025
Iteration 20, loss = 0.19625815
Iteration 21, loss = 0.19291887
Iteration 22, loss = 0.18952097
Iteration 23, loss = 0.18642931
Iteration 24, loss = 0.18348038
Iteration 25, loss = 0.18083983
Iteration 26, loss = 0.17845766
Iteration 27, loss = 0.17581545
Iteration 28, loss = 0.17335249
Iteration 29, loss = 0.17094619
Iteration 30, loss = 0.16887728
Iteration 31, loss = 0.16677904
Iteration 32, loss = 0.16457697
Iteration 33, loss = 0.16290385
Iteration 34, loss = 0.16092416
Iteration 35, loss = 0.15897972
Iteration 36, loss = 0.15742261
Iteration 37, loss = 0.15612651
Iteration 38, loss = 0.15438482
Iteration 39, loss = 0.15301872
Iteration 40, loss = 0.15132209
Iteration 41, loss = 0.14963545
Iteration 42, loss = 0.14847591
Iteration 43, loss = 0.14732351
Iteration 44, loss = 0.14538429
Iteration 45, loss = 0.14413536
Iteration 46, loss = 0.14282435
Iteration 47, loss = 0.14169314
Iteration 48, loss = 0.14048913
Iteration 49, loss = 0.13948997
Iteration 50, loss = 0.13819137
Iteration 51, loss = 0.13718053
Iteration 52, loss = 0.13605140
```

```
Iteration 53, loss = 0.13498371
Iteration 54, loss = 0.13406271
Iteration 55, loss = 0.13303224
Iteration 56, loss = 0.13215417
Iteration 57, loss = 0.13102389
Iteration 58, loss = 0.13033154
Iteration 59, loss = 0.12932909
Iteration 60, loss = 0.12809987
Iteration 61, loss = 0.12716237
Iteration 62, loss = 0.12648895
Iteration 63, loss = 0.12550313
Iteration 64, loss = 0.12470549
Iteration 65, loss = 0.12399793
Iteration 66, loss = 0.12327571
Iteration 67, loss = 0.12231244
Iteration 68, loss = 0.12172784
Iteration 69, loss = 0.12103439
Iteration 70, loss = 0.12013207
Iteration 71, loss = 0.11939127
Iteration 72, loss = 0.11890658
Iteration 73, loss = 0.11806159
Iteration 74, loss = 0.11709756
Iteration 75, loss = 0.11689132
Iteration 76, loss = 0.11594818
Iteration 77, loss = 0.11570395
Iteration 78, loss = 0.11463737
Iteration 79, loss = 0.11429667
Iteration 80, loss = 0.11370933
Iteration 81, loss = 0.11295103
Iteration 82, loss = 0.11239042
Iteration 83, loss = 0.11182893
Iteration 84, loss = 0.11139229
Iteration 85, loss = 0.11079560
Iteration 86, loss = 0.11008215
Iteration 87, loss = 0.10939575
Iteration 88, loss = 0.10910441
Iteration 89, loss = 0.10870534
Iteration 90, loss = 0.10862158
Iteration 91, loss = 0.10757372
Iteration 92, loss = 0.10698764
Iteration 93, loss = 0.10640478
Iteration 94, loss = 0.10585966
Iteration 95, loss = 0.10560933
Iteration 96, loss = 0.10506565
Iteration 97, loss = 0.10436416
Iteration 98, loss = 0.10436289
Iteration 99, loss = 0.10358135
Iteration 100, loss = 0.10282363
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.90801609
Iteration 2, loss = 0.37494441
Iteration 3, loss = 0.30816777
Iteration 4, loss = 0.27855064
Iteration 5, loss = 0.24904203
Iteration 6, loss = 0.23433588
Iteration 7, loss = 0.22536205
Iteration 8, loss = 0.21173230
Iteration 9, loss = 0.20416988
Iteration 10, loss = 0.19667186
Iteration 11, loss = 0.19017231
Iteration 12, loss = 0.18234959
Iteration 13, loss = 0.17893628
Iteration 14, loss = 0.17316408
Iteration 15, loss = 0.16880705
Iteration 16, loss = 0.16214421
Iteration 17, loss = 0.16283087
Iteration 18, loss = 0.15724344
Iteration 19, loss = 0.15450249
Iteration 20, loss = 0.15072334
Iteration 21, loss = 0.14853088
Iteration 22, loss = 0.14708482
Iteration 23, loss = 0.14538225
Iteration 24, loss = 0.14344123
Iteration 25, loss = 0.14005907
Iteration 26, loss = 0.13677439
Iteration 27, loss = 0.13779788
Iteration 28, loss = 0.13575139
Iteration 29, loss = 0.13447395
Iteration 30, loss = 0.13154300
Iteration 31, loss = 0.12980352
Iteration 32, loss = 0.12768152
Iteration 33, loss = 0.12947904
Iteration 34, loss = 0.12541091
Iteration 35, loss = 0.12542418
Iteration 36, loss = 0.12206853
Iteration 37, loss = 0.12200497
Iteration 38, loss = 0.12215906
Iteration 39, loss = 0.12052731
Iteration 40, loss = 0.12248923
Iteration 41, loss = 0.11889548
Iteration 42, loss = 0.11747579
Iteration 43, loss = 0.11566241
Iteration 44, loss = 0.11687125
Iteration 45, loss = 0.11501880
Iteration 46, loss = 0.11625048
Iteration 47, loss = 0.11454541
Iteration 48, loss = 0.11273017
Iteration 49, loss = 0.11163151
Iteration 50, loss = 0.11476994
Iteration 51, loss = 0.10896834
Iteration 52, loss = 0.10951608
```

```
Iteration 53, loss = 0.11252522
Iteration 54, loss = 0.10893265
Iteration 55, loss = 0.10812136
Iteration 56, loss = 0.10753050
Iteration 57, loss = 0.10656736
Iteration 58, loss = 0.10759224
Iteration 59, loss = 0.10728891
Iteration 60, loss = 0.10667561
Iteration 61, loss = 0.10371165
Iteration 62, loss = 0.10504883
Iteration 63, loss = 0.10482636
Iteration 64, loss = 0.10583068
Iteration 65, loss = 0.10261932
Iteration 66, loss = 0.10238438
Iteration 67, loss = 0.10434651
Iteration 68, loss = 0.10276170
Iteration 69, loss = 0.10488954
Iteration 70, loss = 0.10252818
Iteration 71, loss = 0.10182407
Iteration 72, loss = 0.10252680
Iteration 73, loss = 0.10008744
Iteration 74, loss = 0.10115802
Iteration 75, loss = 0.10185894
Iteration 76, loss = 0.10075259
Iteration 77, loss = 0.10171722
Iteration 78, loss = 0.10054277
Iteration 79, loss = 0.09808049
Iteration 80, loss = 0.09834304
Iteration 81, loss = 0.09930483
Iteration 82, loss = 0.09910096
Iteration 83, loss = 0.09796687
Iteration 84, loss = 0.09645470
Iteration 85, loss = 0.09743753
Iteration 86, loss = 0.09818368
Iteration 87, loss = 0.09512213
Iteration 88, loss = 0.10061014
Iteration 89, loss = 0.09562873
Iteration 90, loss = 0.09669678
Iteration 91, loss = 0.09593262
Iteration 92, loss = 0.09865441
Iteration 93, loss = 0.09567753
Iteration 94, loss = 0.09506909
Iteration 95, loss = 0.09571548
Iteration 96, loss = 0.09430691
Iteration 97, loss = 0.09460998
Iteration 98, loss = 0.09402299
Iteration 99, loss = 0.09599777
Iteration 100, loss = 0.09456427
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.98476072
Iteration 2, loss = 0.38426120
Iteration 3, loss = 0.31914079
Iteration 4, loss = 0.28544621
Iteration 5, loss = 0.25674064
Iteration 6, loss = 0.23719356
Iteration 7, loss = 0.22404787
Iteration 8, loss = 0.21262287
Iteration 9, loss = 0.20459224
Iteration 10, loss = 0.20039339
Iteration 11, loss = 0.18981523
Iteration 12, loss = 0.18702486
Iteration 13, loss = 0.17995987
Iteration 14, loss = 0.17523674
Iteration 15, loss = 0.17249480
Iteration 16, loss = 0.16759119
Iteration 17, loss = 0.16440300
Iteration 18, loss = 0.16031837
Iteration 19, loss = 0.15861235
Iteration 20, loss = 0.15683644
Iteration 21, loss = 0.15214493
Iteration 22, loss = 0.15036911
Iteration 23, loss = 0.14791825
Iteration 24, loss = 0.14850451
Iteration 25, loss = 0.14411924
Iteration 26, loss = 0.14393850
Iteration 27, loss = 0.14085959
Iteration 28, loss = 0.14012863
Iteration 29, loss = 0.13780677
Iteration 30, loss = 0.13793248
Iteration 31, loss = 0.13483363
Iteration 32, loss = 0.13366160
Iteration 33, loss = 0.13386033
Iteration 34, loss = 0.13082299
Iteration 35, loss = 0.13129747
Iteration 36, loss = 0.12982309
Iteration 37, loss = 0.13043302
Iteration 38, loss = 0.12802628
Iteration 39, loss = 0.12681994
Iteration 40, loss = 0.12644513
Iteration 41, loss = 0.12611327
Iteration 42, loss = 0.12448570
Iteration 43, loss = 0.12625916
Iteration 44, loss = 0.12438938
Iteration 45, loss = 0.12255480
Iteration 46, loss = 0.12286736
Iteration 47, loss = 0.12111008
Iteration 48, loss = 0.12112961
Iteration 49, loss = 0.12021411
Iteration 50, loss = 0.12009079
Iteration 51, loss = 0.12020951
Iteration 52, loss = 0.11742806
```

```
Iteration 53, loss = 0.11861445
Iteration 54, loss = 0.11858688
Iteration 55, loss = 0.11535820
Iteration 56, loss = 0.11886686
Iteration 57, loss = 0.11778581
Iteration 58, loss = 0.11611208
Iteration 59, loss = 0.11678855
Iteration 60, loss = 0.11572783
Iteration 61, loss = 0.11394884
Iteration 62, loss = 0.11433674
Iteration 63, loss = 0.11352874
Iteration 64, loss = 0.11349246
Iteration 65, loss = 0.11359046
Iteration 66, loss = 0.11391299
Iteration 67, loss = 0.11346332
Iteration 68, loss = 0.11222118
Iteration 69, loss = 0.11368919
Iteration 70, loss = 0.11374283
Iteration 71, loss = 0.11092536
Iteration 72, loss = 0.11019194
Iteration 73, loss = 0.11159372
Iteration 74, loss = 0.11098454
Iteration 75, loss = 0.11186504
Iteration 76, loss = 0.11047805
Iteration 77, loss = 0.11038625
Iteration 78, loss = 0.10898690
Iteration 79, loss = 0.10865193
Iteration 80, loss = 0.10898945
Iteration 81, loss = 0.10855803
Iteration 82, loss = 0.10741799
Iteration 83, loss = 0.10875423
Iteration 84, loss = 0.10839775
Iteration 85, loss = 0.10803744
Iteration 86, loss = 0.10718458
Iteration 87, loss = 0.10822601
Iteration 88, loss = 0.10647723
Iteration 89, loss = 0.10750565
Iteration 90, loss = 0.10693157
Iteration 91, loss = 0.10674938
Iteration 92, loss = 0.10532782
Iteration 93, loss = 0.10646073
Iteration 94, loss = 0.10509963
Iteration 95, loss = 0.10653921
Iteration 96, loss = 0.10473669
Iteration 97, loss = 0.10365089
Iteration 98, loss = 0.10664144
Iteration 99, loss = 0.10476883
Iteration 100, loss = 0.10522463
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.64322664
Iteration 2, loss = 0.44746643
Iteration 3, loss = 0.37450110
Iteration 4, loss = 0.33467731
Iteration 5, loss = 0.30922241
Iteration 6, loss = 0.28992445
Iteration 7, loss = 0.27602028
Iteration 8, loss = 0.26471115
Iteration 9, loss = 0.25566856
Iteration 10, loss = 0.24799532
Iteration 11, loss = 0.24082625
Iteration 12, loss = 0.23490535
Iteration 13, loss = 0.22912135
Iteration 14, loss = 0.22442114
Iteration 15, loss = 0.22076153
Iteration 16, loss = 0.21502665
Iteration 17, loss = 0.21174468
Iteration 18, loss = 0.20783571
Iteration 19, loss = 0.20421765
Iteration 20, loss = 0.20075690
Iteration 21, loss = 0.19766248
Iteration 22, loss = 0.19496926
Iteration 23, loss = 0.19175108
Iteration 24, loss = 0.18949907
Iteration 25, loss = 0.18666581
Iteration 26, loss = 0.18351921
Iteration 27, loss = 0.18155440
Iteration 28, loss = 0.18001129
Iteration 29, loss = 0.17754644
Iteration 30, loss = 0.17528988
Iteration 31, loss = 0.17319418
Iteration 32, loss = 0.17103927
Iteration 33, loss = 0.16929301
Iteration 34, loss = 0.16739986
Iteration 35, loss = 0.16578732
Iteration 36, loss = 0.16367016
Iteration 37, loss = 0.16177293
Iteration 38, loss = 0.16032338
Iteration 39, loss = 0.15863906
Iteration 40, loss = 0.15746635
Iteration 41, loss = 0.15599692
Iteration 42, loss = 0.15416761
Iteration 43, loss = 0.15303841
Iteration 44, loss = 0.15180767
Iteration 45, loss = 0.15095752
Iteration 46, loss = 0.14922837
Iteration 47, loss = 0.14788922
Iteration 48, loss = 0.14664290
Iteration 49, loss = 0.14557348
Iteration 50, loss = 0.14448091
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.26619637
Iteration 2, loss = 0.43010658
Iteration 3, loss = 0.37237972
Iteration 4, loss = 0.33948552
Iteration 5, loss = 0.31537574
Iteration 6, loss = 0.29737138
Iteration 7, loss = 0.28240031
Iteration 8, loss = 0.27019941
Iteration 9, loss = 0.25956831
Iteration 10, loss = 0.25018250
Iteration 11, loss = 0.24255834
Iteration 12, loss = 0.23539079
Iteration 13, loss = 0.22892956
Iteration 14, loss = 0.22345561
Iteration 15, loss = 0.21762290
Iteration 16, loss = 0.21276581
Iteration 17, loss = 0.20813587
Iteration 18, loss = 0.20395972
Iteration 19, loss = 0.19969025
Iteration 20, loss = 0.19625815
Iteration 21, loss = 0.19291887
Iteration 22, loss = 0.18952097
Iteration 23, loss = 0.18642931
Iteration 24, loss = 0.18348038
Iteration 25, loss = 0.18083983
Iteration 26, loss = 0.17845766
Iteration 27, loss = 0.17581545
Iteration 28, loss = 0.17335249
Iteration 29, loss = 0.17094619
Iteration 30, loss = 0.16887728
Iteration 31, loss = 0.16677904
Iteration 32, loss = 0.16457697
Iteration 33, loss = 0.16290385
Iteration 34, loss = 0.16092416
Iteration 35, loss = 0.15897972
Iteration 36, loss = 0.15742261
Iteration 37, loss = 0.15612651
Iteration 38, loss = 0.15438482
Iteration 39, loss = 0.15301872
Iteration 40, loss = 0.15132209
Iteration 41, loss = 0.14963545
Iteration 42, loss = 0.14847591
Iteration 43, loss = 0.14732351
Iteration 44, loss = 0.14538429
Iteration 45, loss = 0.14413536
Iteration 46, loss = 0.14282435
Iteration 47, loss = 0.14169314
Iteration 48, loss = 0.14048913
Iteration 49, loss = 0.13948997
Iteration 50, loss = 0.13819137
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.90801609
Iteration 2, loss = 0.37494441
Iteration 3, loss = 0.30816777
Iteration 4, loss = 0.27855064
Iteration 5, loss = 0.24904203
Iteration 6, loss = 0.23433588
Iteration 7, loss = 0.22536205
Iteration 8, loss = 0.21173230
Iteration 9, loss = 0.20416988
Iteration 10, loss = 0.19667186
Iteration 11, loss = 0.19017231
Iteration 12, loss = 0.18234959
Iteration 13, loss = 0.17893628
Iteration 14, loss = 0.17316408
Iteration 15, loss = 0.16880705
Iteration 16, loss = 0.16214421
Iteration 17, loss = 0.16283087
Iteration 18, loss = 0.15724344
Iteration 19, loss = 0.15450249
Iteration 20, loss = 0.15072334
Iteration 21, loss = 0.14853088
Iteration 22, loss = 0.14708482
Iteration 23, loss = 0.14538225
Iteration 24, loss = 0.14344123
Iteration 25, loss = 0.14005907
Iteration 26, loss = 0.13677439
Iteration 27, loss = 0.13779788
Iteration 28, loss = 0.13575139
Iteration 29, loss = 0.13447395
Iteration 30, loss = 0.13154300
Iteration 31, loss = 0.12980352
Iteration 32, loss = 0.12768152
Iteration 33, loss = 0.12947904
Iteration 34, loss = 0.12541091
Iteration 35, loss = 0.12542418
Iteration 36, loss = 0.12206853
Iteration 37, loss = 0.12200497
Iteration 38, loss = 0.12215906
Iteration 39, loss = 0.12052731
Iteration 40, loss = 0.12248923
Iteration 41, loss = 0.11889548
Iteration 42, loss = 0.11747579
Iteration 43, loss = 0.11566241
Iteration 44, loss = 0.11687125
Iteration 45, loss = 0.11501880
Iteration 46, loss = 0.11625048
Iteration 47, loss = 0.11454541
Iteration 48, loss = 0.11273017
Iteration 49, loss = 0.11163151
Iteration 50, loss = 0.11476994
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.98476072
Iteration 2, loss = 0.38426120
Iteration 3, loss = 0.31914079
Iteration 4, loss = 0.28544621
Iteration 5, loss = 0.25674064
Iteration 6, loss = 0.23719356
Iteration 7, loss = 0.22404787
Iteration 8, loss = 0.21262287
Iteration 9, loss = 0.20459224
Iteration 10, loss = 0.20039339
Iteration 11, loss = 0.18981523
Iteration 12, loss = 0.18702486
Iteration 13, loss = 0.17995987
Iteration 14, loss = 0.17523674
Iteration 15, loss = 0.17249480
Iteration 16, loss = 0.16759119
Iteration 17, loss = 0.16440300
Iteration 18, loss = 0.16031837
Iteration 19, loss = 0.15861235
Iteration 20, loss = 0.15683644
Iteration 21, loss = 0.15214493
Iteration 22, loss = 0.15036911
Iteration 23, loss = 0.14791825
Iteration 24, loss = 0.14850451
Iteration 25, loss = 0.14411924
Iteration 26, loss = 0.14393850
Iteration 27, loss = 0.14085959
Iteration 28, loss = 0.14012863
Iteration 29, loss = 0.13780677
Iteration 30, loss = 0.13793248
Iteration 31, loss = 0.13483363
Iteration 32, loss = 0.13366160
Iteration 33, loss = 0.13386033
Iteration 34, loss = 0.13082299
Iteration 35, loss = 0.13129747
Iteration 36, loss = 0.12982309
Iteration 37, loss = 0.13043302
Iteration 38, loss = 0.12802628
Iteration 39, loss = 0.12681994
Iteration 40, loss = 0.12644513
Iteration 41, loss = 0.12611327
Iteration 42, loss = 0.12448570
Iteration 43, loss = 0.12625916
Iteration 44, loss = 0.12438938
Iteration 45, loss = 0.12255480
Iteration 46, loss = 0.12286736
Iteration 47, loss = 0.12111008
Iteration 48, loss = 0.12112961
Iteration 49, loss = 0.12021411
Iteration 50, loss = 0.12009079
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.64322664
Iteration 2, loss = 0.44746643
Iteration 3, loss = 0.37450110
Iteration 4, loss = 0.33467731
Iteration 5, loss = 0.30922241
Iteration 6, loss = 0.28992445
Iteration 7, loss = 0.27602028
Iteration 8, loss = 0.26471115
Iteration 9, loss = 0.25566856
Iteration 10, loss = 0.24799532
Iteration 11, loss = 0.24082625
Iteration 12, loss = 0.23490535
Iteration 13, loss = 0.22912135
Iteration 14, loss = 0.22442114
Iteration 15, loss = 0.22076153
Iteration 16, loss = 0.21502665
Iteration 17, loss = 0.21174468
Iteration 18, loss = 0.20783571
Iteration 19, loss = 0.20421765
Iteration 20, loss = 0.20075690
Iteration 21, loss = 0.19766248
Iteration 22, loss = 0.19496926
Iteration 23, loss = 0.19175108
Iteration 24, loss = 0.18949907
Iteration 25, loss = 0.18666581
Iteration 26, loss = 0.18351921
Iteration 27, loss = 0.18155440
Iteration 28, loss = 0.18001129
Iteration 29, loss = 0.17754644
Iteration 30, loss = 0.17528988
Iteration 31, loss = 0.17319418
Iteration 32, loss = 0.17103927
Iteration 33, loss = 0.16929301
Iteration 34, loss = 0.16739986
Iteration 35, loss = 0.16578732
Iteration 36, loss = 0.16367016
Iteration 37, loss = 0.16177293
Iteration 38, loss = 0.16032338
Iteration 39, loss = 0.15863906
Iteration 40, loss = 0.15746635
Iteration 41, loss = 0.15599692
Iteration 42, loss = 0.15416761
Iteration 43, loss = 0.15303841
Iteration 44, loss = 0.15180767
Iteration 45, loss = 0.15095752
Iteration 46, loss = 0.14922837
Iteration 47, loss = 0.14788922
Iteration 48, loss = 0.14664290
Iteration 49, loss = 0.14557348
Iteration 50, loss = 0.14448091
Iteration 51, loss = 0.14302138
Iteration 52, loss = 0.14176147
```

```
Iteration 53, loss = 0.14105746
Iteration 54, loss = 0.13990190
Iteration 55, loss = 0.13894293
Iteration 56, loss = 0.13745161
Iteration 57, loss = 0.13658078
Iteration 58, loss = 0.13590397
Iteration 59, loss = 0.13510442
Iteration 60, loss = 0.13392564
Iteration 61, loss = 0.13276611
Iteration 62, loss = 0.13217636
Iteration 63, loss = 0.13115416
Iteration 64, loss = 0.13055297
Iteration 65, loss = 0.12902752
Iteration 66, loss = 0.12822503
Iteration 67, loss = 0.12759875
Iteration 68, loss = 0.12737123
Iteration 69, loss = 0.12646941
Iteration 70, loss = 0.12579975
Iteration 71, loss = 0.12488459
Iteration 72, loss = 0.12400456
Iteration 73, loss = 0.12320072
Iteration 74, loss = 0.12232627
Iteration 75, loss = 0.12218563
Iteration 76, loss = 0.12162755
Iteration 77, loss = 0.12049422
Iteration 78, loss = 0.12040819
Iteration 79, loss = 0.11933545
Iteration 80, loss = 0.11858780
Iteration 81, loss = 0.11806873
Iteration 82, loss = 0.11755653
Iteration 83, loss = 0.11724612
Iteration 84, loss = 0.11629744
Iteration 85, loss = 0.11554210
Iteration 86, loss = 0.11517589
Iteration 87, loss = 0.11467441
Iteration 88, loss = 0.11404625
Iteration 89, loss = 0.11288524
Iteration 90, loss = 0.11297298
Iteration 91, loss = 0.11266455
Iteration 92, loss = 0.11246941
Iteration 93, loss = 0.11154873
Iteration 94, loss = 0.11100713
Iteration 95, loss = 0.11046631
Iteration 96, loss = 0.11033158
Iteration 97, loss = 0.10940870
Iteration 98, loss = 0.10910531
Iteration 99, loss = 0.10864226
Iteration 100, loss = 0.10808699
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.26619637
Iteration 2, loss = 0.43010658
Iteration 3, loss = 0.37237972
Iteration 4, loss = 0.33948552
Iteration 5, loss = 0.31537574
Iteration 6, loss = 0.29737138
Iteration 7, loss = 0.28240031
Iteration 8, loss = 0.27019941
Iteration 9, loss = 0.25956831
Iteration 10, loss = 0.25018250
Iteration 11, loss = 0.24255834
Iteration 12, loss = 0.23539079
Iteration 13, loss = 0.22892956
Iteration 14, loss = 0.22345561
Iteration 15, loss = 0.21762290
Iteration 16, loss = 0.21276581
Iteration 17, loss = 0.20813587
Iteration 18, loss = 0.20395972
Iteration 19, loss = 0.19969025
Iteration 20, loss = 0.19625815
Iteration 21, loss = 0.19291887
Iteration 22, loss = 0.18952097
Iteration 23, loss = 0.18642931
Iteration 24, loss = 0.18348038
Iteration 25, loss = 0.18083983
Iteration 26, loss = 0.17845766
Iteration 27, loss = 0.17581545
Iteration 28, loss = 0.17335249
Iteration 29, loss = 0.17094619
Iteration 30, loss = 0.16887728
Iteration 31, loss = 0.16677904
Iteration 32, loss = 0.16457697
Iteration 33, loss = 0.16290385
Iteration 34, loss = 0.16092416
Iteration 35, loss = 0.15897972
Iteration 36, loss = 0.15742261
Iteration 37, loss = 0.15612651
Iteration 38, loss = 0.15438482
Iteration 39, loss = 0.15301872
Iteration 40, loss = 0.15132209
Iteration 41, loss = 0.14963545
Iteration 42, loss = 0.14847591
Iteration 43, loss = 0.14732351
Iteration 44, loss = 0.14538429
Iteration 45, loss = 0.14413536
Iteration 46, loss = 0.14282435
Iteration 47, loss = 0.14169314
Iteration 48, loss = 0.14048913
Iteration 49, loss = 0.13948997
Iteration 50, loss = 0.13819137
Iteration 51, loss = 0.13718053
Iteration 52, loss = 0.13605140
```

```
Iteration 53, loss = 0.13498371
Iteration 54, loss = 0.13406271
Iteration 55, loss = 0.13303224
Iteration 56, loss = 0.13215417
Iteration 57, loss = 0.13102389
Iteration 58, loss = 0.13033154
Iteration 59, loss = 0.12932909
Iteration 60, loss = 0.12809987
Iteration 61, loss = 0.12716237
Iteration 62, loss = 0.12648895
Iteration 63, loss = 0.12550313
Iteration 64, loss = 0.12470549
Iteration 65, loss = 0.12399793
Iteration 66, loss = 0.12327571
Iteration 67, loss = 0.12231244
Iteration 68, loss = 0.12172784
Iteration 69, loss = 0.12103439
Iteration 70, loss = 0.12013207
Iteration 71, loss = 0.11939127
Iteration 72, loss = 0.11890658
Iteration 73, loss = 0.11806159
Iteration 74, loss = 0.11709756
Iteration 75, loss = 0.11689132
Iteration 76, loss = 0.11594818
Iteration 77, loss = 0.11570395
Iteration 78, loss = 0.11463737
Iteration 79, loss = 0.11429667
Iteration 80, loss = 0.11370933
Iteration 81, loss = 0.11295103
Iteration 82, loss = 0.11239042
Iteration 83, loss = 0.11182893
Iteration 84, loss = 0.11139229
Iteration 85, loss = 0.11079560
Iteration 86, loss = 0.11008215
Iteration 87, loss = 0.10939575
Iteration 88, loss = 0.10910441
Iteration 89, loss = 0.10870534
Iteration 90, loss = 0.10862158
Iteration 91, loss = 0.10757372
Iteration 92, loss = 0.10698764
Iteration 93, loss = 0.10640478
Iteration 94, loss = 0.10585966
Iteration 95, loss = 0.10560933
Iteration 96, loss = 0.10506565
Iteration 97, loss = 0.10436416
Iteration 98, loss = 0.10436289
Iteration 99, loss = 0.10358135
Iteration 100, loss = 0.10282363
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.90801609
Iteration 2, loss = 0.37494441
Iteration 3, loss = 0.30816777
Iteration 4, loss = 0.27855064
Iteration 5, loss = 0.24904203
Iteration 6, loss = 0.23433588
Iteration 7, loss = 0.22536205
Iteration 8, loss = 0.21173230
Iteration 9, loss = 0.20416988
Iteration 10, loss = 0.19667186
Iteration 11, loss = 0.19017231
Iteration 12, loss = 0.18234959
Iteration 13, loss = 0.17893628
Iteration 14, loss = 0.17316408
Iteration 15, loss = 0.16880705
Iteration 16, loss = 0.16214421
Iteration 17, loss = 0.16283087
Iteration 18, loss = 0.15724344
Iteration 19, loss = 0.15450249
Iteration 20, loss = 0.15072334
Iteration 21, loss = 0.14853088
Iteration 22, loss = 0.14708482
Iteration 23, loss = 0.14538225
Iteration 24, loss = 0.14344123
Iteration 25, loss = 0.14005907
Iteration 26, loss = 0.13677439
Iteration 27, loss = 0.13779788
Iteration 28, loss = 0.13575139
Iteration 29, loss = 0.13447395
Iteration 30, loss = 0.13154300
Iteration 31, loss = 0.12980352
Iteration 32, loss = 0.12768152
Iteration 33, loss = 0.12947904
Iteration 34, loss = 0.12541091
Iteration 35, loss = 0.12542418
Iteration 36, loss = 0.12206853
Iteration 37, loss = 0.12200497
Iteration 38, loss = 0.12215906
Iteration 39, loss = 0.12052731
Iteration 40, loss = 0.12248923
Iteration 41, loss = 0.11889548
Iteration 42, loss = 0.11747579
Iteration 43, loss = 0.11566241
Iteration 44, loss = 0.11687125
Iteration 45, loss = 0.11501880
Iteration 46, loss = 0.11625048
Iteration 47, loss = 0.11454541
Iteration 48, loss = 0.11273017
Iteration 49, loss = 0.11163151
Iteration 50, loss = 0.11476994
Iteration 51, loss = 0.10896834
Iteration 52, loss = 0.10951608
```

```
Iteration 53, loss = 0.11252522
Iteration 54, loss = 0.10893265
Iteration 55, loss = 0.10812136
Iteration 56, loss = 0.10753050
Iteration 57, loss = 0.10656736
Iteration 58, loss = 0.10759224
Iteration 59, loss = 0.10728891
Iteration 60, loss = 0.10667561
Iteration 61, loss = 0.10371165
Iteration 62, loss = 0.10504883
Iteration 63, loss = 0.10482636
Iteration 64, loss = 0.10583068
Iteration 65, loss = 0.10261932
Iteration 66, loss = 0.10238438
Iteration 67, loss = 0.10434651
Iteration 68, loss = 0.10276170
Iteration 69, loss = 0.10488954
Iteration 70, loss = 0.10252818
Iteration 71, loss = 0.10182407
Iteration 72, loss = 0.10252680
Iteration 73, loss = 0.10008744
Iteration 74, loss = 0.10115802
Iteration 75, loss = 0.10185894
Iteration 76, loss = 0.10075259
Iteration 77, loss = 0.10171722
Iteration 78, loss = 0.10054277
Iteration 79, loss = 0.09808049
Iteration 80, loss = 0.09834304
Iteration 81, loss = 0.09930483
Iteration 82, loss = 0.09910096
Iteration 83, loss = 0.09796687
Iteration 84, loss = 0.09645470
Iteration 85, loss = 0.09743753
Iteration 86, loss = 0.09818368
Iteration 87, loss = 0.09512213
Iteration 88, loss = 0.10061014
Iteration 89, loss = 0.09562873
Iteration 90, loss = 0.09669678
Iteration 91, loss = 0.09593262
Iteration 92, loss = 0.09865441
Iteration 93, loss = 0.09567753
Iteration 94, loss = 0.09506909
Iteration 95, loss = 0.09571548
Iteration 96, loss = 0.09430691
Iteration 97, loss = 0.09460998
Iteration 98, loss = 0.09402299
Iteration 99, loss = 0.09599777
Iteration 100, loss = 0.09456427
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.98476072
Iteration 2, loss = 0.38426120
Iteration 3, loss = 0.31914079
Iteration 4, loss = 0.28544621
Iteration 5, loss = 0.25674064
Iteration 6, loss = 0.23719356
Iteration 7, loss = 0.22404787
Iteration 8, loss = 0.21262287
Iteration 9, loss = 0.20459224
Iteration 10, loss = 0.20039339
Iteration 11, loss = 0.18981523
Iteration 12, loss = 0.18702486
Iteration 13, loss = 0.17995987
Iteration 14, loss = 0.17523674
Iteration 15, loss = 0.17249480
Iteration 16, loss = 0.16759119
Iteration 17, loss = 0.16440300
Iteration 18, loss = 0.16031837
Iteration 19, loss = 0.15861235
Iteration 20, loss = 0.15683644
Iteration 21, loss = 0.15214493
Iteration 22, loss = 0.15036911
Iteration 23, loss = 0.14791825
Iteration 24, loss = 0.14850451
Iteration 25, loss = 0.14411924
Iteration 26, loss = 0.14393850
Iteration 27, loss = 0.14085959
Iteration 28, loss = 0.14012863
Iteration 29, loss = 0.13780677
Iteration 30, loss = 0.13793248
Iteration 31, loss = 0.13483363
Iteration 32, loss = 0.13366160
Iteration 33, loss = 0.13386033
Iteration 34, loss = 0.13082299
Iteration 35, loss = 0.13129747
Iteration 36, loss = 0.12982309
Iteration 37, loss = 0.13043302
Iteration 38, loss = 0.12802628
Iteration 39, loss = 0.12681994
Iteration 40, loss = 0.12644513
Iteration 41, loss = 0.12611327
Iteration 42, loss = 0.12448570
Iteration 43, loss = 0.12625916
Iteration 44, loss = 0.12438938
Iteration 45, loss = 0.12255480
Iteration 46, loss = 0.12286736
Iteration 47, loss = 0.12111008
Iteration 48, loss = 0.12112961
Iteration 49, loss = 0.12021411
Iteration 50, loss = 0.12009079
Iteration 51, loss = 0.12020951
Iteration 52, loss = 0.11742806
```

```
Iteration 53, loss = 0.11861445
Iteration 54, loss = 0.11858688
Iteration 55, loss = 0.11535820
Iteration 56, loss = 0.11886686
Iteration 57, loss = 0.11778581
Iteration 58, loss = 0.11611208
Iteration 59, loss = 0.11678855
Iteration 60, loss = 0.11572783
Iteration 61, loss = 0.11394884
Iteration 62, loss = 0.11433674
Iteration 63, loss = 0.11352874
Iteration 64, loss = 0.11349246
Iteration 65, loss = 0.11359046
Iteration 66, loss = 0.11391299
Iteration 67, loss = 0.11346332
Iteration 68, loss = 0.11222118
Iteration 69, loss = 0.11368919
Iteration 70, loss = 0.11374283
Iteration 71, loss = 0.11092536
Iteration 72, loss = 0.11019194
Iteration 73, loss = 0.11159372
Iteration 74, loss = 0.11098454
Iteration 75, loss = 0.11186504
Iteration 76, loss = 0.11047805
Iteration 77, loss = 0.11038625
Iteration 78, loss = 0.10898690
Iteration 79, loss = 0.10865193
Iteration 80, loss = 0.10898945
Iteration 81, loss = 0.10855803
Iteration 82, loss = 0.10741799
Iteration 83, loss = 0.10875423
Iteration 84, loss = 0.10839775
Iteration 85, loss = 0.10803744
Iteration 86, loss = 0.10718458
Iteration 87, loss = 0.10822601
Iteration 88, loss = 0.10647723
Iteration 89, loss = 0.10750565
Iteration 90, loss = 0.10693157
Iteration 91, loss = 0.10674938
Iteration 92, loss = 0.10532782
Iteration 93, loss = 0.10646073
Iteration 94, loss = 0.10509963
Iteration 95, loss = 0.10653921
Iteration 96, loss = 0.10473669
Iteration 97, loss = 0.10365089
Iteration 98, loss = 0.10664144
Iteration 99, loss = 0.10476883
Iteration 100, loss = 0.10522463
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.55520877
Iteration 2, loss = 0.45153631
Iteration 3, loss = 0.37597383
Iteration 4, loss = 0.33895131
Iteration 5, loss = 0.31459111
Iteration 6, loss = 0.29660611
Iteration 7, loss = 0.28251802
Iteration 8, loss = 0.27048592
Iteration 9, loss = 0.26073982
Iteration 10, loss = 0.25215779
Iteration 11, loss = 0.24532254
Iteration 12, loss = 0.23849721
Iteration 13, loss = 0.23253743
Iteration 14, loss = 0.22801788
Iteration 15, loss = 0.22242953
Iteration 16, loss = 0.21830013
Iteration 17, loss = 0.21502738
Iteration 18, loss = 0.21132621
Iteration 19, loss = 0.20718891
Iteration 20, loss = 0.20436733
Iteration 21, loss = 0.20115835
Iteration 22, loss = 0.19825876
Iteration 23, loss = 0.19555682
Iteration 24, loss = 0.19278328
Iteration 25, loss = 0.19106485
Iteration 26, loss = 0.18800234
Iteration 27, loss = 0.18556278
Iteration 28, loss = 0.18365760
Iteration 29, loss = 0.18129077
Iteration 30, loss = 0.17948847
Iteration 31, loss = 0.17711758
Iteration 32, loss = 0.17600897
Iteration 33, loss = 0.17378269
Iteration 34, loss = 0.17220199
Iteration 35, loss = 0.17034956
Iteration 36, loss = 0.16905691
Iteration 37, loss = 0.16771959
Iteration 38, loss = 0.16588095
Iteration 39, loss = 0.16522234
Iteration 40, loss = 0.16347085
Iteration 41, loss = 0.16138039
Iteration 42, loss = 0.16021938
Iteration 43, loss = 0.15878747
Iteration 44, loss = 0.15803007
Iteration 45, loss = 0.15678759
Iteration 46, loss = 0.15555646
Iteration 47, loss = 0.15398052
Iteration 48, loss = 0.15238866
Iteration 49, loss = 0.15158716
Iteration 50, loss = 0.15028156
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18446270
Iteration 2, loss = 0.43440252
Iteration 3, loss = 0.37597126
Iteration 4, loss = 0.34324044
Iteration 5, loss = 0.31993371
Iteration 6, loss = 0.30265833
Iteration 7, loss = 0.28857308
Iteration 8, loss = 0.27574162
Iteration 9, loss = 0.26503788
Iteration 10, loss = 0.25571917
Iteration 11, loss = 0.24765400
Iteration 12, loss = 0.24018936
Iteration 13, loss = 0.23344656
Iteration 14, loss = 0.22758198
Iteration 15, loss = 0.22254878
Iteration 16, loss = 0.21782889
Iteration 17, loss = 0.21347235
Iteration 18, loss = 0.20927169
Iteration 19, loss = 0.20558477
Iteration 20, loss = 0.20167788
Iteration 21, loss = 0.19877371
Iteration 22, loss = 0.19574245
Iteration 23, loss = 0.19289674
Iteration 24, loss = 0.19013027
Iteration 25, loss = 0.18756741
Iteration 26, loss = 0.18540903
Iteration 27, loss = 0.18309951
Iteration 28, loss = 0.18044146
Iteration 29, loss = 0.17851433
Iteration 30, loss = 0.17630124
Iteration 31, loss = 0.17428966
Iteration 32, loss = 0.17274904
Iteration 33, loss = 0.17051523
Iteration 34, loss = 0.16871222
Iteration 35, loss = 0.16685536
Iteration 36, loss = 0.16547939
Iteration 37, loss = 0.16382840
Iteration 38, loss = 0.16220581
Iteration 39, loss = 0.16076547
Iteration 40, loss = 0.15915559
Iteration 41, loss = 0.15811441
Iteration 42, loss = 0.15643836
Iteration 43, loss = 0.15509720
Iteration 44, loss = 0.15370473
Iteration 45, loss = 0.15251920
Iteration 46, loss = 0.15141485
Iteration 47, loss = 0.15015645
Iteration 48, loss = 0.14911739
Iteration 49, loss = 0.14778458
Iteration 50, loss = 0.14655624
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83016396
Iteration 2, loss = 0.39187184
Iteration 3, loss = 0.31382096
Iteration 4, loss = 0.27864189
Iteration 5, loss = 0.26196771
Iteration 6, loss = 0.24810105
Iteration 7, loss = 0.23341762
Iteration 8, loss = 0.22134124
Iteration 9, loss = 0.21100152
Iteration 10, loss = 0.20447277
Iteration 11, loss = 0.19815122
Iteration 12, loss = 0.19287148
Iteration 13, loss = 0.18453294
Iteration 14, loss = 0.18191539
Iteration 15, loss = 0.17677003
Iteration 16, loss = 0.17177320
Iteration 17, loss = 0.17191890
Iteration 18, loss = 0.16370683
Iteration 19, loss = 0.16294258
Iteration 20, loss = 0.16012759
Iteration 21, loss = 0.15491247
Iteration 22, loss = 0.15397076
Iteration 23, loss = 0.14801935
Iteration 24, loss = 0.14850437
Iteration 25, loss = 0.14540434
Iteration 26, loss = 0.14636679
Iteration 27, loss = 0.14103024
Iteration 28, loss = 0.13938007
Iteration 29, loss = 0.13808698
Iteration 30, loss = 0.13711884
Iteration 31, loss = 0.13572909
Iteration 32, loss = 0.13447188
Iteration 33, loss = 0.13298500
Iteration 34, loss = 0.13054258
Iteration 35, loss = 0.12763910
Iteration 36, loss = 0.13050691
Iteration 37, loss = 0.12516453
Iteration 38, loss = 0.12440973
Iteration 39, loss = 0.12644672
Iteration 40, loss = 0.12475196
Iteration 41, loss = 0.12301953
Iteration 42, loss = 0.12456237
Iteration 43, loss = 0.11895292
Iteration 44, loss = 0.12260095
Iteration 45, loss = 0.11961652
Iteration 46, loss = 0.11847605
Iteration 47, loss = 0.11934114
Iteration 48, loss = 0.11585294
Iteration 49, loss = 0.11617471
Iteration 50, loss = 0.11723837
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.85483652
Iteration 2, loss = 0.38828490
Iteration 3, loss = 0.32313285
Iteration 4, loss = 0.29032141
Iteration 5, loss = 0.26490751
Iteration 6, loss = 0.24618751
Iteration 7, loss = 0.23547346
Iteration 8, loss = 0.22140848
Iteration 9, loss = 0.21422447
Iteration 10, loss = 0.20713531
Iteration 11, loss = 0.20023228
Iteration 12, loss = 0.19176431
Iteration 13, loss = 0.18949049
Iteration 14, loss = 0.18367251
Iteration 15, loss = 0.17910822
Iteration 16, loss = 0.17489221
Iteration 17, loss = 0.17398324
Iteration 18, loss = 0.17072590
Iteration 19, loss = 0.16652264
Iteration 20, loss = 0.16549070
Iteration 21, loss = 0.16233017
Iteration 22, loss = 0.16053522
Iteration 23, loss = 0.15686104
Iteration 24, loss = 0.15423817
Iteration 25, loss = 0.15384192
Iteration 26, loss = 0.15315142
Iteration 27, loss = 0.15092553
Iteration 28, loss = 0.14953008
Iteration 29, loss = 0.14683047
Iteration 30, loss = 0.14631482
Iteration 31, loss = 0.14536189
Iteration 32, loss = 0.14343077
Iteration 33, loss = 0.14309345
Iteration 34, loss = 0.14108443
Iteration 35, loss = 0.13981096
Iteration 36, loss = 0.13879040
Iteration 37, loss = 0.13765456
Iteration 38, loss = 0.13747752
Iteration 39, loss = 0.13661612
Iteration 40, loss = 0.13389711
Iteration 41, loss = 0.13600064
Iteration 42, loss = 0.13255333
Iteration 43, loss = 0.13335499
Iteration 44, loss = 0.13227518
Iteration 45, loss = 0.13118556
Iteration 46, loss = 0.13027505
Iteration 47, loss = 0.12936939
Iteration 48, loss = 0.12996099
Iteration 49, loss = 0.12787750
Iteration 50, loss = 0.12715985
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.55520877
Iteration 2, loss = 0.45153631
Iteration 3, loss = 0.37597383
Iteration 4, loss = 0.33895131
Iteration 5, loss = 0.31459111
Iteration 6, loss = 0.29660611
Iteration 7, loss = 0.28251802
Iteration 8, loss = 0.27048592
Iteration 9, loss = 0.26073982
Iteration 10, loss = 0.25215779
Iteration 11, loss = 0.24532254
Iteration 12, loss = 0.23849721
Iteration 13, loss = 0.23253743
Iteration 14, loss = 0.22801788
Iteration 15, loss = 0.22242953
Iteration 16, loss = 0.21830013
Iteration 17, loss = 0.21502738
Iteration 18, loss = 0.21132621
Iteration 19, loss = 0.20718891
Iteration 20, loss = 0.20436733
Iteration 21, loss = 0.20115835
Iteration 22, loss = 0.19825876
Iteration 23, loss = 0.19555682
Iteration 24, loss = 0.19278328
Iteration 25, loss = 0.19106485
Iteration 26, loss = 0.18800234
Iteration 27, loss = 0.18556278
Iteration 28, loss = 0.18365760
Iteration 29, loss = 0.18129077
Iteration 30, loss = 0.17948847
Iteration 31, loss = 0.17711758
Iteration 32, loss = 0.17600897
Iteration 33, loss = 0.17378269
Iteration 34, loss = 0.17220199
Iteration 35, loss = 0.17034956
Iteration 36, loss = 0.16905691
Iteration 37, loss = 0.16771959
Iteration 38, loss = 0.16588095
Iteration 39, loss = 0.16522234
Iteration 40, loss = 0.16347085
Iteration 41, loss = 0.16138039
Iteration 42, loss = 0.16021938
Iteration 43, loss = 0.15878747
Iteration 44, loss = 0.15803007
Iteration 45, loss = 0.15678759
Iteration 46, loss = 0.15555646
Iteration 47, loss = 0.15398052
Iteration 48, loss = 0.15238866
Iteration 49, loss = 0.15158716
Iteration 50, loss = 0.15028156
Iteration 51, loss = 0.14995747
Iteration 52, loss = 0.14793493
```

```
Iteration 53, loss = 0.14743229
Iteration 54, loss = 0.14620606
Iteration 55, loss = 0.14604837
Iteration 56, loss = 0.14505930
Iteration 57, loss = 0.14403168
Iteration 58, loss = 0.14277950
Iteration 59, loss = 0.14284331
Iteration 60, loss = 0.14120745
Iteration 61, loss = 0.14007551
Iteration 62, loss = 0.13983238
Iteration 63, loss = 0.13875617
Iteration 64, loss = 0.13746717
Iteration 65, loss = 0.13675122
Iteration 66, loss = 0.13655941
Iteration 67, loss = 0.13544912
Iteration 68, loss = 0.13480329
Iteration 69, loss = 0.13406781
Iteration 70, loss = 0.13364151
Iteration 71, loss = 0.13272817
Iteration 72, loss = 0.13192051
Iteration 73, loss = 0.13146398
Iteration 74, loss = 0.13092709
Iteration 75, loss = 0.12951912
Iteration 76, loss = 0.12902495
Iteration 77, loss = 0.12832728
Iteration 78, loss = 0.12814569
Iteration 79, loss = 0.12760737
Iteration 80, loss = 0.12683845
Iteration 81, loss = 0.12625905
Iteration 82, loss = 0.12583044
Iteration 83, loss = 0.12557327
Iteration 84, loss = 0.12468138
Iteration 85, loss = 0.12379146
Iteration 86, loss = 0.12317361
Iteration 87, loss = 0.12243240
Iteration 88, loss = 0.12248064
Iteration 89, loss = 0.12218826
Iteration 90, loss = 0.12145821
Iteration 91, loss = 0.12122165
Iteration 92, loss = 0.12001836
Iteration 93, loss = 0.11981187
Iteration 94, loss = 0.11950840
Iteration 95, loss = 0.11837660
Iteration 96, loss = 0.11831481
Iteration 97, loss = 0.11852025
Iteration 98, loss = 0.11737017
Iteration 99, loss = 0.11672990
Iteration 100, loss = 0.11599236
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18446270
Iteration 2, loss = 0.43440252
Iteration 3, loss = 0.37597126
Iteration 4, loss = 0.34324044
Iteration 5, loss = 0.31993371
Iteration 6, loss = 0.30265833
Iteration 7, loss = 0.28857308
Iteration 8, loss = 0.27574162
Iteration 9, loss = 0.26503788
Iteration 10, loss = 0.25571917
Iteration 11, loss = 0.24765400
Iteration 12, loss = 0.24018936
Iteration 13, loss = 0.23344656
Iteration 14, loss = 0.22758198
Iteration 15, loss = 0.22254878
Iteration 16, loss = 0.21782889
Iteration 17, loss = 0.21347235
Iteration 18, loss = 0.20927169
Iteration 19, loss = 0.20558477
Iteration 20, loss = 0.20167788
Iteration 21, loss = 0.19877371
Iteration 22, loss = 0.19574245
Iteration 23, loss = 0.19289674
Iteration 24, loss = 0.19013027
Iteration 25, loss = 0.18756741
Iteration 26, loss = 0.18540903
Iteration 27, loss = 0.18309951
Iteration 28, loss = 0.18044146
Iteration 29, loss = 0.17851433
Iteration 30, loss = 0.17630124
Iteration 31, loss = 0.17428966
Iteration 32, loss = 0.17274904
Iteration 33, loss = 0.17051523
Iteration 34, loss = 0.16871222
Iteration 35, loss = 0.16685536
Iteration 36, loss = 0.16547939
Iteration 37, loss = 0.16382840
Iteration 38, loss = 0.16220581
Iteration 39, loss = 0.16076547
Iteration 40, loss = 0.15915559
Iteration 41, loss = 0.15811441
Iteration 42, loss = 0.15643836
Iteration 43, loss = 0.15509720
Iteration 44, loss = 0.15370473
Iteration 45, loss = 0.15251920
Iteration 46, loss = 0.15141485
Iteration 47, loss = 0.15015645
Iteration 48, loss = 0.14911739
Iteration 49, loss = 0.14778458
Iteration 50, loss = 0.14655624
Iteration 51, loss = 0.14551076
Iteration 52, loss = 0.14431147
```

```
Iteration 53, loss = 0.14354065
Iteration 54, loss = 0.14235198
Iteration 55, loss = 0.14121427
Iteration 56, loss = 0.14081735
Iteration 57, loss = 0.13963580
Iteration 58, loss = 0.13883788
Iteration 59, loss = 0.13762190
Iteration 60, loss = 0.13673800
Iteration 61, loss = 0.13622766
Iteration 62, loss = 0.13545964
Iteration 63, loss = 0.13438046
Iteration 64, loss = 0.13348285
Iteration 65, loss = 0.13249386
Iteration 66, loss = 0.13198602
Iteration 67, loss = 0.13102710
Iteration 68, loss = 0.13048873
Iteration 69, loss = 0.13002494
Iteration 70, loss = 0.12890924
Iteration 71, loss = 0.12825126
Iteration 72, loss = 0.12758023
Iteration 73, loss = 0.12699828
Iteration 74, loss = 0.12600189
Iteration 75, loss = 0.12511301
Iteration 76, loss = 0.12481296
Iteration 77, loss = 0.12418866
Iteration 78, loss = 0.12367908
Iteration 79, loss = 0.12306286
Iteration 80, loss = 0.12255170
Iteration 81, loss = 0.12158655
Iteration 82, loss = 0.12114072
Iteration 83, loss = 0.12048730
Iteration 84, loss = 0.11962847
Iteration 85, loss = 0.11938874
Iteration 86, loss = 0.11861154
Iteration 87, loss = 0.11784213
Iteration 88, loss = 0.11782427
Iteration 89, loss = 0.11728654
Iteration 90, loss = 0.11676280
Iteration 91, loss = 0.11617852
Iteration 92, loss = 0.11554679
Iteration 93, loss = 0.11494701
Iteration 94, loss = 0.11451707
Iteration 95, loss = 0.11403911
Iteration 96, loss = 0.11356972
Iteration 97, loss = 0.11298385
Iteration 98, loss = 0.11269306
Iteration 99, loss = 0.11197519
Iteration 100, loss = 0.11159417
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83016396
Iteration 2, loss = 0.39187184
Iteration 3, loss = 0.31382096
Iteration 4, loss = 0.27864189
Iteration 5, loss = 0.26196771
Iteration 6, loss = 0.24810105
Iteration 7, loss = 0.23341762
Iteration 8, loss = 0.22134124
Iteration 9, loss = 0.21100152
Iteration 10, loss = 0.20447277
Iteration 11, loss = 0.19815122
Iteration 12, loss = 0.19287148
Iteration 13, loss = 0.18453294
Iteration 14, loss = 0.18191539
Iteration 15, loss = 0.17677003
Iteration 16, loss = 0.17177320
Iteration 17, loss = 0.17191890
Iteration 18, loss = 0.16370683
Iteration 19, loss = 0.16294258
Iteration 20, loss = 0.16012759
Iteration 21, loss = 0.15491247
Iteration 22, loss = 0.15397076
Iteration 23, loss = 0.14801935
Iteration 24, loss = 0.14850437
Iteration 25, loss = 0.14540434
Iteration 26, loss = 0.14636679
Iteration 27, loss = 0.14103024
Iteration 28, loss = 0.13938007
Iteration 29, loss = 0.13808698
Iteration 30, loss = 0.13711884
Iteration 31, loss = 0.13572909
Iteration 32, loss = 0.13447188
Iteration 33, loss = 0.13298500
Iteration 34, loss = 0.13054258
Iteration 35, loss = 0.12763910
Iteration 36, loss = 0.13050691
Iteration 37, loss = 0.12516453
Iteration 38, loss = 0.12440973
Iteration 39, loss = 0.12644672
Iteration 40, loss = 0.12475196
Iteration 41, loss = 0.12301953
Iteration 42, loss = 0.12456237
Iteration 43, loss = 0.11895292
Iteration 44, loss = 0.12260095
Iteration 45, loss = 0.11961652
Iteration 46, loss = 0.11847605
Iteration 47, loss = 0.11934114
Iteration 48, loss = 0.11585294
Iteration 49, loss = 0.11617471
Iteration 50, loss = 0.11723837
Iteration 51, loss = 0.11683749
Iteration 52, loss = 0.11308768
```

```
Iteration 53, loss = 0.11484638
Iteration 54, loss = 0.11304556
Iteration 55, loss = 0.11248175
Iteration 56, loss = 0.11307641
Iteration 57, loss = 0.11122721
Iteration 58, loss = 0.11417510
Iteration 59, loss = 0.11254530
Iteration 60, loss = 0.10905721
Iteration 61, loss = 0.11133357
Iteration 62, loss = 0.10936983
Iteration 63, loss = 0.10961700
Iteration 64, loss = 0.10742665
Iteration 65, loss = 0.11064126
Iteration 66, loss = 0.10856279
Iteration 67, loss = 0.10691096
Iteration 68, loss = 0.10557789
Iteration 69, loss = 0.10824367
Iteration 70, loss = 0.10676646
Iteration 71, loss = 0.10542800
Iteration 72, loss = 0.10678433
Iteration 73, loss = 0.10554140
Iteration 74, loss = 0.10584077
Iteration 75, loss = 0.10481631
Iteration 76, loss = 0.10471429
Iteration 77, loss = 0.10361627
Iteration 78, loss = 0.10310737
Iteration 79, loss = 0.10355810
Iteration 80, loss = 0.10295109
Iteration 81, loss = 0.10376244
Iteration 82, loss = 0.10307433
Iteration 83, loss = 0.10371219
Iteration 84, loss = 0.10041267
Iteration 85, loss = 0.10505241
Iteration 86, loss = 0.10296131
Iteration 87, loss = 0.10026205
Iteration 88, loss = 0.10056689
Iteration 89, loss = 0.10226085
Iteration 90, loss = 0.10040277
Iteration 91, loss = 0.09963332
Iteration 92, loss = 0.10088711
Iteration 93, loss = 0.10100509
Iteration 94, loss = 0.09975172
Iteration 95, loss = 0.09934424
Iteration 96, loss = 0.09800460
Iteration 97, loss = 0.10264492
Iteration 98, loss = 0.09901449
Iteration 99, loss = 0.09766312
Iteration 100, loss = 0.09715486
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.85483652
Iteration 2, loss = 0.38828490
Iteration 3, loss = 0.32313285
Iteration 4, loss = 0.29032141
Iteration 5, loss = 0.26490751
Iteration 6, loss = 0.24618751
Iteration 7, loss = 0.23547346
Iteration 8, loss = 0.22140848
Iteration 9, loss = 0.21422447
Iteration 10, loss = 0.20713531
Iteration 11, loss = 0.20023228
Iteration 12, loss = 0.19176431
Iteration 13, loss = 0.18949049
Iteration 14, loss = 0.18367251
Iteration 15, loss = 0.17910822
Iteration 16, loss = 0.17489221
Iteration 17, loss = 0.17398324
Iteration 18, loss = 0.17072590
Iteration 19, loss = 0.16652264
Iteration 20, loss = 0.16549070
Iteration 21, loss = 0.16233017
Iteration 22, loss = 0.16053522
Iteration 23, loss = 0.15686104
Iteration 24, loss = 0.15423817
Iteration 25, loss = 0.15384192
Iteration 26, loss = 0.15315142
Iteration 27, loss = 0.15092553
Iteration 28, loss = 0.14953008
Iteration 29, loss = 0.14683047
Iteration 30, loss = 0.14631482
Iteration 31, loss = 0.14536189
Iteration 32, loss = 0.14343077
Iteration 33, loss = 0.14309345
Iteration 34, loss = 0.14108443
Iteration 35, loss = 0.13981096
Iteration 36, loss = 0.13879040
Iteration 37, loss = 0.13765456
Iteration 38, loss = 0.13747752
Iteration 39, loss = 0.13661612
Iteration 40, loss = 0.13389711
Iteration 41, loss = 0.13600064
Iteration 42, loss = 0.13255333
Iteration 43, loss = 0.13335499
Iteration 44, loss = 0.13227518
Iteration 45, loss = 0.13118556
Iteration 46, loss = 0.13027505
Iteration 47, loss = 0.12936939
Iteration 48, loss = 0.12996099
Iteration 49, loss = 0.12787750
Iteration 50, loss = 0.12715985
Iteration 51, loss = 0.12836914
Iteration 52, loss = 0.12718527
```

```
Iteration 53, loss = 0.12573180
Iteration 54, loss = 0.12667544
Iteration 55, loss = 0.12449885
Iteration 56, loss = 0.12610125
Iteration 57, loss = 0.12411438
Iteration 58, loss = 0.12386353
Iteration 59, loss = 0.12422909
Iteration 60, loss = 0.12306038
Iteration 61, loss = 0.12210395
Iteration 62, loss = 0.12068688
Iteration 63, loss = 0.12128870
Iteration 64, loss = 0.12181274
Iteration 65, loss = 0.12240890
Iteration 66, loss = 0.11942675
Iteration 67, loss = 0.11997152
Iteration 68, loss = 0.12021689
Iteration 69, loss = 0.12018874
Iteration 70, loss = 0.11846816
Iteration 71, loss = 0.12023189
Iteration 72, loss = 0.11792768
Iteration 73, loss = 0.12010913
Iteration 74, loss = 0.11714590
Iteration 75, loss = 0.11798797
Iteration 76, loss = 0.11611934
Iteration 77, loss = 0.11631966
Iteration 78, loss = 0.11709276
Iteration 79, loss = 0.11728862
Iteration 80, loss = 0.11679253
Iteration 81, loss = 0.11555371
Iteration 82, loss = 0.11649673
Iteration 83, loss = 0.11567849
Iteration 84, loss = 0.11586297
Iteration 85, loss = 0.11475662
Iteration 86, loss = 0.11662176
Iteration 87, loss = 0.11313622
Iteration 88, loss = 0.11485808
Iteration 89, loss = 0.11363688
Iteration 90, loss = 0.11492364
Iteration 91, loss = 0.11392307
Iteration 92, loss = 0.11356734
Iteration 93, loss = 0.11404613
Iteration 94, loss = 0.11306863
Iteration 95, loss = 0.11252615
Iteration 96, loss = 0.11388088
Iteration 97, loss = 0.11295816
Iteration 98, loss = 0.11284609
Iteration 99, loss = 0.11190334
Iteration 100, loss = 0.11230997
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.55520877
Iteration 2, loss = 0.45153631
Iteration 3, loss = 0.37597383
Iteration 4, loss = 0.33895131
Iteration 5, loss = 0.31459111
Iteration 6, loss = 0.29660611
Iteration 7, loss = 0.28251802
Iteration 8, loss = 0.27048592
Iteration 9, loss = 0.26073982
Iteration 10, loss = 0.25215779
Iteration 11, loss = 0.24532254
Iteration 12, loss = 0.23849721
Iteration 13, loss = 0.23253743
Iteration 14, loss = 0.22801788
Iteration 15, loss = 0.22242953
Iteration 16, loss = 0.21830013
Iteration 17, loss = 0.21502738
Iteration 18, loss = 0.21132621
Iteration 19, loss = 0.20718891
Iteration 20, loss = 0.20436733
Iteration 21, loss = 0.20115835
Iteration 22, loss = 0.19825876
Iteration 23, loss = 0.19555682
Iteration 24, loss = 0.19278328
Iteration 25, loss = 0.19106485
Iteration 26, loss = 0.18800234
Iteration 27, loss = 0.18556278
Iteration 28, loss = 0.18365760
Iteration 29, loss = 0.18129077
Iteration 30, loss = 0.17948847
Iteration 31, loss = 0.17711758
Iteration 32, loss = 0.17600897
Iteration 33, loss = 0.17378269
Iteration 34, loss = 0.17220199
Iteration 35, loss = 0.17034956
Iteration 36, loss = 0.16905691
Iteration 37, loss = 0.16771959
Iteration 38, loss = 0.16588095
Iteration 39, loss = 0.16522234
Iteration 40, loss = 0.16347085
Iteration 41, loss = 0.16138039
Iteration 42, loss = 0.16021938
Iteration 43, loss = 0.15878747
Iteration 44, loss = 0.15803007
Iteration 45, loss = 0.15678759
Iteration 46, loss = 0.15555646
Iteration 47, loss = 0.15398052
Iteration 48, loss = 0.15238866
Iteration 49, loss = 0.15158716
Iteration 50, loss = 0.15028156
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18446270
Iteration 2, loss = 0.43440252
Iteration 3, loss = 0.37597126
Iteration 4, loss = 0.34324044
Iteration 5, loss = 0.31993371
Iteration 6, loss = 0.30265833
Iteration 7, loss = 0.28857308
Iteration 8, loss = 0.27574162
Iteration 9, loss = 0.26503788
Iteration 10, loss = 0.25571917
Iteration 11, loss = 0.24765400
Iteration 12, loss = 0.24018936
Iteration 13, loss = 0.23344656
Iteration 14, loss = 0.22758198
Iteration 15, loss = 0.22254878
Iteration 16, loss = 0.21782889
Iteration 17, loss = 0.21347235
Iteration 18, loss = 0.20927169
Iteration 19, loss = 0.20558477
Iteration 20, loss = 0.20167788
Iteration 21, loss = 0.19877371
Iteration 22, loss = 0.19574245
Iteration 23, loss = 0.19289674
Iteration 24, loss = 0.19013027
Iteration 25, loss = 0.18756741
Iteration 26, loss = 0.18540903
Iteration 27, loss = 0.18309951
Iteration 28, loss = 0.18044146
Iteration 29, loss = 0.17851433
Iteration 30, loss = 0.17630124
Iteration 31, loss = 0.17428966
Iteration 32, loss = 0.17274904
Iteration 33, loss = 0.17051523
Iteration 34, loss = 0.16871222
Iteration 35, loss = 0.16685536
Iteration 36, loss = 0.16547939
Iteration 37, loss = 0.16382840
Iteration 38, loss = 0.16220581
Iteration 39, loss = 0.16076547
Iteration 40, loss = 0.15915559
Iteration 41, loss = 0.15811441
Iteration 42, loss = 0.15643836
Iteration 43, loss = 0.15509720
Iteration 44, loss = 0.15370473
Iteration 45, loss = 0.15251920
Iteration 46, loss = 0.15141485
Iteration 47, loss = 0.15015645
Iteration 48, loss = 0.14911739
Iteration 49, loss = 0.14778458
Iteration 50, loss = 0.14655624
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83016396
Iteration 2, loss = 0.39187184
Iteration 3, loss = 0.31382096
Iteration 4, loss = 0.27864189
Iteration 5, loss = 0.26196771
Iteration 6, loss = 0.24810105
Iteration 7, loss = 0.23341762
Iteration 8, loss = 0.22134124
Iteration 9, loss = 0.21100152
Iteration 10, loss = 0.20447277
Iteration 11, loss = 0.19815122
Iteration 12, loss = 0.19287148
Iteration 13, loss = 0.18453294
Iteration 14, loss = 0.18191539
Iteration 15, loss = 0.17677003
Iteration 16, loss = 0.17177320
Iteration 17, loss = 0.17191890
Iteration 18, loss = 0.16370683
Iteration 19, loss = 0.16294258
Iteration 20, loss = 0.16012759
Iteration 21, loss = 0.15491247
Iteration 22, loss = 0.15397076
Iteration 23, loss = 0.14801935
Iteration 24, loss = 0.14850437
Iteration 25, loss = 0.14540434
Iteration 26, loss = 0.14636679
Iteration 27, loss = 0.14103024
Iteration 28, loss = 0.13938007
Iteration 29, loss = 0.13808698
Iteration 30, loss = 0.13711884
Iteration 31, loss = 0.13572909
Iteration 32, loss = 0.13447188
Iteration 33, loss = 0.13298500
Iteration 34, loss = 0.13054258
Iteration 35, loss = 0.12763910
Iteration 36, loss = 0.13050691
Iteration 37, loss = 0.12516453
Iteration 38, loss = 0.12440973
Iteration 39, loss = 0.12644672
Iteration 40, loss = 0.12475196
Iteration 41, loss = 0.12301953
Iteration 42, loss = 0.12456237
Iteration 43, loss = 0.11895292
Iteration 44, loss = 0.12260095
Iteration 45, loss = 0.11961652
Iteration 46, loss = 0.11847605
Iteration 47, loss = 0.11934114
Iteration 48, loss = 0.11585294
Iteration 49, loss = 0.11617471
Iteration 50, loss = 0.11723837
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.85483652
Iteration 2, loss = 0.38828490
Iteration 3, loss = 0.32313285
Iteration 4, loss = 0.29032141
Iteration 5, loss = 0.26490751
Iteration 6, loss = 0.24618751
Iteration 7, loss = 0.23547346
Iteration 8, loss = 0.22140848
Iteration 9, loss = 0.21422447
Iteration 10, loss = 0.20713531
Iteration 11, loss = 0.20023228
Iteration 12, loss = 0.19176431
Iteration 13, loss = 0.18949049
Iteration 14, loss = 0.18367251
Iteration 15, loss = 0.17910822
Iteration 16, loss = 0.17489221
Iteration 17, loss = 0.17398324
Iteration 18, loss = 0.17072590
Iteration 19, loss = 0.16652264
Iteration 20, loss = 0.16549070
Iteration 21, loss = 0.16233017
Iteration 22, loss = 0.16053522
Iteration 23, loss = 0.15686104
Iteration 24, loss = 0.15423817
Iteration 25, loss = 0.15384192
Iteration 26, loss = 0.15315142
Iteration 27, loss = 0.15092553
Iteration 28, loss = 0.14953008
Iteration 29, loss = 0.14683047
Iteration 30, loss = 0.14631482
Iteration 31, loss = 0.14536189
Iteration 32, loss = 0.14343077
Iteration 33, loss = 0.14309345
Iteration 34, loss = 0.14108443
Iteration 35, loss = 0.13981096
Iteration 36, loss = 0.13879040
Iteration 37, loss = 0.13765456
Iteration 38, loss = 0.13747752
Iteration 39, loss = 0.13661612
Iteration 40, loss = 0.13389711
Iteration 41, loss = 0.13600064
Iteration 42, loss = 0.13255333
Iteration 43, loss = 0.13335499
Iteration 44, loss = 0.13227518
Iteration 45, loss = 0.13118556
Iteration 46, loss = 0.13027505
Iteration 47, loss = 0.12936939
Iteration 48, loss = 0.12996099
Iteration 49, loss = 0.12787750
Iteration 50, loss = 0.12715985
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (50) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.55520877
Iteration 2, loss = 0.45153631
Iteration 3, loss = 0.37597383
Iteration 4, loss = 0.33895131
Iteration 5, loss = 0.31459111
Iteration 6, loss = 0.29660611
Iteration 7, loss = 0.28251802
Iteration 8, loss = 0.27048592
Iteration 9, loss = 0.26073982
Iteration 10, loss = 0.25215779
Iteration 11, loss = 0.24532254
Iteration 12, loss = 0.23849721
Iteration 13, loss = 0.23253743
Iteration 14, loss = 0.22801788
Iteration 15, loss = 0.22242953
Iteration 16, loss = 0.21830013
Iteration 17, loss = 0.21502738
Iteration 18, loss = 0.21132621
Iteration 19, loss = 0.20718891
Iteration 20, loss = 0.20436733
Iteration 21, loss = 0.20115835
Iteration 22, loss = 0.19825876
Iteration 23, loss = 0.19555682
Iteration 24, loss = 0.19278328
Iteration 25, loss = 0.19106485
Iteration 26, loss = 0.18800234
Iteration 27, loss = 0.18556278
Iteration 28, loss = 0.18365760
Iteration 29, loss = 0.18129077
Iteration 30, loss = 0.17948847
Iteration 31, loss = 0.17711758
Iteration 32, loss = 0.17600897
Iteration 33, loss = 0.17378269
Iteration 34, loss = 0.17220199
Iteration 35, loss = 0.17034956
Iteration 36, loss = 0.16905691
Iteration 37, loss = 0.16771959
Iteration 38, loss = 0.16588095
Iteration 39, loss = 0.16522234
Iteration 40, loss = 0.16347085
Iteration 41, loss = 0.16138039
Iteration 42, loss = 0.16021938
Iteration 43, loss = 0.15878747
Iteration 44, loss = 0.15803007
Iteration 45, loss = 0.15678759
Iteration 46, loss = 0.15555646
Iteration 47, loss = 0.15398052
Iteration 48, loss = 0.15238866
Iteration 49, loss = 0.15158716
Iteration 50, loss = 0.15028156
Iteration 51, loss = 0.14995747
Iteration 52, loss = 0.14793493
```

```
Iteration 53, loss = 0.14743229
Iteration 54, loss = 0.14620606
Iteration 55, loss = 0.14604837
Iteration 56, loss = 0.14505930
Iteration 57, loss = 0.14403168
Iteration 58, loss = 0.14277950
Iteration 59, loss = 0.14284331
Iteration 60, loss = 0.14120745
Iteration 61, loss = 0.14007551
Iteration 62, loss = 0.13983238
Iteration 63, loss = 0.13875617
Iteration 64, loss = 0.13746717
Iteration 65, loss = 0.13675122
Iteration 66, loss = 0.13655941
Iteration 67, loss = 0.13544912
Iteration 68, loss = 0.13480329
Iteration 69, loss = 0.13406781
Iteration 70, loss = 0.13364151
Iteration 71, loss = 0.13272817
Iteration 72, loss = 0.13192051
Iteration 73, loss = 0.13146398
Iteration 74, loss = 0.13092709
Iteration 75, loss = 0.12951912
Iteration 76, loss = 0.12902495
Iteration 77, loss = 0.12832728
Iteration 78, loss = 0.12814569
Iteration 79, loss = 0.12760737
Iteration 80, loss = 0.12683845
Iteration 81, loss = 0.12625905
Iteration 82, loss = 0.12583044
Iteration 83, loss = 0.12557327
Iteration 84, loss = 0.12468138
Iteration 85, loss = 0.12379146
Iteration 86, loss = 0.12317361
Iteration 87, loss = 0.12243240
Iteration 88, loss = 0.12248064
Iteration 89, loss = 0.12218826
Iteration 90, loss = 0.12145821
Iteration 91, loss = 0.12122165
Iteration 92, loss = 0.12001836
Iteration 93, loss = 0.11981187
Iteration 94, loss = 0.11950840
Iteration 95, loss = 0.11837660
Iteration 96, loss = 0.11831481
Iteration 97, loss = 0.11852025
Iteration 98, loss = 0.11737017
Iteration 99, loss = 0.11672990
Iteration 100, loss = 0.11599236
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.18446270
Iteration 2, loss = 0.43440252
Iteration 3, loss = 0.37597126
Iteration 4, loss = 0.34324044
Iteration 5, loss = 0.31993371
Iteration 6, loss = 0.30265833
Iteration 7, loss = 0.28857308
Iteration 8, loss = 0.27574162
Iteration 9, loss = 0.26503788
Iteration 10, loss = 0.25571917
Iteration 11, loss = 0.24765400
Iteration 12, loss = 0.24018936
Iteration 13, loss = 0.23344656
Iteration 14, loss = 0.22758198
Iteration 15, loss = 0.22254878
Iteration 16, loss = 0.21782889
Iteration 17, loss = 0.21347235
Iteration 18, loss = 0.20927169
Iteration 19, loss = 0.20558477
Iteration 20, loss = 0.20167788
Iteration 21, loss = 0.19877371
Iteration 22, loss = 0.19574245
Iteration 23, loss = 0.19289674
Iteration 24, loss = 0.19013027
Iteration 25, loss = 0.18756741
Iteration 26, loss = 0.18540903
Iteration 27, loss = 0.18309951
Iteration 28, loss = 0.18044146
Iteration 29, loss = 0.17851433
Iteration 30, loss = 0.17630124
Iteration 31, loss = 0.17428966
Iteration 32, loss = 0.17274904
Iteration 33, loss = 0.17051523
Iteration 34, loss = 0.16871222
Iteration 35, loss = 0.16685536
Iteration 36, loss = 0.16547939
Iteration 37, loss = 0.16382840
Iteration 38, loss = 0.16220581
Iteration 39, loss = 0.16076547
Iteration 40, loss = 0.15915559
Iteration 41, loss = 0.15811441
Iteration 42, loss = 0.15643836
Iteration 43, loss = 0.15509720
Iteration 44, loss = 0.15370473
Iteration 45, loss = 0.15251920
Iteration 46, loss = 0.15141485
Iteration 47, loss = 0.15015645
Iteration 48, loss = 0.14911739
Iteration 49, loss = 0.14778458
Iteration 50, loss = 0.14655624
Iteration 51, loss = 0.14551076
Iteration 52, loss = 0.14431147
```

```
Iteration 53, loss = 0.14354065
Iteration 54, loss = 0.14235198
Iteration 55, loss = 0.14121427
Iteration 56, loss = 0.14081735
Iteration 57, loss = 0.13963580
Iteration 58, loss = 0.13883788
Iteration 59, loss = 0.13762190
Iteration 60, loss = 0.13673800
Iteration 61, loss = 0.13622766
Iteration 62, loss = 0.13545964
Iteration 63, loss = 0.13438046
Iteration 64, loss = 0.13348285
Iteration 65, loss = 0.13249386
Iteration 66, loss = 0.13198602
Iteration 67, loss = 0.13102710
Iteration 68, loss = 0.13048873
Iteration 69, loss = 0.13002494
Iteration 70, loss = 0.12890924
Iteration 71, loss = 0.12825126
Iteration 72, loss = 0.12758023
Iteration 73, loss = 0.12699828
Iteration 74, loss = 0.12600189
Iteration 75, loss = 0.12511301
Iteration 76, loss = 0.12481296
Iteration 77, loss = 0.12418866
Iteration 78, loss = 0.12367908
Iteration 79, loss = 0.12306286
Iteration 80, loss = 0.12255170
Iteration 81, loss = 0.12158655
Iteration 82, loss = 0.12114072
Iteration 83, loss = 0.12048730
Iteration 84, loss = 0.11962847
Iteration 85, loss = 0.11938874
Iteration 86, loss = 0.11861154
Iteration 87, loss = 0.11784213
Iteration 88, loss = 0.11782427
Iteration 89, loss = 0.11728654
Iteration 90, loss = 0.11676280
Iteration 91, loss = 0.11617852
Iteration 92, loss = 0.11554679
Iteration 93, loss = 0.11494701
Iteration 94, loss = 0.11451707
Iteration 95, loss = 0.11403911
Iteration 96, loss = 0.11356972
Iteration 97, loss = 0.11298385
Iteration 98, loss = 0.11269306
Iteration 99, loss = 0.11197519
Iteration 100, loss = 0.11159417
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.83016396
Iteration 2, loss = 0.39187184
Iteration 3, loss = 0.31382096
Iteration 4, loss = 0.27864189
Iteration 5, loss = 0.26196771
Iteration 6, loss = 0.24810105
Iteration 7, loss = 0.23341762
Iteration 8, loss = 0.22134124
Iteration 9, loss = 0.21100152
Iteration 10, loss = 0.20447277
Iteration 11, loss = 0.19815122
Iteration 12, loss = 0.19287148
Iteration 13, loss = 0.18453294
Iteration 14, loss = 0.18191539
Iteration 15, loss = 0.17677003
Iteration 16, loss = 0.17177320
Iteration 17, loss = 0.17191890
Iteration 18, loss = 0.16370683
Iteration 19, loss = 0.16294258
Iteration 20, loss = 0.16012759
Iteration 21, loss = 0.15491247
Iteration 22, loss = 0.15397076
Iteration 23, loss = 0.14801935
Iteration 24, loss = 0.14850437
Iteration 25, loss = 0.14540434
Iteration 26, loss = 0.14636679
Iteration 27, loss = 0.14103024
Iteration 28, loss = 0.13938007
Iteration 29, loss = 0.13808698
Iteration 30, loss = 0.13711884
Iteration 31, loss = 0.13572909
Iteration 32, loss = 0.13447188
Iteration 33, loss = 0.13298500
Iteration 34, loss = 0.13054258
Iteration 35, loss = 0.12763910
Iteration 36, loss = 0.13050691
Iteration 37, loss = 0.12516453
Iteration 38, loss = 0.12440973
Iteration 39, loss = 0.12644672
Iteration 40, loss = 0.12475196
Iteration 41, loss = 0.12301953
Iteration 42, loss = 0.12456237
Iteration 43, loss = 0.11895292
Iteration 44, loss = 0.12260095
Iteration 45, loss = 0.11961652
Iteration 46, loss = 0.11847605
Iteration 47, loss = 0.11934114
Iteration 48, loss = 0.11585294
Iteration 49, loss = 0.11617471
Iteration 50, loss = 0.11723837
Iteration 51, loss = 0.11683749
Iteration 52, loss = 0.11308768
```

```
Iteration 53, loss = 0.11484638
Iteration 54, loss = 0.11304556
Iteration 55, loss = 0.11248175
Iteration 56, loss = 0.11307641
Iteration 57, loss = 0.11122721
Iteration 58, loss = 0.11417510
Iteration 59, loss = 0.11254530
Iteration 60, loss = 0.10905721
Iteration 61, loss = 0.11133357
Iteration 62, loss = 0.10936983
Iteration 63, loss = 0.10961700
Iteration 64, loss = 0.10742665
Iteration 65, loss = 0.11064126
Iteration 66, loss = 0.10856279
Iteration 67, loss = 0.10691096
Iteration 68, loss = 0.10557789
Iteration 69, loss = 0.10824367
Iteration 70, loss = 0.10676646
Iteration 71, loss = 0.10542800
Iteration 72, loss = 0.10678433
Iteration 73, loss = 0.10554140
Iteration 74, loss = 0.10584077
Iteration 75, loss = 0.10481631
Iteration 76, loss = 0.10471429
Iteration 77, loss = 0.10361627
Iteration 78, loss = 0.10310737
Iteration 79, loss = 0.10355810
Iteration 80, loss = 0.10295109
Iteration 81, loss = 0.10376244
Iteration 82, loss = 0.10307433
Iteration 83, loss = 0.10371219
Iteration 84, loss = 0.10041267
Iteration 85, loss = 0.10505241
Iteration 86, loss = 0.10296131
Iteration 87, loss = 0.10026205
Iteration 88, loss = 0.10056689
Iteration 89, loss = 0.10226085
Iteration 90, loss = 0.10040277
Iteration 91, loss = 0.09963332
Iteration 92, loss = 0.10088711
Iteration 93, loss = 0.10100509
Iteration 94, loss = 0.09975172
Iteration 95, loss = 0.09934424
Iteration 96, loss = 0.09800460
Iteration 97, loss = 0.10264492
Iteration 98, loss = 0.09901449
Iteration 99, loss = 0.09766312
Iteration 100, loss = 0.09715486
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 1.85483652
Iteration 2, loss = 0.38828490
Iteration 3, loss = 0.32313285
Iteration 4, loss = 0.29032141
Iteration 5, loss = 0.26490751
Iteration 6, loss = 0.24618751
Iteration 7, loss = 0.23547346
Iteration 8, loss = 0.22140848
Iteration 9, loss = 0.21422447
Iteration 10, loss = 0.20713531
Iteration 11, loss = 0.20023228
Iteration 12, loss = 0.19176431
Iteration 13, loss = 0.18949049
Iteration 14, loss = 0.18367251
Iteration 15, loss = 0.17910822
Iteration 16, loss = 0.17489221
Iteration 17, loss = 0.17398324
Iteration 18, loss = 0.17072590
Iteration 19, loss = 0.16652264
Iteration 20, loss = 0.16549070
Iteration 21, loss = 0.16233017
Iteration 22, loss = 0.16053522
Iteration 23, loss = 0.15686104
Iteration 24, loss = 0.15423817
Iteration 25, loss = 0.15384192
Iteration 26, loss = 0.15315142
Iteration 27, loss = 0.15092553
Iteration 28, loss = 0.14953008
Iteration 29, loss = 0.14683047
Iteration 30, loss = 0.14631482
Iteration 31, loss = 0.14536189
Iteration 32, loss = 0.14343077
Iteration 33, loss = 0.14309345
Iteration 34, loss = 0.14108443
Iteration 35, loss = 0.13981096
Iteration 36, loss = 0.13879040
Iteration 37, loss = 0.13765456
Iteration 38, loss = 0.13747752
Iteration 39, loss = 0.13661612
Iteration 40, loss = 0.13389711
Iteration 41, loss = 0.13600064
Iteration 42, loss = 0.13255333
Iteration 43, loss = 0.13335499
Iteration 44, loss = 0.13227518
Iteration 45, loss = 0.13118556
Iteration 46, loss = 0.13027505
Iteration 47, loss = 0.12936939
Iteration 48, loss = 0.12996099
Iteration 49, loss = 0.12787750
Iteration 50, loss = 0.12715985
Iteration 51, loss = 0.12836914
Iteration 52, loss = 0.12718527
```

```
Iteration 53, loss = 0.12573180
Iteration 54, loss = 0.12667544
Iteration 55, loss = 0.12449885
Iteration 56, loss = 0.12610125
Iteration 57, loss = 0.12411438
Iteration 58, loss = 0.12386353
Iteration 59, loss = 0.12422909
Iteration 60, loss = 0.12306038
Iteration 61, loss = 0.12210395
Iteration 62, loss = 0.12068688
Iteration 63, loss = 0.12128870
Iteration 64, loss = 0.12181274
Iteration 65, loss = 0.12240890
Iteration 66, loss = 0.11942675
Iteration 67, loss = 0.11997152
Iteration 68, loss = 0.12021689
Iteration 69, loss = 0.12018874
Iteration 70, loss = 0.11846816
Iteration 71, loss = 0.12023189
Iteration 72, loss = 0.11792768
Iteration 73, loss = 0.12010913
Iteration 74, loss = 0.11714590
Iteration 75, loss = 0.11798797
Iteration 76, loss = 0.11611934
Iteration 77, loss = 0.11631966
Iteration 78, loss = 0.11709276
Iteration 79, loss = 0.11728862
Iteration 80, loss = 0.11679253
Iteration 81, loss = 0.11555371
Iteration 82, loss = 0.11649673
Iteration 83, loss = 0.11567849
Iteration 84, loss = 0.11586297
Iteration 85, loss = 0.11475662
Iteration 86, loss = 0.11662176
Iteration 87, loss = 0.11313622
Iteration 88, loss = 0.11485808
Iteration 89, loss = 0.11363688
Iteration 90, loss = 0.11492364
Iteration 91, loss = 0.11392307
Iteration 92, loss = 0.11356734
Iteration 93, loss = 0.11404613
Iteration 94, loss = 0.11306863
Iteration 95, loss = 0.11252615
Iteration 96, loss = 0.11388088
Iteration 97, loss = 0.11295816
Iteration 98, loss = 0.11284609
Iteration 99, loss = 0.11190334
Iteration 100, loss = 0.11230997
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Iteration 1, loss = 0.93978834
Iteration 2, loss = 0.36664269
Iteration 3, loss = 0.31068436
Iteration 4, loss = 0.27868344
Iteration 5, loss = 0.25643965
Iteration 6, loss = 0.23894696
Iteration 7, loss = 0.22455648
Iteration 8, loss = 0.21285328
Iteration 9, loss = 0.20333737
Iteration 10, loss = 0.19399545
Iteration 11, loss = 0.18638647
Iteration 12, loss = 0.18001324
Iteration 13, loss = 0.17400492
Iteration 14, loss = 0.16829215
Iteration 15, loss = 0.16307033
Iteration 16, loss = 0.15859751
Iteration 17, loss = 0.15438820
Iteration 18, loss = 0.15019366
Iteration 19, loss = 0.14638070
Iteration 20, loss = 0.14303218
Iteration 21, loss = 0.13965797
Iteration 22, loss = 0.13671035
Iteration 23, loss = 0.13398846
Iteration 24, loss = 0.13132780
Iteration 25, loss = 0.12867221
Iteration 26, loss = 0.12651217
Iteration 27, loss = 0.12380565
Iteration 28, loss = 0.12194231
Iteration 29, loss = 0.11978015
Iteration 30, loss = 0.11794056
Iteration 31, loss = 0.11604094
Iteration 32, loss = 0.11428387
Iteration 33, loss = 0.11237646
Iteration 34, loss = 0.11075323
Iteration 35, loss = 0.10897822
Iteration 36, loss = 0.10764940
Iteration 37, loss = 0.10617475
Iteration 38, loss = 0.10469851
Iteration 39, loss = 0.10333451
Iteration 40, loss = 0.10204618
Iteration 41, loss = 0.10095883
Iteration 42, loss = 0.09963241
Iteration 43, loss = 0.09819366
Iteration 44, loss = 0.09720834
Iteration 45, loss = 0.09595727
Iteration 46, loss = 0.09487856
Iteration 47, loss = 0.09370193
Iteration 48, loss = 0.09307163
Iteration 49, loss = 0.09195403
Iteration 50, loss = 0.09083477
Iteration 51, loss = 0.08992010
Iteration 52, loss = 0.08901070
```

```
Iteration 53, loss = 0.08820012
Iteration 54, loss = 0.08722144
Iteration 55, loss = 0.08650753
Iteration 56, loss = 0.08561910
Iteration 57, loss = 0.08497802
Iteration 58, loss = 0.08419831
Iteration 59, loss = 0.08330165
Iteration 60, loss = 0.08260518
Iteration 61, loss = 0.08177415
Iteration 62, loss = 0.08117502
Iteration 63, loss = 0.08046565
Iteration 64, loss = 0.07970842
Iteration 65, loss = 0.07911283
Iteration 66, loss = 0.07833590
Iteration 67, loss = 0.07767858
Iteration 68, loss = 0.07709969
Iteration 69, loss = 0.07646224
Iteration 70, loss = 0.07580653
Iteration 71, loss = 0.07523470
Iteration 72, loss = 0.07474650
Iteration 73, loss = 0.07436336
Iteration 74, loss = 0.07368287
Iteration 75, loss = 0.07305408
Iteration 76, loss = 0.07259542
Iteration 77, loss = 0.07180740
Iteration 78, loss = 0.07135705
Iteration 79, loss = 0.07095710
Iteration 80, loss = 0.07067529
Iteration 81, loss = 0.07002464
Iteration 82, loss = 0.06945759
Iteration 83, loss = 0.06900549
Iteration 84, loss = 0.06864334
Iteration 85, loss = 0.06810920
Iteration 86, loss = 0.06766026
Iteration 87, loss = 0.06732871
Iteration 88, loss = 0.06690201
Iteration 89, loss = 0.06630075
Iteration 90, loss = 0.06601103
Iteration 91, loss = 0.06561740
Iteration 92, loss = 0.06520549
Iteration 93, loss = 0.06488310
Iteration 94, loss = 0.06443979
Iteration 95, loss = 0.06404998
Iteration 96, loss = 0.06363112
Iteration 97, loss = 0.06321895
Iteration 98, loss = 0.06278369
Iteration 99, loss = 0.06269502
Iteration 100, loss = 0.06213193
CPU times: user 1d 23h 58min 4s, sys: 1h 25min 58s, total: 2d 1h 24min 3s
Wall time: 8h 37min 2s
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (100) reached and the optimization hasn't converged yet.
  warnings.warn(
```

Out[23]:
```
GridSearchCV(cv=TimeSeriesSplit(gap=0, max_train_size=None, n_splits=2, test_s
ize=None),
             estimator=MLPRegressor(random_state=32, verbose=1),
             param_grid={'activation': ['tanh', 'relu'],
                         'alpha': [0.0001, 0.05],
                         'hidden_layer_sizes': [(150, 100, 50), (120, 80, 40),
                                                (100, 50, 30)],
                         'learning_rate': ['constant', 'adaptive'],
                         'max_iter': [50, 100], 'solver': ['sgd', 'adam']})
```

In [24]:
```
MLPgrid.best_params_
```

Out[24]:
```
{'activation': 'relu',
 'alpha': 0.0001,
 'hidden_layer_sizes': (150, 100, 50),
 'learning_rate': 'constant',
 'max_iter': 100,
 'solver': 'sgd'}
```

In [26]:
```
%%time
#Instantiate
MLPmodel2 = MLPRegressor(verbose = 1, random_state = 32, activation
= 'relu', alpha = 0.0001, \
                       hidden_layer_sizes = (150, 100, 50),
learning_rate = 'constant'\
                        max_iter = 200, solver = 'sgd')
#Fit Model
MLPmodel2.fit(X_trainscaled, y_train)
print(MLPmodel2)
```

MLPRegressor Grid Search - Best Parameters and Run Time

- Best Parameters {'activation': 'relu', 'alpha': 0.0001, 'hidden_layer_sizes': (150, 100, 50), 'learning_rate': 'constant', 'max_iter': 100, 'solver': 'sgd'}
- Run Time: 8h 37min 2s

In [28]:
```
# Gather grid search predictions
grid_pred = MLPgrid.predict(X_testscaled)
```

In [29]:
```
# Gather results in dataframe for visualization of expected vs.
predictions
results_MLP_grid = pd.DataFrame(data = {'Actual':y_test, \
                                       'Predictions':grid_pred},
index=y_test.index)
```

In [31]:
```
results_MLP_grid
```

Out[31]:

startdate	Actual	Predictions
2016-05-02	21.080032	21.303924
2016-05-02	12.921798	13.245692
2016-05-02	11.742004	11.297715
2016-05-02	18.386656	17.989621
2016-05-02	10.771266	10.771513
...	...	...
2016-08-31	19.772009	16.822504
2016-08-31	19.998930	17.165045
2016-08-31	20.392469	17.283563
2016-08-31	10.406187	11.432712
2016-08-31	15.910995	14.843682

62622 rows × 2 columns

In [32]:
```
# Error Metrics for MLP Grid Search
print('R-squared =
{:.3f}'.format(r2_score(results_MLP_grid['Actual'],results_MLP_grid['F
print('RMSE =
{:.3f}'.format(sqrt(mean_squared_error(results_MLP_grid['Actual'],res
```

```
R-squared = 0.754
RMSE = 2.783
```

MLP Grid Search Evaluation

R-squared = 0.754 RMSE = 2.783

The grid search proved to have poorer scores than the default MLPRegresssor. We will try out the optimized grid search parameters with 200 iterrations and see if the metrics improve.

In [34]:

```
%%time
#Instantiate
MLPmodel2 = MLPRegressor(verbose = 1, random_state = 32, activation
= 'relu', alpha = 0.0001, \
                       hidden_layer_sizes = (150, 100, 50),
learning_rate = 'constant',\
                        max_iter = 200, solver = 'sgd')
#Fit Model
MLPmodel2.fit(X_trainscaled, y_train)
print(MLPmodel2)
```

```
Iteration 1, loss = 0.93978834
Iteration 2, loss = 0.36664269
Iteration 3, loss = 0.31068436
Iteration 4, loss = 0.27868344
Iteration 5, loss = 0.25643965
Iteration 6, loss = 0.23894696
Iteration 7, loss = 0.22455648
Iteration 8, loss = 0.21285328
Iteration 9, loss = 0.20333737
Iteration 10, loss = 0.19399545
Iteration 11, loss = 0.18638647
Iteration 12, loss = 0.18001324
Iteration 13, loss = 0.17400492
Iteration 14, loss = 0.16829215
Iteration 15, loss = 0.16307033
Iteration 16, loss = 0.15859751
Iteration 17, loss = 0.15438820
Iteration 18, loss = 0.15019366
Iteration 19, loss = 0.14638070
Iteration 20, loss = 0.14303218
Iteration 21, loss = 0.13965797
Iteration 22, loss = 0.13671035
Iteration 23, loss = 0.13398846
Iteration 24, loss = 0.13132780
Iteration 25, loss = 0.12867221
Iteration 26, loss = 0.12651217
Iteration 27, loss = 0.12380565
Iteration 28, loss = 0.12194231
Iteration 29, loss = 0.11978015
Iteration 30, loss = 0.11794056
Iteration 31, loss = 0.11604094
Iteration 32, loss = 0.11428387
Iteration 33, loss = 0.11237646
Iteration 34, loss = 0.11075323
Iteration 35, loss = 0.10897822
Iteration 36, loss = 0.10764940
Iteration 37, loss = 0.10617475
Iteration 38, loss = 0.10469851
Iteration 39, loss = 0.10333451
Iteration 40, loss = 0.10204618
Iteration 41, loss = 0.10095883
Iteration 42, loss = 0.09963241
Iteration 43, loss = 0.09819366
Iteration 44, loss = 0.09720834
Iteration 45, loss = 0.09595727
Iteration 46, loss = 0.09487856
Iteration 47, loss = 0.09370193
Iteration 48, loss = 0.09307163
Iteration 49, loss = 0.09195403
Iteration 50, loss = 0.09083477
Iteration 51, loss = 0.08992010
Iteration 52, loss = 0.08901070
```

```
Iteration 53, loss = 0.08820012
Iteration 54, loss = 0.08722144
Iteration 55, loss = 0.08650753
Iteration 56, loss = 0.08561910
Iteration 57, loss = 0.08497802
Iteration 58, loss = 0.08419831
Iteration 59, loss = 0.08330165
Iteration 60, loss = 0.08260518
Iteration 61, loss = 0.08177415
Iteration 62, loss = 0.08117502
Iteration 63, loss = 0.08046565
Iteration 64, loss = 0.07970842
Iteration 65, loss = 0.07911283
Iteration 66, loss = 0.07833590
Iteration 67, loss = 0.07767858
Iteration 68, loss = 0.07709969
Iteration 69, loss = 0.07646224
Iteration 70, loss = 0.07580653
Iteration 71, loss = 0.07523470
Iteration 72, loss = 0.07474650
Iteration 73, loss = 0.07436336
Iteration 74, loss = 0.07368287
Iteration 75, loss = 0.07305408
Iteration 76, loss = 0.07259542
Iteration 77, loss = 0.07180740
Iteration 78, loss = 0.07135705
Iteration 79, loss = 0.07095710
Iteration 80, loss = 0.07067529
Iteration 81, loss = 0.07002464
Iteration 82, loss = 0.06945759
Iteration 83, loss = 0.06900549
Iteration 84, loss = 0.06864334
Iteration 85, loss = 0.06810920
Iteration 86, loss = 0.06766026
Iteration 87, loss = 0.06732871
Iteration 88, loss = 0.06690201
Iteration 89, loss = 0.06630075
Iteration 90, loss = 0.06601103
Iteration 91, loss = 0.06561740
Iteration 92, loss = 0.06520549
Iteration 93, loss = 0.06488310
Iteration 94, loss = 0.06443979
Iteration 95, loss = 0.06404998
Iteration 96, loss = 0.06363112
Iteration 97, loss = 0.06321895
Iteration 98, loss = 0.06278369
Iteration 99, loss = 0.06269502
Iteration 100, loss = 0.06213193
Iteration 101, loss = 0.06196479
Iteration 102, loss = 0.06164666
Iteration 103, loss = 0.06113473
Iteration 104, loss = 0.06078501
```

```
Iteration 105, loss = 0.06060282
Iteration 106, loss = 0.06032986
Iteration 107, loss = 0.05997126
Iteration 108, loss = 0.05969640
Iteration 109, loss = 0.05941975
Iteration 110, loss = 0.05903298
Iteration 111, loss = 0.05887884
Iteration 112, loss = 0.05849439
Iteration 113, loss = 0.05819520
Iteration 114, loss = 0.05797428
Iteration 115, loss = 0.05759235
Iteration 116, loss = 0.05732471
Iteration 117, loss = 0.05705141
Iteration 118, loss = 0.05680362
Iteration 119, loss = 0.05660600
Iteration 120, loss = 0.05632556
Iteration 121, loss = 0.05592323
Iteration 122, loss = 0.05577633
Iteration 123, loss = 0.05556058
Iteration 124, loss = 0.05535124
Iteration 125, loss = 0.05504981
Iteration 126, loss = 0.05472987
Iteration 127, loss = 0.05465903
Iteration 128, loss = 0.05439519
Iteration 129, loss = 0.05400848
Iteration 130, loss = 0.05391480
Iteration 131, loss = 0.05362991
Iteration 132, loss = 0.05335481
Iteration 133, loss = 0.05336378
Iteration 134, loss = 0.05312028
Iteration 135, loss = 0.05283715
Iteration 136, loss = 0.05268788
Iteration 137, loss = 0.05248252
Iteration 138, loss = 0.05219867
Iteration 139, loss = 0.05197603
Iteration 140, loss = 0.05176484
Iteration 141, loss = 0.05148551
Iteration 142, loss = 0.05136494
Iteration 143, loss = 0.05115191
Iteration 144, loss = 0.05090323
Iteration 145, loss = 0.05090097
Iteration 146, loss = 0.05060390
Iteration 147, loss = 0.05034267
Iteration 148, loss = 0.05029297
Iteration 149, loss = 0.04987506
Iteration 150, loss = 0.04991937
Iteration 151, loss = 0.04959585
Iteration 152, loss = 0.04942595
Iteration 153, loss = 0.04936190
Iteration 154, loss = 0.04916208
Iteration 155, loss = 0.04895357
Iteration 156, loss = 0.04879786
```

```
Iteration 157, loss = 0.04862182
Iteration 158, loss = 0.04842527
Iteration 159, loss = 0.04825594
Iteration 160, loss = 0.04836664
Iteration 161, loss = 0.04807375
Iteration 162, loss = 0.04795424
Iteration 163, loss = 0.04773726
Iteration 164, loss = 0.04739279
Iteration 165, loss = 0.04735320
Iteration 166, loss = 0.04718601
Iteration 167, loss = 0.04709746
Iteration 168, loss = 0.04688906
Iteration 169, loss = 0.04671930
Iteration 170, loss = 0.04666795
Iteration 171, loss = 0.04652074
Iteration 172, loss = 0.04623822
Iteration 173, loss = 0.04615613
Iteration 174, loss = 0.04603813
Iteration 175, loss = 0.04597242
Iteration 176, loss = 0.04571087
Iteration 177, loss = 0.04566112
Iteration 178, loss = 0.04546162
Iteration 179, loss = 0.04524879
Iteration 180, loss = 0.04517729
Iteration 181, loss = 0.04506823
Iteration 182, loss = 0.04492935
Iteration 183, loss = 0.04492001
Iteration 184, loss = 0.04468217
Iteration 185, loss = 0.04458527
Iteration 186, loss = 0.04435923
Iteration 187, loss = 0.04436573
Iteration 188, loss = 0.04414504
Iteration 189, loss = 0.04405233
Iteration 190, loss = 0.04385438
Iteration 191, loss = 0.04371042
Iteration 192, loss = 0.04375990
Iteration 193, loss = 0.04356766
Iteration 194, loss = 0.04339095
Iteration 195, loss = 0.04334318
Iteration 196, loss = 0.04324076
Iteration 197, loss = 0.04297672
Iteration 198, loss = 0.04289550
Iteration 199, loss = 0.04292981
Iteration 200, loss = 0.04278101
MLPRegressor(hidden_layer_sizes=(150, 100, 50), random_state=32, solver='sgd',
             verbose=1)
CPU times: user 1h 47min 50s, sys: 3min 5s, total: 1h 50min 55s
Wall time: 19min 24s
```

```
/Users/kileymack/opt/anaconda3/lib/python3.9/site-packages/sklearn/neural_netw
ork/_multilayer_perceptron.py:692: ConvergenceWarning: Stochastic Optimizer: M
aximum iterations (200) reached and the optimization hasn't converged yet.
  warnings.warn(
```

In [36]:
```
# Gather grid search predictions
pred2 = MLPmodel2.predict(X_testscaled)
```

In [37]:
```
# Gather results in dataframe for visualization of expected vs.
predictions
results_MLP2 = pd.DataFrame(data = {'Actual':y_test, \
                                    'Predictions':pred2},
index=y_test.index)
```

In [38]:
```
results_MLP2
```

Out[38]:

startdate	Actual	Predictions
2016-05-02	21.080032	21.276929
2016-05-02	12.921798	13.328666
2016-05-02	11.742004	11.743602
2016-05-02	18.386656	17.927709
2016-05-02	10.771266	10.915823
...	...	...
2016-08-31	19.772009	16.797451
2016-08-31	19.998930	17.183268
2016-08-31	20.392469	17.279610
2016-08-31	10.406187	10.420368
2016-08-31	15.910995	14.193742

62622 rows × 2 columns

In [39]:
```
# Error Metrics for MLP2
print('R-squared =
{:.3f}'.format(r2_score(results_MLP2['Actual'],results_MLP2['Predicti
print('RMSE =
{:.3f}'.format(sqrt(mean_squared_error(results_MLP2['Actual'],results_
```

```
R-squared = 0.720
RMSE = 2.966
```

MLPRegressor - 200 Iterations with "Optimized Parameters"

- R-squared = 0.720

- RMSE = 2.966

Our metrics did not improve, lending more evidence that the default MLPRegressor to be superior with this dataset.

We also ran some different length testing sets to see how our error scores would be affected. With this small sample size, we see our R-squared score increase with the longer test set but the RMSE score decrease. The test set for the datathon submission is only two months long, and our RSME could improve upon submission with the shorter testing window.

The MLPRegressor is scoring lower than our RandomForestRegressor, and we did not have to scale the data. Our next step will be to compose a submission for the Datathon with the RFR model since it has consistently performed better than the MLP Regressor. This submission will give use a baseline to improve from.

We will then have to look to feature engineering and/or other regression models to further improve upon our modeling error metrics in subsequent notebooks.

RFR - Submission

- We will fit our RFR with a train/test split of the WiDS `training_data` with the optimized parameters from the grid search in Notebook 1.
- We evaluate on the test split to make sure things transferred well to this notebook.
- Finally, we will then fit the RFR on the complete `training_data` and make predictions on the WiDS `test_data` and reformat for a submission to the datathon.

In [76]:
```
#Check X_test global variable -- Look good
X_test
```

Out[76]:

	index	lat	lon	contest-pevpr-sfc-gauss-14d__pevpr	nmme0-tmp2m-34w__cancm30	nmme0-tmp2m-34w__cancm40	nm tm 34w__cc
startdate							
2016-05-02	95639	0.409091	0.266667	374.589996	13.440000	14.210000	11.84
2016-05-02	212599	0.636364	0.800000	293.670013	10.670000	12.210000	10.26
2016-05-02	184090	0.590909	0.466667	197.000000	3.580000	6.840000	2.62
2016-05-02	116838	0.454545	0.300000	395.859985	10.430000	11.370000	9.08
2016-05-02	369764	1.000000	0.600000	221.509995	4.290000	6.690000	6.38
...	...	...	...	...	...	...	
2016-08-31	255118	0.727273	0.833333	302.059998	24.760000	33.759998	25.90
2016-08-31	255849	0.727273	0.866667	324.470001	25.049999	33.889999	26.74
2016-08-31	256580	0.727273	0.900000	326.140015	25.139999	33.590000	27.46
2016-08-31	187135	0.590909	0.600000	494.890015	21.930000	22.770000	21.43
2016-08-31	375733	1.000000	0.866667	295.290009	23.129999	27.200001	20.25

62622 rows × 260 columns

In [77]:

```
#Import model and scoring metric
from sklearn.ensemble import RandomForestRegressor
```

In [78]:

```
#Instatiate
RFRmodel = RandomForestRegressor(n_estimators=100, max_features =
None, \
                                 verbose = 1, random_state=32)
```

In [79]:

```
%%time
#Fit Model
RFRmodel.fit(X_train,y_train)
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worker
s.
```

```
CPU times: user 1h 4min 58s, sys: 19.8 s, total: 1h 5min 18s
Wall time: 1h 5min 43s
```

```
[Parallel(n_jobs=1)]: Done 100 out of 100 | elapsed: 65.7min finished
```

Out[79]:
```
RandomForestRegressor(max_features=None, random_state=32, verbose=1)
```

In [80]:
```
# Get Predictions from RFR Model
pred = RFRmodel.predict(X_test)
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worker
s.
[Parallel(n_jobs=1)]: Done 100 out of 100 | elapsed:    4.6s finished
```

In [81]:
```
# Gather results in dataframe for visualization of expected vs.
predictions
results_RFR = pd.DataFrame(data = {'Actual':y_test, \
                                   'Predictions':pred},
index=y_test.index)
```

In [82]:
```
results_RFR
```

Out[82]:

	Actual	Predictions
startdate		
2016-05-02	21.080032	20.437980
2016-05-02	12.921798	13.407156
2016-05-02	11.742004	11.323933
2016-05-02	18.386656	17.999544
2016-05-02	10.771266	11.368966
...	...	...
2016-08-31	19.772009	19.208867
2016-08-31	19.998930	19.483500
2016-08-31	20.392469	19.578225
2016-08-31	10.406187	11.230049
2016-08-31	15.910995	16.410757

62622 rows × 2 columns

In [83]:
```
# Error Metrics for initial RFR
print('R-squared =
{:.3f}'.format(r2_score(results_RFR['Actual'],results_RFR['Predictions
print('RMSE =
{:.3f}'.format(sqrt(mean_squared_error(results_RFR['Actual'],results_R
```

```
R-squared = 0.908
RMSE = 1.696
```

The RFR is performing at pretty much the same level as in our last notebook after optimized. We will proceed.

Notebook 1: R-squared = 0.909 RMSE = 1.694

Notebook 2: R-squared = 0.908 RMSE = 1.696

Transform Test_Data

- Set up WiDS `test_data` with a stardate as index as we did for the `training_data` allowing our models fit on our cleaned and transformed data to run the WiDS `WiDS` test data.
- The `test_data` from WiDS has no target variable. Therefore, we will not split it into X and y.
- We will predict the target and then upon submission to the WiDS Kaggle site we will know our RMSE metric.
- This will be our baseline score to improve upon.

In [84]:

```
# Read in clean training set with start date as datetime index
test_data = pd.read_csv('data/test_data_clean.csv')
```

In [85]:

```
# Let's view the indices and shape of the original test set. So, we can make sure the index will realign
# when we make our submission.
test_data.head()
```

Out[85]:

	index	lat	lon	startdate	contest-pevpr-sfc-gauss-14d__pevpr	nmme0-tmp2m-34w__cancm30	nmme0-tmp2m-34w__cancm40	nmme tmp2ı 34w__ccsm:
0	375734	0.0	0.833333	2022-11-01	339.88	30.88	30.92	29
1	375735	0.0	0.833333	2022-11-02	334.63	30.88	30.92	29
2	375736	0.0	0.833333	2022-11-03	337.83	30.88	30.92	29
3	375737	0.0	0.833333	2022-11-04	345.81	30.88	30.92	29
4	375738	0.0	0.833333	2022-11-05	357.39	30.88	30.92	29

5 rows × 261 columns

In [86]:
```
test_data.tail()
```

Out[86]:

	index	lat	lon	startdate	contest-pevpr-sfc-gauss-14d__pevpr	nmme0-tmp2m-34w__cancm30	nmme0-tmp2m-34w__cancm40	n t 34w__c
31349	407083	1.0	0.866667	2022-12-27	62.72	4.6	8.71	
31350	407084	1.0	0.866667	2022-12-28	73.41	4.6	8.71	
31351	407085	1.0	0.866667	2022-12-29	70.00	4.6	8.71	
31352	407086	1.0	0.866667	2022-12-30	79.81	4.6	8.71	
31353	407087	1.0	0.866667	2022-12-31	86.17	4.6	8.71	

5 rows × 261 columns

In [87]:
```
test_data.shape
```

Out[87]:
```
(31354, 261)
```

In [89]:
```
# Check that start date is still in date time data type
with pd.option_context('display.max_rows', None,
'display.max_columns', None):
    print(test_data.dtypes)
```

```
index                                            int64
lat                                            float64
lon                                            float64
startdate                                       object
contest-pevpr-sfc-gauss-14d__pevpr             float64
nmme0-tmp2m-34w__cancm30                       float64
nmme0-tmp2m-34w__cancm40                       float64
nmme0-tmp2m-34w__ccsm30                        float64
nmme0-tmp2m-34w__ccsm40                        float64
nmme0-tmp2m-34w__cfsv20                        float64
nmme0-tmp2m-34w__gfdlflora0                    float64
nmme0-tmp2m-34w__gfdlflorb0                    float64
nmme0-tmp2m-34w__gfdl0                         float64
nmme0-tmp2m-34w__nasa0                         float64
nmme0-tmp2m-34w__nmme0mean                     float64
contest-wind-h10-14d__wind-hgt-10              float64
nmme-tmp2m-56w__cancm3                         float64
nmme-tmp2m-56w__cancm4                         float64
nmme-tmp2m-56w__ccsm3                          float64
nmme-tmp2m-56w__ccsm4                          float64
nmme-tmp2m-56w__cfsv2                          float64
nmme-tmp2m-56w__gfdl                           float64
nmme-tmp2m-56w__gfdlflora                      float64
nmme-tmp2m-56w__gfdlflorb                      float64
nmme-tmp2m-56w__nasa                           float64
nmme-tmp2m-56w__nmmemean                       float64
contest-rhum-sig995-14d__rhum                  float64
nmme-prate-34w__cancm3                         float64
nmme-prate-34w__cancm4                         float64
nmme-prate-34w__ccsm3                          float64
nmme-prate-34w__ccsm4                          float64
nmme-prate-34w__cfsv2                          float64
nmme-prate-34w__gfdl                           float64
nmme-prate-34w__gfdlflora                      float64
nmme-prate-34w__gfdlflorb                      float64
nmme-prate-34w__nasa                           float64
nmme-prate-34w__nmmemean                       float64
contest-wind-h100-14d__wind-hgt-100            float64
nmme0-prate-56w__cancm30                       float64
nmme0-prate-56w__cancm40                       float64
nmme0-prate-56w__ccsm30                        float64
nmme0-prate-56w__ccsm40                        float64
nmme0-prate-56w__cfsv20                        float64
nmme0-prate-56w__gfdlflora0                    float64
nmme0-prate-56w__gfdlflorb0                    float64
nmme0-prate-56w__gfdl0                         float64
nmme0-prate-56w__nasa0                         float64
nmme0-prate-56w__nmme0mean                     float64
nmme0-prate-34w__cancm30                       float64
nmme0-prate-34w__cancm40                       float64
nmme0-prate-34w__ccsm30                        float64
nmme0-prate-34w__ccsm40                        float64
```

```
nmme0-prate-34w__cfsv20                    float64
nmme0-prate-34w__gfdlflora0                float64
nmme0-prate-34w__gfdlflorb0                float64
nmme0-prate-34w__gfdl0                     float64
nmme0-prate-34w__nasa0                     float64
nmme0-prate-34w__nmme0mean                 float64
contest-slp-14d__slp                       float64
contest-wind-vwnd-925-14d__wind-vwnd-925   float64
nmme-prate-56w__cancm3                     float64
nmme-prate-56w__cancm4                     float64
nmme-prate-56w__ccsm3                      float64
nmme-prate-56w__ccsm4                      float64
nmme-prate-56w__cfsv2                      float64
nmme-prate-56w__gfdl                       float64
nmme-prate-56w__gfdlflora                  float64
nmme-prate-56w__gfdlflorb                  float64
nmme-prate-56w__nasa                       float64
nmme-prate-56w__nmmemean                   float64
contest-pres-sfc-gauss-14d__pres           float64
contest-wind-uwnd-250-14d__wind-uwnd-250   float64
nmme-tmp2m-34w__cancm3                     float64
nmme-tmp2m-34w__cancm4                     float64
nmme-tmp2m-34w__ccsm3                      float64
nmme-tmp2m-34w__ccsm4                      float64
nmme-tmp2m-34w__cfsv2                      float64
nmme-tmp2m-34w__gfdl                       float64
nmme-tmp2m-34w__gfdlflora                  float64
nmme-tmp2m-34w__gfdlflorb                  float64
nmme-tmp2m-34w__nasa                       float64
nmme-tmp2m-34w__nmmemean                   float64
contest-prwtr-eatm-14d__prwtr              float64
contest-wind-vwnd-250-14d__wind-vwnd-250   float64
contest-precip-14d__precip                 float64
contest-wind-h850-14d__wind-hgt-850        float64
contest-wind-uwnd-925-14d__wind-uwnd-925   float64
contest-wind-h500-14d__wind-hgt-500        float64
cancm30                                    float64
cancm40                                    float64
ccsm30                                     float64
ccsm40                                     float64
cfsv20                                     float64
gfdlflora0                                 float64
gfdlflorb0                                 float64
gfdl0                                      float64
nasa0                                      float64
nmme0mean                                  float64
elevation__elevation                         int64
wind-vwnd-250-2010-1                       float64
wind-vwnd-250-2010-2                       float64
wind-vwnd-250-2010-3                       float64
wind-vwnd-250-2010-4                       float64
wind-vwnd-250-2010-5                       float64
```

```
wind-vwnd-250-2010-6                            float64
wind-vwnd-250-2010-7                            float64
wind-vwnd-250-2010-8                            float64
wind-vwnd-250-2010-9                            float64
wind-vwnd-250-2010-10                           float64
wind-vwnd-250-2010-11                           float64
wind-vwnd-250-2010-12                           float64
wind-vwnd-250-2010-13                           float64
wind-vwnd-250-2010-14                           float64
wind-vwnd-250-2010-15                           float64
wind-vwnd-250-2010-16                           float64
wind-vwnd-250-2010-17                           float64
wind-vwnd-250-2010-18                           float64
wind-vwnd-250-2010-19                           float64
wind-vwnd-250-2010-20                           float64
wind-uwnd-250-2010-1                            float64
wind-uwnd-250-2010-2                            float64
wind-uwnd-250-2010-3                            float64
wind-uwnd-250-2010-4                            float64
wind-uwnd-250-2010-5                            float64
wind-uwnd-250-2010-6                            float64
wind-uwnd-250-2010-7                            float64
wind-uwnd-250-2010-8                            float64
wind-uwnd-250-2010-9                            float64
wind-uwnd-250-2010-10                           float64
wind-uwnd-250-2010-11                           float64
wind-uwnd-250-2010-12                           float64
wind-uwnd-250-2010-13                           float64
wind-uwnd-250-2010-14                           float64
wind-uwnd-250-2010-15                           float64
wind-uwnd-250-2010-16                           float64
wind-uwnd-250-2010-17                           float64
wind-uwnd-250-2010-18                           float64
wind-uwnd-250-2010-19                           float64
wind-uwnd-250-2010-20                           float64
mjo1d__phase                                    float64
mjo1d__amplitude                                float64
mei__mei                                        float64
mei__meirank                                    float64
mei__nip                                        float64
wind-hgt-850-2010-1                             float64
wind-hgt-850-2010-2                             float64
wind-hgt-850-2010-3                             float64
wind-hgt-850-2010-4                             float64
wind-hgt-850-2010-5                             float64
wind-hgt-850-2010-6                             float64
wind-hgt-850-2010-7                             float64
wind-hgt-850-2010-8                             float64
wind-hgt-850-2010-9                             float64
wind-hgt-850-2010-10                            float64
sst-2010-1                                      float64
sst-2010-2                                      float64
```

```
sst-2010-3                                    float64
sst-2010-4                                    float64
sst-2010-5                                    float64
sst-2010-6                                    float64
sst-2010-7                                    float64
sst-2010-8                                    float64
sst-2010-9                                    float64
sst-2010-10                                   float64
wind-hgt-500-2010-1                           float64
wind-hgt-500-2010-2                           float64
wind-hgt-500-2010-3                           float64
wind-hgt-500-2010-4                           float64
wind-hgt-500-2010-5                           float64
wind-hgt-500-2010-6                           float64
wind-hgt-500-2010-7                           float64
wind-hgt-500-2010-8                           float64
wind-hgt-500-2010-9                           float64
wind-hgt-500-2010-10                          float64
icec-2010-1                                   float64
icec-2010-2                                   float64
icec-2010-3                                   float64
icec-2010-4                                   float64
icec-2010-5                                   float64
icec-2010-6                                   float64
icec-2010-7                                   float64
icec-2010-8                                   float64
icec-2010-9                                   float64
icec-2010-10                                  float64
wind-uwnd-925-2010-1                          float64
wind-uwnd-925-2010-2                          float64
wind-uwnd-925-2010-3                          float64
wind-uwnd-925-2010-4                          float64
wind-uwnd-925-2010-5                          float64
wind-uwnd-925-2010-6                          float64
wind-uwnd-925-2010-7                          float64
wind-uwnd-925-2010-8                          float64
wind-uwnd-925-2010-9                          float64
wind-uwnd-925-2010-10                         float64
wind-uwnd-925-2010-11                         float64
wind-uwnd-925-2010-12                         float64
wind-uwnd-925-2010-13                         float64
wind-uwnd-925-2010-14                         float64
wind-uwnd-925-2010-15                         float64
wind-uwnd-925-2010-16                         float64
wind-uwnd-925-2010-17                         float64
wind-uwnd-925-2010-18                         float64
wind-uwnd-925-2010-19                         float64
wind-uwnd-925-2010-20                         float64
wind-hgt-10-2010-1                            float64
wind-hgt-10-2010-2                            float64
wind-hgt-10-2010-3                            float64
wind-hgt-10-2010-4                            float64
```

```
wind-hgt-10-2010-5                            float64
wind-hgt-10-2010-6                            float64
wind-hgt-10-2010-7                            float64
wind-hgt-10-2010-8                            float64
wind-hgt-10-2010-9                            float64
wind-hgt-10-2010-10                           float64
wind-hgt-100-2010-1                           float64
wind-hgt-100-2010-2                           float64
wind-hgt-100-2010-3                           float64
wind-hgt-100-2010-4                           float64
wind-hgt-100-2010-5                           float64
wind-hgt-100-2010-6                           float64
wind-hgt-100-2010-7                           float64
wind-hgt-100-2010-8                           float64
wind-hgt-100-2010-9                           float64
wind-hgt-100-2010-10                          float64
wind-vwnd-925-2010-1                          float64
wind-vwnd-925-2010-2                          float64
wind-vwnd-925-2010-3                          float64
wind-vwnd-925-2010-4                          float64
wind-vwnd-925-2010-5                          float64
wind-vwnd-925-2010-6                          float64
wind-vwnd-925-2010-7                          float64
wind-vwnd-925-2010-8                          float64
wind-vwnd-925-2010-9                          float64
wind-vwnd-925-2010-10                         float64
wind-vwnd-925-2010-11                         float64
wind-vwnd-925-2010-12                         float64
wind-vwnd-925-2010-13                         float64
wind-vwnd-925-2010-14                         float64
wind-vwnd-925-2010-15                         float64
wind-vwnd-925-2010-16                         float64
wind-vwnd-925-2010-17                         float64
wind-vwnd-925-2010-18                         float64
wind-vwnd-925-2010-19                         float64
wind-vwnd-925-2010-20                         float64
BSh                                             int64
BSk                                             int64
BWh                                             int64
BWk                                             int64
Cfa                                             int64
Cfb                                             int64
Csa                                             int64
Csb                                             int64
Dfa                                             int64
Dfb                                             int64
Dfc                                             int64
Dsb                                             int64
Dsc                                             int64
Dwa                                             int64
Dwb                                             int64
month_number                                    int64
```

```
season_number                                        int64
dtype: object
```

In [90]:

```
# No pd.read_csv converted startdate back into an object
# Convert start date to datetime data type for test data
test_data['startdate'] = pd.to_datetime(test_data['startdate'])
```

In [91]:

```
# Check that start date is still in date time data type
with pd.option_context('display.max_rows', None,
'display.max_columns', None):
    print(test_data.dtypes)
```

```
index                                            int64
lat                                            float64
lon                                            float64
startdate                               datetime64[ns]
contest-pevpr-sfc-gauss-14d__pevpr             float64
nmme0-tmp2m-34w__cancm30                       float64
nmme0-tmp2m-34w__cancm40                       float64
nmme0-tmp2m-34w__ccsm30                        float64
nmme0-tmp2m-34w__ccsm40                        float64
nmme0-tmp2m-34w__cfsv20                        float64
nmme0-tmp2m-34w__gfdlflora0                    float64
nmme0-tmp2m-34w__gfdlflorb0                    float64
nmme0-tmp2m-34w__gfdl0                         float64
nmme0-tmp2m-34w__nasa0                         float64
nmme0-tmp2m-34w__nmme0mean                     float64
contest-wind-h10-14d__wind-hgt-10              float64
nmme-tmp2m-56w__cancm3                         float64
nmme-tmp2m-56w__cancm4                         float64
nmme-tmp2m-56w__ccsm3                          float64
nmme-tmp2m-56w__ccsm4                          float64
nmme-tmp2m-56w__cfsv2                          float64
nmme-tmp2m-56w__gfdl                           float64
nmme-tmp2m-56w__gfdlflora                      float64
nmme-tmp2m-56w__gfdlflorb                      float64
nmme-tmp2m-56w__nasa                           float64
nmme-tmp2m-56w__nmmemean                       float64
contest-rhum-sig995-14d__rhum                  float64
nmme-prate-34w__cancm3                         float64
nmme-prate-34w__cancm4                         float64
nmme-prate-34w__ccsm3                          float64
nmme-prate-34w__ccsm4                          float64
nmme-prate-34w__cfsv2                          float64
nmme-prate-34w__gfdl                           float64
nmme-prate-34w__gfdlflora                      float64
nmme-prate-34w__gfdlflorb                      float64
nmme-prate-34w__nasa                           float64
nmme-prate-34w__nmmemean                       float64
contest-wind-h100-14d__wind-hgt-100            float64
nmme0-prate-56w__cancm30                       float64
nmme0-prate-56w__cancm40                       float64
nmme0-prate-56w__ccsm30                        float64
nmme0-prate-56w__ccsm40                        float64
nmme0-prate-56w__cfsv20                        float64
nmme0-prate-56w__gfdlflora0                    float64
nmme0-prate-56w__gfdlflorb0                    float64
nmme0-prate-56w__gfdl0                         float64
nmme0-prate-56w__nasa0                         float64
nmme0-prate-56w__nmme0mean                     float64
nmme0-prate-34w__cancm30                       float64
nmme0-prate-34w__cancm40                       float64
nmme0-prate-34w__ccsm30                        float64
nmme0-prate-34w__ccsm40                        float64
```

```
nmme0-prate-34w__cfsv20                              float64
nmme0-prate-34w__gfdlflora0                          float64
nmme0-prate-34w__gfdlflorb0                          float64
nmme0-prate-34w__gfdl0                               float64
nmme0-prate-34w__nasa0                               float64
nmme0-prate-34w__nmme0mean                           float64
contest-slp-14d__slp                                 float64
contest-wind-vwnd-925-14d__wind-vwnd-925             float64
nmme-prate-56w__cancm3                               float64
nmme-prate-56w__cancm4                               float64
nmme-prate-56w__ccsm3                                float64
nmme-prate-56w__ccsm4                                float64
nmme-prate-56w__cfsv2                                float64
nmme-prate-56w__gfdl                                 float64
nmme-prate-56w__gfdlflora                            float64
nmme-prate-56w__gfdlflorb                            float64
nmme-prate-56w__nasa                                 float64
nmme-prate-56w__nmmemean                             float64
contest-pres-sfc-gauss-14d__pres                     float64
contest-wind-uwnd-250-14d__wind-uwnd-250             float64
nmme-tmp2m-34w__cancm3                               float64
nmme-tmp2m-34w__cancm4                               float64
nmme-tmp2m-34w__ccsm3                                float64
nmme-tmp2m-34w__ccsm4                                float64
nmme-tmp2m-34w__cfsv2                                float64
nmme-tmp2m-34w__gfdl                                 float64
nmme-tmp2m-34w__gfdlflora                            float64
nmme-tmp2m-34w__gfdlflorb                            float64
nmme-tmp2m-34w__nasa                                 float64
nmme-tmp2m-34w__nmmemean                             float64
contest-prwtr-eatm-14d__prwtr                        float64
contest-wind-vwnd-250-14d__wind-vwnd-250             float64
contest-precip-14d__precip                           float64
contest-wind-h850-14d__wind-hgt-850                  float64
contest-wind-uwnd-925-14d__wind-uwnd-925             float64
contest-wind-h500-14d__wind-hgt-500                  float64
cancm30                                              float64
cancm40                                              float64
ccsm30                                               float64
ccsm40                                               float64
cfsv20                                               float64
gfdlflora0                                           float64
gfdlflorb0                                           float64
gfdl0                                                float64
nasa0                                                float64
nmme0mean                                            float64
elevation__elevation                                   int64
wind-vwnd-250-2010-1                                 float64
wind-vwnd-250-2010-2                                 float64
wind-vwnd-250-2010-3                                 float64
wind-vwnd-250-2010-4                                 float64
wind-vwnd-250-2010-5                                 float64
```

```
wind-vwnd-250-2010-6                                    float64
wind-vwnd-250-2010-7                                    float64
wind-vwnd-250-2010-8                                    float64
wind-vwnd-250-2010-9                                    float64
wind-vwnd-250-2010-10                                   float64
wind-vwnd-250-2010-11                                   float64
wind-vwnd-250-2010-12                                   float64
wind-vwnd-250-2010-13                                   float64
wind-vwnd-250-2010-14                                   float64
wind-vwnd-250-2010-15                                   float64
wind-vwnd-250-2010-16                                   float64
wind-vwnd-250-2010-17                                   float64
wind-vwnd-250-2010-18                                   float64
wind-vwnd-250-2010-19                                   float64
wind-vwnd-250-2010-20                                   float64
wind-uwnd-250-2010-1                                    float64
wind-uwnd-250-2010-2                                    float64
wind-uwnd-250-2010-3                                    float64
wind-uwnd-250-2010-4                                    float64
wind-uwnd-250-2010-5                                    float64
wind-uwnd-250-2010-6                                    float64
wind-uwnd-250-2010-7                                    float64
wind-uwnd-250-2010-8                                    float64
wind-uwnd-250-2010-9                                    float64
wind-uwnd-250-2010-10                                   float64
wind-uwnd-250-2010-11                                   float64
wind-uwnd-250-2010-12                                   float64
wind-uwnd-250-2010-13                                   float64
wind-uwnd-250-2010-14                                   float64
wind-uwnd-250-2010-15                                   float64
wind-uwnd-250-2010-16                                   float64
wind-uwnd-250-2010-17                                   float64
wind-uwnd-250-2010-18                                   float64
wind-uwnd-250-2010-19                                   float64
wind-uwnd-250-2010-20                                   float64
mjo1d__phase                                            float64
mjo1d__amplitude                                        float64
mei__mei                                                float64
mei__meirank                                            float64
mei__nip                                                float64
wind-hgt-850-2010-1                                     float64
wind-hgt-850-2010-2                                     float64
wind-hgt-850-2010-3                                     float64
wind-hgt-850-2010-4                                     float64
wind-hgt-850-2010-5                                     float64
wind-hgt-850-2010-6                                     float64
wind-hgt-850-2010-7                                     float64
wind-hgt-850-2010-8                                     float64
wind-hgt-850-2010-9                                     float64
wind-hgt-850-2010-10                                    float64
sst-2010-1                                              float64
sst-2010-2                                              float64
```

```
sst-2010-3                                        float64
sst-2010-4                                        float64
sst-2010-5                                        float64
sst-2010-6                                        float64
sst-2010-7                                        float64
sst-2010-8                                        float64
sst-2010-9                                        float64
sst-2010-10                                       float64
wind-hgt-500-2010-1                               float64
wind-hgt-500-2010-2                               float64
wind-hgt-500-2010-3                               float64
wind-hgt-500-2010-4                               float64
wind-hgt-500-2010-5                               float64
wind-hgt-500-2010-6                               float64
wind-hgt-500-2010-7                               float64
wind-hgt-500-2010-8                               float64
wind-hgt-500-2010-9                               float64
wind-hgt-500-2010-10                              float64
icec-2010-1                                       float64
icec-2010-2                                       float64
icec-2010-3                                       float64
icec-2010-4                                       float64
icec-2010-5                                       float64
icec-2010-6                                       float64
icec-2010-7                                       float64
icec-2010-8                                       float64
icec-2010-9                                       float64
icec-2010-10                                      float64
wind-uwnd-925-2010-1                              float64
wind-uwnd-925-2010-2                              float64
wind-uwnd-925-2010-3                              float64
wind-uwnd-925-2010-4                              float64
wind-uwnd-925-2010-5                              float64
wind-uwnd-925-2010-6                              float64
wind-uwnd-925-2010-7                              float64
wind-uwnd-925-2010-8                              float64
wind-uwnd-925-2010-9                              float64
wind-uwnd-925-2010-10                             float64
wind-uwnd-925-2010-11                             float64
wind-uwnd-925-2010-12                             float64
wind-uwnd-925-2010-13                             float64
wind-uwnd-925-2010-14                             float64
wind-uwnd-925-2010-15                             float64
wind-uwnd-925-2010-16                             float64
wind-uwnd-925-2010-17                             float64
wind-uwnd-925-2010-18                             float64
wind-uwnd-925-2010-19                             float64
wind-uwnd-925-2010-20                             float64
wind-hgt-10-2010-1                                float64
wind-hgt-10-2010-2                                float64
wind-hgt-10-2010-3                                float64
wind-hgt-10-2010-4                                float64
```

```
wind-hgt-10-2010-5                                   float64
wind-hgt-10-2010-6                                   float64
wind-hgt-10-2010-7                                   float64
wind-hgt-10-2010-8                                   float64
wind-hgt-10-2010-9                                   float64
wind-hgt-10-2010-10                                  float64
wind-hgt-100-2010-1                                  float64
wind-hgt-100-2010-2                                  float64
wind-hgt-100-2010-3                                  float64
wind-hgt-100-2010-4                                  float64
wind-hgt-100-2010-5                                  float64
wind-hgt-100-2010-6                                  float64
wind-hgt-100-2010-7                                  float64
wind-hgt-100-2010-8                                  float64
wind-hgt-100-2010-9                                  float64
wind-hgt-100-2010-10                                 float64
wind-vwnd-925-2010-1                                 float64
wind-vwnd-925-2010-2                                 float64
wind-vwnd-925-2010-3                                 float64
wind-vwnd-925-2010-4                                 float64
wind-vwnd-925-2010-5                                 float64
wind-vwnd-925-2010-6                                 float64
wind-vwnd-925-2010-7                                 float64
wind-vwnd-925-2010-8                                 float64
wind-vwnd-925-2010-9                                 float64
wind-vwnd-925-2010-10                                float64
wind-vwnd-925-2010-11                                float64
wind-vwnd-925-2010-12                                float64
wind-vwnd-925-2010-13                                float64
wind-vwnd-925-2010-14                                float64
wind-vwnd-925-2010-15                                float64
wind-vwnd-925-2010-16                                float64
wind-vwnd-925-2010-17                                float64
wind-vwnd-925-2010-18                                float64
wind-vwnd-925-2010-19                                float64
wind-vwnd-925-2010-20                                float64
BSh                                                    int64
BSk                                                    int64
BWh                                                    int64
BWk                                                    int64
Cfa                                                    int64
Cfb                                                    int64
Csa                                                    int64
Csb                                                    int64
Dfa                                                    int64
Dfb                                                    int64
Dfc                                                    int64
Dsb                                                    int64
Dsc                                                    int64
Dwa                                                    int64
Dwb                                                    int64
month_number                                           int64
```

```
season_number                                              int64
dtype: object
```

In [92]:
```
# Set index to datetime feature of start date and sort by startdate
# Make copy to keep training data with original index
time_test_data = test_data.copy()
time_test_data.set_index('startdate', inplace=True)
time_test_data.sort_index(inplace=True)
```

In [93]:
```
time_test_data.head()
```

Out[93]:

	index	lat	lon	contest-pevpr-sfc-gauss-14d__pevpr	nmme0-tmp2m-34w__cancm30	nmme0-tmp2m-34w__cancm40	nm tm 34w__cc
startdate							
2022-11-01	375734	0.000000	0.833333	339.88	30.88	30.92	
2022-11-01	404099	0.954545	0.100000	224.64	16.43	17.98	
2022-11-01	394827	0.681818	0.600000	417.74	22.07	24.84	
2022-11-01	386287	0.454545	0.766667	411.23	28.95	33.25	
2022-11-01	390679	0.590909	0.266667	433.60	23.09	23.65	

5 rows × 260 columns

In [94]:
```
#Check to make sure test_data and X are of the same shape - Good to go!
time_test_data.shape
```

Out[94]:
```
(31354, 260)
```

In [95]:
```
X.shape
```

Out[95]:
```
(375734, 260)
```

Fit RFR on Full training_data from WiDS

- We can use the full X and y dataset to train our model.

In [99]:

```
#Instatiate
RFRmodel_final = RandomForestRegressor(n_estimators=100,
max_features = None, \
                                        verbose = 2, random_state=32)
```

In [100…

```
%%time
#Fit Model to complete training set
RFRmodel_final.fit(X,y)
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worker
s.
building tree 1 of 100
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:   47.1s remaining:    0.0
s
```

```
building tree 2 of 100
building tree 3 of 100
building tree 4 of 100
building tree 5 of 100
building tree 6 of 100
building tree 7 of 100
building tree 8 of 100
building tree 9 of 100
building tree 10 of 100
building tree 11 of 100
building tree 12 of 100
building tree 13 of 100
building tree 14 of 100
building tree 15 of 100
building tree 16 of 100
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building tree 45 of 100
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building tree 50 of 100
building tree 51 of 100
building tree 52 of 100
building tree 53 of 100
```

```
building tree 54 of 100
building tree 55 of 100
building tree 56 of 100
building tree 57 of 100
building tree 58 of 100
building tree 59 of 100
building tree 60 of 100
building tree 61 of 100
building tree 62 of 100
building tree 63 of 100
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building tree 89 of 100
building tree 90 of 100
building tree 91 of 100
building tree 92 of 100
building tree 93 of 100
building tree 94 of 100
building tree 95 of 100
building tree 96 of 100
building tree 97 of 100
building tree 98 of 100
building tree 99 of 100
building tree 100 of 100
CPU times: user 1h 18min 57s, sys: 20.8 s, total: 1h 19min 18s
Wall time: 1h 19min 54s
```

```
[Parallel(n_jobs=1)]: Done 100 out of 100 | elapsed: 79.9min finished
```

Out[100]:

```
RandomForestRegressor(max_features=None, random_state=32, verbose=2)
```

In [102…

```
# Obtain predictions from RFR_final model with complete test_data
from WiDS
pred = RFRmodel_final.predict(time_test_data)
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent worker
s.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.1s remaining:    0.0
s
[Parallel(n_jobs=1)]: Done 100 out of 100 | elapsed:    5.8s finished
```

In [192…

```
# Gather predictions and index for submission dataframe
submission = pd.DataFrame(data =
{'Predictions':pred,'Index':time_test_data['index']})
```

In [193…

```
# Resort values by index
submission=submission.sort_values(by='Index', ascending=True)
```

In [194…

```
# Check
submission
```

Out[194]:

	Predictions	Index
startdate		
2022-11-01	28.385288	375734
2022-11-02	28.325583	375735
2022-11-03	28.530644	375736
2022-11-04	28.483178	375737
2022-11-05	28.648197	375738
...	...	...
2022-12-27	3.478709	407083
2022-12-28	3.660469	407084
2022-12-29	3.361483	407085
2022-12-30	2.882080	407086
2022-12-31	2.885870	407087

31354 rows × 2 columns

In [195…

```
# Drop start date index
submission = submission.reset_index()
```

In [196…

```
submission
```

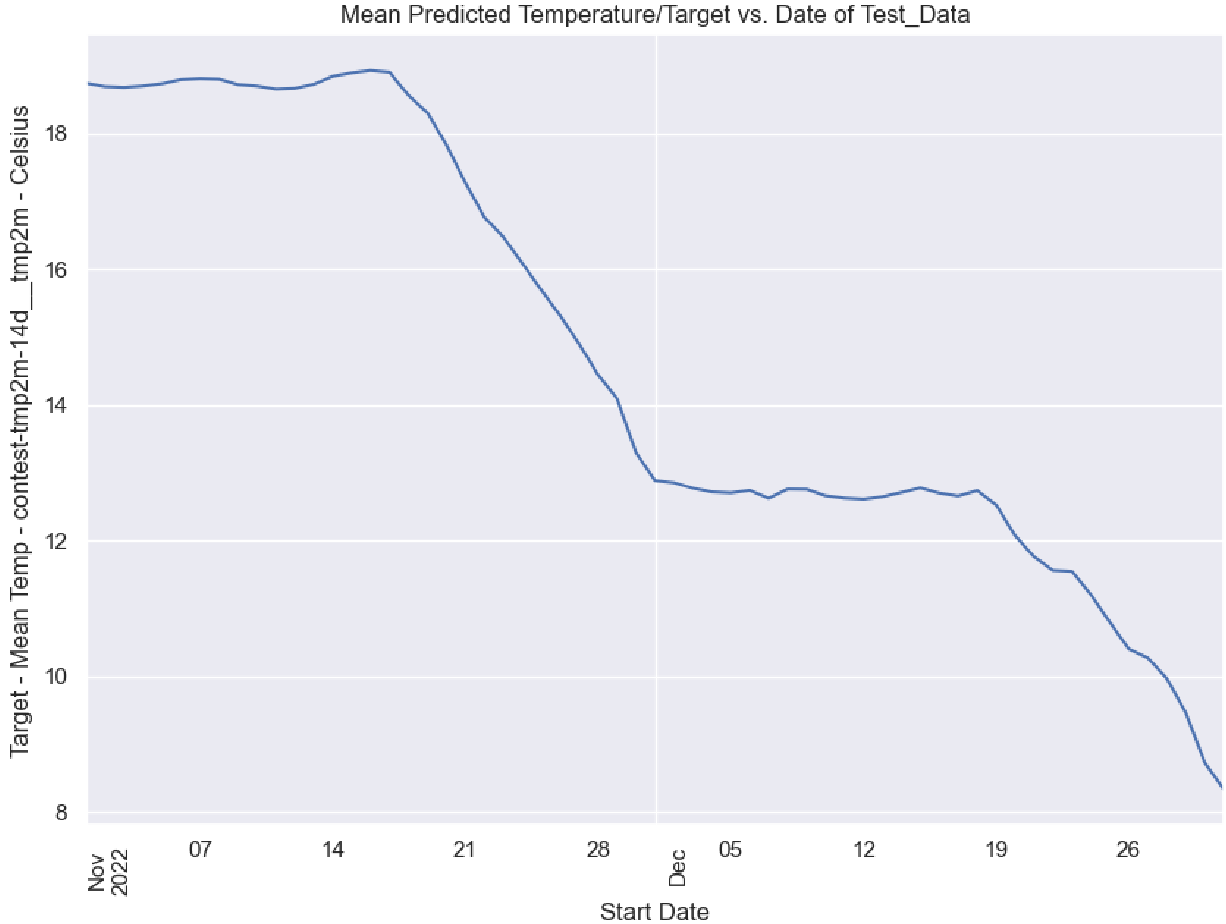
Out[196]:

	startdate	Predictions	Index
0	2022-11-01	28.385288	375734
1	2022-11-02	28.325583	375735
2	2022-11-03	28.530644	375736
3	2022-11-04	28.483178	375737
4	2022-11-05	28.648197	375738
...	...	...	...
31349	2022-12-27	3.478709	407083
31350	2022-12-28	3.660469	407084
31351	2022-12-29	3.361483	407085
31352	2022-12-30	2.882080	407086
31353	2022-12-31	2.885870	407087

31354 rows × 3 columns

In [211…

```
#Visualize mean daily prediction temps over startdate
plt.figure()
submission.groupby(by=['startdate']).mean()['Predictions'].plot()
plt.title('Mean Predicted Temperature/Target vs. Date of Test_Data')
plt.ylabel('Target - Mean Temp - contest-tmp2m-14d__tmp2m - 
Celsius')
plt.xlabel('Start Date')
plt.xticks(rotation=90)
plt.show()
```



These temps look reasonable and we will proceed with the submission.

In [212…

```
# Rename predictions to target variable as in sample solution from WiDS
submission = submission.rename(columns = {'Predictions':'contest-tmp2m-14d__tmp2m'})
```

In [215…

```
# Drop start date to match sample solution
submission = submission.drop(['startdate'], axis = 1)
```

In [216…

```
# Check
submission
```

Out[216]:

	contest-tmp2m-14d__tmp2m	Index
0	28.385288	375734
1	28.325583	375735
2	28.530644	375736
3	28.483178	375737
4	28.648197	375738
...	...	...
31349	3.478709	407083
31350	3.660469	407084
31351	3.361483	407085
31352	2.882080	407086
31353	2.885870	407087

31354 rows × 2 columns

In [173…

```
# Read in sample solution to compare format
sample_solution = pd.read_csv('data/sample_solution.csv')
```

In [174…

```
# Check - Our submission is in the same format as the sample
solution.
sample_solution
```

Out[174]:

	contest-tmp2m-14d__tmp2m	index
0	27.073876	375734
1	25.109308	375735
2	22.557390	375736
3	25.572875	375737
4	20.781073	375738
...	...	...
31349	28.303967	407083
31350	26.635933	407084
31351	27.057762	407085
31352	26.871066	407086
31353	21.253714	407087

31354 rows × 2 columns

In [218…

```
#Export Submission
submission.to_csv('data/submission_mack.csv', index=False)
```

In [219…

```
#Export time_test_data
time_test_data.to_csv('data/time_test_data_clean.csv', index=False)
```

Notebook 2 Conclusion

Workflow Initial MLPRegressor --> MLPRegressor Optimization --> MLPR vs. RFR Comparison--> RFR Baseline WiDS Submission

We have refined our ability to prepare and evaluate models in this notebook. We adopted a data reduction strategy to reduce each parameter's data type to minimize memory load and run times. We determined that the regressor models have quicker run times on my local machine over Google Collab. We can look into other methods of running cloud-based models such as AWS if run times becoming a major in inhibition to advancement.

My task as part of my WiDS team was to evaluate the Random Forest Regressor and Multi-layer Perceptron Regressor models. Both models have proven effective in predictive regression time series modeling.

After optimizing the MLPRegressor, we see that the Random Forest Regressor optimized in Notebook 1 achieved better scoring metrics. We wanted to make sure to get in a submission to WiDS to establish our baseline and know that we could properly format a submission.

After fitting our optimized RFR with the full `training_data` from WiDS, we ran the WiDS `test_data` through the RFR model to gain predictions for our baseline submission. We successfully made the submission to the WiDS Kaggle site. WiDS evaluated our predictions on the actual target mean temperatures and we scored a root mean squared error of 1.91 degrees celsius. This gives us a good baseline, and we will feel confident formatting submissions in the future.

We will need to carry out a variety of steps in successive notebooks to achieve better results.

Next Steps

- Feature engineering
  - We will research steps to boost the predictive power of our features.
- More comprehensive model evaluation
  - We will need to extend our grid searches to other regression models.