



# O problema do Overfitting na Regressão

☰ Ciclo	Ciclo 04: As garantias de aprendizado
# Aula	31
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## Objetivo da Aula:

- ☐ Regressão com Overfitting
- ☐ Resumo
- ☐ Próxima aula

## Conteúdo:

### ▼ 1. Regressão com Overfitting

```
## 0.0 Import Libraries
import numpy as np
import math
import matplotlib.pyplot as plt

from sklearn import model_selection as ms

## 1.0 Synthetic regression dataset
hidden_law = np.vectorize(lambda x: math.sin(2*math.pi*x)) # made to run on vectors
x_all = np.arange(0, 1, 0.01)
```

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y_hidden = hidden_law(x_all)
plt.plot(x_all, y_hidden, ':g');

np.random.seed(42) # to make repeatable
noise = 0.2
samples = 20

# dataset
x = np.random.rand( samples )
y = np.sin( 2*np.pi*x ) + noise*np.random.randn( samples )

# split training and test dataset
x_train, x_valid, y_train, y_valid = ms.train_test_split( x, y, test_size=0.3 )

plt.plot(x_all, y_hidden, ':g')
plt.plot(x_train, y_train, '.')
plt.plot(x_valid, y_valid, 'r.')
plt.legend(['Hidden law', 'Train', 'Validation']);

# ## Treinamento

max_poly_degree = 14
poly_degrees = range(max_poly_degree)

polys = []
for p in poly_degrees:
    poly_model = np.polyfit( x_train, y_train, p )
    polys.append( poly_model )

rmse_train = np.zeros( max_poly_degree )
rmse_val = np.zeros( max_poly_degree)

for p in poly_degrees:
    # predict over training dataset
    yhat_train = np.polyval( polys[p], x_train)
    rmse_train[p] = np.sqrt( np.mean( np.square( yhat_train - y_train ) ) )

    # predict over validation dataset
    yhat_val = np.polyval( polys[p], x_val )
    rmse_val[p] = np.sqrt( np.mean( np.square( yhat_val - y_val ) ) )

plt.plot( poly_degrees, rmse_train, 'b' )
plt.plot( poly_degrees, rmse_val, 'r' )
plt.axis( ( 0, max_poly_degree-1, 0, 10 ) )
plt.legend(['Training', 'Validation'])
plt.xlabel('Polynomial degree')
plt.ylabel('RMSE');

plt.figure(figsize=(15, 9))
for p in poly_degrees:
    plt.subplot(3, 5, p+1)
    y_pol = np.polyval(polys[p], x_all)
    plt.plot(x_all, y_hidden, ':g')
    plt.plot(x_train, y_train, '.')

```

```
plt.plot(x_val, y_val, 'r.')  
plt.plot(x_all, y_pol, 'b')  
plt.title(polyDegree)  
plt.axis((0, 1, -1.5, 1.5))
```

## ▼ 2. Resumo

1. O aprendizado supervisionada do tipo Regressão é utilizado para duas finalidades: Estudar o fenômeno ou criar um modelo para fazer previsão.
2. Tarefas de Regressão usam uma variável alvo ou resposta como representação do fenômeno.

## ▼ 3. Próxima aula

As principais causas do Overfitting e Underfitting