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```
clear;close all
```

addpath for PQN working

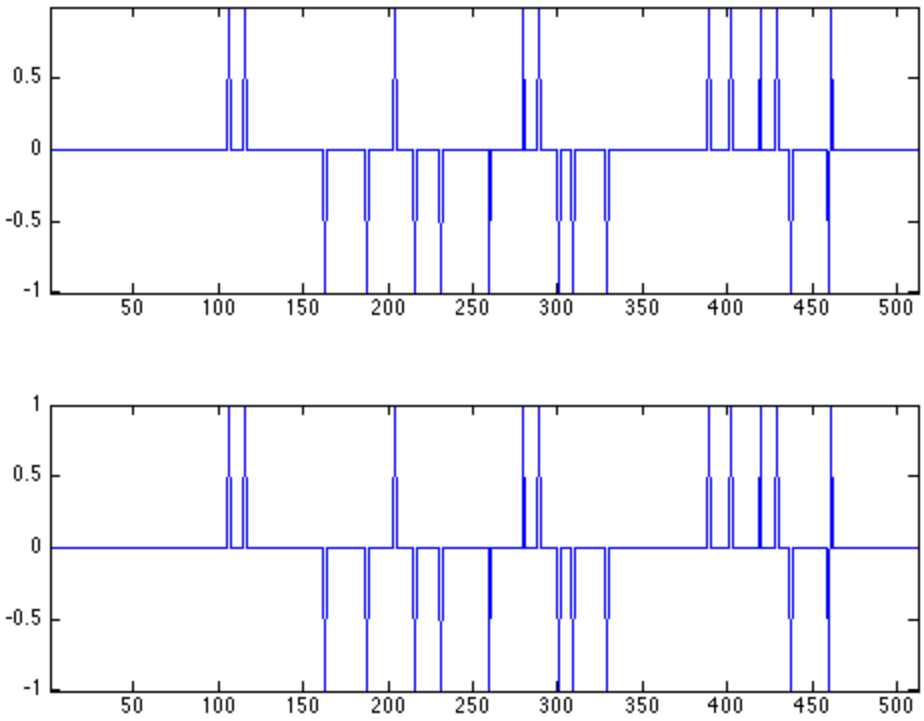
```
cd ../../../../functions;
addpath(genpath(pwd))
cd ../experiments/help_spgl1/modifying/task16bpdn/

%stream = RandStream.getGlobalStream;
%reset(stream);

% %problem setting
m = 120; n = 512; k = 20; % m rows, n cols, k nonzeros.
p = randperm(n); x0 = zeros(n,1); x0(p(1:k)) = sign(randn(k,1));
A  = randn(m,n); [Q,R] = qr(A',0);  A = Q';
b  = A*x0;
```

lasso

```
tau = norm(x0,1);
opts.optTol = 1e-4;
opts.fid = fopen('spg_lasso.txt','w');
[x_spg,r_spg,g_spg,info_spg] = spgl1(A, b, tau, [], zeros(size(A,2),1), opts); % F
opts.fid = fopen('pqn_lasso.txt','w');
opts.optTol = info_spg.rNorm2(end);
[x_pqn1,r_pqn1,g_pqn1,info_pqn1] = pqnl1_2(A, b, tau, [], zeros(size(A,2),1), opts
h = figure;
subplot(2,1,1);plot(x_spg);axis tight;
subplot(2,1,2);plot(x_pqn1);axis tight;
saveas(h,'lasso result.jpg')
info_spg
info_pqn1

save info_lasso info_spg info_pqn1
```

```
info_spg =

      tau: 20
    rNorm: 3.2505e-04
     rGap: 9.4663e-05
    gNorm: 3.1306e-05
     stat: 4
```

```
            iter: 153
          nProdA: 213
         nProdAt: 154
         nNewton: 0
     timeProject: 0.1569
     timeMatProd: 0.3160
         itnLSQR: 0
         options: [1x1 struct]
       timeTotal: 0.9894
           xNorm1: [153x1 double]
           rNorm2: [153x1 double]
           lambda: [153x1 double]


info_pqn1 =

             tau: 20
           rNorm: 3.1280e-04
             rGap: 4.5262e-04
           gNorm: 4.5667e-05
            stat: 4
            iter: 55
          nProdA: 57
         nProdAt: 57
         nNewton: 0
     timeProject: 4.3478
     timeMatProd: 0.0352
         itnLSQR: 0
         options: [1x1 struct]
       timeTotal: 3.5392
        Projects: 2790
           xNorm1: [55x1 double]
           rNorm2: [55x1 double]
           lambda: [55x1 double]
```

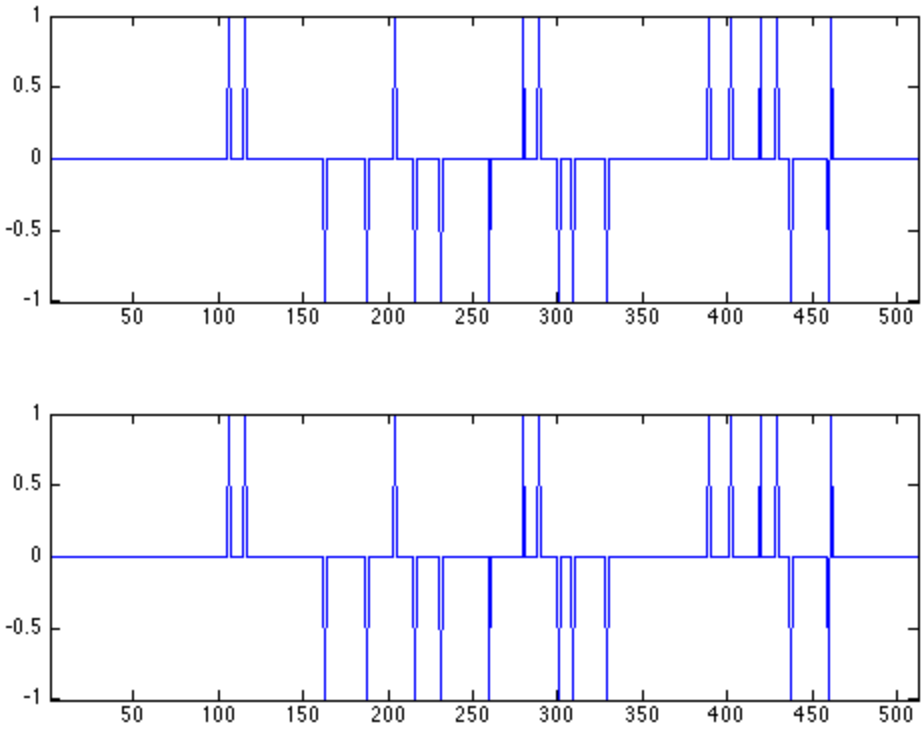


bpdn

```
b  = A*x0 + 1e-3*rand(size(A,1),1);

opts.fid = fopen('spg_bpdn','w');
[x_spg,r_spg,g_spg,info_spg] = spgl1(A, b, 0, 1e-3, zeros(size(A,2),1), opts); % F
sigma_ref = info_spg.rNorm;
opts.fid = fopen('pqn_bpdn','w');
[x_pqn1,r_pqn1,g_pqn1,info_pqn1] = pqnl1_2(A, b, 0, 1e-3, zeros(size(A,2),1), opts
h = figure;
subplot(2,1,1);plot(x_spg);axis tight;
subplot(2,1,2);plot(x_pqn1);axis tight;
saveas(h,'bpdn result.jpg');
info_spg
info_pqn1

save info_bpdn info_spg info_pqn1
```

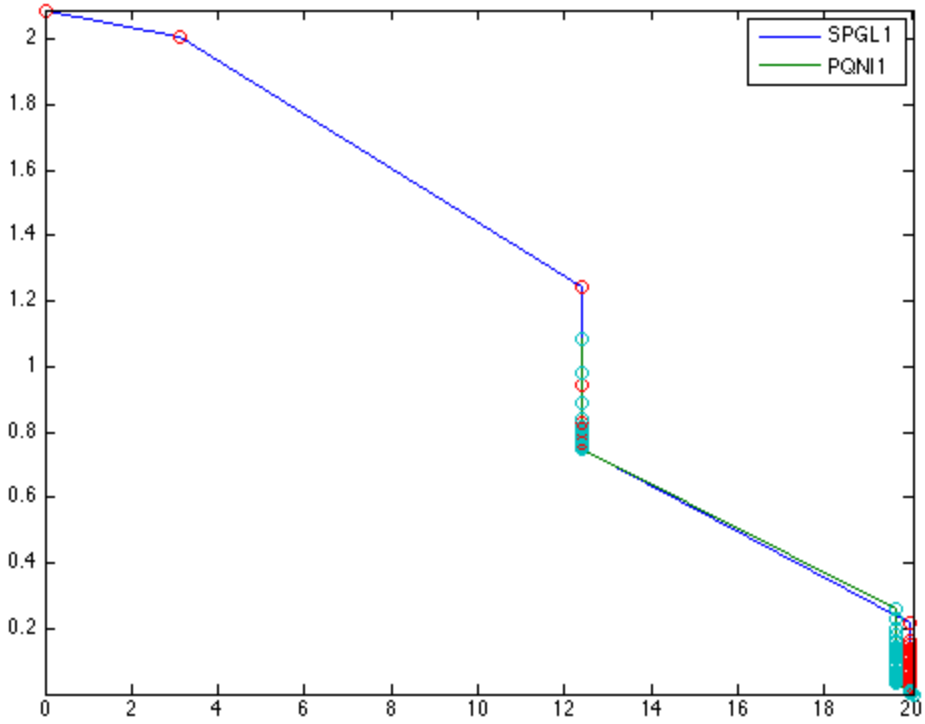
```
info_spg =

      tau: 20.0327
    rNorm: 0.0011
     rGap: 3.2703e-04
    gNorm: 8.6729e-05
     stat: 1
```

```
            iter: 137
           nProdA: 184
          nProdAt: 138
          nNewton: 4
      timeProject: 0.1063
      timeMatProd: 0.1271
          itnLSQR: 0
          options: [1x1 struct]
        timeTotal: 0.5147
           xNorm1: [137x1 double]
           rNorm2: [137x1 double]
           lambda: [137x1 double]


info_pqn1 =

             tau: 20.0336
           rNorm: 0.0014
            rGap: 7.1651e-05
           gNorm: 1.0056e-04
            stat: 11
            iter: 105
           nProdA: 111
          nProdAt: 111
          nNewton: 5
      timeProject: 4.4555
      timeMatProd: 0.0709
          itnLSQR: 0
          options: [1x1 struct]
        timeTotal: 3.5391
         Projects: 3259
           xNorm1: [105x1 double]
           rNorm2: [105x1 double]
           lambda: [105x1 double]
```



show result

```
h = figure('Name','Solution paths');
plot(info_spg.xNorm1,info_spg.rNorm2,info_pqn1.xNorm1,info_pqn1.rNorm2);hold on
scatter(info_spg.xNorm1,info_spg.rNorm2);
scatter(info_pqn1.xNorm1,info_pqn1.rNorm2);hold off
legend('SPGL1','PQNl1')
axis tight
saveas(h,'solution path.jpg');
```



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