gradient_descent

July 11, 2023

[ ]:
```
import math, copy
import numpy as np
import matplotlib.pyplot as plt
plt.style.use('./deeplearning.mplstyle')
from lab_utils_uni import plt_house_x, plt_contour_wgrad, plt_divergence,␣
 ↪plt_gradients
```

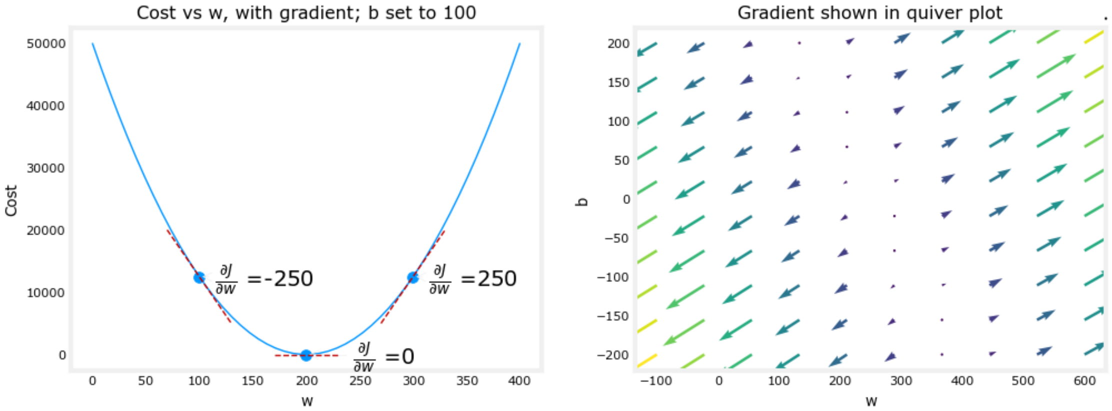
[ ]:
```
# Load our data set
x_train = np.array([1.0, 2.0])   #features
y_train = np.array([300.0, 500.0])   #target value
```

[ ]:
```
#Function to calculate the cost
def compute_cost(x, y, w, b):

    m = x.shape[0]
    cost = 0

    for i in range(m):
        f_wb = w * x[i] + b
        cost = cost + (f_wb - y[i])**2
    total_cost = 1 / (2 * m) * cost

    return total_cost
```

[ ]:
```
def compute_gradient(x, y, w, b):
    """
    Computes the gradient for linear regression
    Args:
      x (ndarray (m,)): Data, m examples
      y (ndarray (m,)): target values
      w,b (scalar)    : model parameters
    Returns
      dj_dw (scalar): The gradient of the cost w.r.t. the parameters w
      dj_db (scalar): The gradient of the cost w.r.t. the parameter b
     """

    # Number of training examples
    m = x.shape[0]
    dj_dw = 0
    dj_db = 0

    for i in range(m):
        f_wb = w * x[i] + b
        dj_dw_i = (f_wb - y[i]) * x[i]
        dj_db_i = f_wb - y[i]
        dj_db += dj_db_i
        dj_dw += dj_dw_i
    dj_dw = dj_dw / m
    dj_db = dj_db / m

    return dj_dw, dj_db
```

[ ]:

```
plt_gradients(x_train,y_train, compute_cost, compute_gradient)
plt.show()
```


Cost vs w, with gradient; b set to 100
Cost
w
$\frac{\partial J}{\partial w}$ =-250
$\frac{\partial J}{\partial w}$ =250
$\frac{\partial J}{\partial w}$ =0
Gradient shown in quiver plot
b
w