CSE 344 : Computer Vision Homework 18

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```
In [1]: import numpy as np
        from scipy import signal
        x=np.array([[12 ,14 ,15 ,17],[34 ,56 ,73 ,32],[ 67 ,43 ,31 ,21],[32 ,31 ,43 ,56]])
        w=np.array([[-1 , 0],[0,-1]])
        b=0.3
        dy= np.array([[-2, 3, 4],[-1, 5, 3],[2, 3, 4]])
```

Compute updated 'b' and 'w' in the current layer. [0.5 marks]

```
In [2]: # Calculation db
        db = np.sum(dy)
        print("db : ", db)

        db :  21
```

```
In [3]: #Calculation dw
        dw = signal.convolve2d(x,dy,mode = "valid")

        print("dw : \n", dw)

        dw :
         [[764 859]
         [970 911]]
```

```
In [4]: #updating w and b
        learning_rate = 0.1

        w_up = w - learning_rate*dw
        b_up = b - learning_rate*db

        print("updated w :\n", w_up)
        print("updated b :\n", b_up)

        updated w :
         [[-77.4 -85.9]
         [-97.  -92.1]]
        updated b :
         -1.8
```

Compute 'dy' for the next layer (in the backward direction) [0.5 marks]

```
In [5]: #calculating dx
        dy_0 = np.zeros((dy.shape[0]+2,dy.shape[1]+2 )) #padded dy
        dy_0[1:-1,1:-1] = dy
        w_prime = np.rot90(w,2)
        dx = signal.convolve2d(dy_0,w_prime, mode = "valid")

        print("dx : \n", dx)

        dx :
         [[ 2. -3. -4.  0.]
         [ 1. -3. -6. -4.]
         [-2. -2. -9. -3.]
         [ 0. -2. -3. -4.]]
```

```
In [6]: x_up = x - learning_rate*dx
        print("x updated:\n", x_up)

        x updated:
         [[11.8 14.3 15.4 17. ]
         [33.9 56.3 73.6 32.4]
         [67.2 43.2 31.9 21.3]
         [32.  31.2 43.3 56.4]]
```

```
In [7]: dy_new = signal.convolve2d(x_up, w_up, mode = "valid")
        print("dy for the next layer : \n", dy_new)

        dy for the next layer :
         [[ -9743.51 -13343.64 -11897.34]
         [-17699.45 -18504.37 -14310.19]
         [-15543.2  -13104.52 -13088.92]]
```

```
In [ ]:
```