experimento-Copy2

November 3, 2019

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.preprocessing import LabelEncoder,OneHotEncoder
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
#from sklearn import metrics

from keras.wrappers.scikit_learn import KerasRegressor
#from keras import metrics
from keras.models import Sequential
from keras.layers import Dense
from keras.callbacks import ModelCheckpoint
from keras.callbacks import EarlyStopping

# load a saved model
from keras.models import load_model

from matplotlib import pyplot

import os
%matplotlib inline
print(os.listdir("../dados/input"))
```

```
Using TensorFlow backend.
```

```
['teste.csv', 'todos.csv', 'treino.csv']
```

In [2]:
```
original_data = pd.read_csv('../dados/input/todos.csv')
```

In [3]:
```
n_values = len(original_data.iloc[:,1])
n_test = 5
n_train = n_values - n_test
n_train_start = n_test+1
```

```
        date = 0
        max_temp = 1
        sales = 19

In [4]: X_train = original_data.iloc[n_train_start : n_values, max_temp : sales ]

In [5]: X_train.values

Out[5]: array([[ 30.2 ,  74.25,   0.  , ..., 138.  , 188.  , 165.  ],
               [ 28.3 ,  70.75,   1.  , ..., 188.  , 165.  , 110.  ],
               [ 21.1 ,  85.  ,   0.  , ..., 165.  , 110.  , 355.  ],
               ...,
               [ 24.1 ,  88.25,   1.  , ...,   0.  ,   0.  ,   0.  ],
               [ 20.3 ,  78.75,   0.  , ...,   0.  ,   0.  ,   0.  ],
               [ 25.2 ,  83.5 ,   0.  , ...,   0.  ,   0.  ,   0.  ]])

In [6]: Y_train = original_data.iloc[n_train_start:n_values, sales].values

In [7]: Y_train

Out[7]: array([203, 323,  49, 138, 188, 165, 110, 355, 387, 411, 287, 216, 440,
               422, 432, 310, 238, 432, 407, 424, 316, 268, 409, 393, 384, 321,
               247, 416, 413, 432, 312, 417, 402, 381, 337, 288, 429, 387, 495,
               337, 243, 485, 415, 465, 358, 260, 460, 436, 467, 331, 261, 473,
               407, 476, 305,  20,  40,  68, 110,  18, 204, 216, 363,   0, 256,
               412,  73, 469, 391,   0, 439, 442, 468, 382, 353, 425, 453, 247,
               261, 309, 496, 456, 523, 426,  68, 455, 507, 402, 352, 464, 442,
               490, 413, 319, 529, 453, 503, 439, 344, 532, 457, 335, 512, 481,
               533, 460, 320, 526, 488, 547, 448, 349, 532, 491, 572, 443, 398,
               568, 465, 551, 486, 424, 398, 520, 463, 389, 525, 490, 553, 340,
               544, 500, 548, 413, 378, 514, 502, 502, 430, 308, 461, 443, 470,
               446,  42,  70,  64, 101, 178, 215, 263, 145, 295, 351, 387, 294,
               194, 460, 363, 437, 314, 212, 396, 336, 427, 312, 218, 407, 428,
               306, 220, 367, 352, 463, 320, 306, 451, 353,  95, 149, 209, 227,
               202, 233, 391, 358, 456, 335, 323, 469, 319, 297, 411, 370, 412,
               331, 255, 446, 394, 472, 361, 263, 428, 336, 470, 343, 232, 449,
               386, 477, 377, 347, 480, 359, 224, 450, 375, 491, 347, 266, 415,
               405, 464, 358, 253, 446, 388, 523, 346, 245, 438, 361, 503, 319,
                39,  45,  97, 115, 138, 134, 211, 308, 353, 401, 382, 321, 352,
               428, 453, 433, 376, 449, 403, 286, 408, 393, 442, 431,  17,  12,
                17,  27,  16, 141, 117,  42,  20, 363, 162,  35, 351,  21,  23,
                27,  28, 162,  23,  14,  84,  41,   9,  15,  15,  17,  26,  10,
                14,  17,  26,  10,  22,  14], dtype=int64)

In [8]: X_test = original_data.iloc[1:n_test+1, max_temp : sales].values
        X_test

Out[8]: array([[ 28.  ,  72.75,   0.  ,   1.  ,   0.  ,   0.  ,   0.  ,   1.  ,
                  0.  ,   0.  ,   0.  ,   1.  ,   1.  , 293.  , 263.  , 402.  ,
```

```
       382.  , 203.  ],
      [ 21.  ,  82.75,   1.  ,   0.  ,   0.  ,   0.  ,   0.  ,   1.  ,
        0.  ,   0.  ,   0.  ,   1.  ,   3.  , 263.  , 402.  , 382.  ,
       203.  , 323.  ],
      [ 25.4 ,  85.5 ,   0.  ,   0.  ,   0.  ,   0.  ,   1.  ,   1.  ,
        0.  ,   0.  ,   0.  ,   3.  ,   1.  , 402.  , 382.  , 203.  ,
       323.  ,  49.  ],
      [ 21.4 ,  91.  ,   0.  ,   0.  ,   0.  ,   1.  ,   0.  ,   1.  ,
        0.  ,   0.  ,   0.  ,   1.  ,   1.  , 382.  , 203.  , 323.  ,
        49.  , 138.  ],
      [ 19.5 ,  88.75,   0.  ,   0.  ,   1.  ,   0.  ,   0.  ,   1.  ,
        0.  ,   0.  ,   0.  ,   1.  ,   1.  , 203.  , 323.  ,  49.  ,
       138.  , 188.  ]])
```

In [9]:
```
Y_test = original_data.iloc[1:n_test+1, sales].values
Y_test
```

Out[9]:
```
array([437, 293, 263, 402, 382], dtype=int64)
```

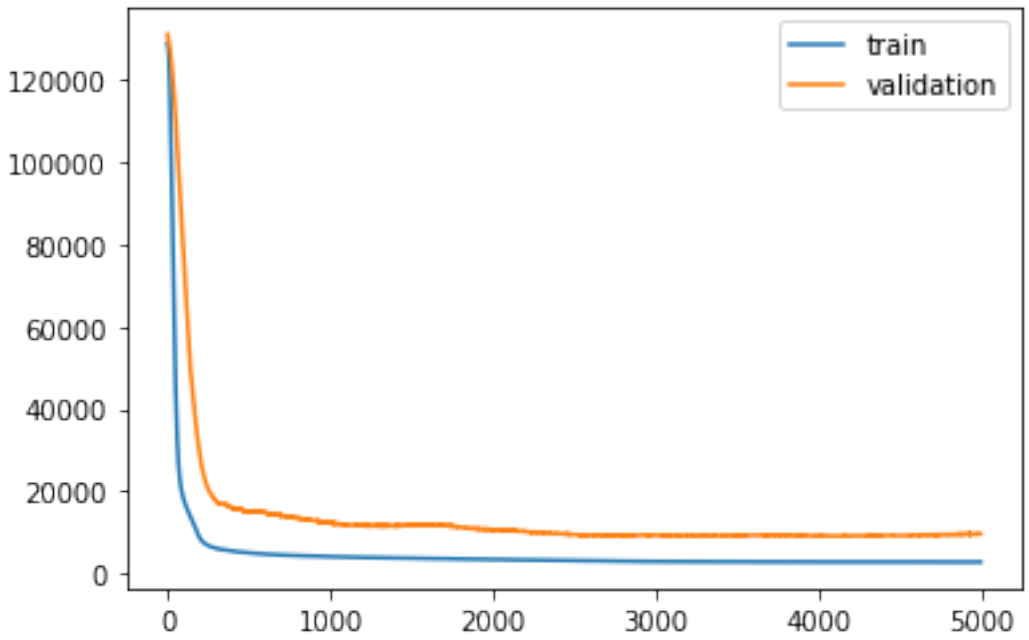
In [10]:
```
scaler = StandardScaler().fit(X_train)
standardized_X_train = scaler.transform(X_train)
standardized_X_test = scaler.transform(X_test)
```

In [11]:
```
early_stopping_monitor = EarlyStopping(
                                        monitor = 'mean_squared_error',
                                        mode = 'min',
                                        min_delta=1,
                                        verbose=0,
                                        patience = 500
)
model_checkpoint = ModelCheckpoint('best_model.h5', monitor='mean_squared_error', mode
```

In [12]:
```
model1 = Sequential()
model1.add(
            Dense(
                    9,
                    activation='relu',
                    input_dim=standardized_X_train.shape[1]
            )
)
model1.add(
            Dense(1)
)
model1.compile(
                loss='mean_squared_error',
                optimizer='adam',
                metrics=[   'accuracy',
                            'mse',
                            'mae',
```

```
                                ]
        )
```

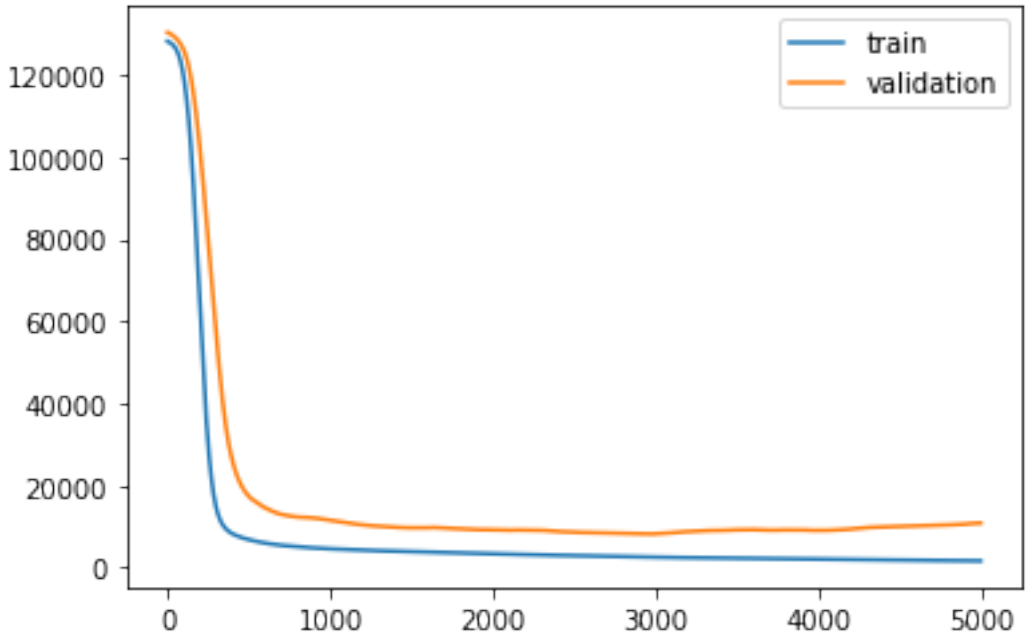
In [13]:
```
model1_history = model1.fit(
                    standardized_X_train,
                    Y_train,
                    batch_size=5,
                    epochs=5000,
                    #validation_split=0.3,
                    validation_data=(standardized_X_test,Y_test),
                    verbose=0,
                    callbacks=[model_checkpoint,early_stopping_monitor]
        )

        saved_model1 = load_model('best_model.h5')

        pyplot.plot(model1_history.history['loss'], label='train')
        pyplot.plot(model1_history.history['val_loss'], label='validation')
        pyplot.legend()
        pyplot.show()
```



In [14]:
```
model2 = Sequential()

        model2.add(
                    Dense(
                            standardized_X_train.shape[1],
```

```
                        activation='relu',
                        input_dim=standardized_X_train.shape[1]
                )
        )
        model2.add(
                Dense(
                        9,
                        activation='relu',
                        input_dim=standardized_X_train.shape[1]
                )
        )
        model2.add(
                Dense(1)
        )
        model2.compile(
                    loss='mean_squared_error',
                    optimizer='adam',
                    metrics=[   'accuracy',
                                'mse',
                                'mae',
                            ]
        )
```

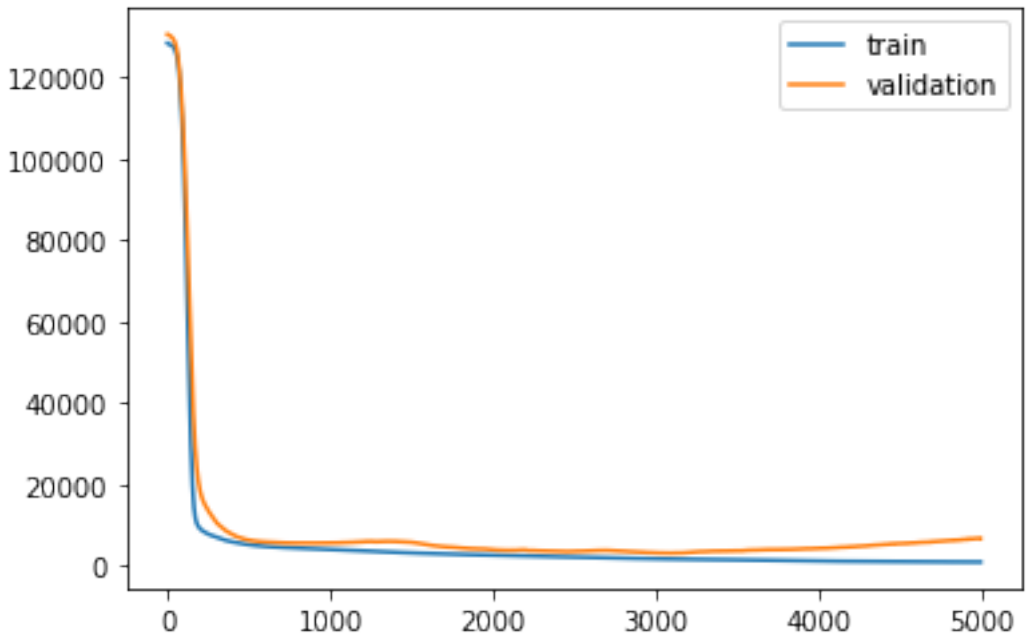
In [15]:
```
        model2_history = model2.fit(
                standardized_X_train,
                Y_train,
                batch_size=148,
                epochs=5000,
                #validation_split=0.3,
                validation_data=(standardized_X_test,Y_test),
                verbose=0,
                callbacks=[model_checkpoint,early_stopping_monitor]
        )
        saved_model2 = load_model('best_model.h5')

        pyplot.plot(model2_history.history['loss'], label='train')
        pyplot.plot(model2_history.history['val_loss'], label='validation')
        pyplot.legend()
        pyplot.show()
```



In [16]:
```
model3 = Sequential()
model3.add(
            Dense(
                    standardized_X_train.shape[1],
                    activation='relu',
                    input_dim=standardized_X_train.shape[1]
            )
)
model3.add(
            Dense(
                    10,
                    activation='relu',
                    input_dim=standardized_X_train.shape[1]
            )
)
model3.add(
            Dense(
                    5,
                    activation='relu',
                    input_dim=10
            )
)
model3.add(
            Dense(1)
)
model3.compile(
```

```
                        loss='mean_squared_error',
                        optimizer='adam',
                        metrics=[   'accuracy',
                                    'mse',
                                    'mae',
                                ]
        )
```

In [17]:
```
model3_history = model3.fit(
                    standardized_X_train,
                    Y_train,
                    batch_size=148,
                    epochs=5000,
                    #validation_split=0.3,
                    validation_data=(standardized_X_test,Y_test),
                    verbose=0,
                    callbacks=[model_checkpoint,early_stopping_monitor]
        )

        saved_model3 = load_model('best_model.h5')

        pyplot.plot(model3_history.history['loss'], label='train')
        pyplot.plot(model3_history.history['val_loss'], label='validation')
        pyplot.legend()
        pyplot.show()
```

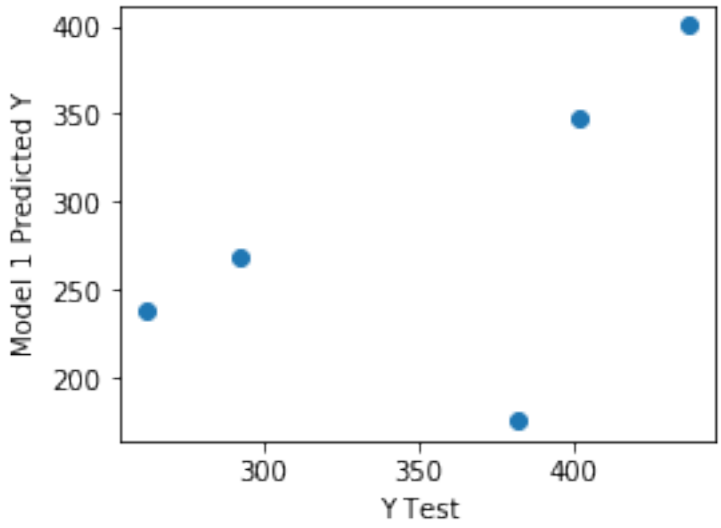


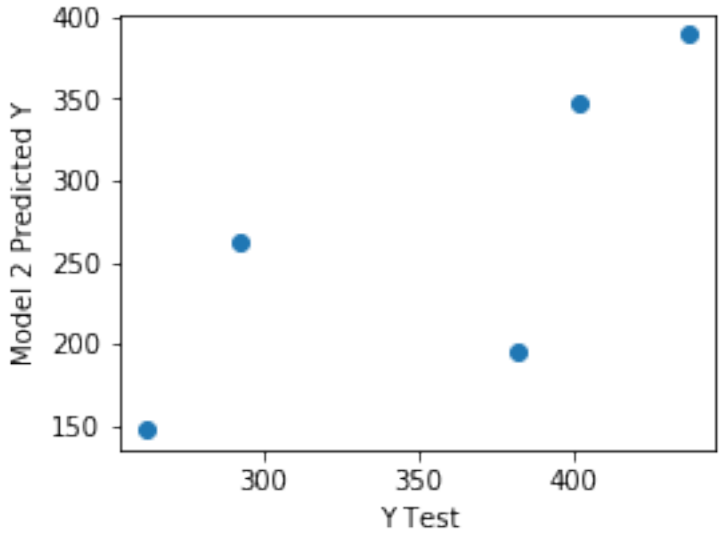
In [18]:
```
predictions1 = saved_model1.predict(standardized_X_test)
predictions2 = saved_model2.predict(standardized_X_test)
predictions3 = saved_model3.predict(standardized_X_test)

# evaluate the model
train_acc1 = saved_model1.evaluate(standardized_X_train, Y_train)
train_acc2 = saved_model2.evaluate(standardized_X_train, Y_train)
train_acc3 = saved_model3.evaluate(standardized_X_train, Y_train)
test_acc = saved_model3.evaluate(standardized_X_test, Y_test)

print(saved_model1.metrics_names)
print('Model 1: ')
print(train_acc1)
print('Model 2: ')
print(train_acc2)
print('Model 3: ')
print(train_acc3)
print('Test: ')
print(test_acc)
```

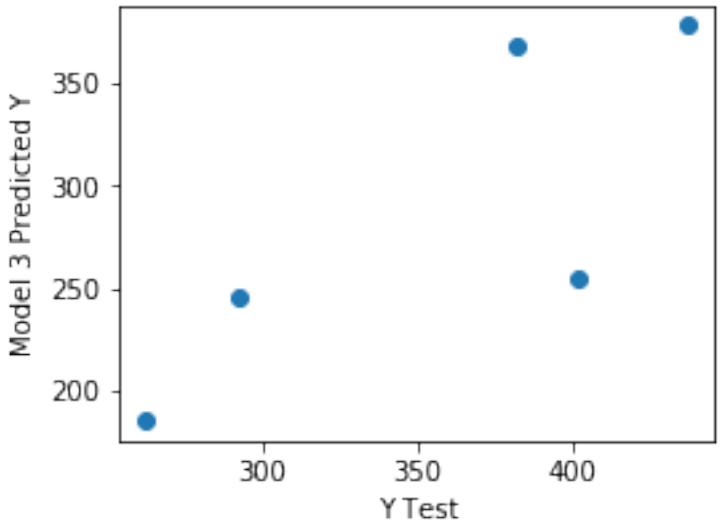
```
292/292 [==============================] - 0s 882us/step
292/292 [==============================] - 0s 642us/step
292/292 [==============================] - 0s 628us/step
5/5 [==============================] - 0s 0us/step
['loss', 'acc', 'mean_squared_error', 'mean_absolute_error']
Model 1:
[2795.494822880993, 0.010273972602739725, 2795.494822880993, 37.3871581195152]
Model 2:
[1651.4664925353168, 0.00684931506849315, 1651.4664925353168, 28.372098948857555]
Model 3:
[846.8061464910638, 0.010273972602739725, 846.8061464910638, 20.93486033400444]
Test:
[6721.0283203125, 0.0, 6721.0283203125, 69.08389282226562]
```

In [19]:
```
plt.figure(figsize=(4,3))
plt.scatter(Y_test[:200],predictions1[:200])
plt.xlabel('Y Test')
plt.ylabel('Model 1 Predicted Y')

plt.figure(figsize=(4,3))
plt.scatter(Y_test[:200],predictions2[:200])
plt.xlabel('Y Test')
plt.ylabel('Model 2 Predicted Y')

plt.figure(figsize=(4,3))
plt.scatter(Y_test[:200],predictions3[:200])
plt.xlabel('Y Test')
plt.ylabel('Model 3 Predicted Y')
```

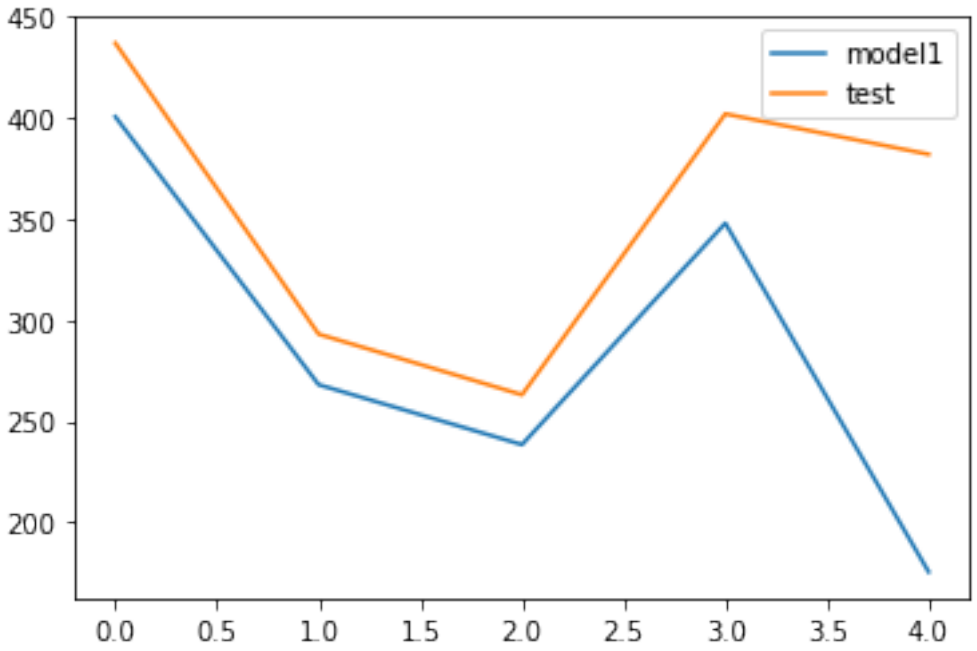
Out[19]: Text(0, 0.5, 'Model 3 Predicted Y')

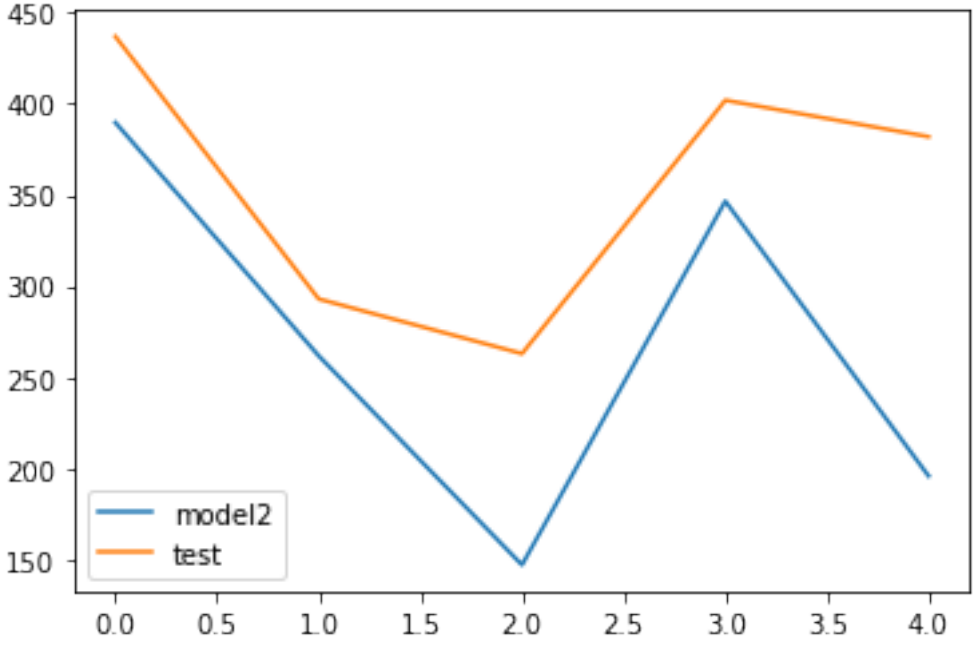


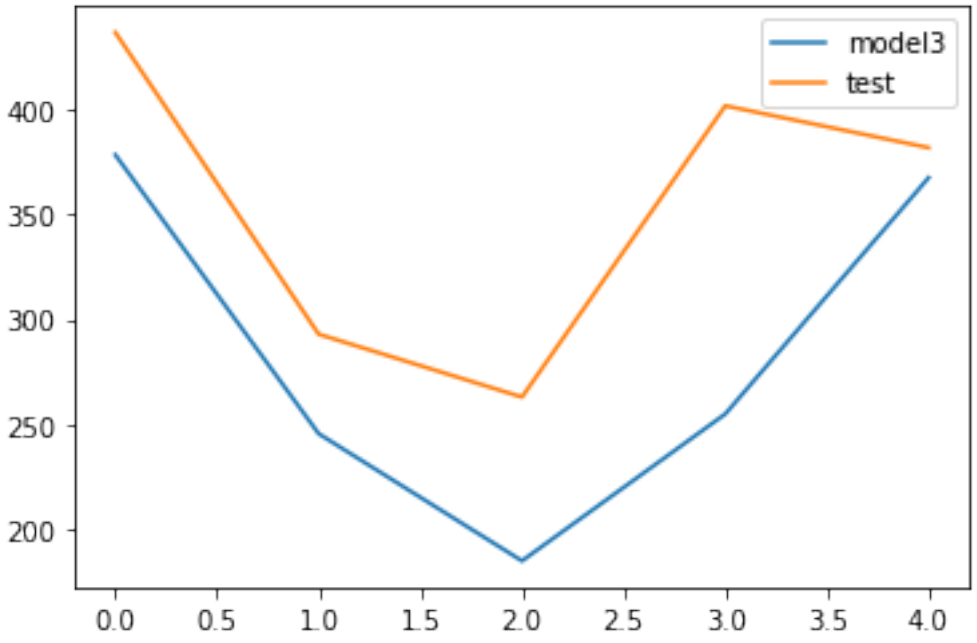




In [20]:
```
pyplot.plot(predictions1, label='model1')
pyplot.plot(Y_test, label='test')
pyplot.legend()
pyplot.show()

pyplot.plot(predictions2, label='model2')
pyplot.plot(Y_test, label='test')
pyplot.legend()
pyplot.show()

pyplot.plot(predictions3, label='model3')
pyplot.plot(Y_test, label='test')
pyplot.legend()
pyplot.show()
```


model1
test
450
400
350
300
250
200
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0


model2
test
450
400
350
300
250
200
150
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0


model3
test
400
350
300
250
200
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0