

A demonstration of the ROAD method

The Regularized Optimal Affine Discriminant (ROAD) is a high-dimensional classification method, which was proposed by Fan et al. (2012)([pdf link](#)). Currently, the code handles binary classifications, but extensions to multi-class will be available later. The following example illustrates how to apply ROAD.

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Setting up the parameters

```
p = 1000;      % number of variables
n = 300;      % number of observations
s0 = 10;      % number of nonzero mean differences

rho = 0.5;    % pairwise correlation coefficient
randSeed = 1; % setup the random seed to let the program repeatable
```

Generate data

First, we generate the means and the common covariance matrix for the two classes. Then, we generate the training and testing data from the true multivariate gaussian distributions.

```
mu1 = zeros(p,1);
mu2 = zeros(p,1);

mu2(1:s0) = 1;

Sigma = eqcor(p,rho);

rand('state', randSeed);
randn('state',randSeed);

nTrain = n;
nTest  = n;

Y1Train = mvnrnd(repmat(mu1',nTrain,1),Sigma);
Y2Train = mvnrnd(repmat(mu2',nTrain,1),Sigma);

Y1Test  = mvnrnd(repmat(mu1',nTest,1),Sigma);
Y2Test  = mvnrnd(repmat(mu2',nTest,1),Sigma);

x = [Y1Train;Y2Train];
y = [zeros(n,1);ones(n,1)];

xtest = [Y1Test;Y2Test];
ytest = [zeros(n,1);ones(n,1)];
```

Test the ROAD method

Here we test the ROAD and screening-based versions S-ROAD1 and S-ROAD2. In the roadBatch function, the second to last parameter represents whether we use a diagonal-based version (0=no, 1=yes), and the last parameter represents whether we use a screening-based version (0=no, 1=1st version, 2=2nd version).

```
[ROADfit] = roadBatch(x, y, xtest, ytest, 0, 0) % ROAD  
[sROAD1fit] = roadBatch(x, y, xtest, ytest, 0, 1) % Screening-based ROAD version 1 (S-ROAD1)  
[sROAD2fit] = roadBatch(x, y, xtest, ytest, 0, 2) % Screening-based ROAD version 2 (S-ROAD2)
```

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