q7

January 20, 2018

1 Finding the 1-D filter

```
In [3]: inp = [12, 20, 3, 10, 22, 19, 23, 16, 0, 21, 23, 16, 18]
        inp_size = size(inp,2)
```

```
inp =

    12    20     3    10    22    19    23    16     0    21    23    16    18


inp_size =

    13
```

```
In [4]: out = [75, 52, 33, 97, 251, 211, 63, 65]
        out_size = size(out,2)
```

```
out =

    75    52    33    97   251   211    63    65


out_size =

     8
```

1.0.1 Method:

- Using Linear regressio we will try to find the filter
- Hence we are assuming random values in beginning
- We will calculate the pred_out
- We will find the loss and gradient

1.1 Using Normalize equations

```
In [7]: % Assuming stride = 1
        % Assuming padding = 0
        filter_size = (size(inp,2) - size(out,2) + 1);
```

```
In [8]: inp_pred = zeros(filter_size,out_size);
        for i = 1:inp_size - filter_size + 1
            inp_pred(:,i) = inp(i:i+filter_size-1);
        end
        inp_pred
```

```
inp_pred =

    12    20     3    10    22    19    23    16
    20     3    10    22    19    23    16     0
     3    10    22    19    23    16     0    21
    10    22    19    23    16     0    21    23
    22    19    23    16     0    21    23    16
    19    23    16     0    21    23    16    18
```

```
In [9]: filter = out*pinv(inp_pred)
```

```
filter =

    5.0000    4.0000    4.0000   -3.0000   -3.0000    1.0000
```

1.2 Using Gradient Desent

```
In [10]: epoch = 1000;
         lr = 0.001;
         FILTER = rand(1,filter_size).*10
```

```
FILTER =

    8.1472    9.0579    1.2699    9.1338    6.3236    0.9754
```

```
In [18]: for ind = 1:epoch

         out_pred = FILTER*inp_pred;
         loss = sum((out - out_pred).^2)/(2*out_size);
         gradient = (out_pred - out)*inp_pred'/out_size;
         FILTER = FILTER - lr.*gradient;

         end
```

```
In [16]: FILTER = round(FILTER)
         out_pred = FILTER*inp_pred
         out
```

```
FILTER =

     5     4     4    -3    -3     1


out_pred =

    75    52    33    97   251   211    63    65


out =

    75    52    33    97   251   211    63    65
```

```
In [17]: FILTER = flip(FILTER)
```

```
FILTER =

     1    -3    -3     4     4     5
```

```
In [ ]:
```