ProblemAnswers

October 22, 2016

0.1 Problem 1

In [10]:
```
N = 10
A = zeros(N,N)
for i in 1:N, j in 1:N
    abs(i-j)<=1 ? A[i,j]+=1 : nothing
    i==j ? A[i,j]-=3 : nothing
end
A
```

Out[10]:
```
10×10 Array{Float64,2}:
 -2.0   1.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
  1.0  -2.0   1.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
  0.0   1.0  -2.0   1.0   0.0   0.0   0.0   0.0   0.0   0.0
  0.0   0.0   1.0  -2.0   1.0   0.0   0.0   0.0   0.0   0.0
  0.0   0.0   0.0   1.0  -2.0   1.0   0.0   0.0   0.0   0.0
  0.0   0.0   0.0   0.0   1.0  -2.0   1.0   0.0   0.0   0.0
  0.0   0.0   0.0   0.0   0.0   1.0  -2.0   1.0   0.0   0.0
  0.0   0.0   0.0   0.0   0.0   0.0   1.0  -2.0   1.0   0.0
  0.0   0.0   0.0   0.0   0.0   0.0   0.0   1.0  -2.0   1.0
  0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   1.0  -2.0
```

In [14]:
```
#### Prepare Data

X = rand(1000, 3)                # feature matrix
a0 = rand(3)                     # ground truths
y = X * a0 + 0.1 * randn(1000);  # generate response
```

Out[14]:
```
1000-element Array{Float64,1}:
 1.0737
 0.617939
 0.941093
 0.142068
 0.6174
 0.361449
 0.657612
 0.571313
 0.310871
```

```
 0.407938
 0.330809
 0.263355
 0.949922
 ⋮
 0.223555
 0.41471
 0.29676
 0.991029
 0.395745
 0.947528
 0.835744
 0.669867
 0.836518
 0.393077
 0.543453
 0.5212
```

0.2 Problem 2

```
In [15]: X2 = hcat(X,ones(1000))
         println(X2\y)
```

```
[0.120512,0.0732871,0.954649,0.00897003]
```

0.3 Problem 3

```
In [16]: using MultivariateStats
         llsq(X,y)
```

```
Out[16]: 4-element Array{Float64,1}:
          0.120512
          0.0732871
          0.954649
          0.00897003
```

0.4 Problem 4

```
In [23]: using DataFrames, GLM
         data = DataFrame(X1=X[:,1], X2=X[:,2], X3=X[:,3],Y=y)
         OLS = lm(Y ~ X1 + X2 + X3, data)
```

```
Out[23]: DataFrames.DataFrameRegressionModel{GLM.LinearModel{GLM.LmResp{Array{Float

         Formula: Y ~ 1 + X1 + X2 + X3

         Coefficients:
                        Estimate  Std.Error  t value Pr(>|t|)
```

(Intercept)	0.00897003	0.00960328	0.934059	0.3505
X1	0.120512	0.0106063	11.3623	<1e-27
X2	0.0732871	0.010627	6.8963	<1e-11
X3	0.954649	0.0106649	89.5128	<1e-99