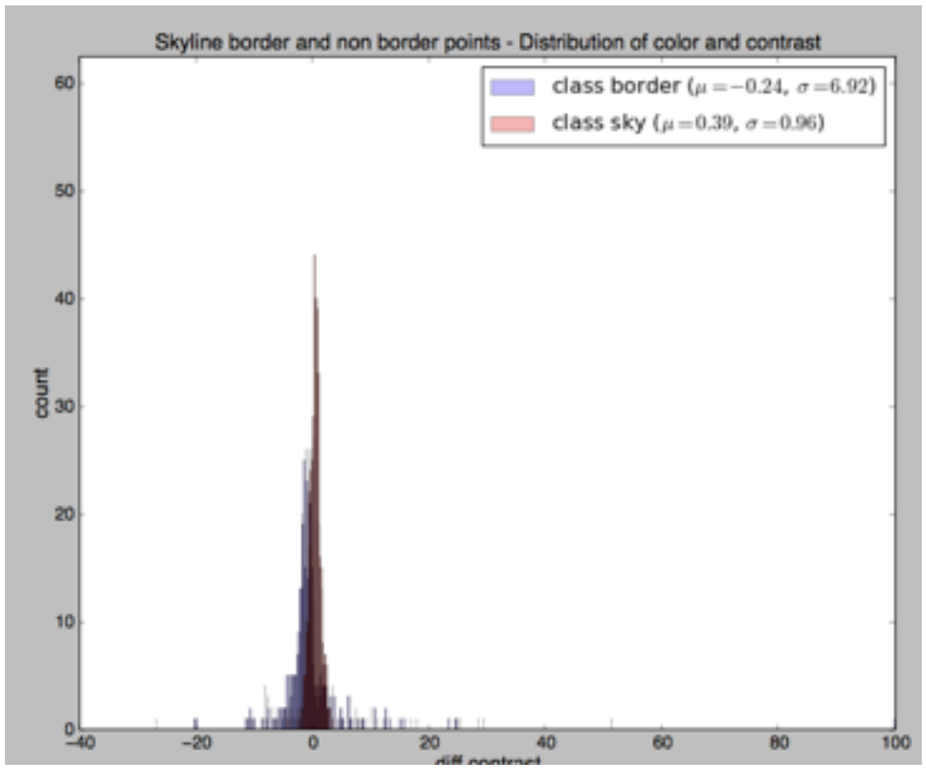
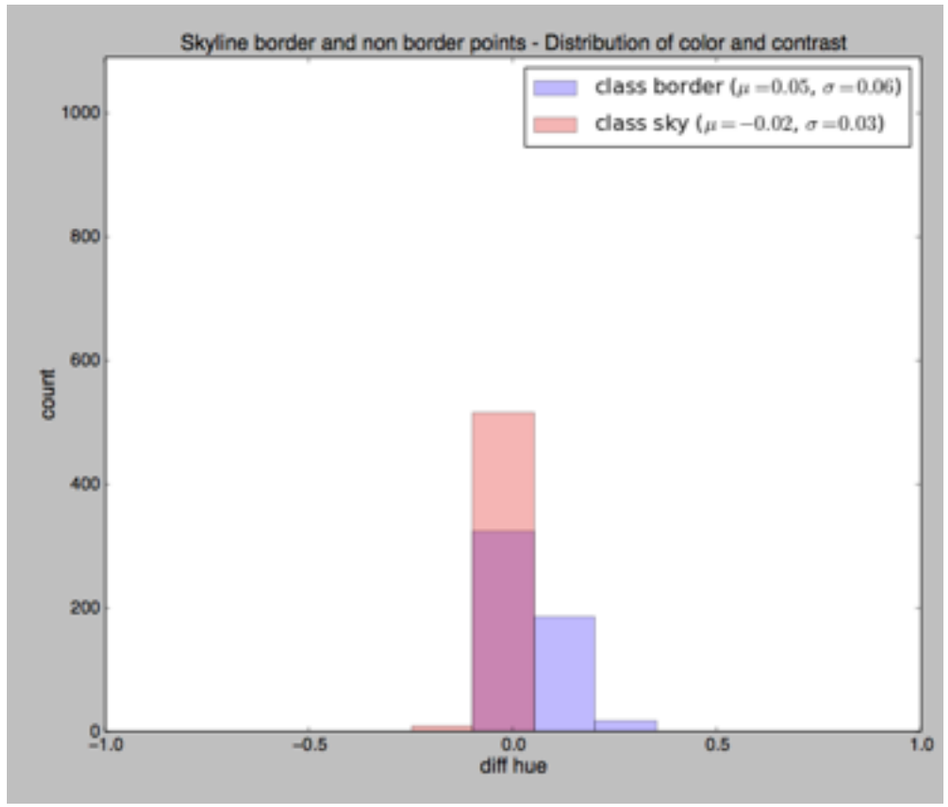
LDA look at difference in contrast, hue, blue or red, and CIE theta, all divided by their respective standard deviations.

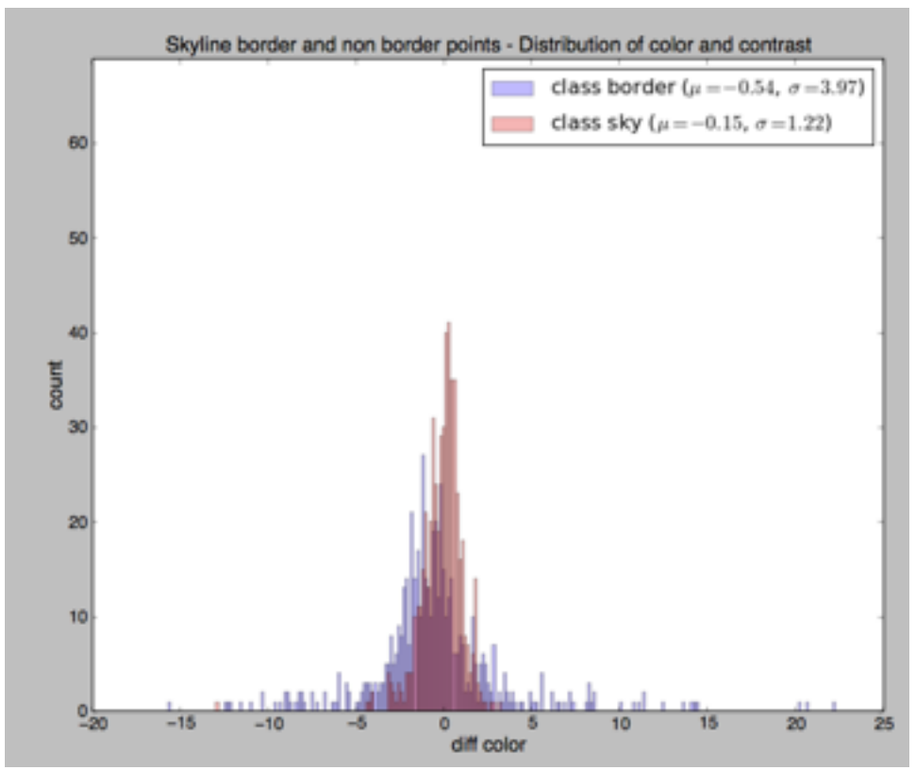
Brown & Lowe 2003, image 1

Brown & Lowe 2003, image 1

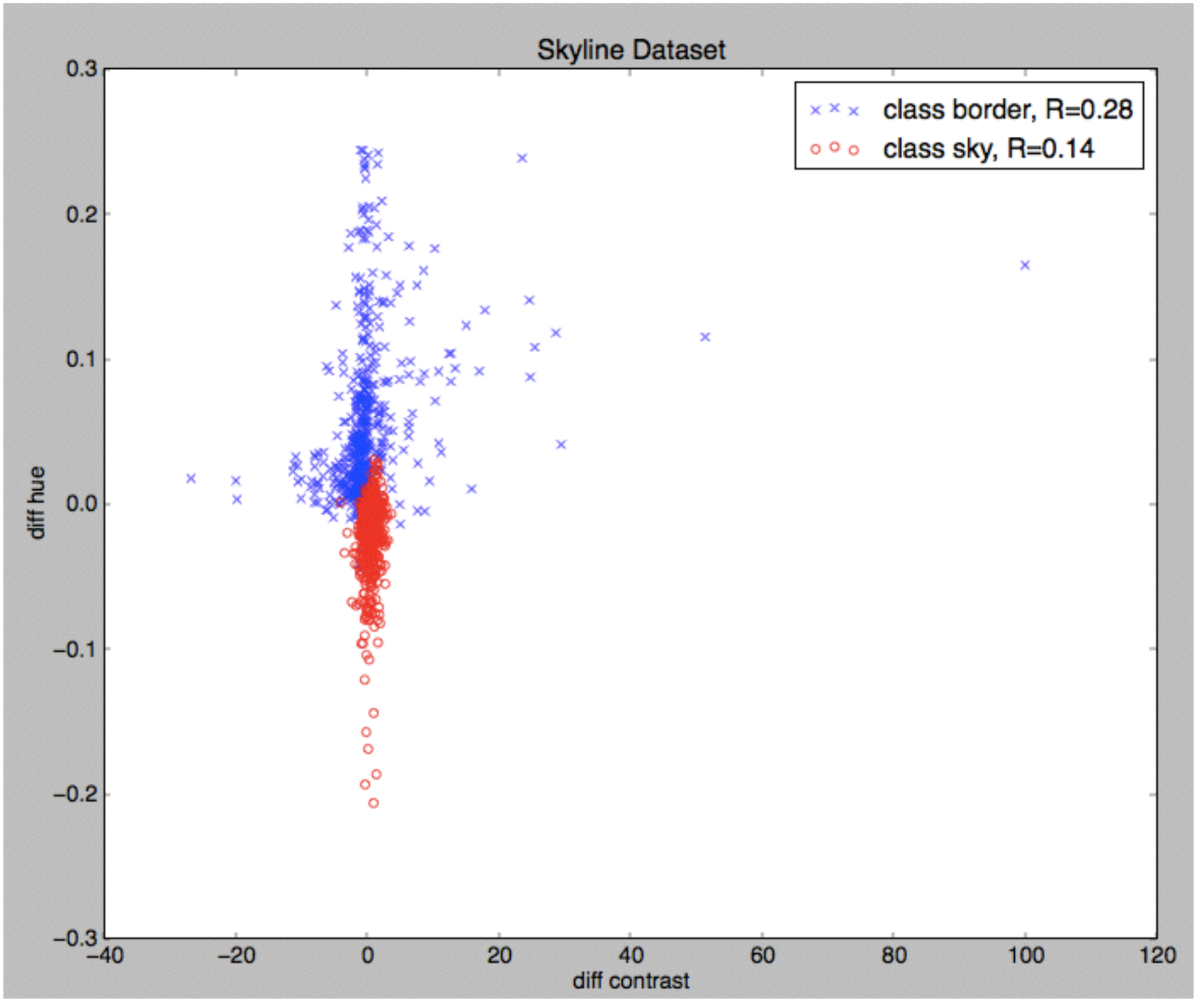


*note: the largest contrasts were removed from analysis for plot visibility

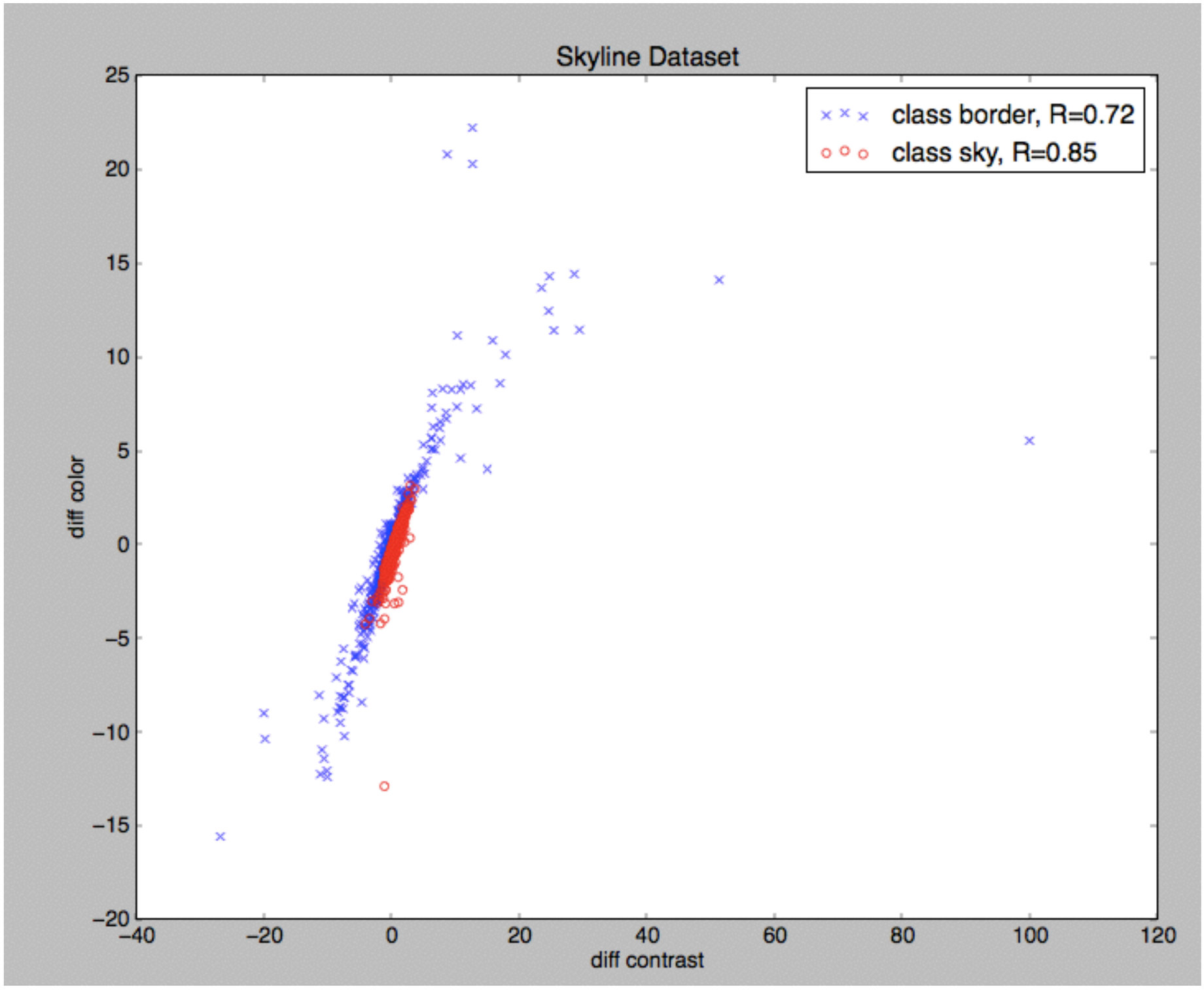




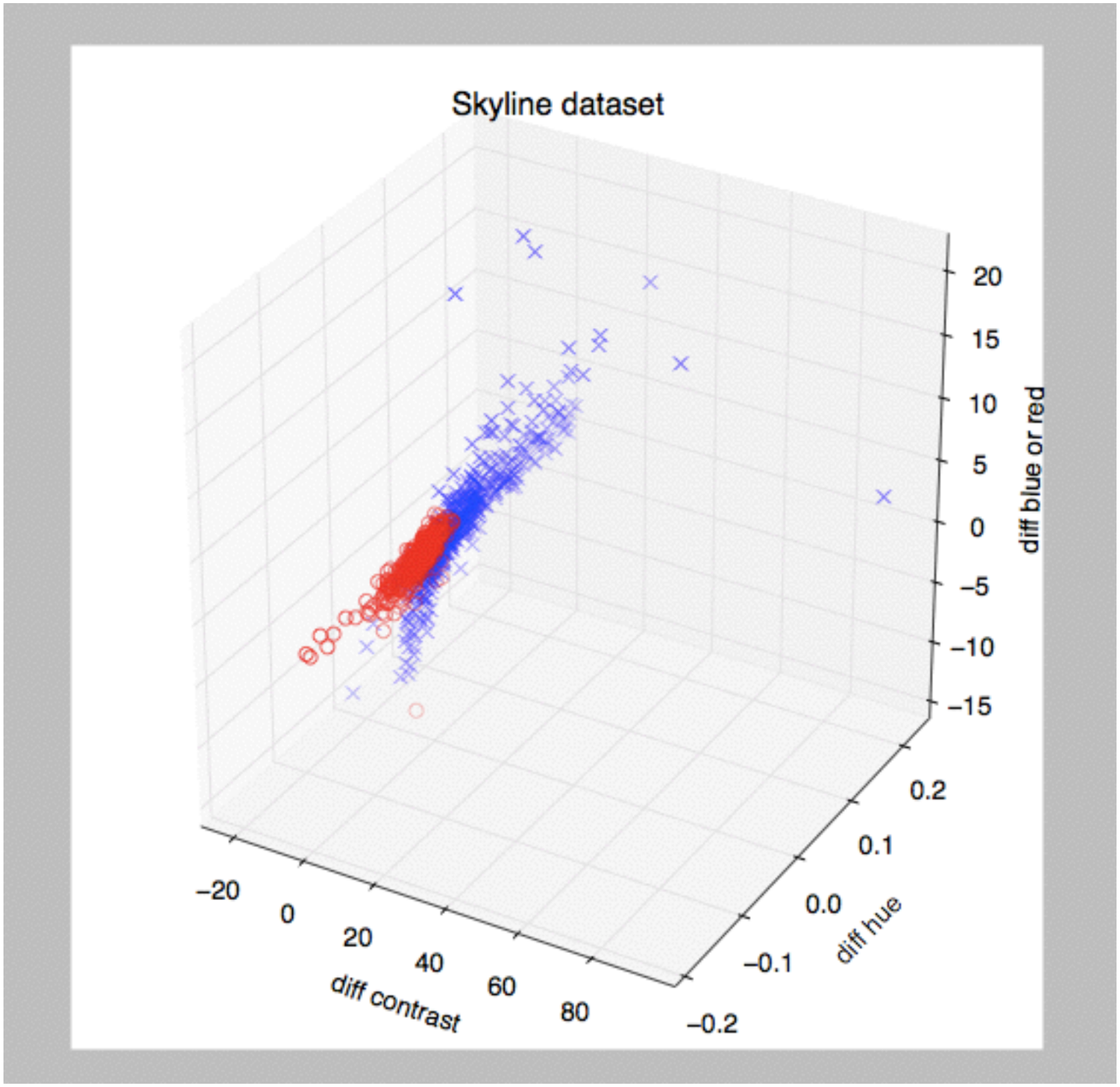
Brown & Lowe 2003, image 1



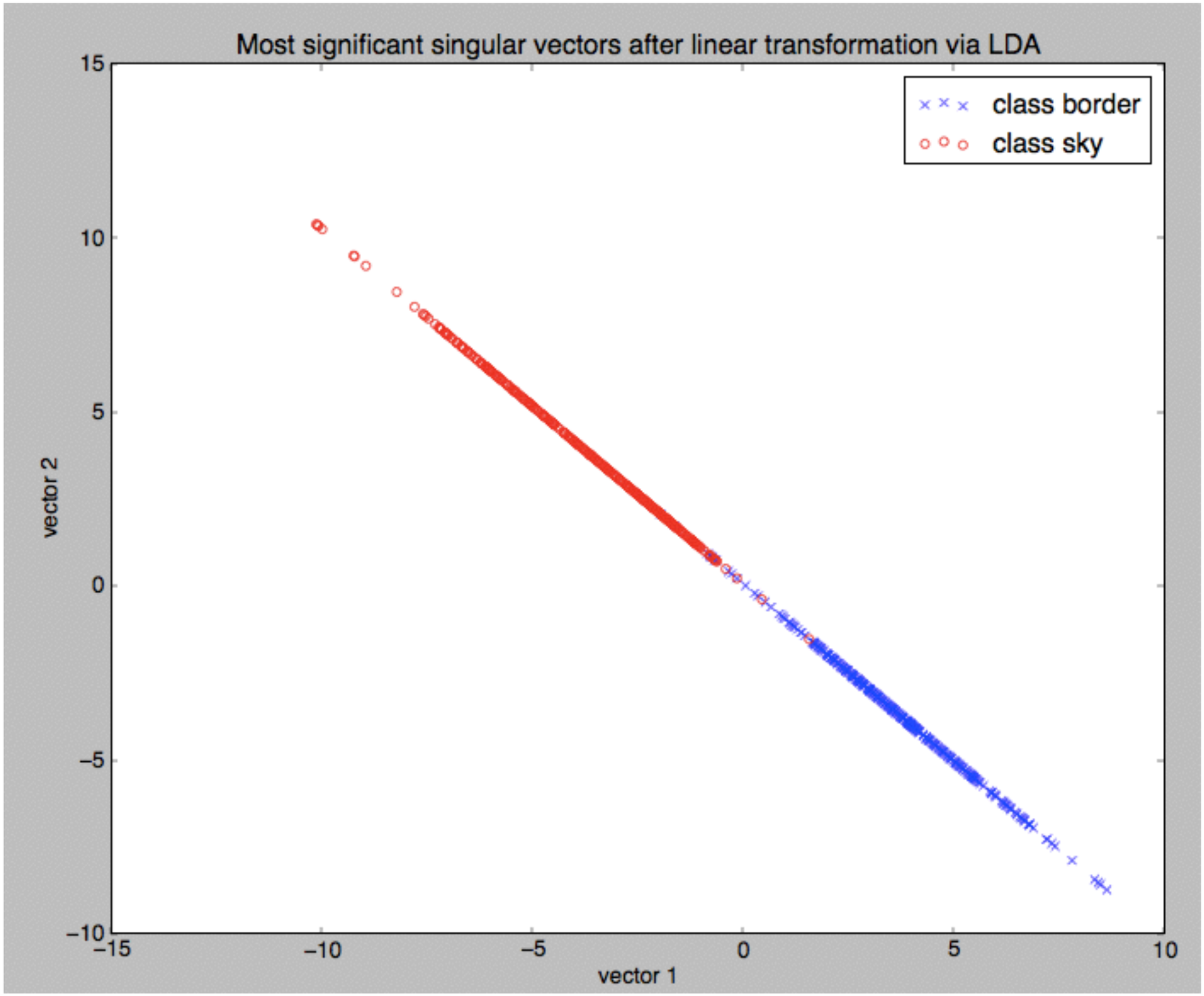
Brown & Lowe 2003, image 1



Brown & Lowe 2003, image 1

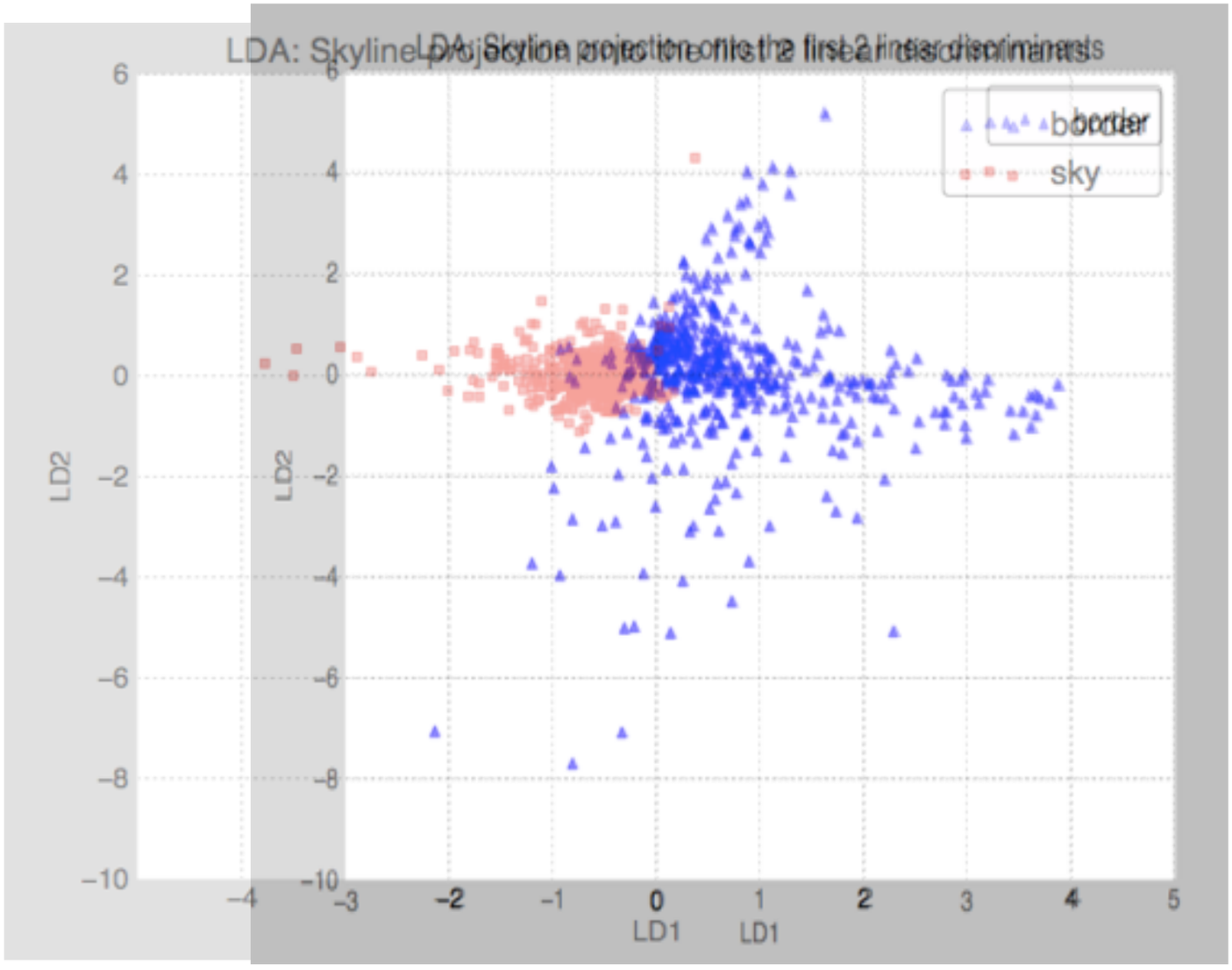


Brown & Lowe 2003, image 1



stats using 24 neighbors

Brown & Lowe 2003, image 1




```
                          contrast  hue     BorR
Mean Vector class 1: [-0.0646  0.6527 -0.0675]

Mean Vector class 2: [ 0.0646 -0.6527  0.0675]

('within-class Scatter Matrix:\n',
array([[ 1043.6244,   204.0609,   748.2823],
       [  204.0609,   601.5069,   250.4388],
       [  748.2823,   250.4388,  1043.225 ]]))
('between-class Scatter Matrix:\n',
array([[   13.1269,  -132.6017,    13.7128],
       [ -132.6017,  1339.4792,  -138.5203],
       [   13.7128,  -138.5203,    14.3249]]))

Eigenvector 1:
[[-0.0718]
 [ 0.9701]
 [-0.232 ]]
Eigenvalue 1: 2.63e+00

Eigenvector 2:
[[ 0.0031]
 [-0.1026]
 [-0.9947]]
Eigenvalue 2: -5.72e-18

Eigenvector 3:
[[ 0.4721]
 [ 0.1368]
 [ 0.8709]]
Eigenvalue 3: 0.00e+00
ok
Eigenvalues in decreasing order:

2.6256396264
5.716642657e-18
0.0
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.0718,  0.9701, -0.232 ],
       [ 0.0031, -0.1026, -0.9947]]))
```

http://sebastianraschka.com/Articles/2014_python_lda.html

"*within-class scattering matrix*": for each class i: S_i = summation_x in data((x-m_i)*(x-m_i)^T)
where m_i = (1/n_i) * summation_d in data(x_k)
==> S_w = summation_i in classes (S_i)

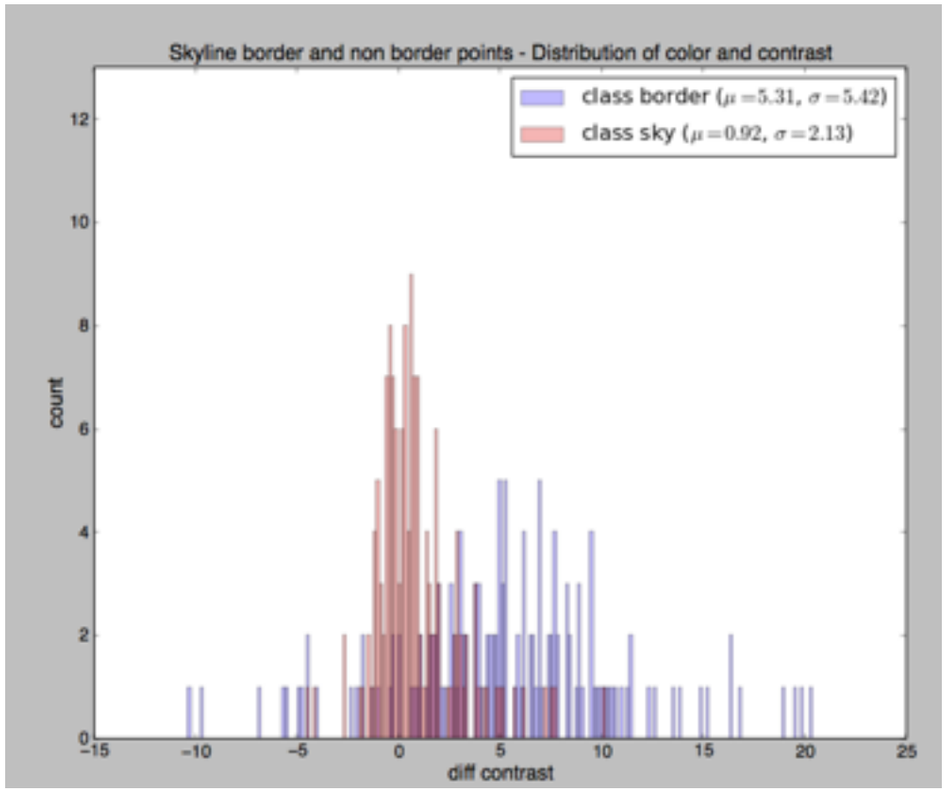
"*between-class scattering matrix*":
==> S_B = summation_i in classes (N * (m_i - m) * (m_i - m)^T)
where m is the overall mean, and m_i and N_i are the sample mean and sizes

Solving for A*nu = lambda * nu where A = *S_w^-1 dot S_B, nu is eigenvector ,and lambda is eigenvalue*
==> LD1 and LD2 are diff contrast and diff hue transformed by y = W^T * X (== W.T.dot(X.T).T)

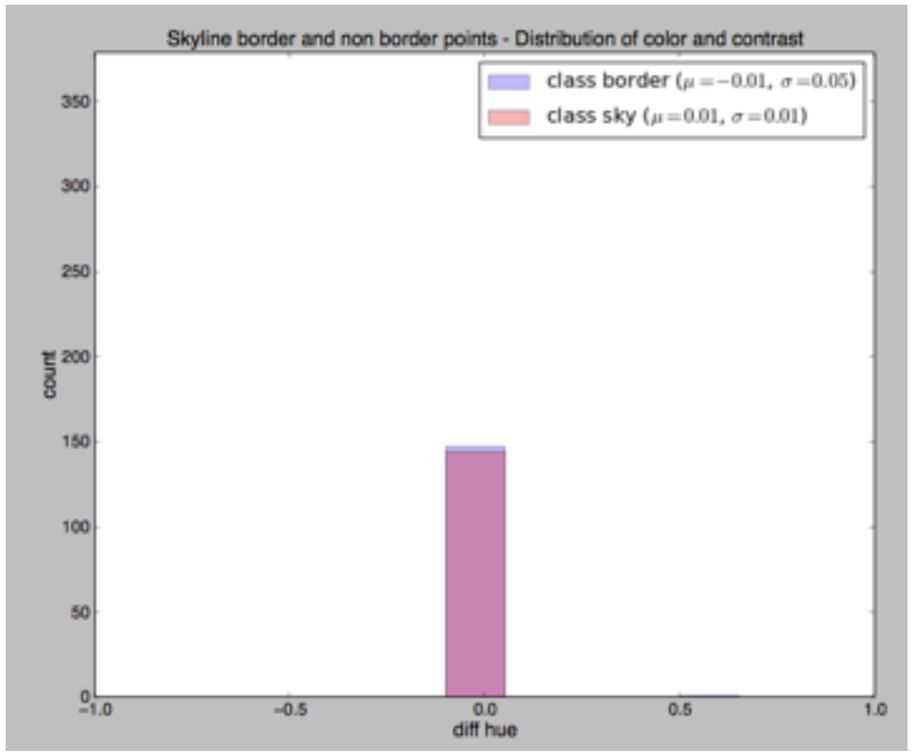
LDA look at difference in contrast, hue, blue or red, and CIE theta, all divided by their respective standard deviations.

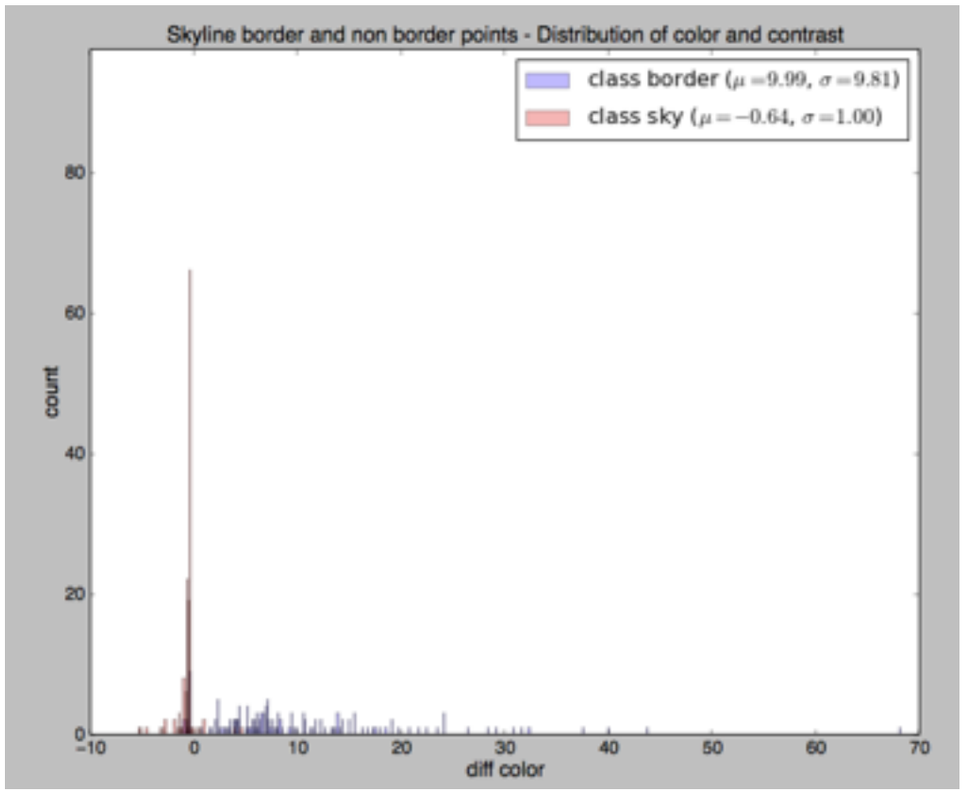
Venturi mtn range, image 1

Venturi mtn range, image 1

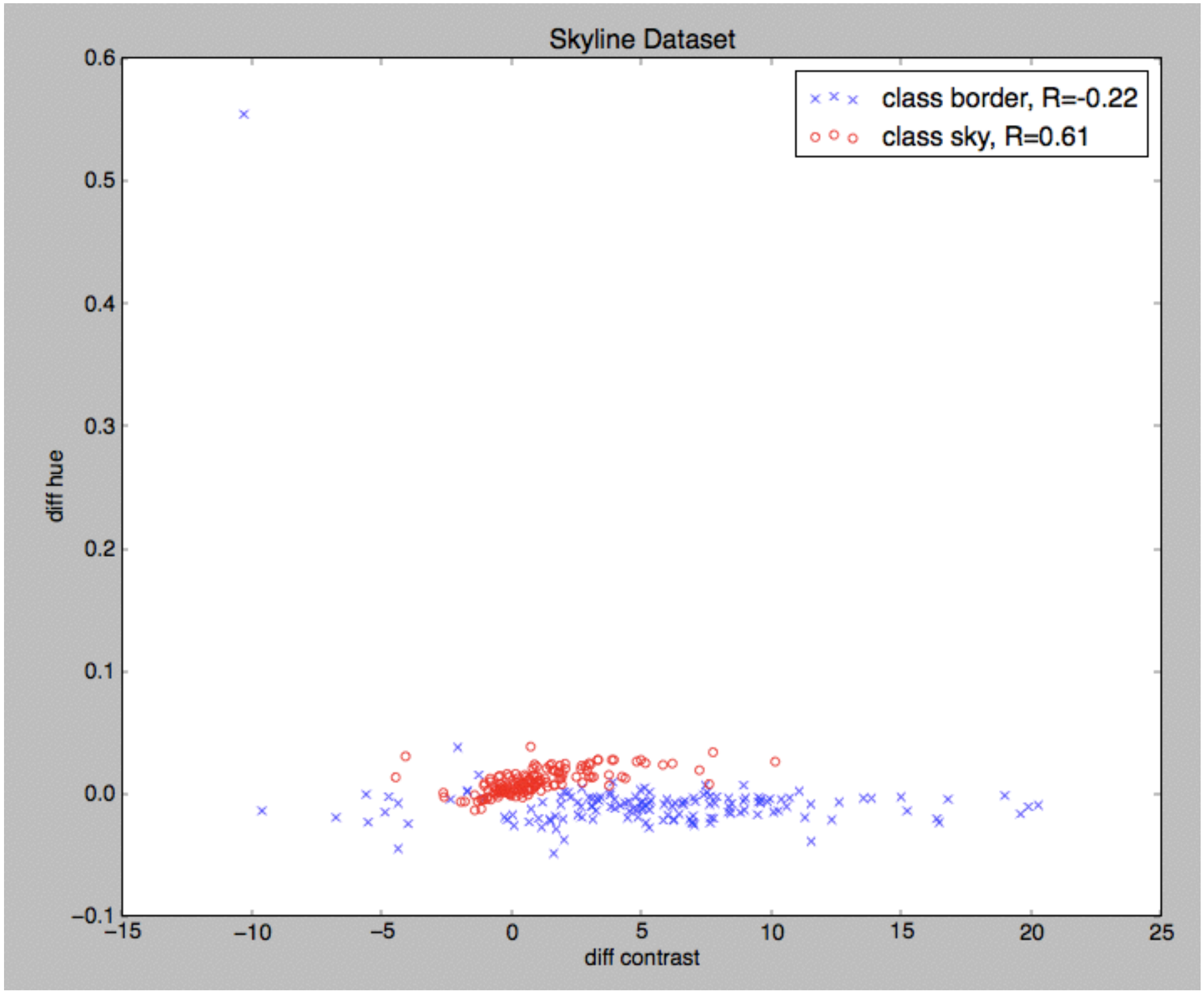


*note: the largest contrasts were removed from analysis for plot visibility

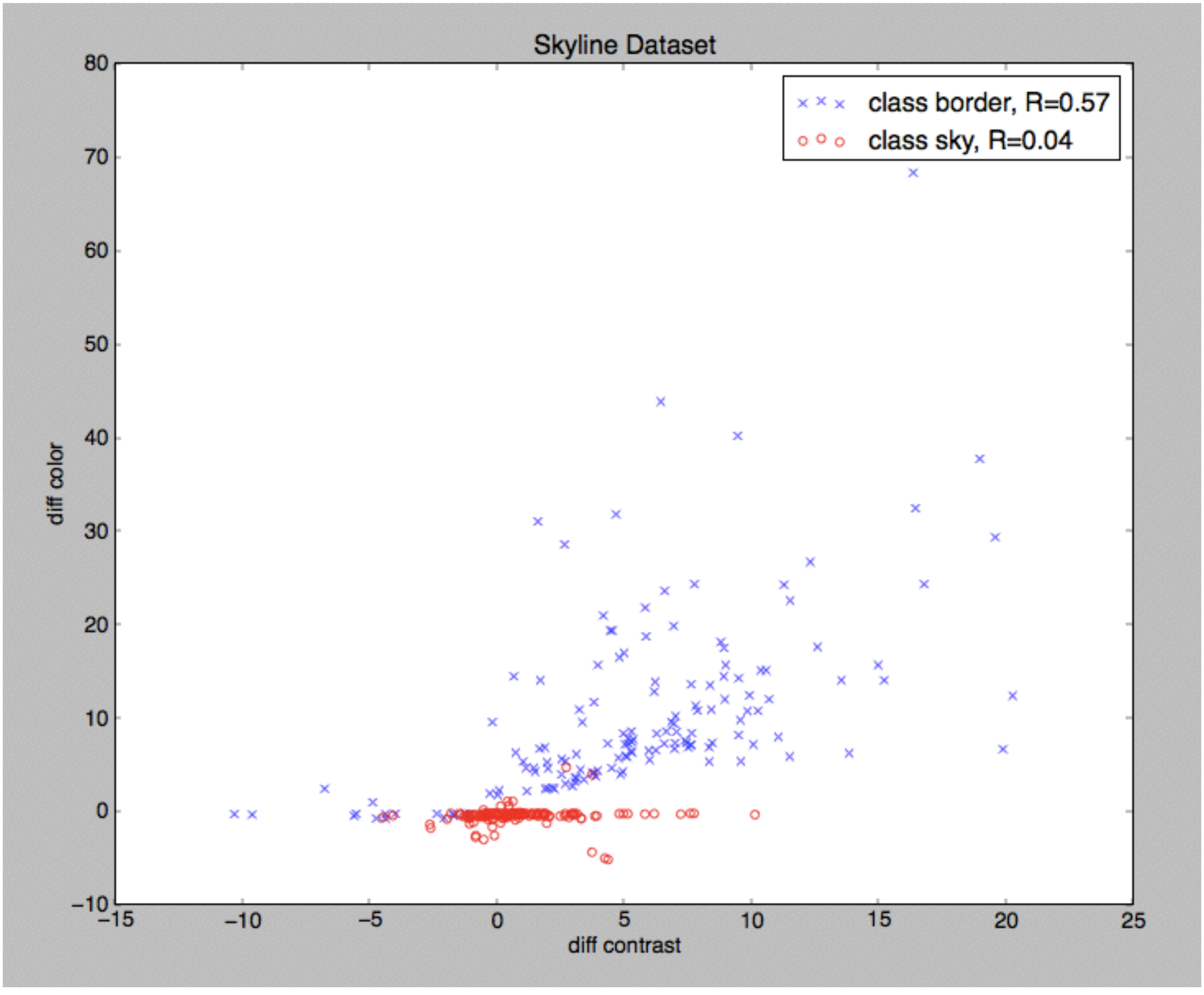




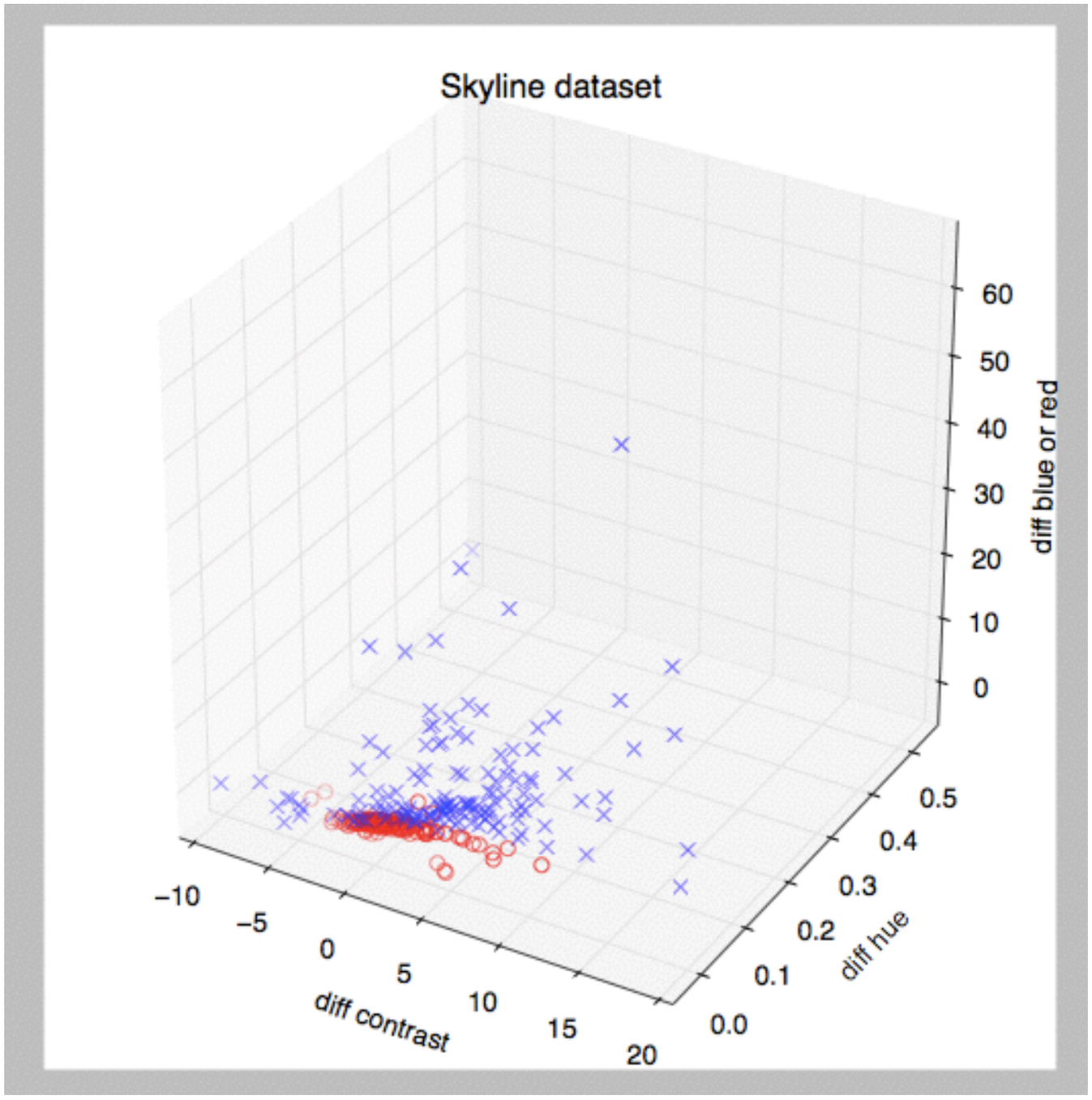
Venturi mtn range, image 1



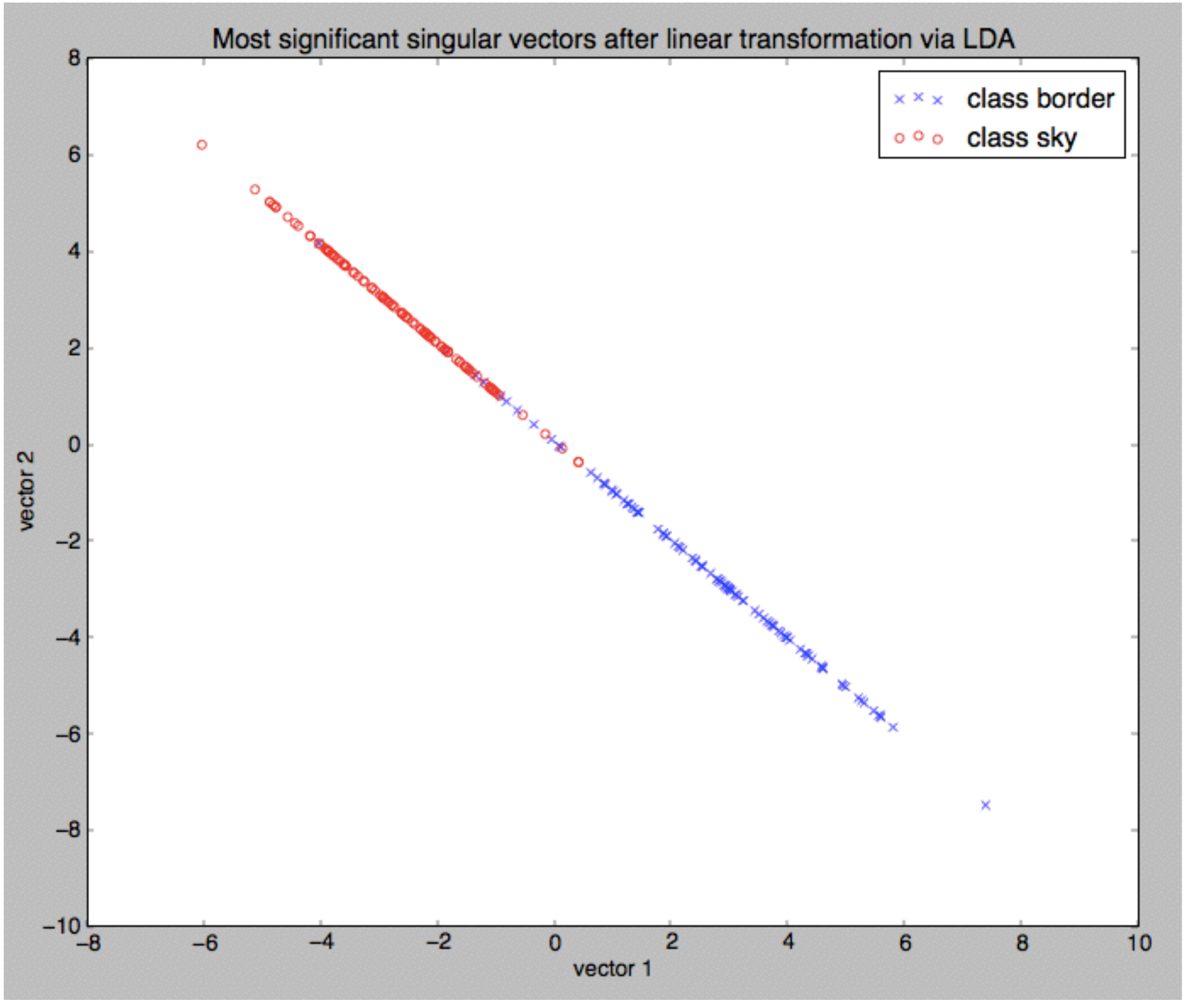
Venturi mtn range, image 1



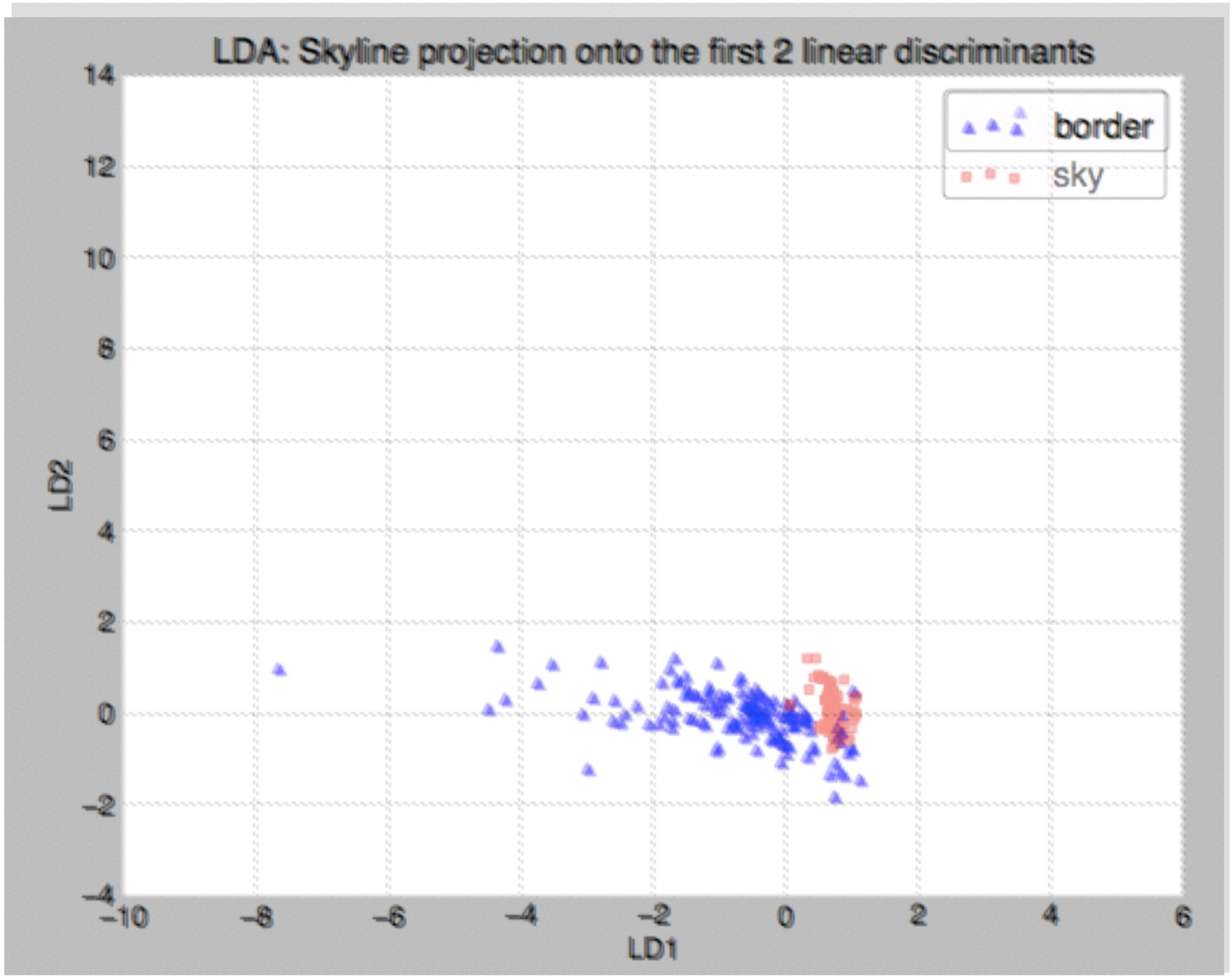
Venturi mtn range, image 1



Venturi mtn range, image 1



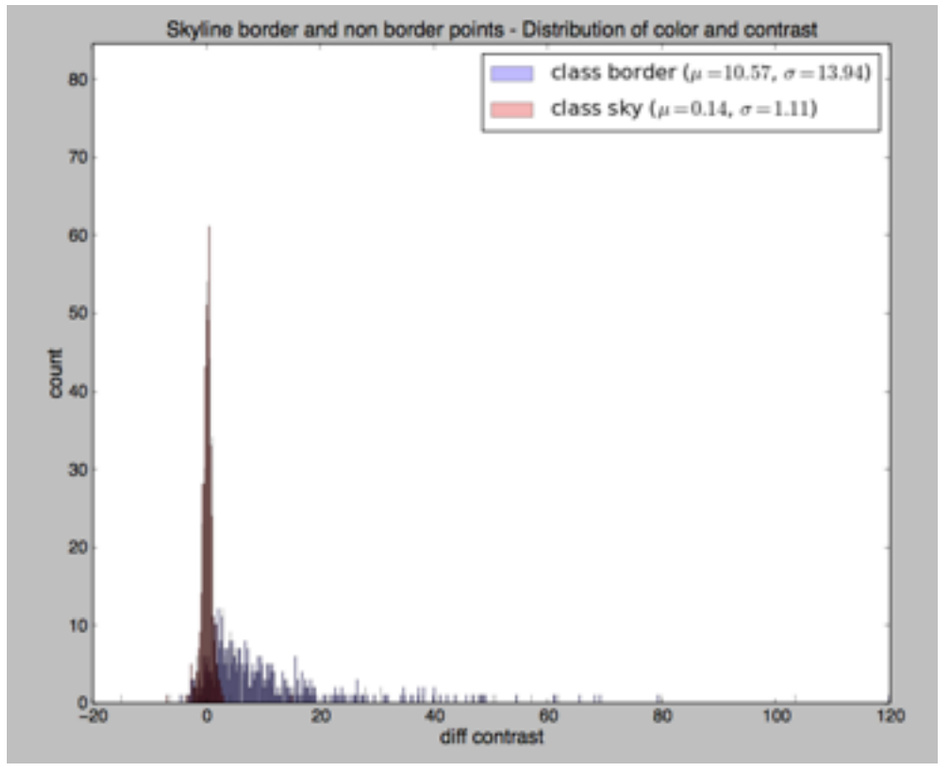
Venturi mtn range, image 1



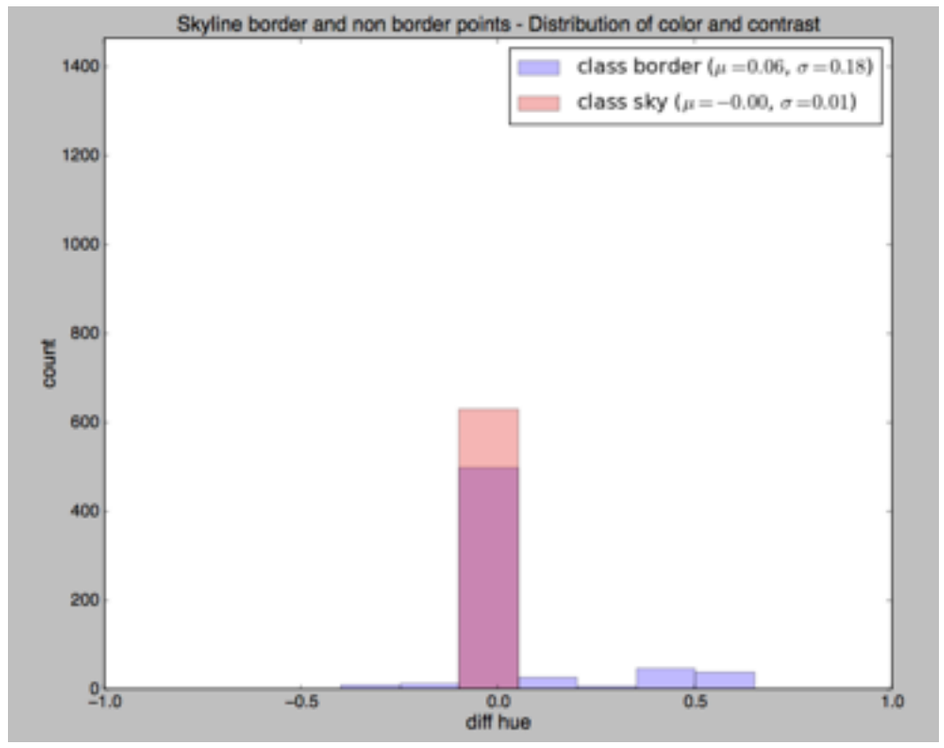

```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.4626 -0.2326  0.5956]

Mean Vector class 2: [-0.4754  0.2391 -0.6122]

('within-class Scatter Matrix:\n',
array([[ 227.7815,  -40.2087,  108.4066],
       [ -40.2087,  275.757 ,  -32.2207],
       [ 108.4066,  -32.2207,  185.5247]]))
('between-class Scatter Matrix:\n',
array([[ 192.6906,  -96.8562,  248.106 ],
       [ -96.8562,   48.7642, -124.726 ],
       [ 248.106 , -124.726 ,  319.461 ]]))

Eigenvector 1:
[[-0.2236]
 [ 0.149 ]
 [-0.9632]]
Eigenvalue 1: 1.84e+00

Eigenvector 2:
[[ 0.7602]
 [-0.1221]
 [-0.6381]]
Eigenvalue 2: 1.18e-16

Eigenvector 3:
[[ 0.3866]
 [ 0.9204]
 [ 0.0591]]
Eigenvalue 3: 2.72e-04
ok
Eigenvalues in decreasing order:

1.83771695135
0.000271576220989
1.17934013279e-16
Variance explained:

eigenvalue 1: 99.99%
eigenvalue 2: 0.01%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.2236,  0.149 , -0.9632],
       [ 0.3866,  0.9204,  0.0591]]))
```

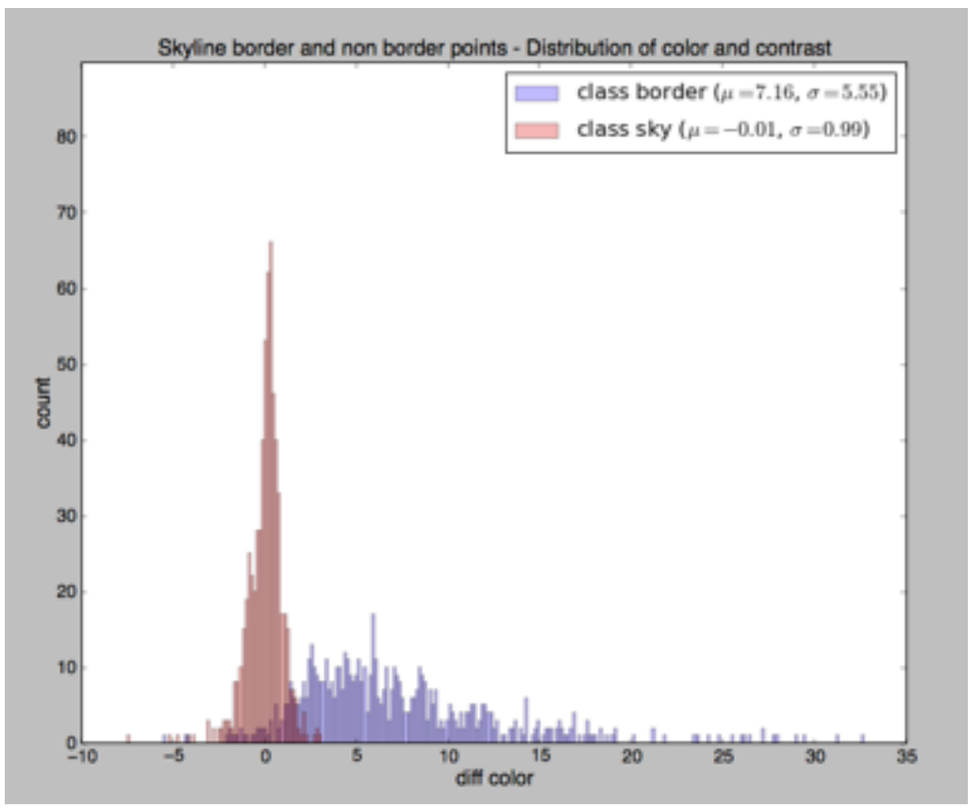
seattle test image

seattle test image

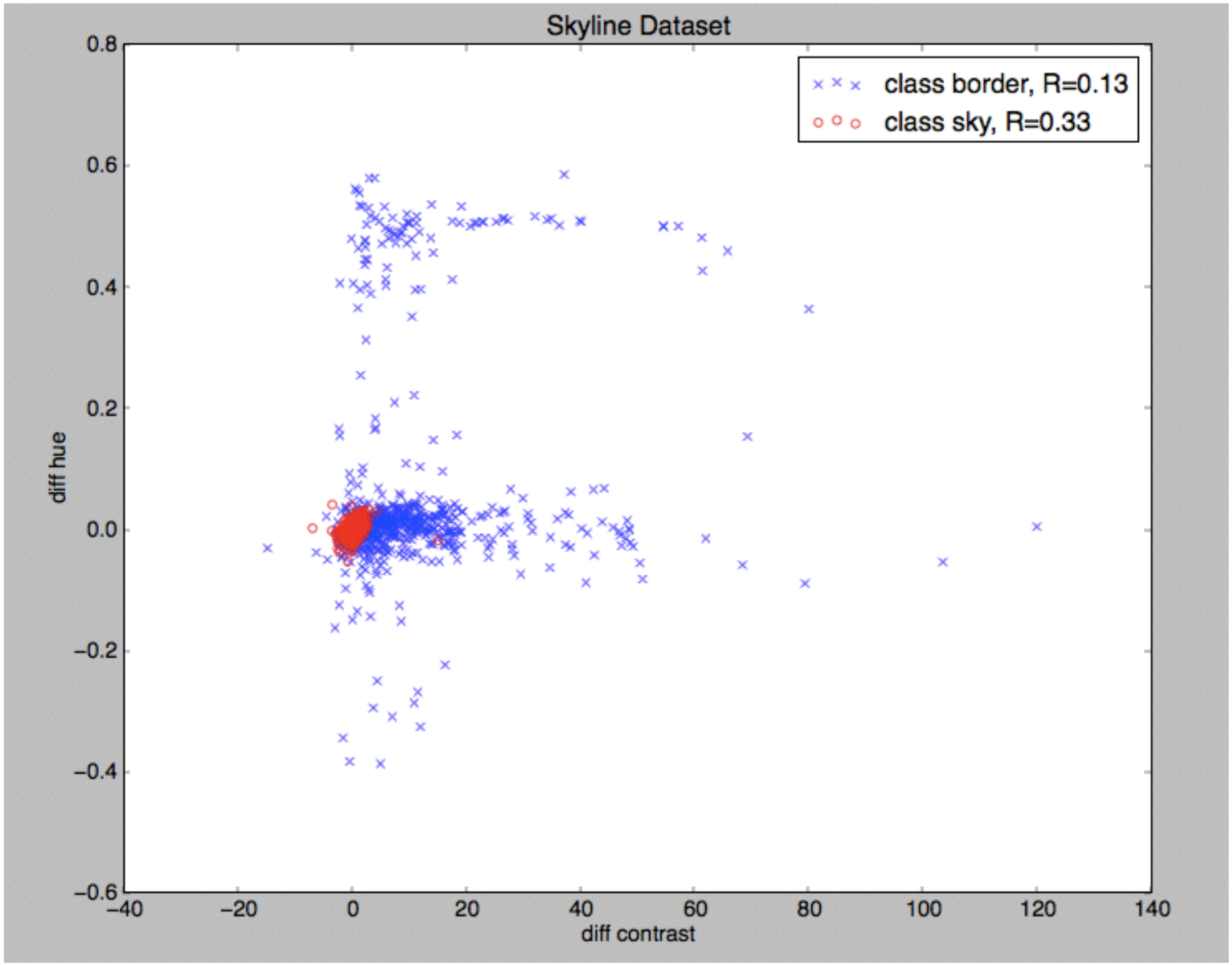


*note: the largest contrasts were removed from analysis for plot visibility

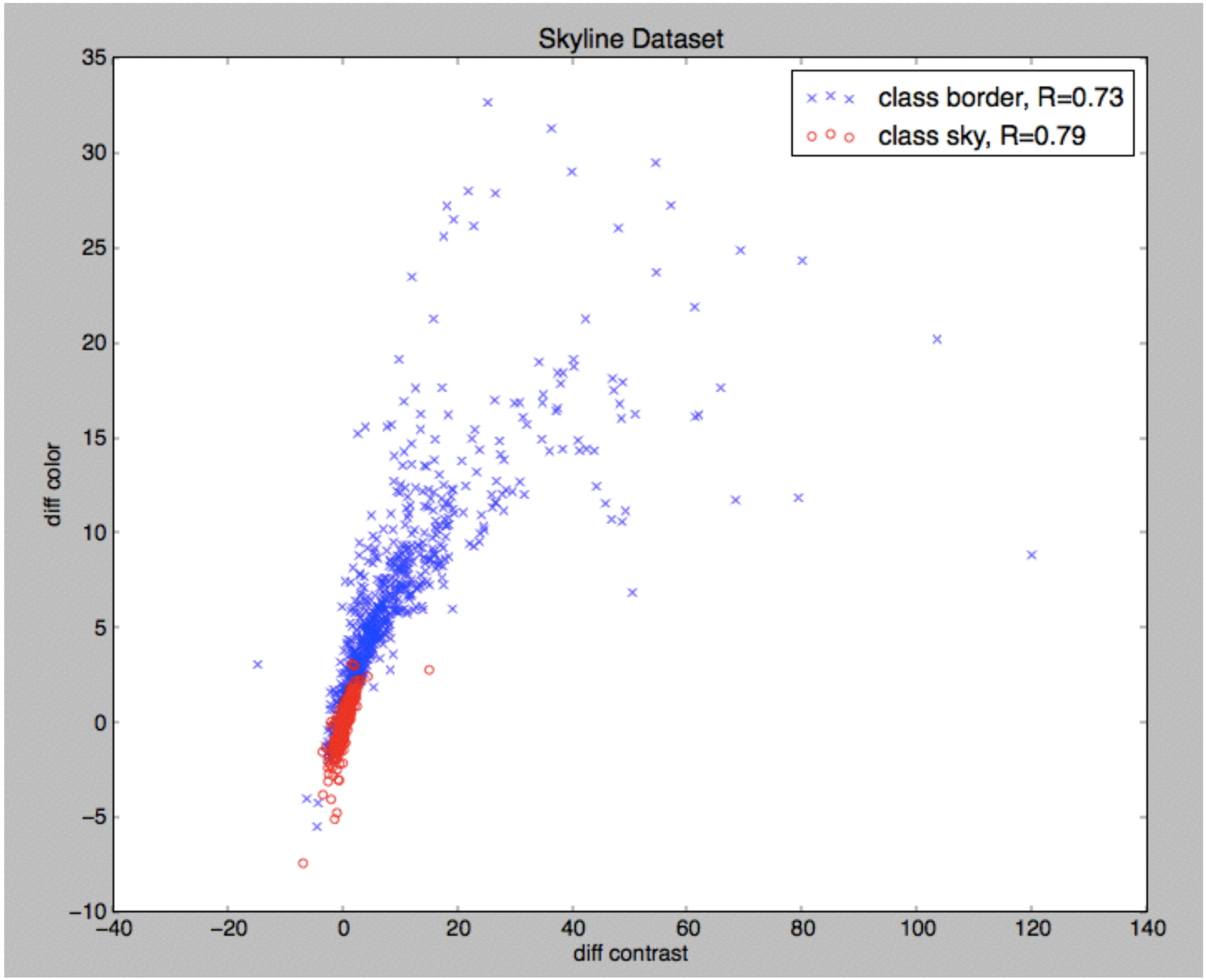




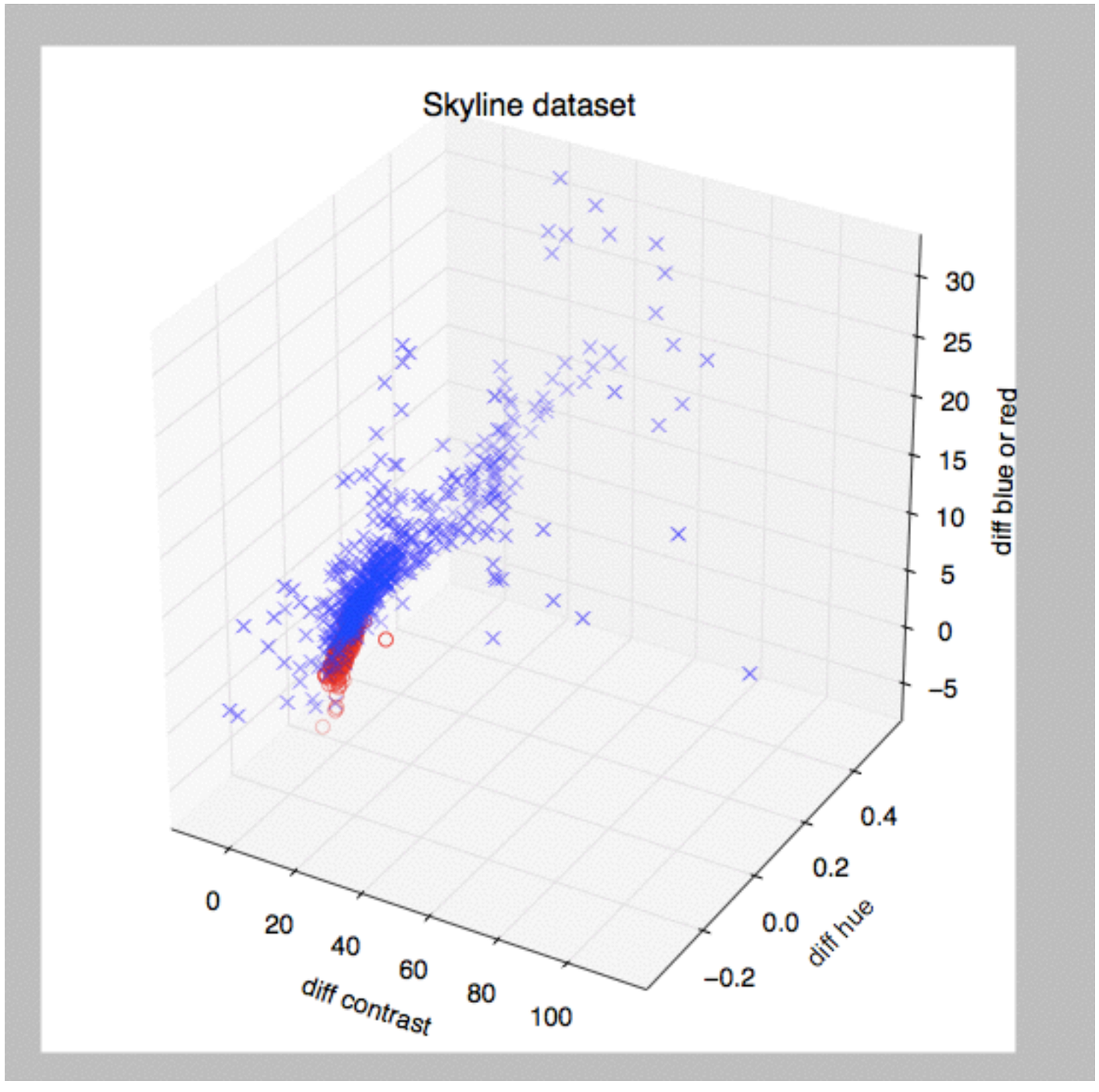
[seattle test image]



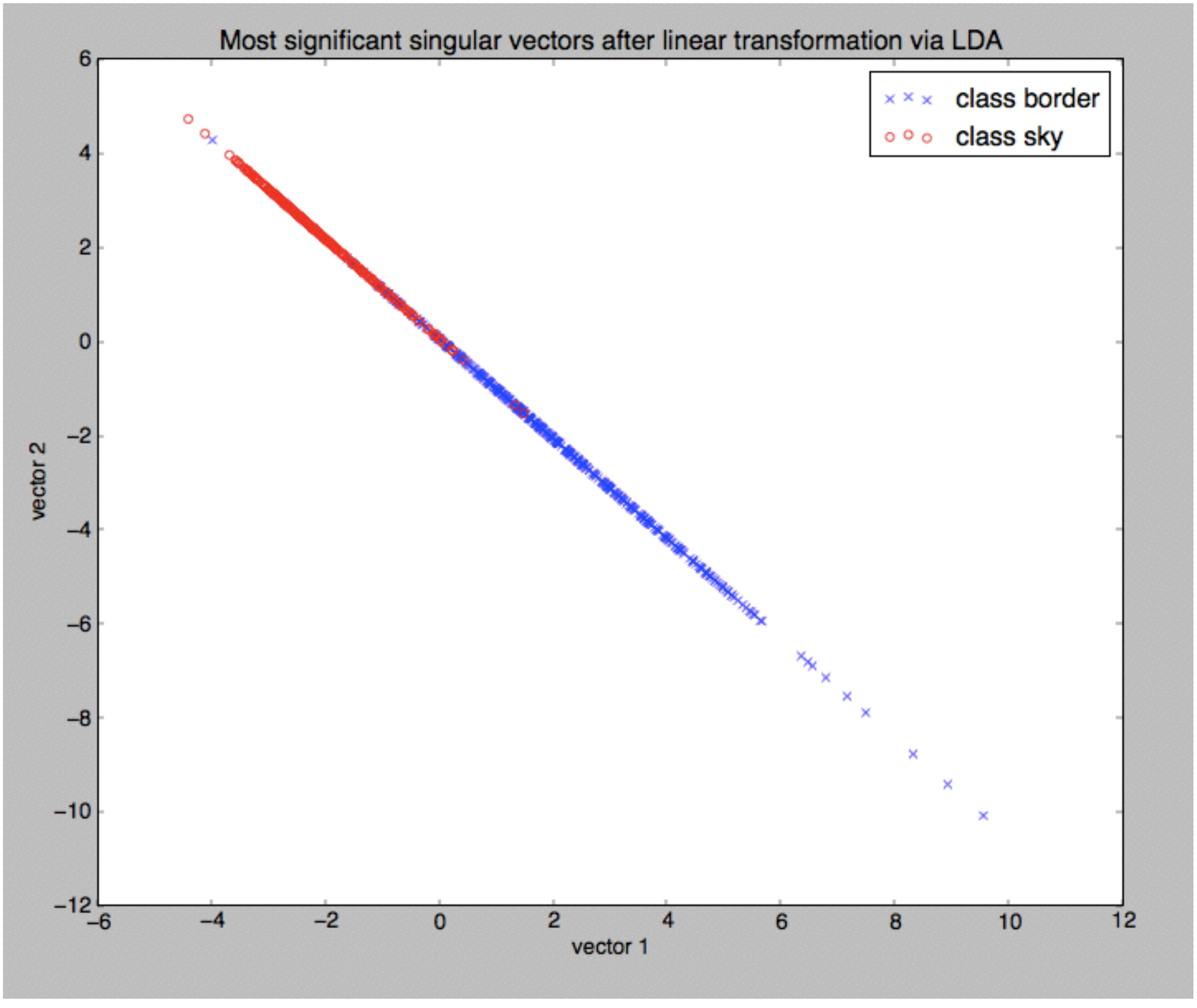
[seattle test image]



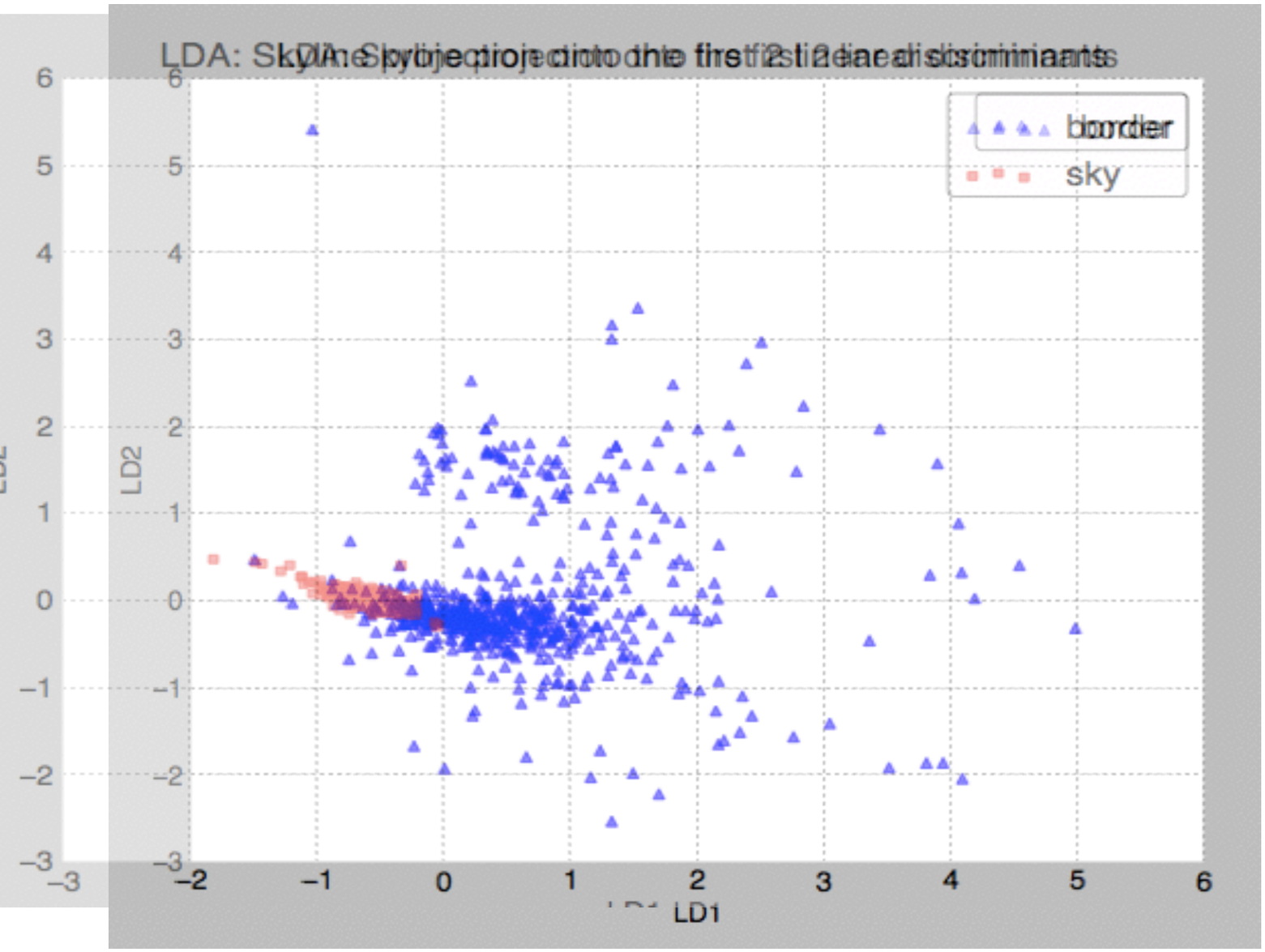
[seattle test image]



[seattle test image]



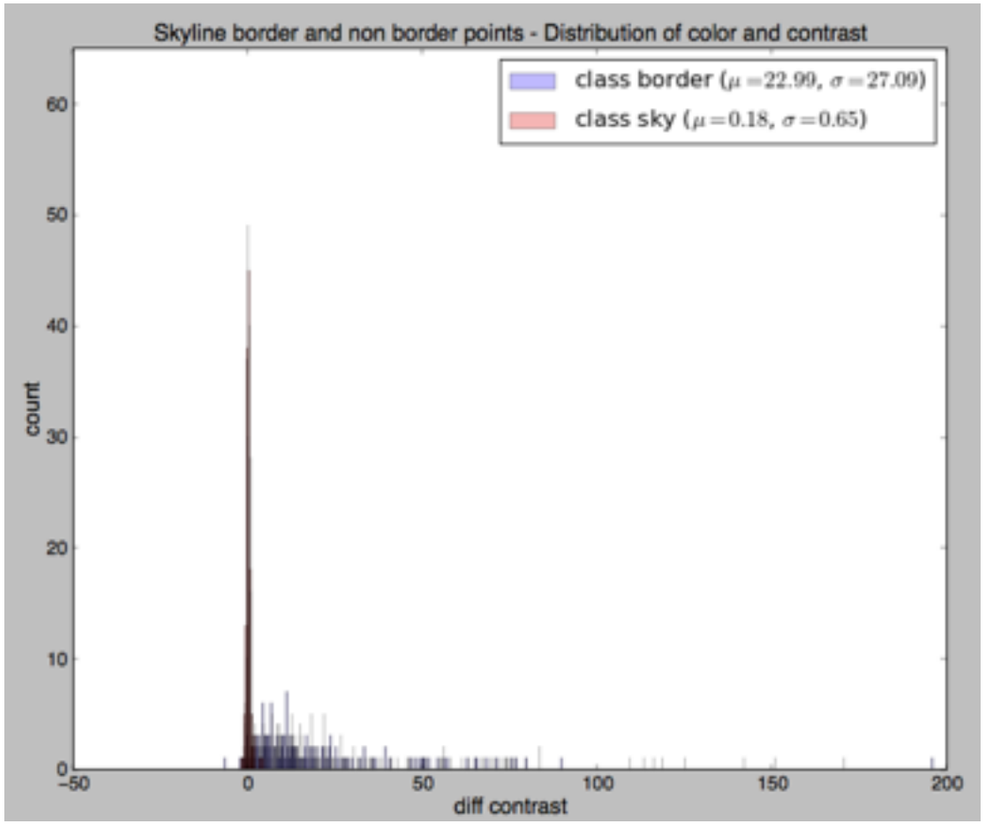
seattle test image



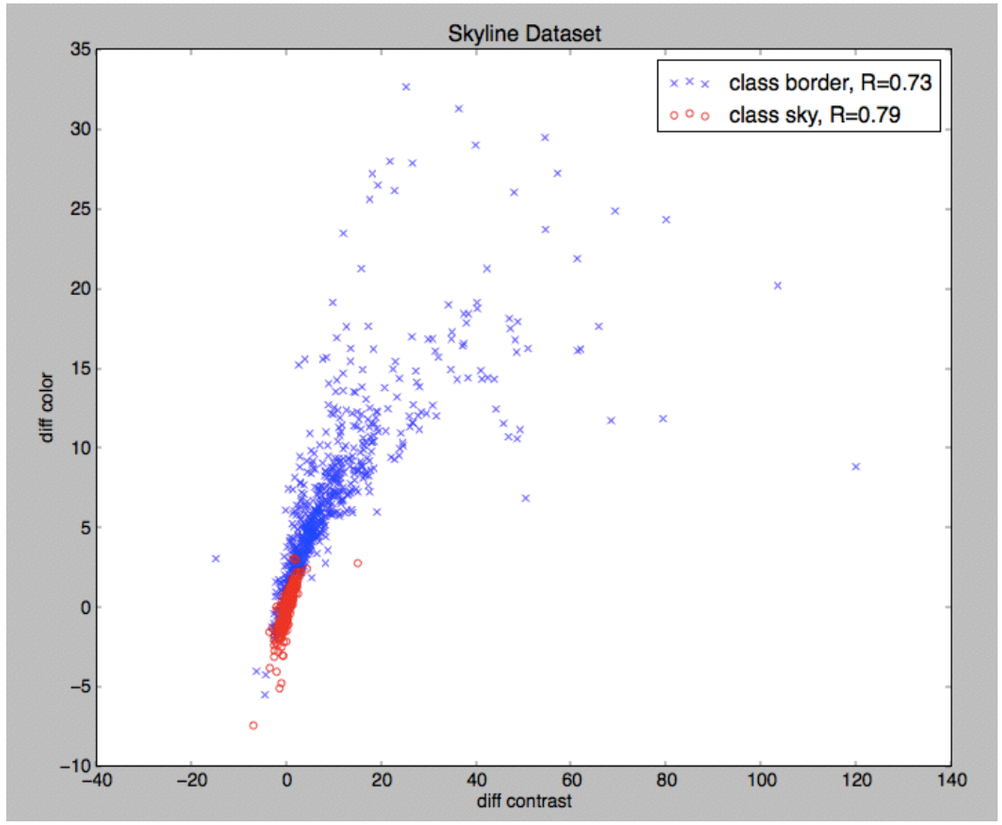

```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.4656  0.2477  0.6669]

Mean Vector class 2: [-0.4671 -0.2485 -0.669 ]

('within-class Scatter Matrix:\n',
array([[  985.996 ,   139.7075,   599.7238],
       [  139.7075,  1182.4522,   237.0341],
       [  599.7238,   237.0341,   697.8901]]))
('between-class Scatter Matrix:\n',
array([[  822.0142,   437.3073,  1177.3651],
       [  437.3073,   232.6457,   626.3517],
       [ 1177.3651,   626.3517,  1686.332 ]]))

Eigenvector 1:
[[-0.1942]
 [ 0.0051]
 [ 0.9809]]
Eigenvalue 1: 2.51e+00

Eigenvector 2:
[[-0.8163]
 [ 0.392 ]
 [ 0.4243]]
Eigenvalue 2: -5.33e-16

Eigenvector 3:
[[ 0.5968]
 [ 0.521 ]
 [-0.6102]]
Eigenvalue 3: 1.38e-06
ok
Eigenvalues in decreasing order:

2.50953939789
1.37504566598e-06
5.33350812381e-16
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.1942,  0.0051,  0.9809],
       [ 0.5968,  0.521 , -0.6102]]))
```

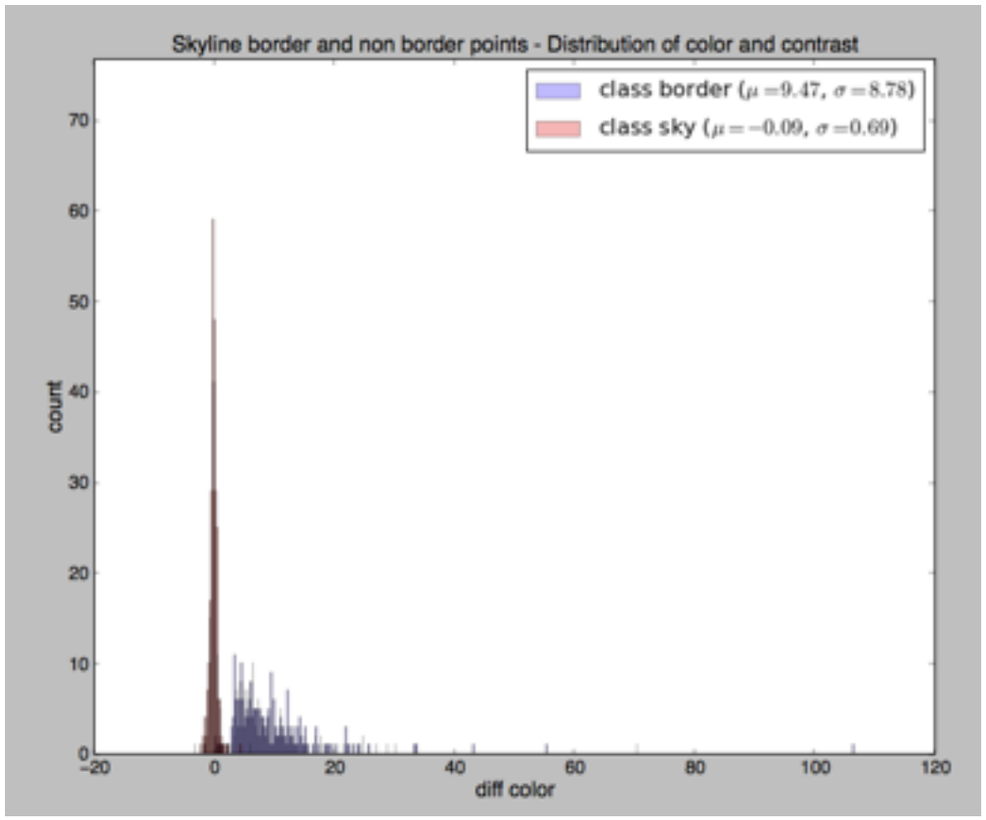
arches test image

arches test image

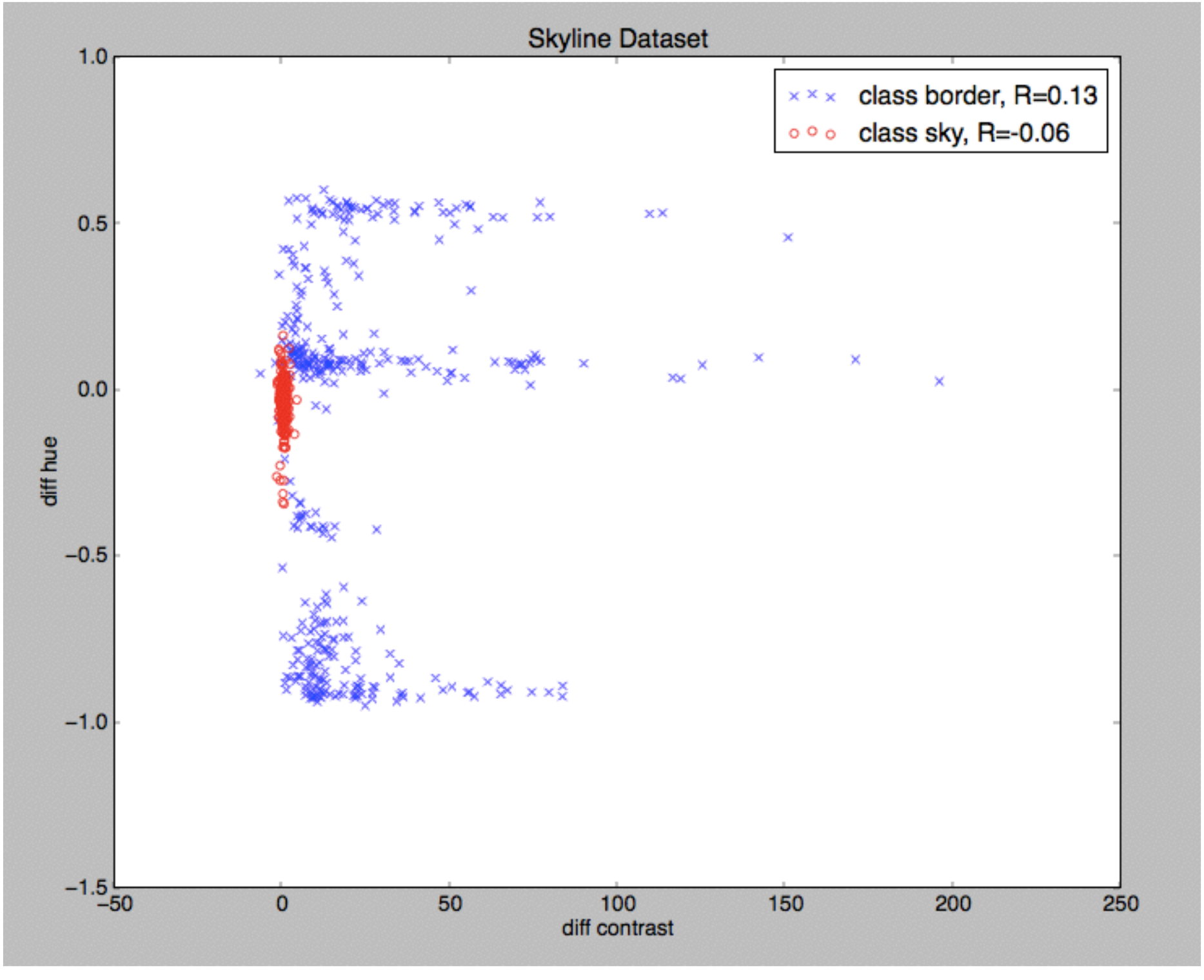


*note: the largest contrasts were removed from analysis for plot visibility

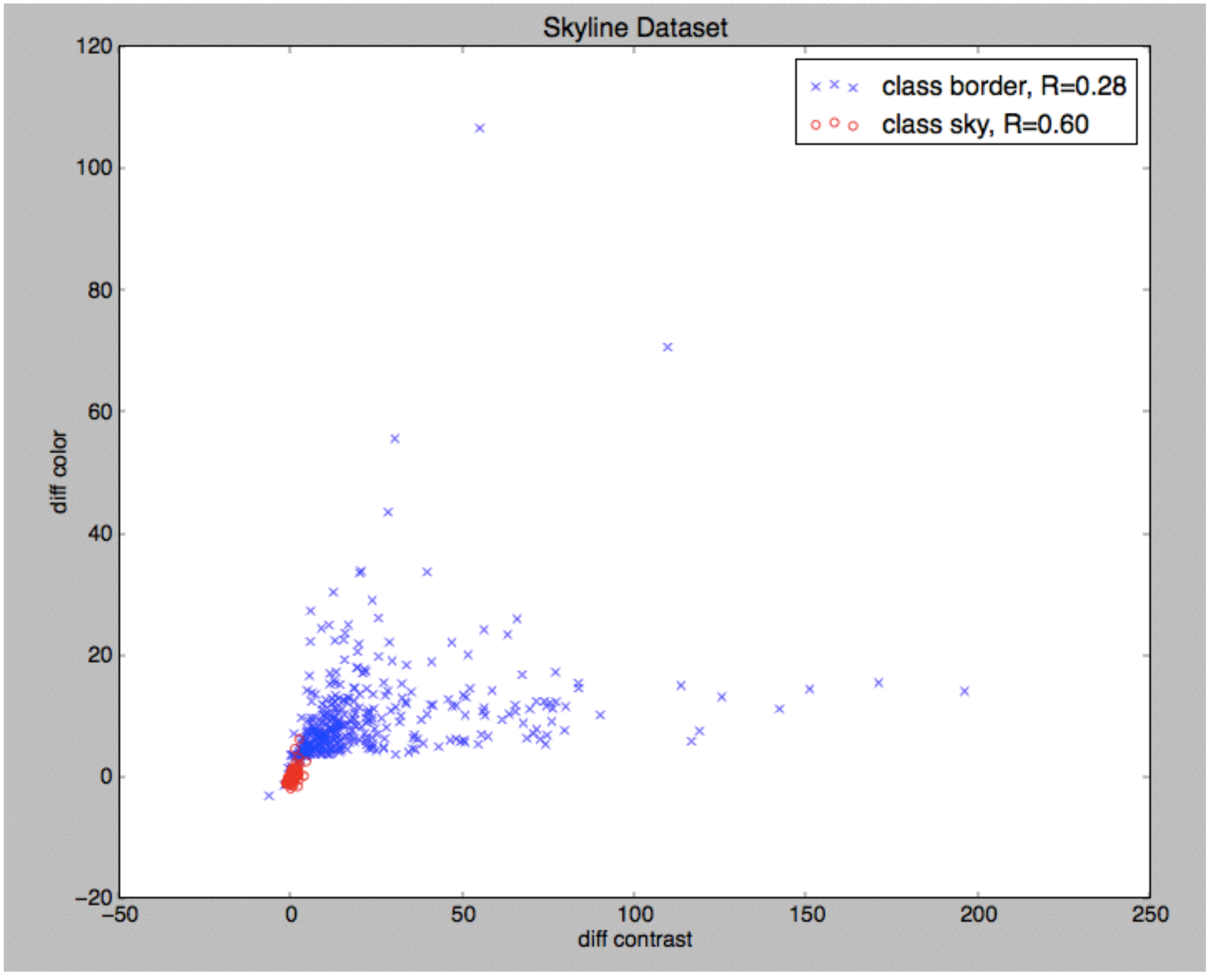




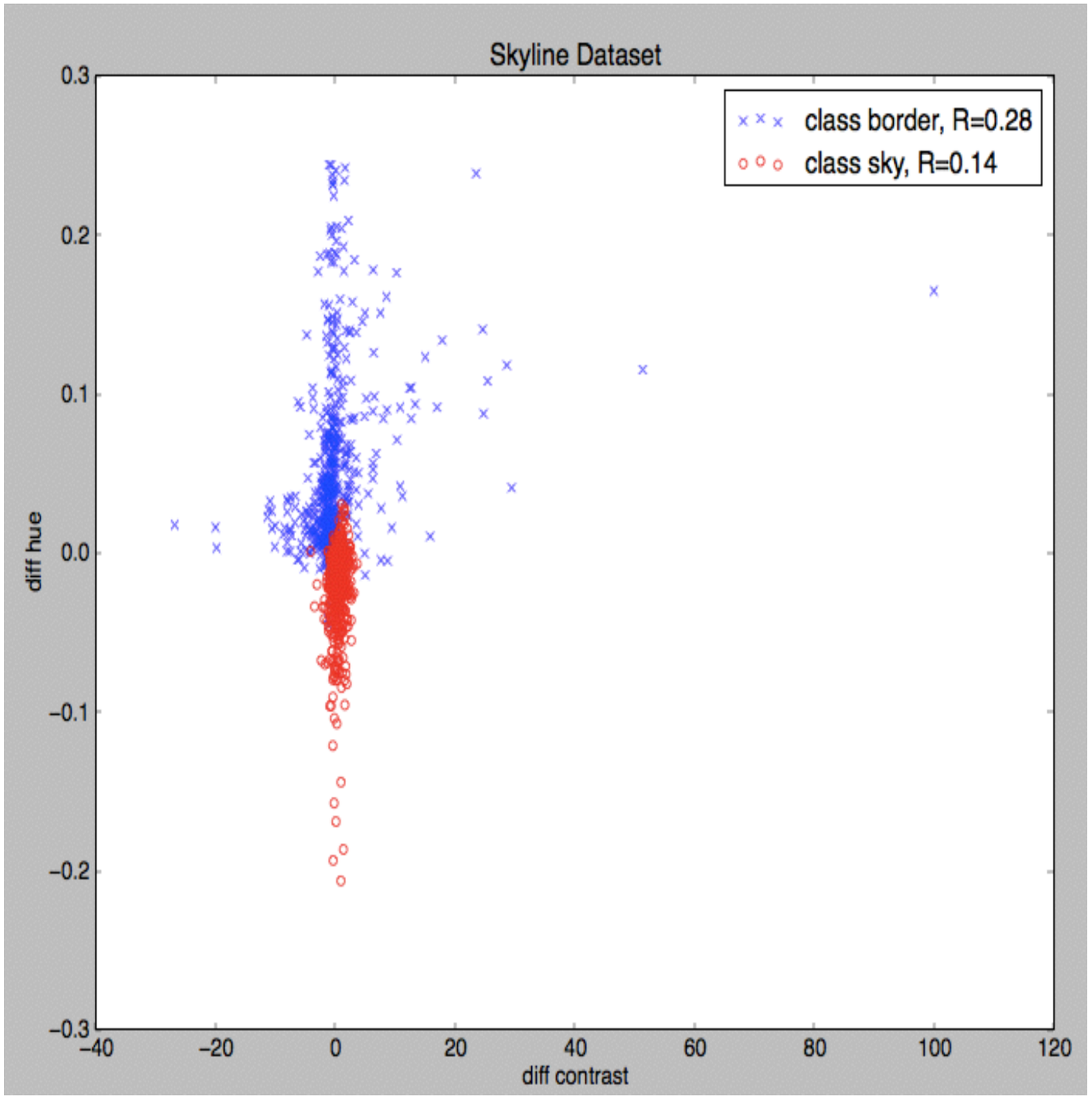
[arches test image]



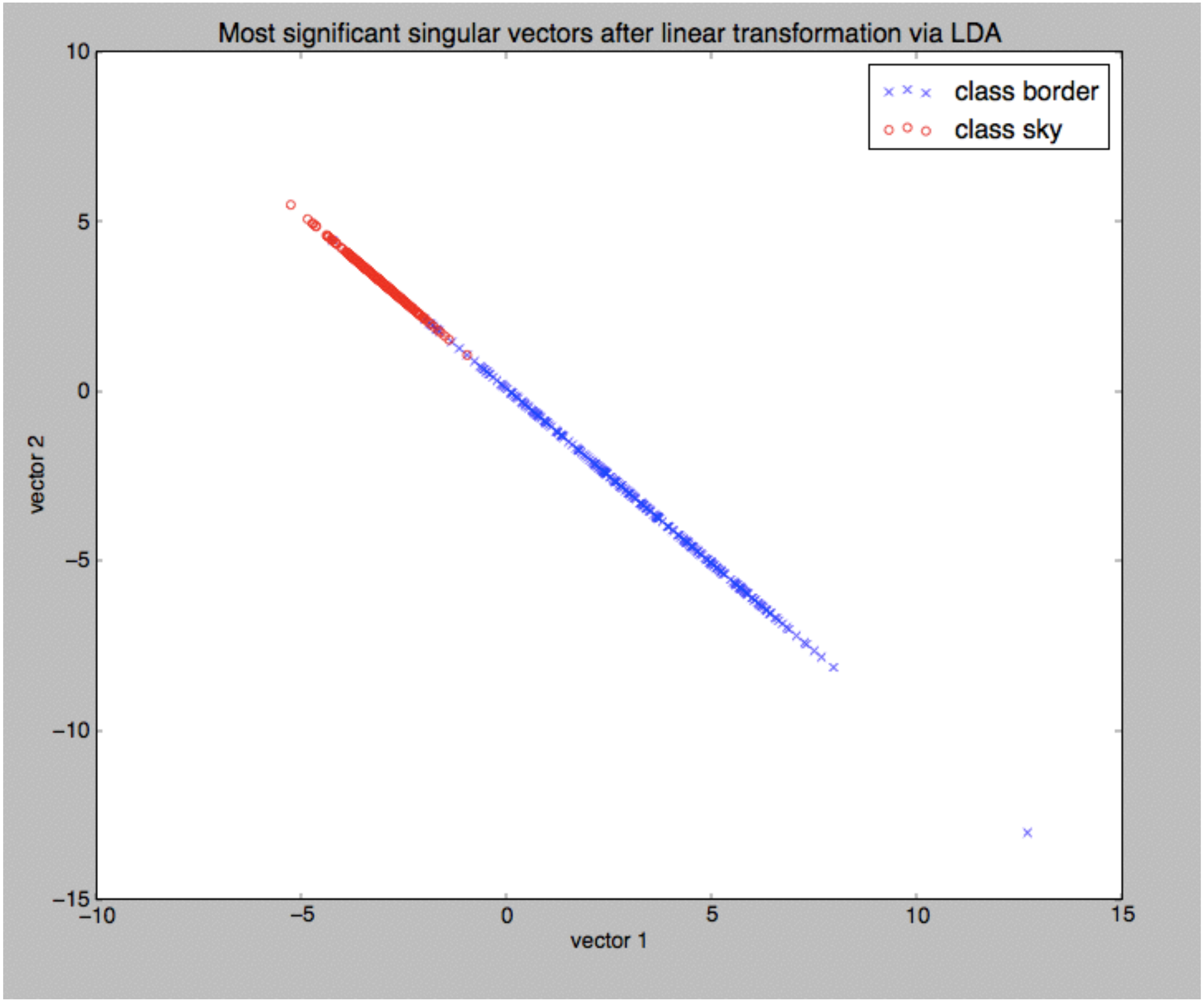
[arches test image]



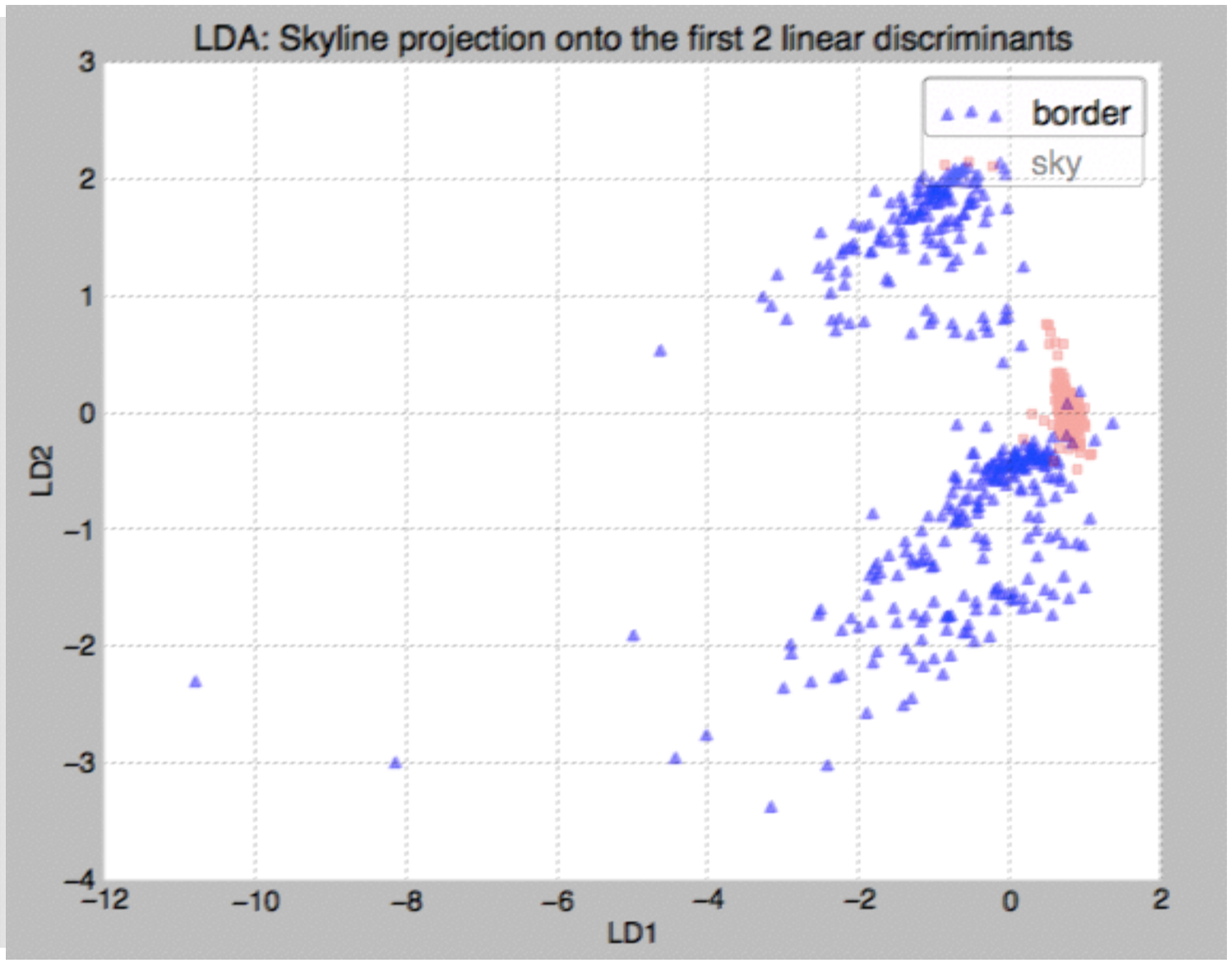
arches test image



[arches test image]



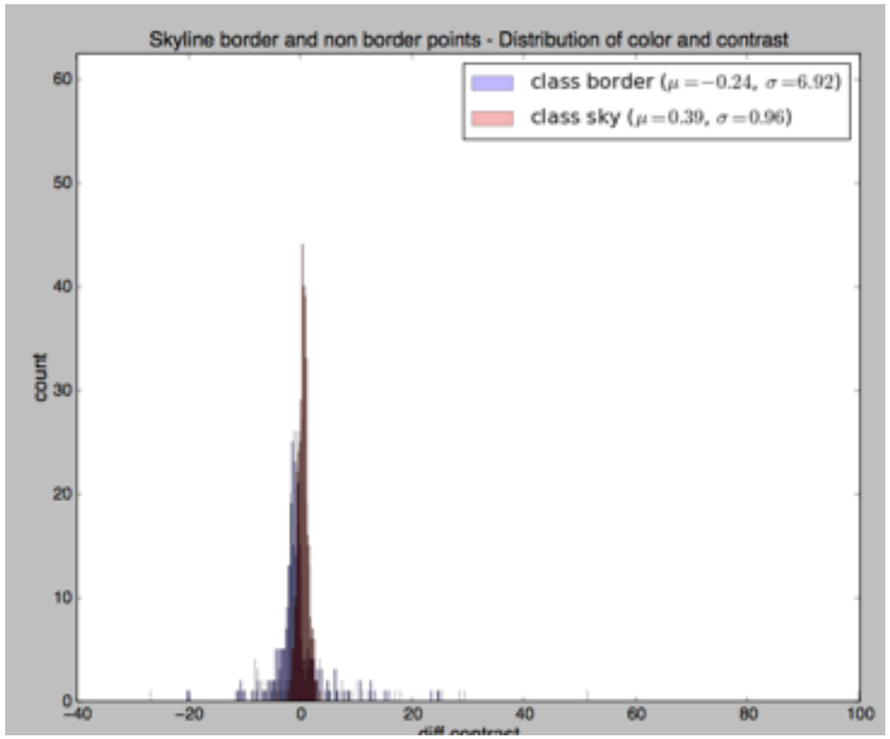
arches test image



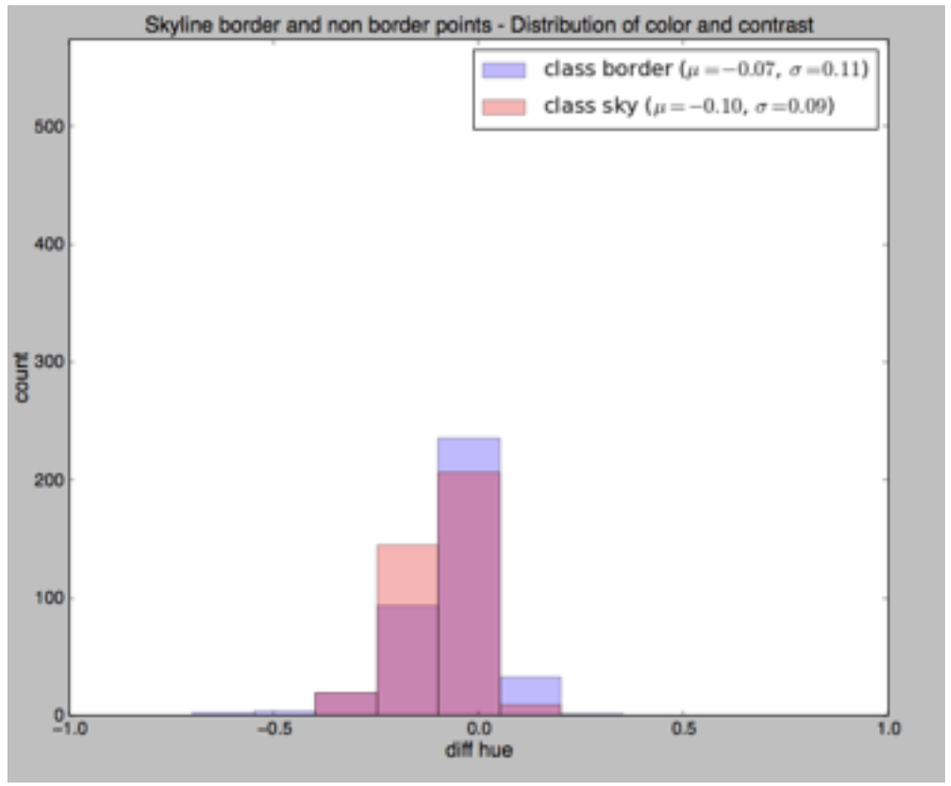

```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.5095 -0.1761  0.6067]

Mean Vector class 2: [-0.5123  0.177  -0.6099]

('within-class Scatter Matrix:\n',
array([[ 551.2873,   78.8521,  144.3438],
       [  78.8521,  722.7472,  146.1896],
       [ 144.3438,  146.1896,  469.9548]]))
('between-class Scatter Matrix:\n',
array([[ 584.1418, -201.8594,  695.5218],
       [-201.8594,   69.7621, -240.3494],
       [ 695.5218, -240.3494,  828.1391]]))

Eigenvector 1:
[[-0.4385]
 [ 0.3714]
 [-0.8184]]
Eigenvalue 1: 2.72e+00

Eigenvector 2:
[[-0.749]
 [ 0.093]
 [ 0.656]]
Eigenvalue 2: 3.72e-16

Eigenvector 3:
[[-0.3207]
 [-0.9472]
 [-0.0055]]
Eigenvalue 3: 7.63e-06
ok
Eigenvalues in decreasing order:

2.72354460153
7.62574597694e-06
3.7249290295e-16
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.4385,  0.3714, -0.8184],
       [-0.3207, -0.9472, -0.0055]]))
```

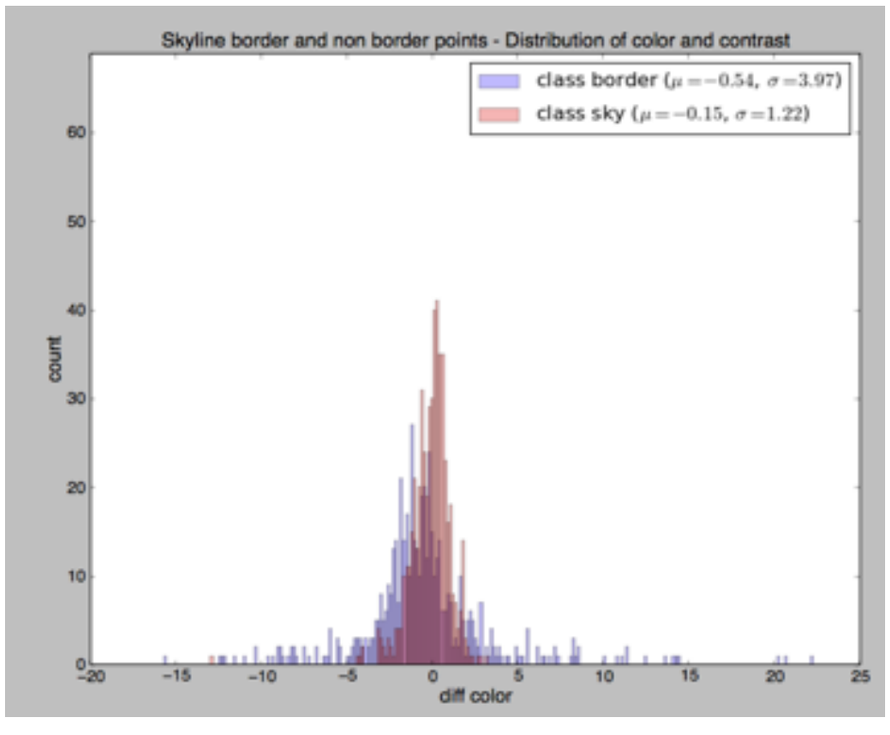
stinson test image

stinson test image

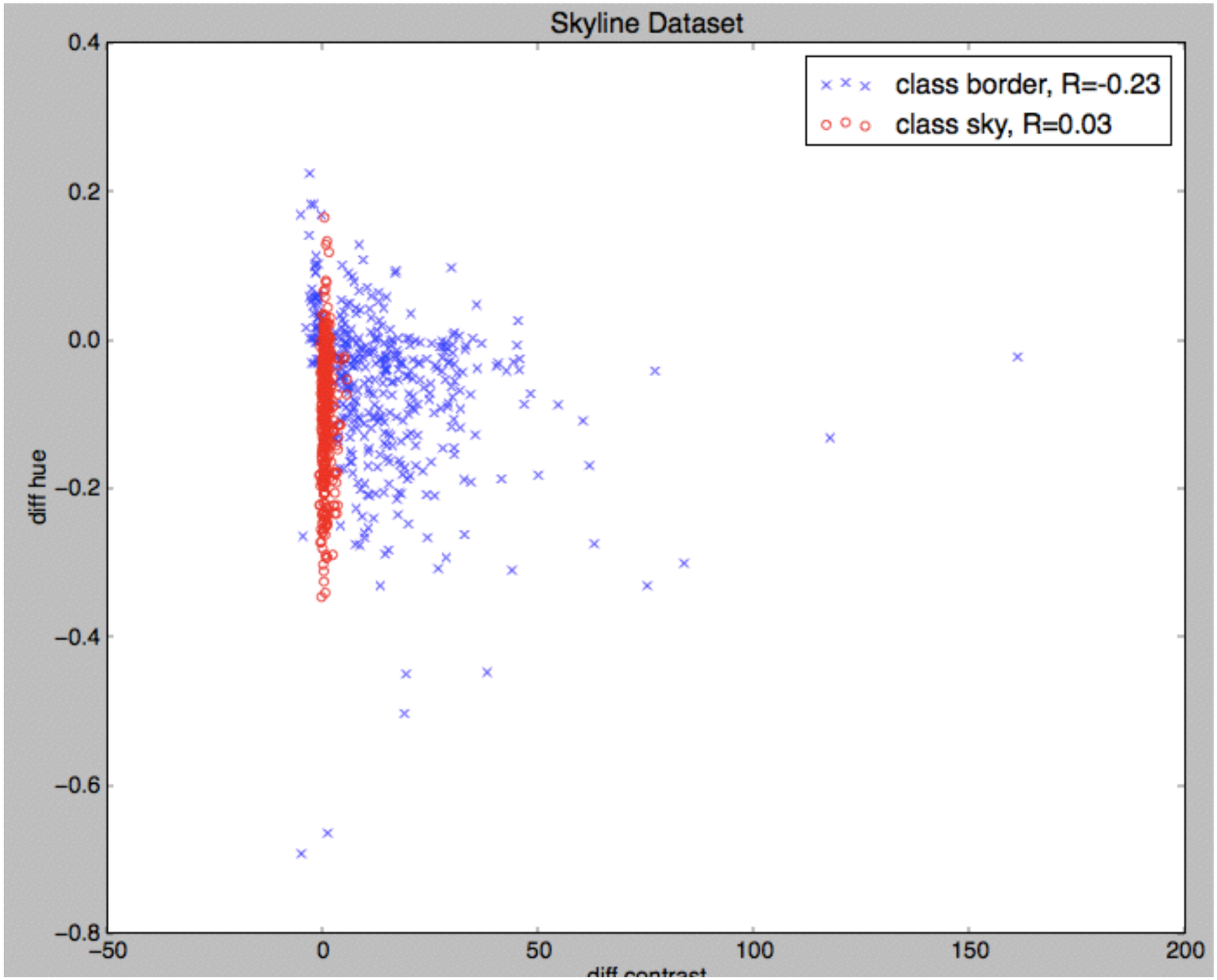


*note: the largest contrasts were removed from analysis for plot visibility

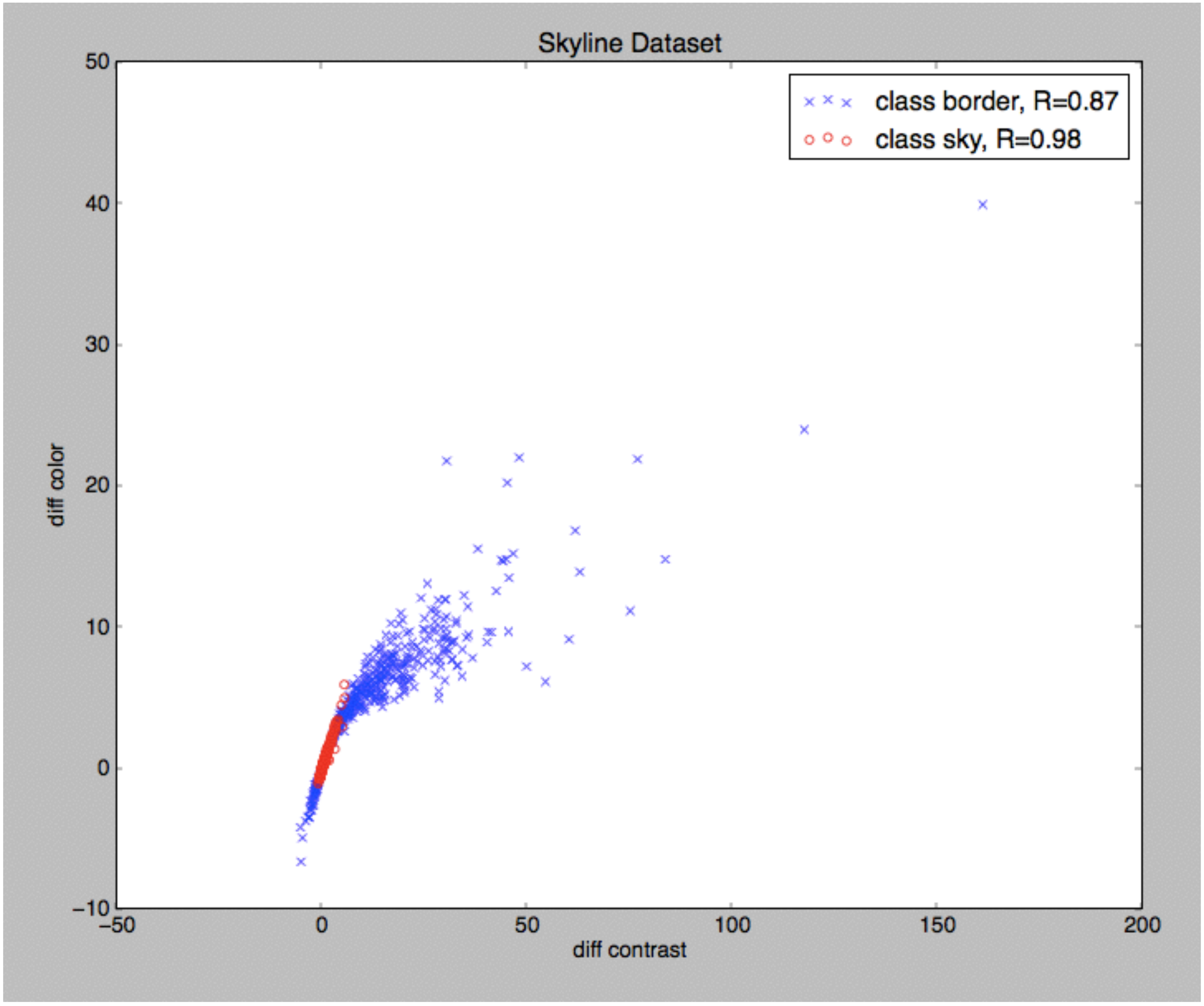




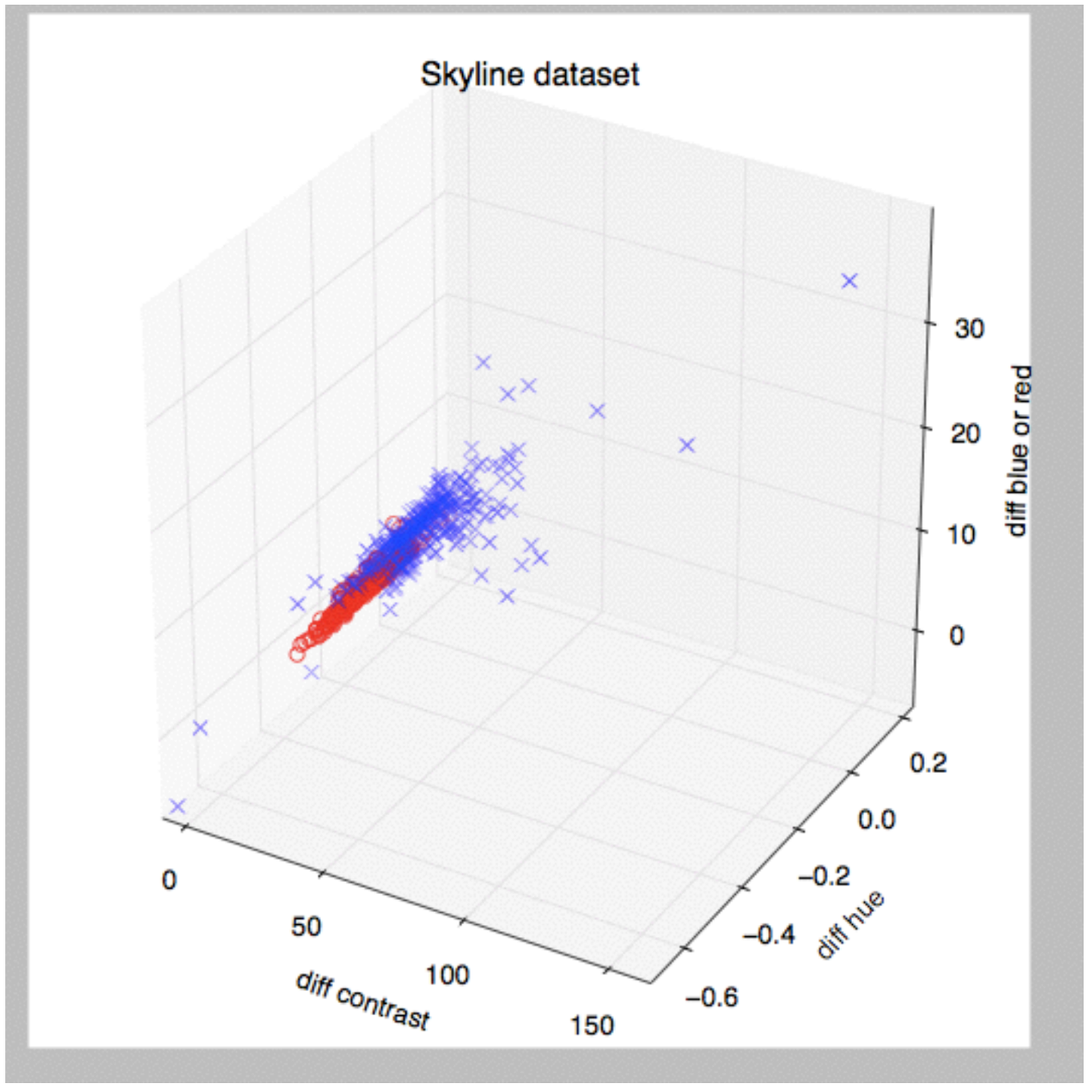
stinson test image



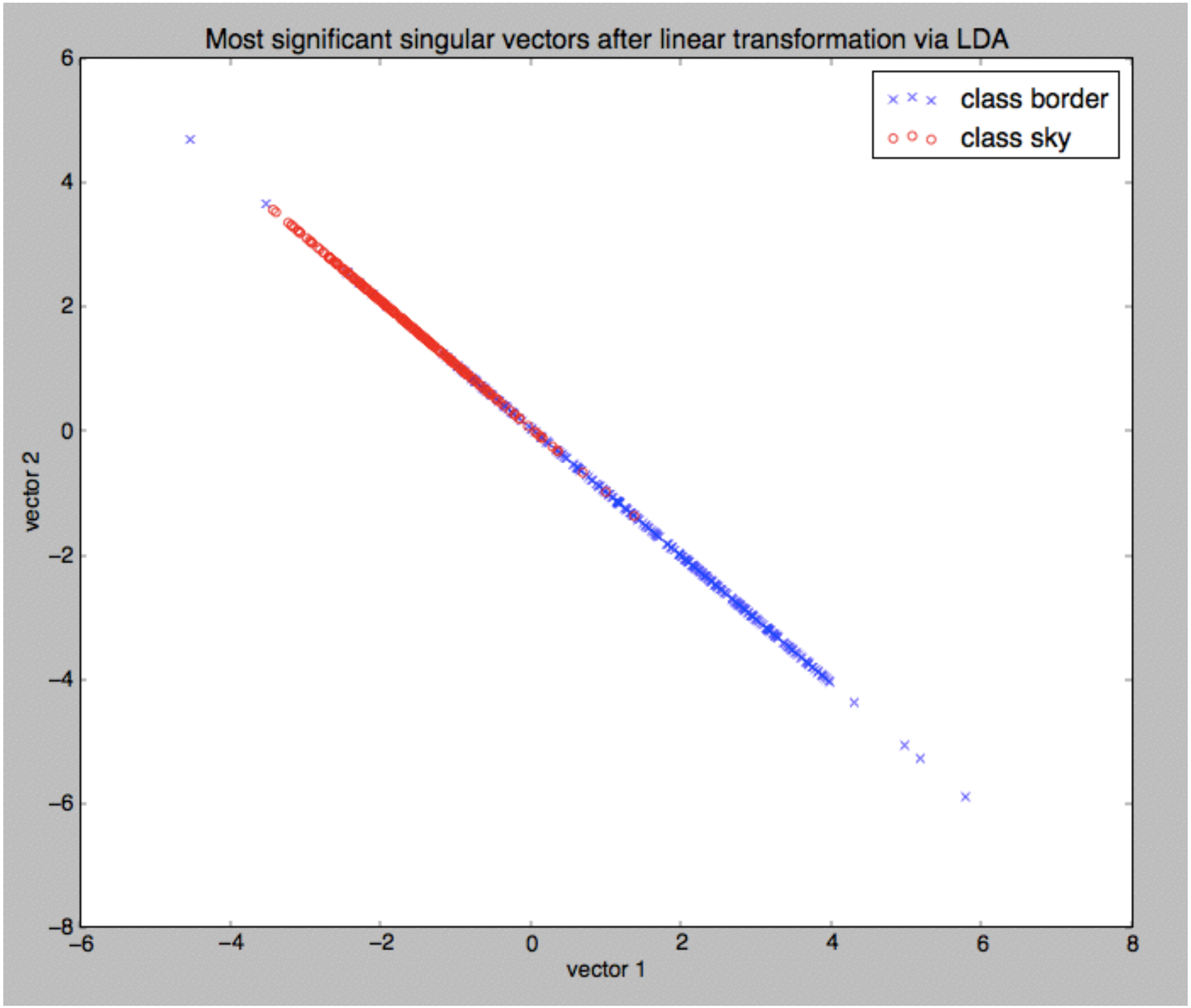
stinson test image



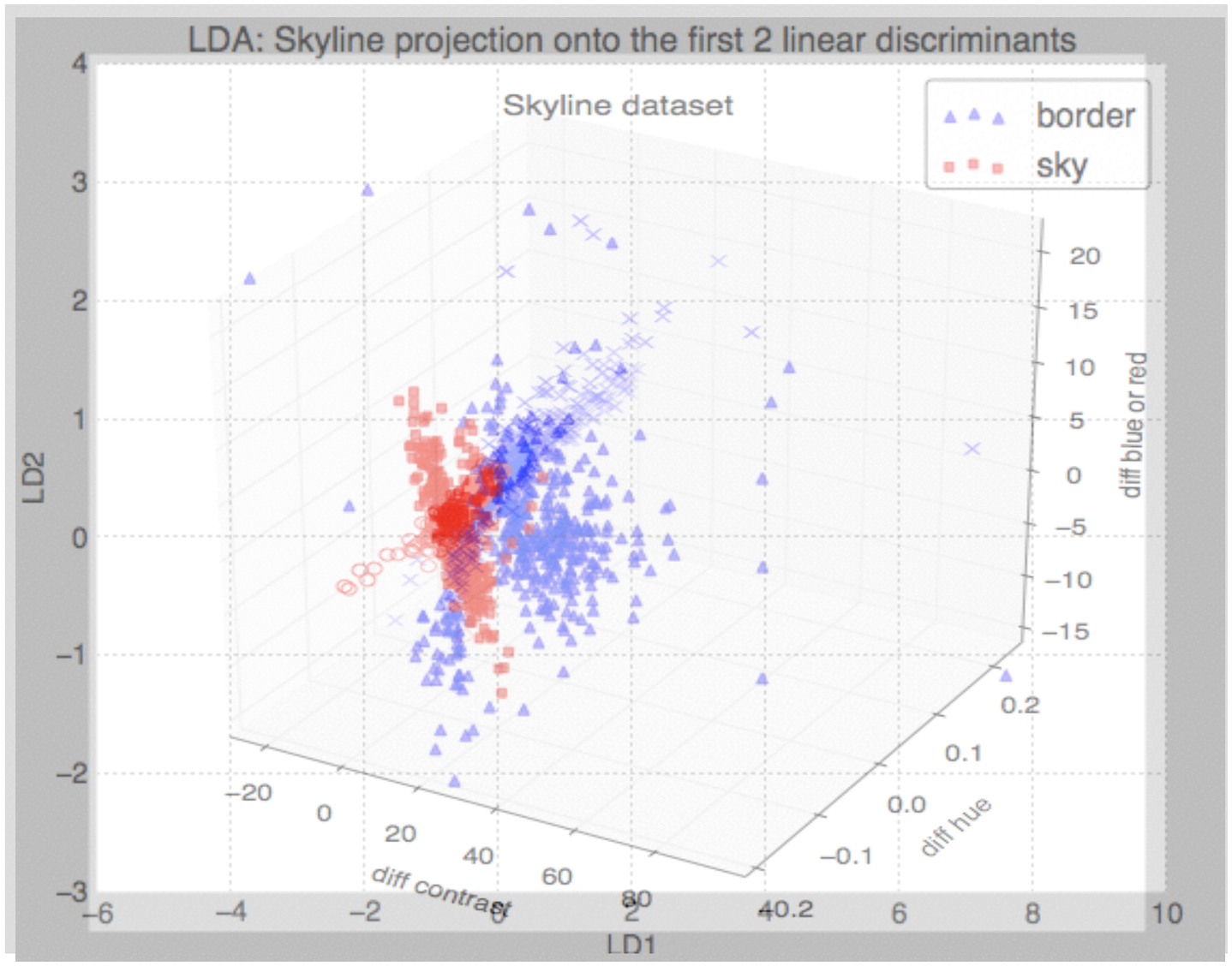
stinson test image



stinson test image



stinson test image

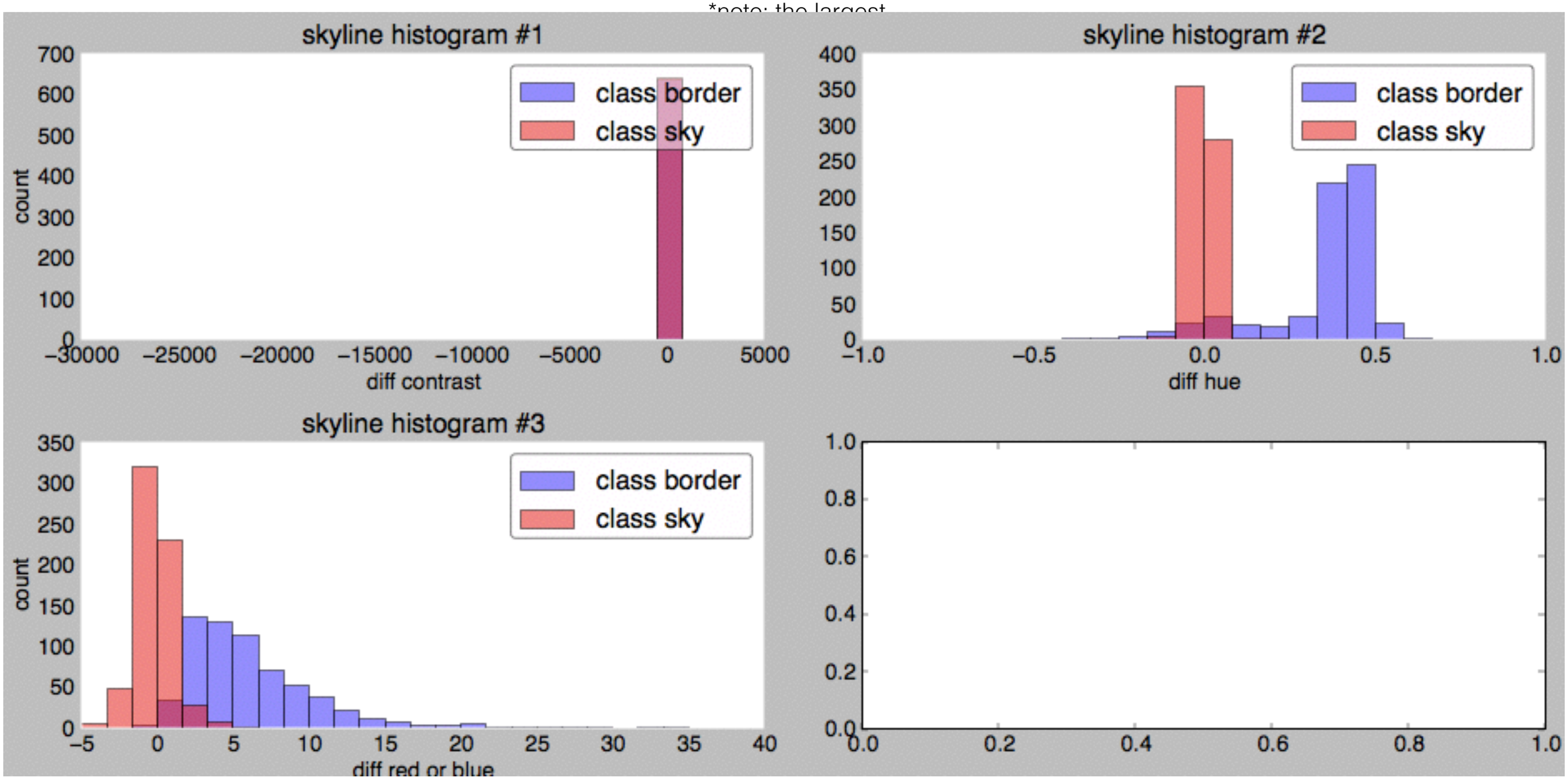



```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.5255  0.1549  0.6003]

Mean Vector class 2: [-0.5352 -0.1578 -0.6113]

('within-class Scatter Matrix:\n',
array([[ 549.8782, -113.949 ,  444.6411],
       [-113.949 ,  746.2949, -103.0094],
       [ 444.6411, -103.0094,  484.2682]]))
('between-class Scatter Matrix:\n',
array([[ 645.4086,  190.3452,  737.2838],
       [ 190.3452,   56.1584,  217.4369],
       [ 737.2838,  217.4369,  842.2385]]))

Eigenvector 1:
[[-0.0858]
 [ 0.2585]
 [ 0.9622]]
Eigenvalue 1: 2.00e+00

Eigenvector 2:
[[ 0.7624]
 [-0.1281]
 [-0.6343]]
Eigenvalue 2: 1.70e-15

Eigenvector 3:
[[-0.5799]
 [-0.5062]
 [ 0.6383]]
Eigenvalue 3: 3.54e-05
ok
Eigenvalues in decreasing order:

2.00244332556
3.54152869335e-05
1.70182369067e-15
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.0858,  0.2585,  0.9622],
       [-0.5799, -0.5062,  0.6383]]))
```

cloudy san jose test image

[cloudy san jose test image]

*note: the largest



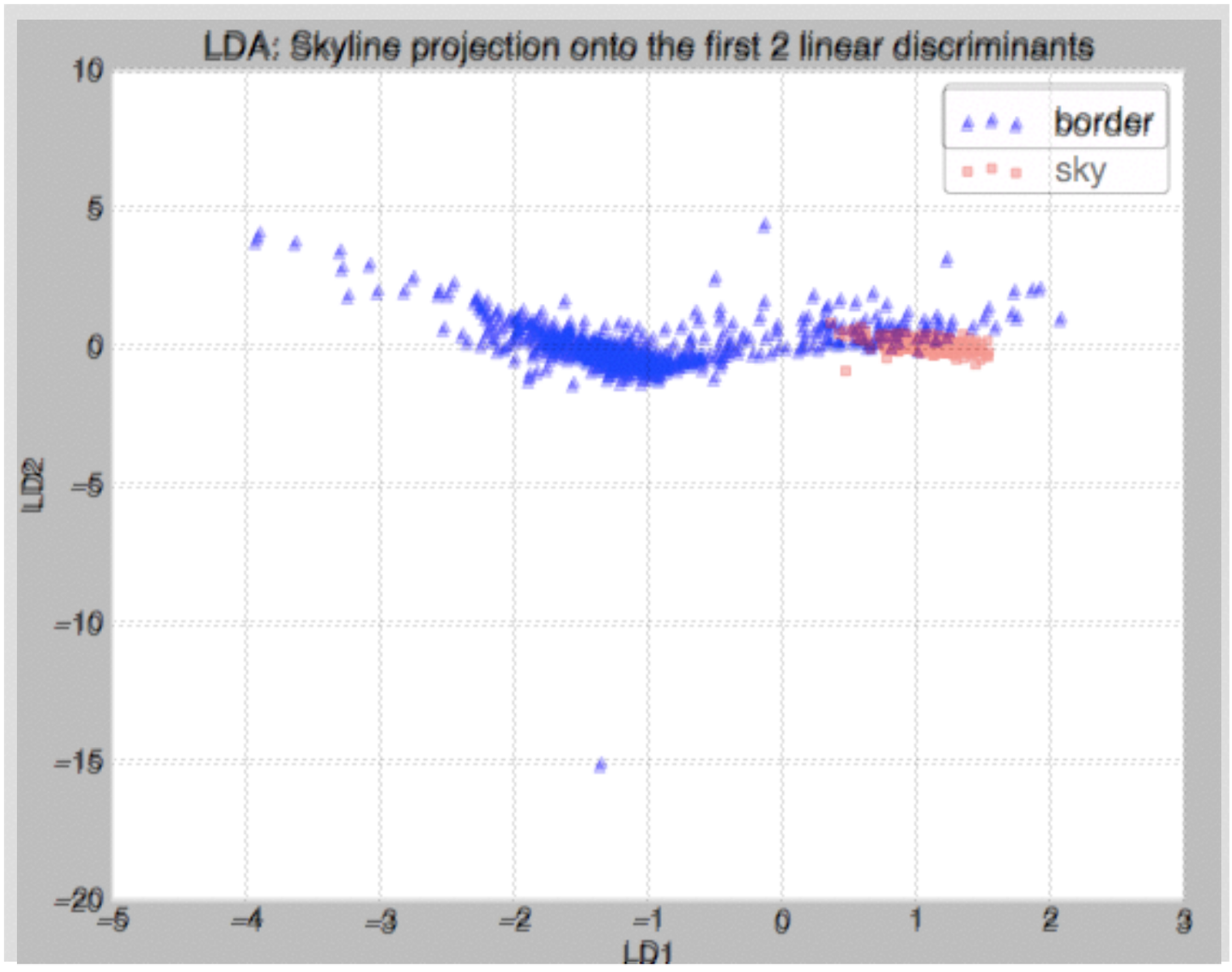
cloudy san jose test image

cloudy san jose test image

cloudy san jose test image

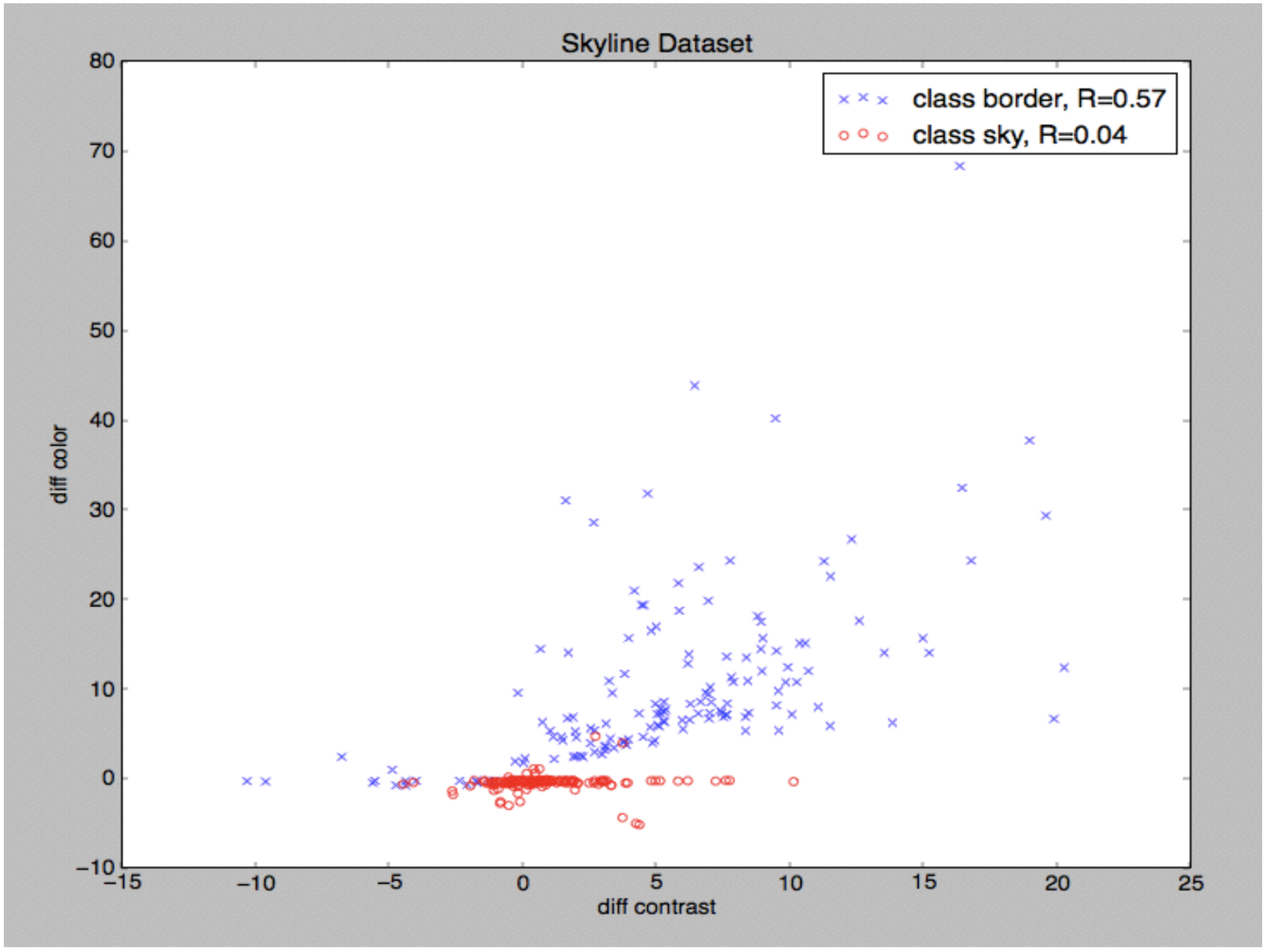
cloudy san jose test image

cloudy san jose test image



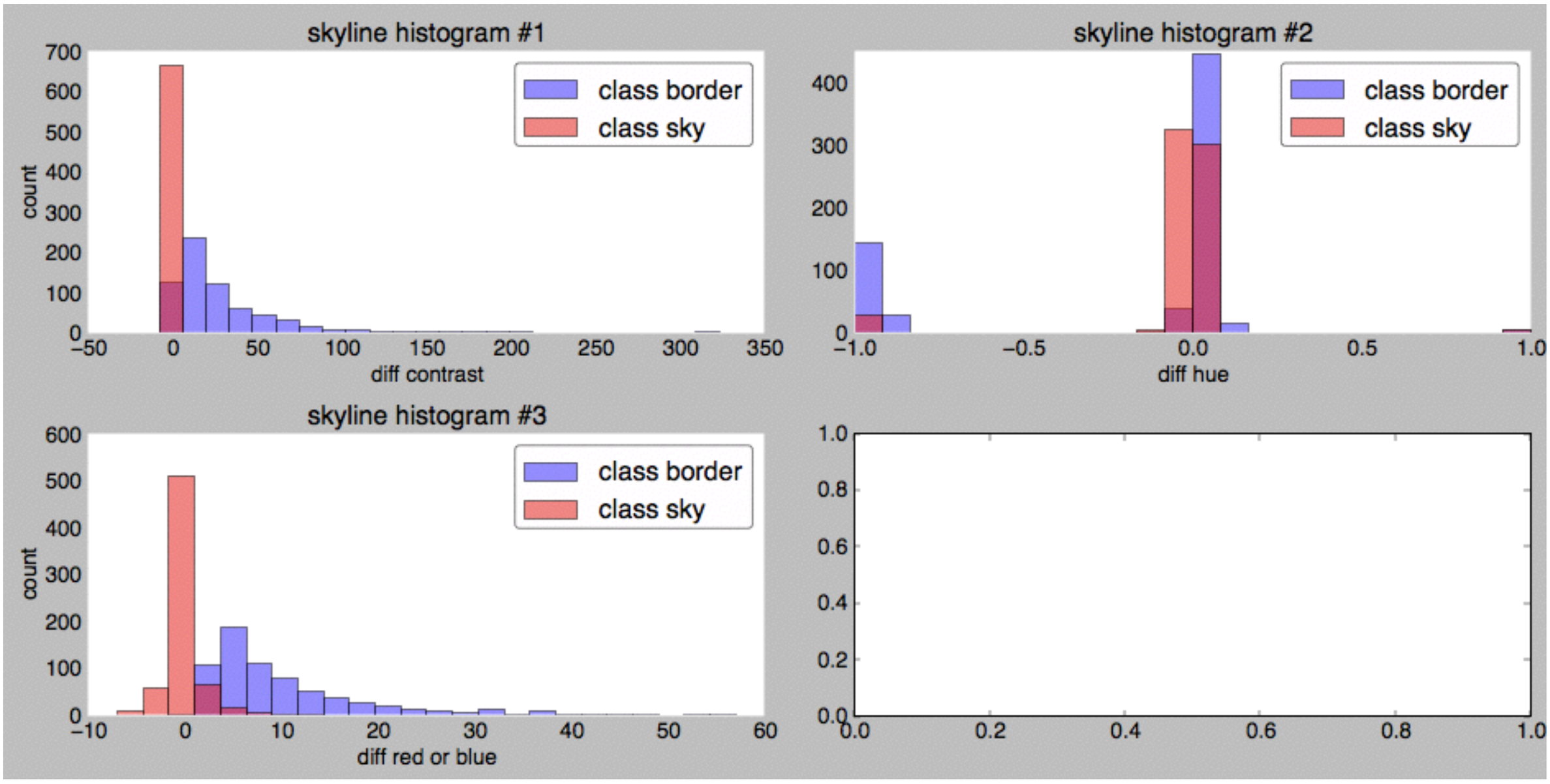

```
                          contrast  hue     BorR
Mean Vector class 1: [-0.0218  0.8184  0.6903]

Mean Vector class 2: [ 0.0218 -0.8184 -0.6903]

('within-class Scatter Matrix:\n', array([[ 1281.39  ,
       [    1.9572,   423.3152,    88.2208],
       [   -1.5929,    88.2208,   671.1791]]))
('between-class Scatter Matrix:\n', array([[  1.8299e+00,
       [ -6.8659e+01,   2.5761e+03,   2.1727e+03],
       [ -5.7907e+01,   2.1727e+03,   1.8325e+03]]))

Eigenvector 1:
[[ 0.0097]
 [-0.9117]
 [-0.4106]]
Eigenvalue 1: 7.68e+00

Eigenvector 2:
[[-0.9952]
 [ 0.0459]
 [-0.0859]]
Eigenvalue 2: -9.73e-18

Eigenvector 3:
[[ 0.4335]
 [-0.5742]
 [ 0.6945]]
Eigenvalue 3: -3.76e-16
ok
Eigenvalues in decreasing order:

7.67840538363
3.76177431343e-16
9.72887856366e-18
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[ 0.0097, -0.9117, -0.4106],
       [ 0.4335, -0.5742,  0.6945]]))
```

stonehenge test image

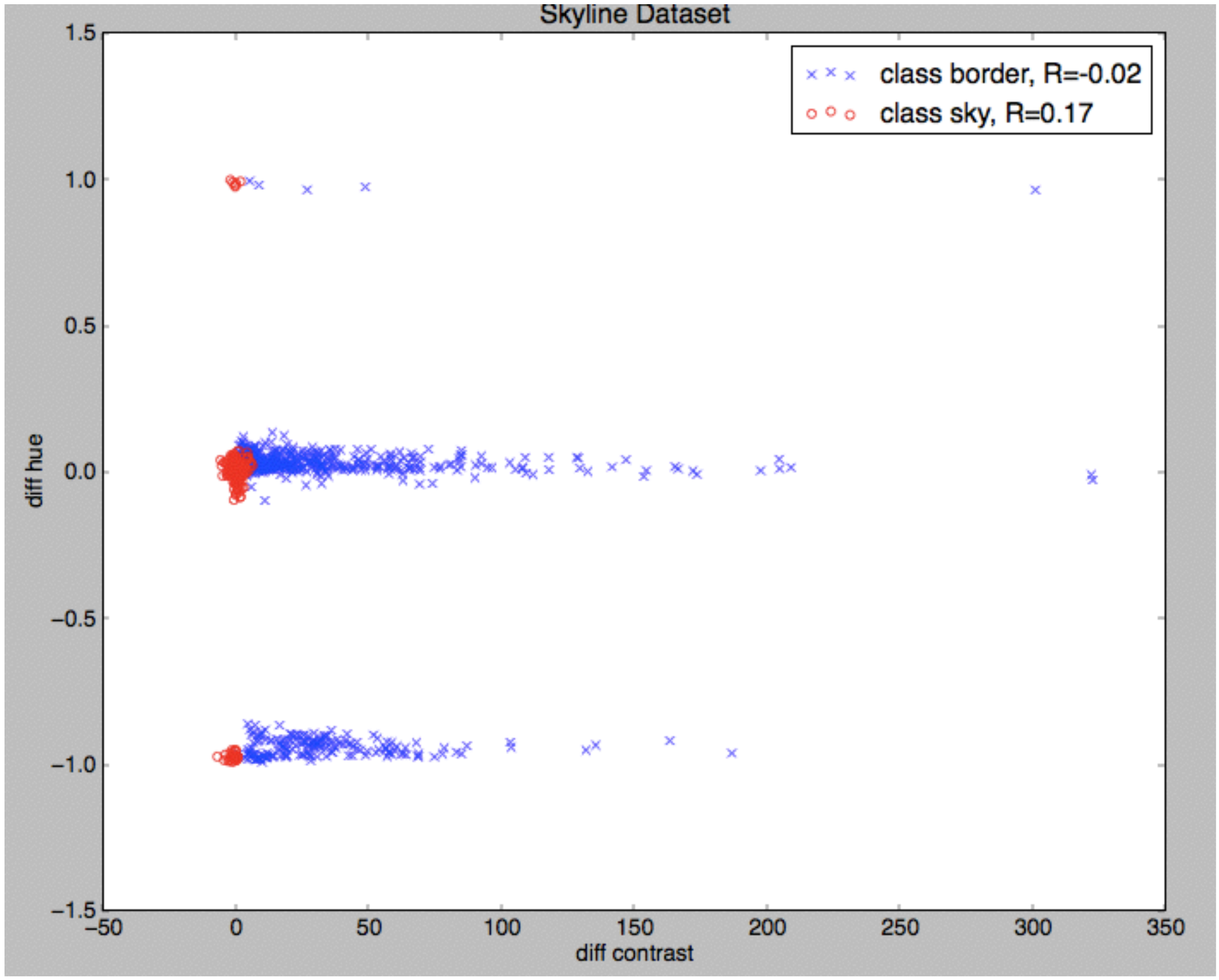


stonehenge test image

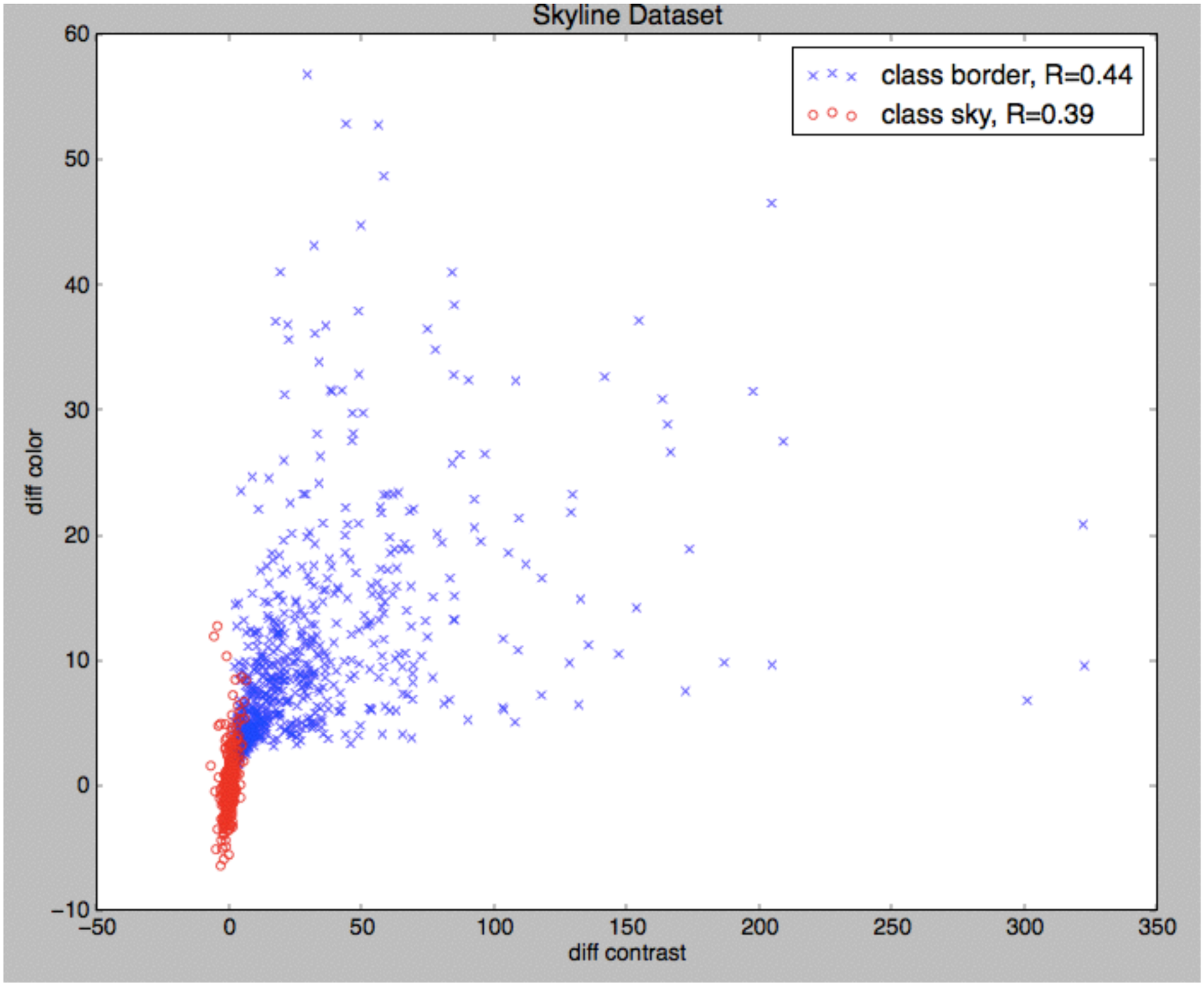
*note: the largest
contrasts
were removed
from analysis
for plot visibility



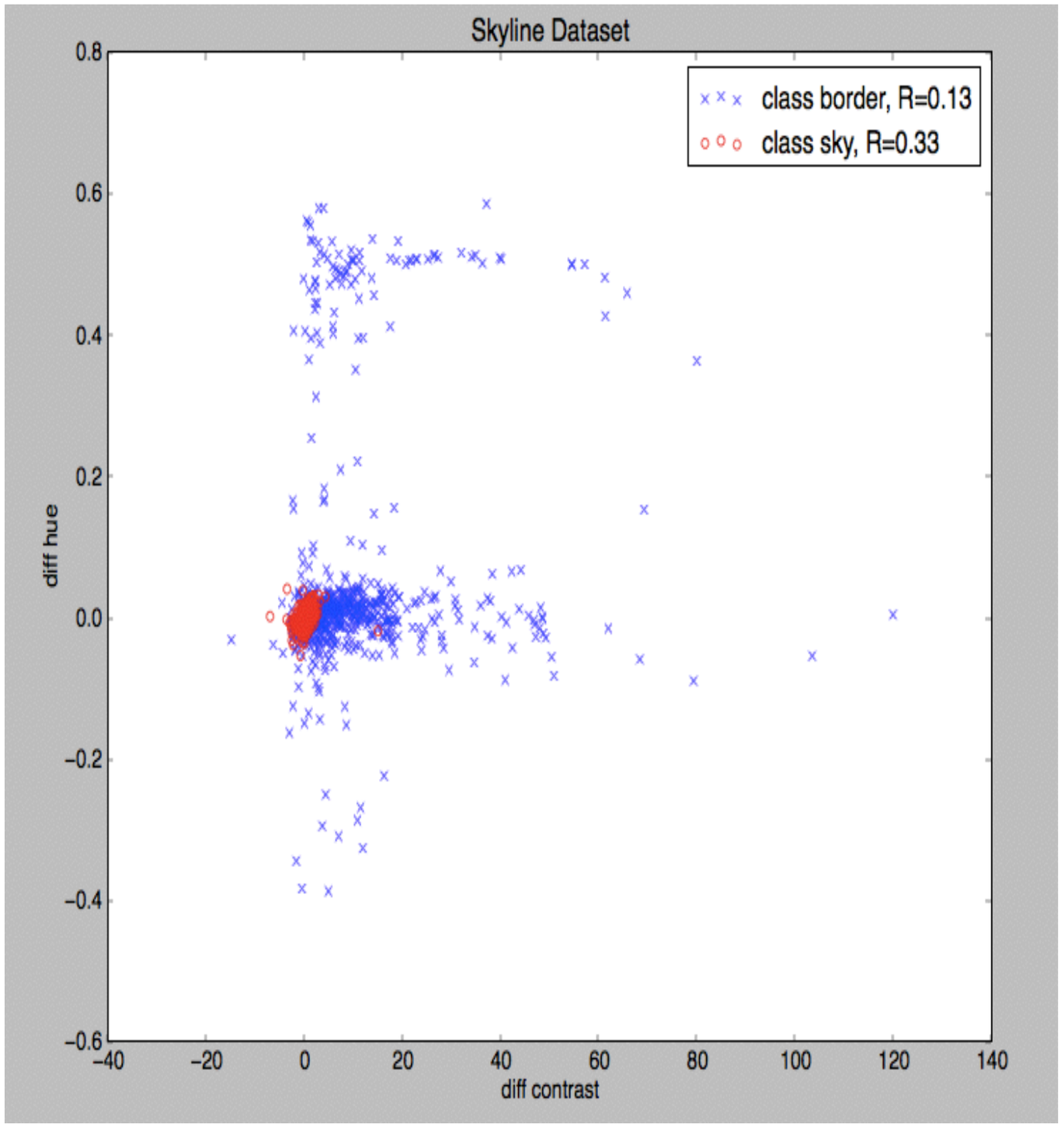
[stonehenge test image]



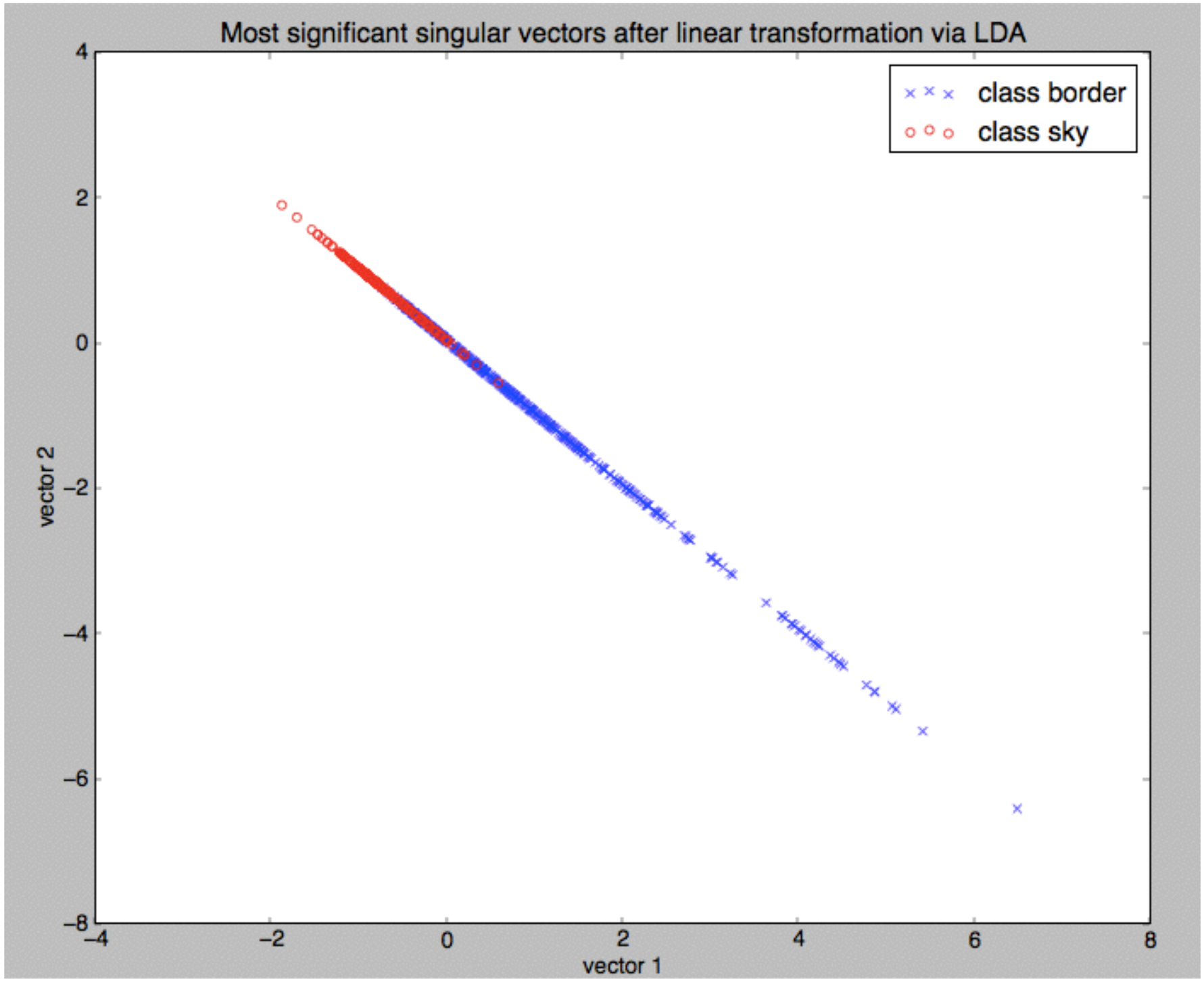
[stonehenge test image]



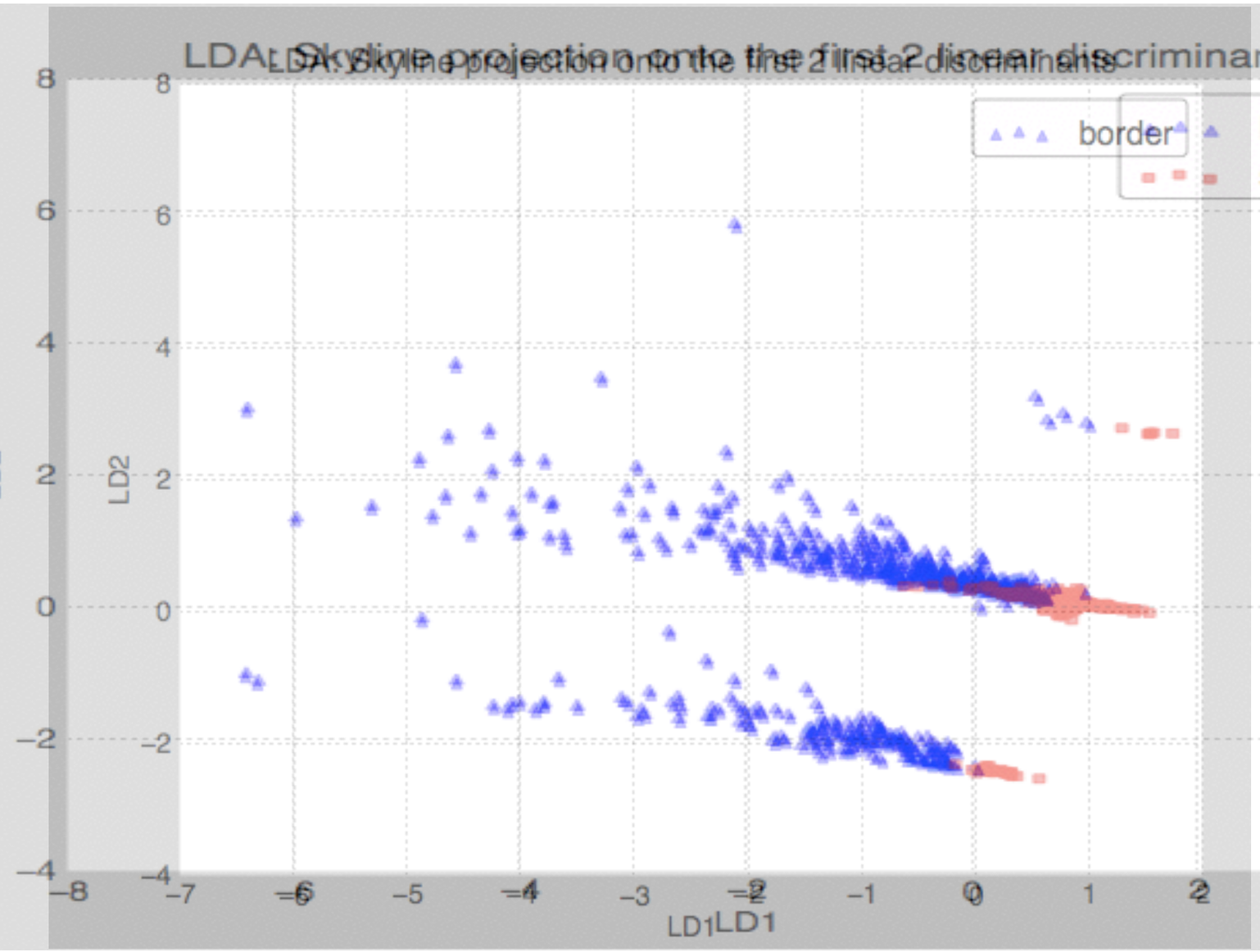
stonehenge test image



[stonehenge test image]

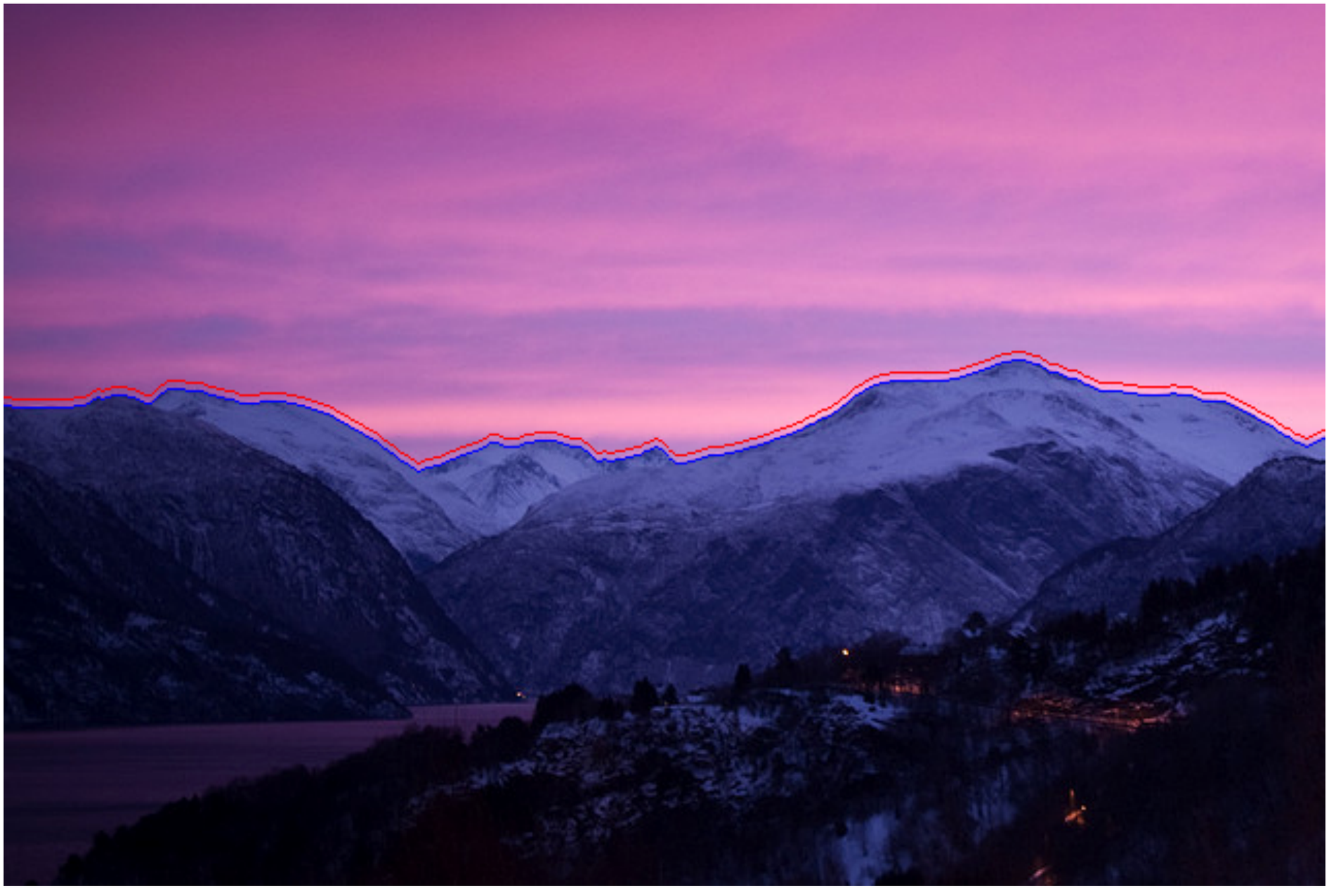


[cloudy san jose test image]



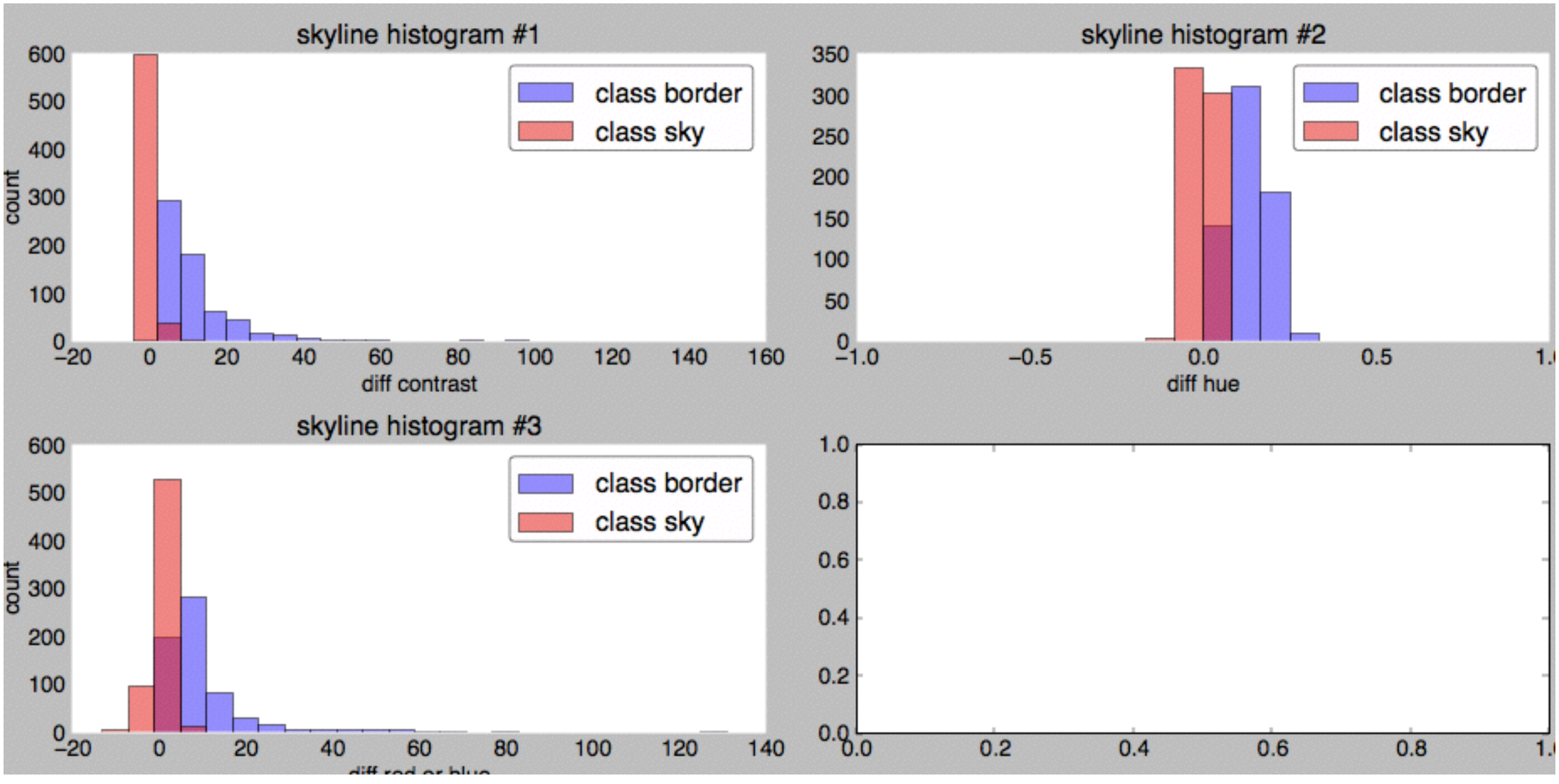

```
                          contrast  hue     BorR
Mean Vector class 1: [ 0.4857 -0.2494  0.6323]

Mean Vector class 2: [-0.4952  0.2543 -0.6446]

('within-class Scatter Matrix:\n',
array([[ 1021.4766,   -21.9237,   388.2432],
       [  -21.9237,  1259.7083,   -32.2011],
       [  388.2432,   -32.2011,   796.8329]]))
('between-class Scatter Matrix:\n',
array([[  970.6595,  -498.2525,  1263.4595],
       [ -498.2525,   255.9645,  -648.5915],
       [ 1263.4595,  -648.5915,  1644.5908]]))

Eigenvector 1:
[[-0.288 ]
 [ 0.24  ]
 [-0.9271]]
Eigenvalue 1: 2.38e+00

Eigenvector 2:
[[ 0.7619]
 [-0.1266]
 [-0.6352]]
Eigenvalue 2: 4.64e-16

Eigenvector 3:
[[ 0.3213]
 [ 0.9389]
 [ 0.1234]]
Eigenvalue 3: 1.38e-04
ok
Eigenvalues in decreasing order:

2.38176496287
0.000138253355036
4.63763505546e-16
Variance explained:

eigenvalue 1: 99.99%
eigenvalue 2: 0.01%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.288 ,  0.24  , -0.9271],
       [ 0.3213,  0.9389,  0.1234]]))
```

norwegian mtn range test image

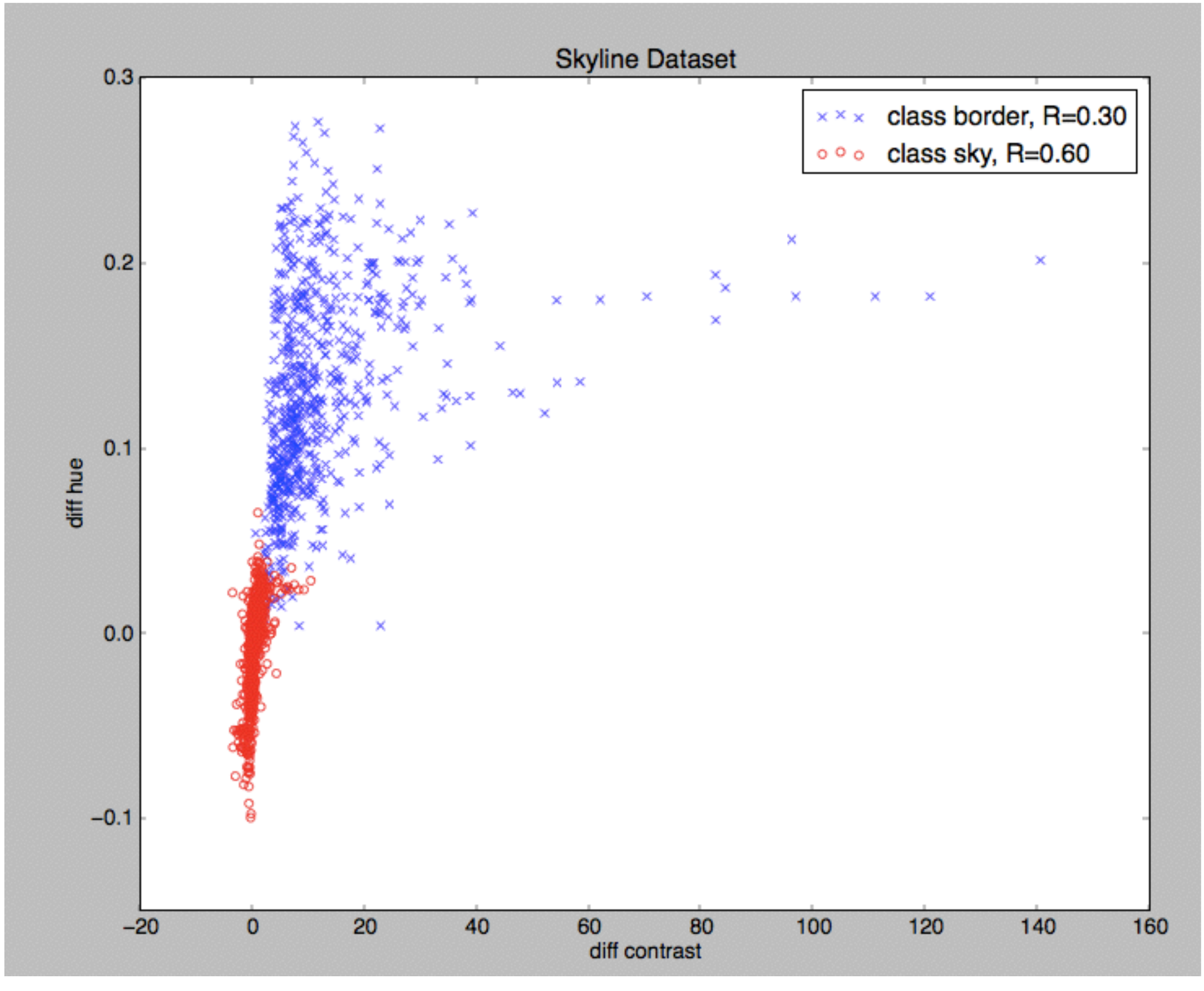


[norwegian mtn range test image]

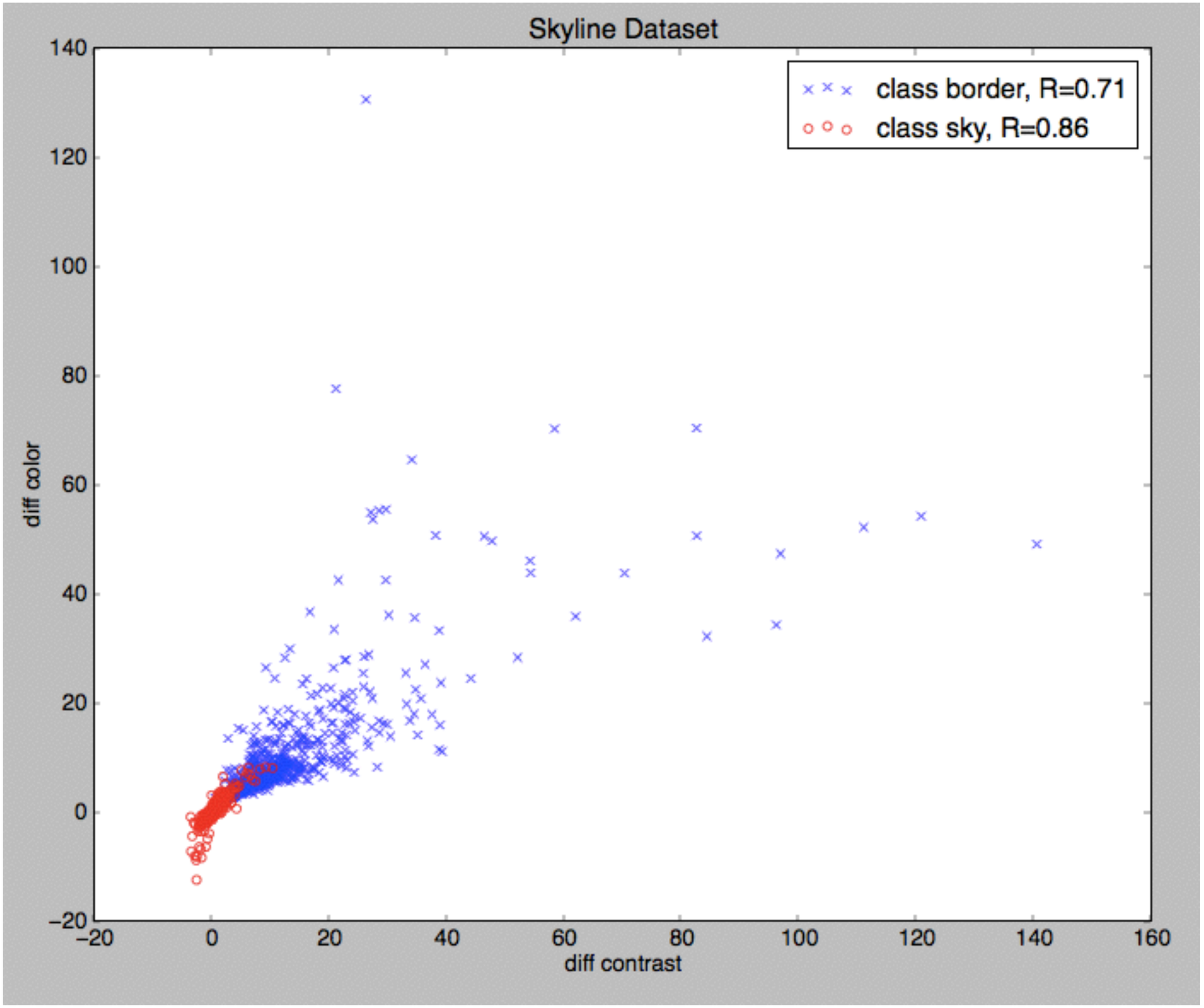
*note: the largest
contrasts
were removed
from analysis
for plot visibility



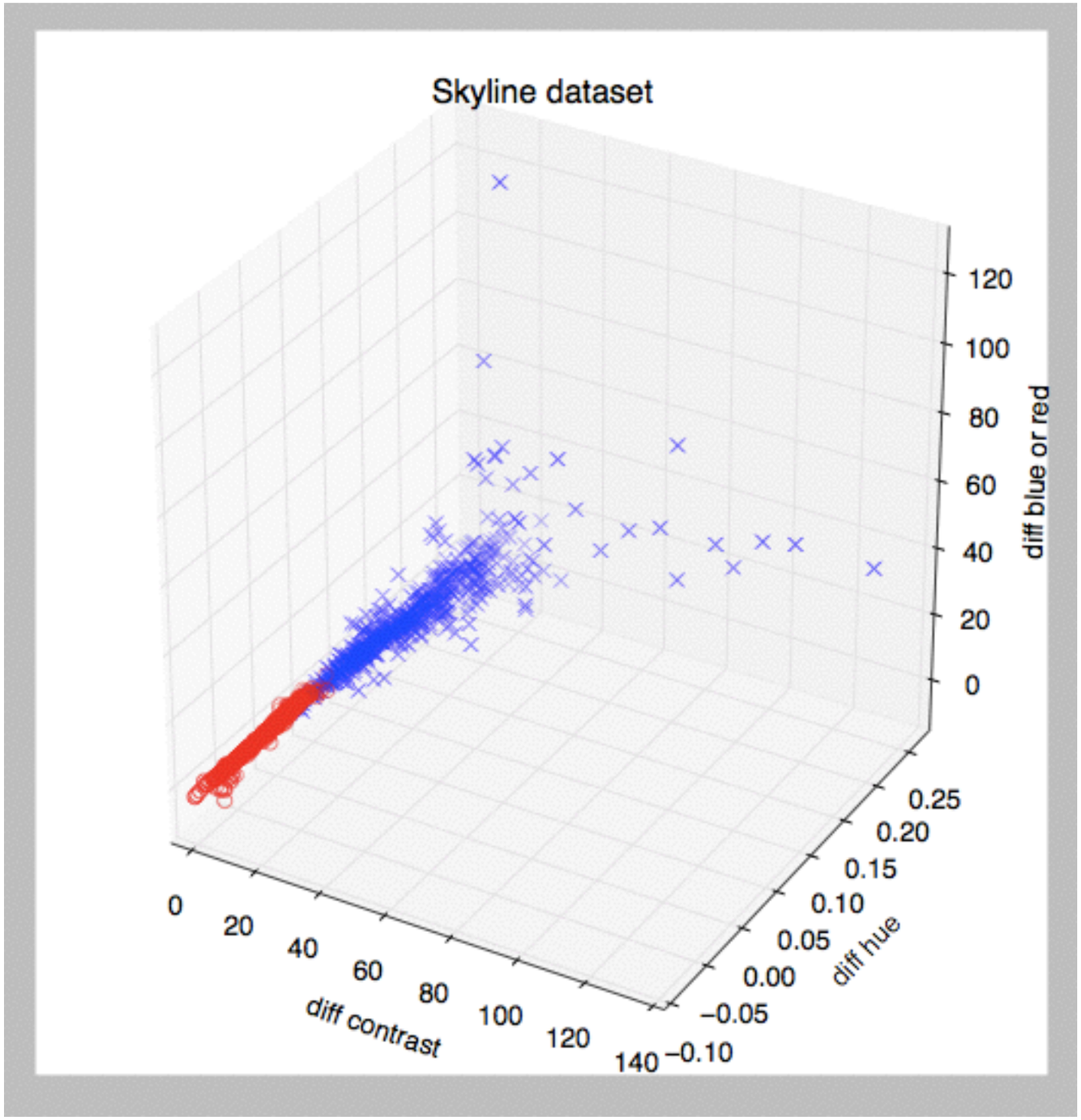
[norwegian mtn range test image]



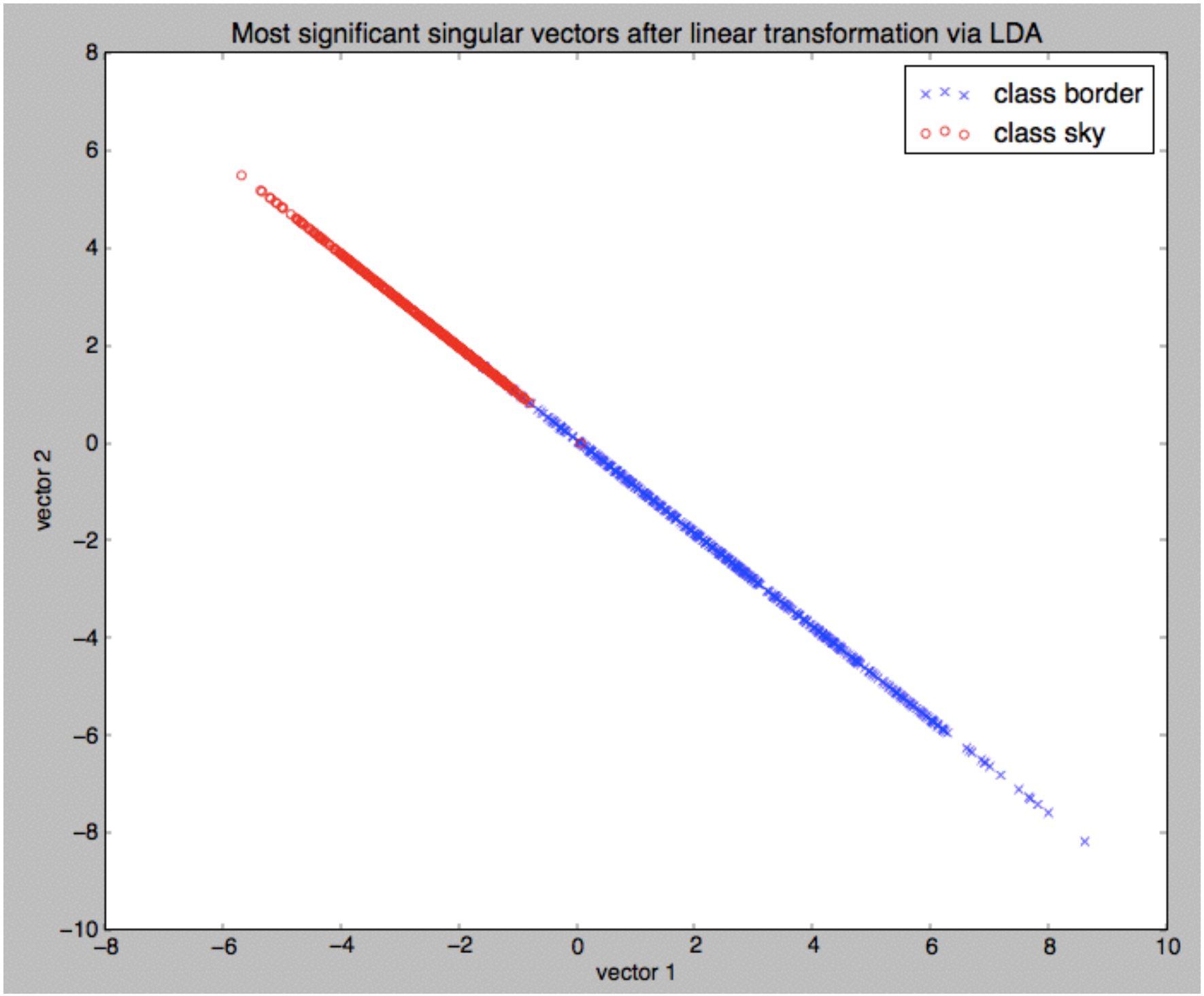
[norwegian mtn range test image]



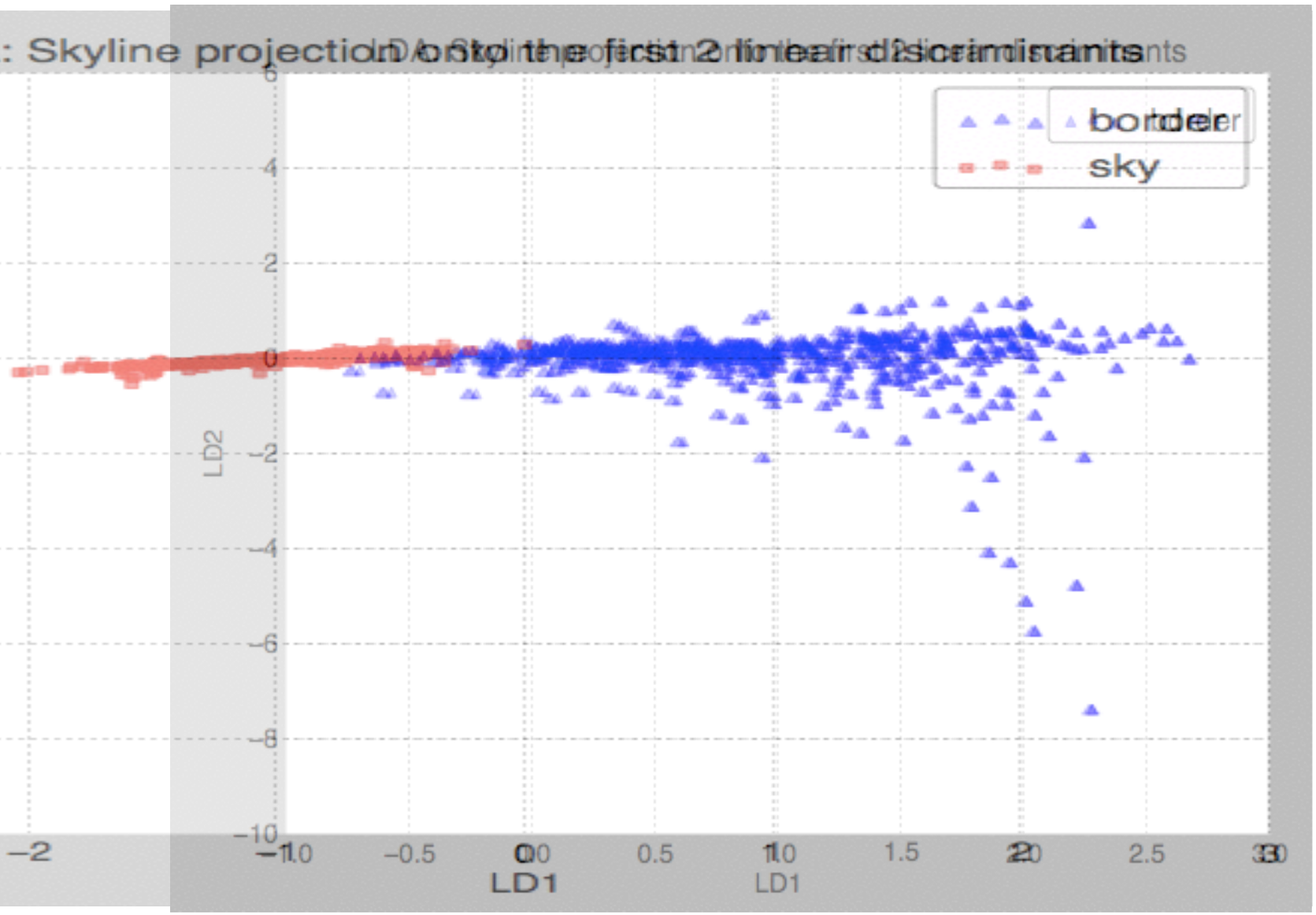
[norwegian mtn range test image]



[norwegian mtn range test image]



[norwegian mtn range test image]

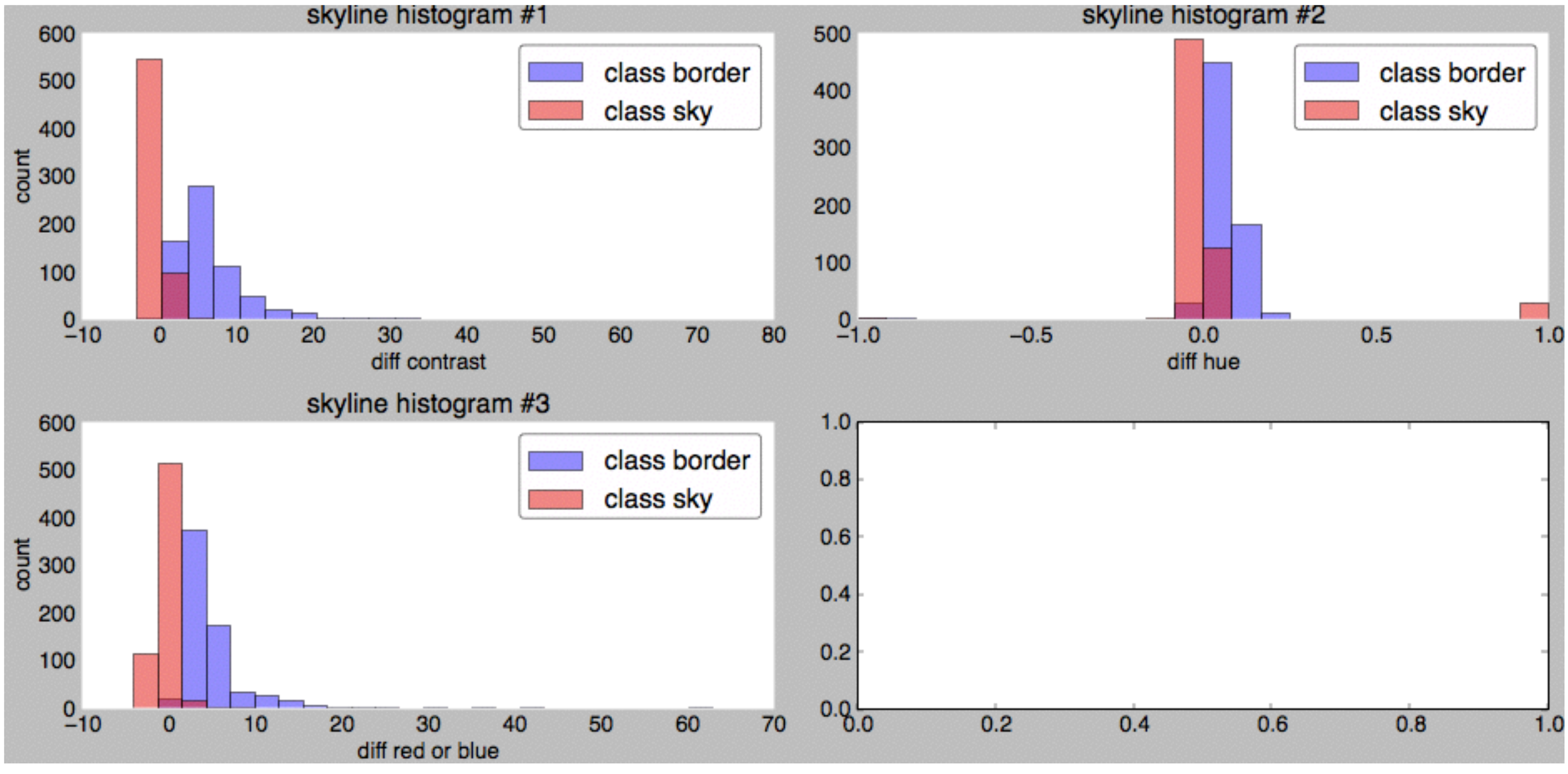



```
                      contrast  hue     BorR
Mean Vector class 1: [ 0.532   0.8454  0.5258]

Mean Vector class 2: [-0.532  -0.8454 -0.5258]

('within-class Scatter Matrix:\n',
array([[ 917.7271,  171.4775,  652.0411],
       [ 171.4775,  365.1207,  153.523 ],
       [ 652.0411,  153.523 ,  926.0844]]))
('between-class Scatter Matrix:\n',
array([[ 1086.8187,  1727.1143,  1074.2097],
       [ 1727.1143,  2744.6379,  1707.0766],
       [ 1074.2097,  1707.0766,  1061.7469]]))

Eigenvector 1:
[[ 0.0203]
 [ 0.997 ]
 [ 0.0749]]
Eigenvalue 1: 7.65e+00

Eigenvector 2:
[[-0.8529]
 [ 0.2526]
 [ 0.4568]]
Eigenvalue 2: -3.80e-16

Eigenvector 3:
[[ 0.6005]
 [-0.6593]
 [ 0.4525]]
Eigenvalue 3: 2.64e-16
ok
Eigenvalues in decreasing order:

7.64994769908
3.79939460534e-16
2.63875429893e-16
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[ 0.0203,  0.997 ,  0.0749],
       [-0.8529,  0.2526,  0.4568]]))
```

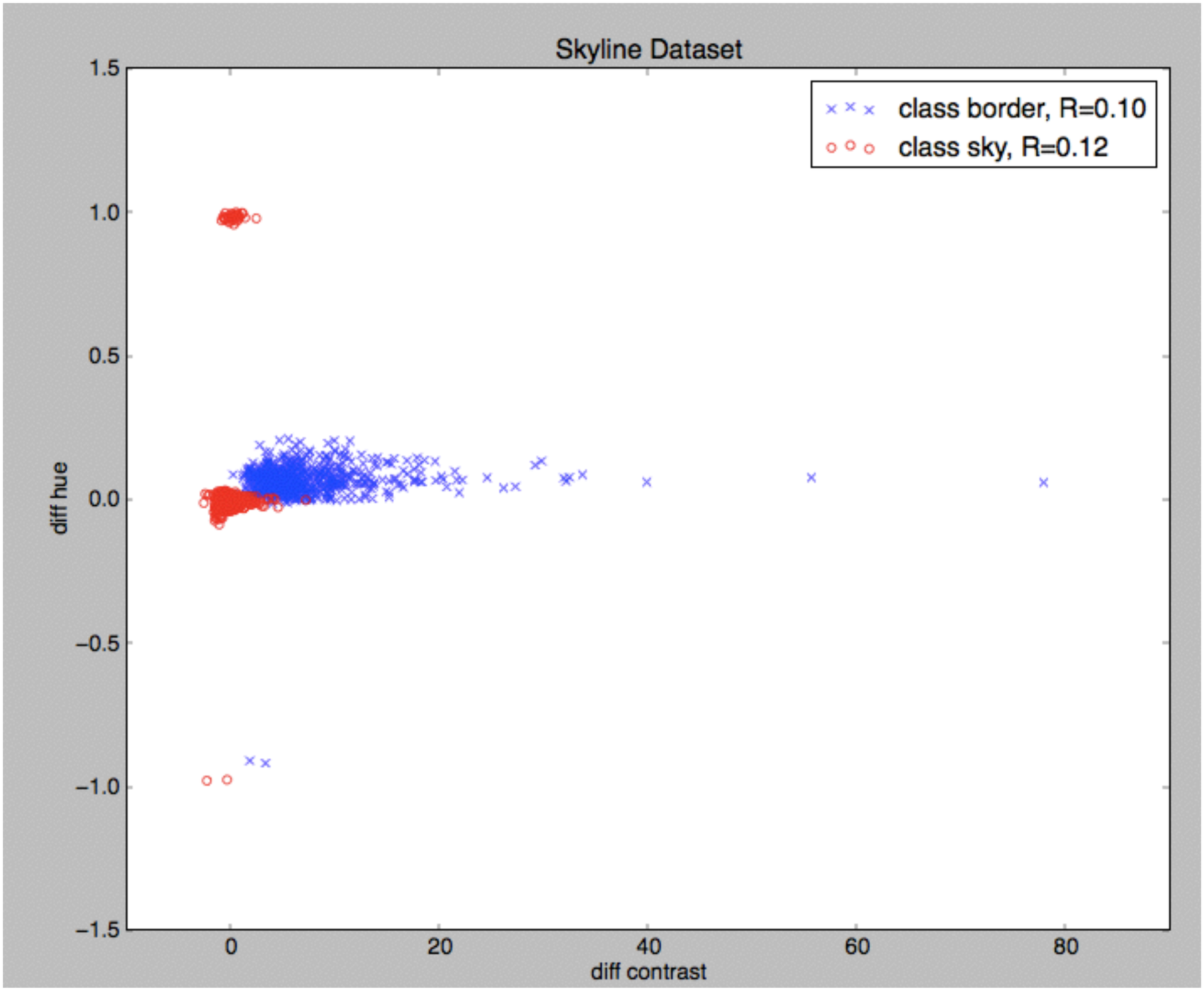
half dome test image

half dome test image

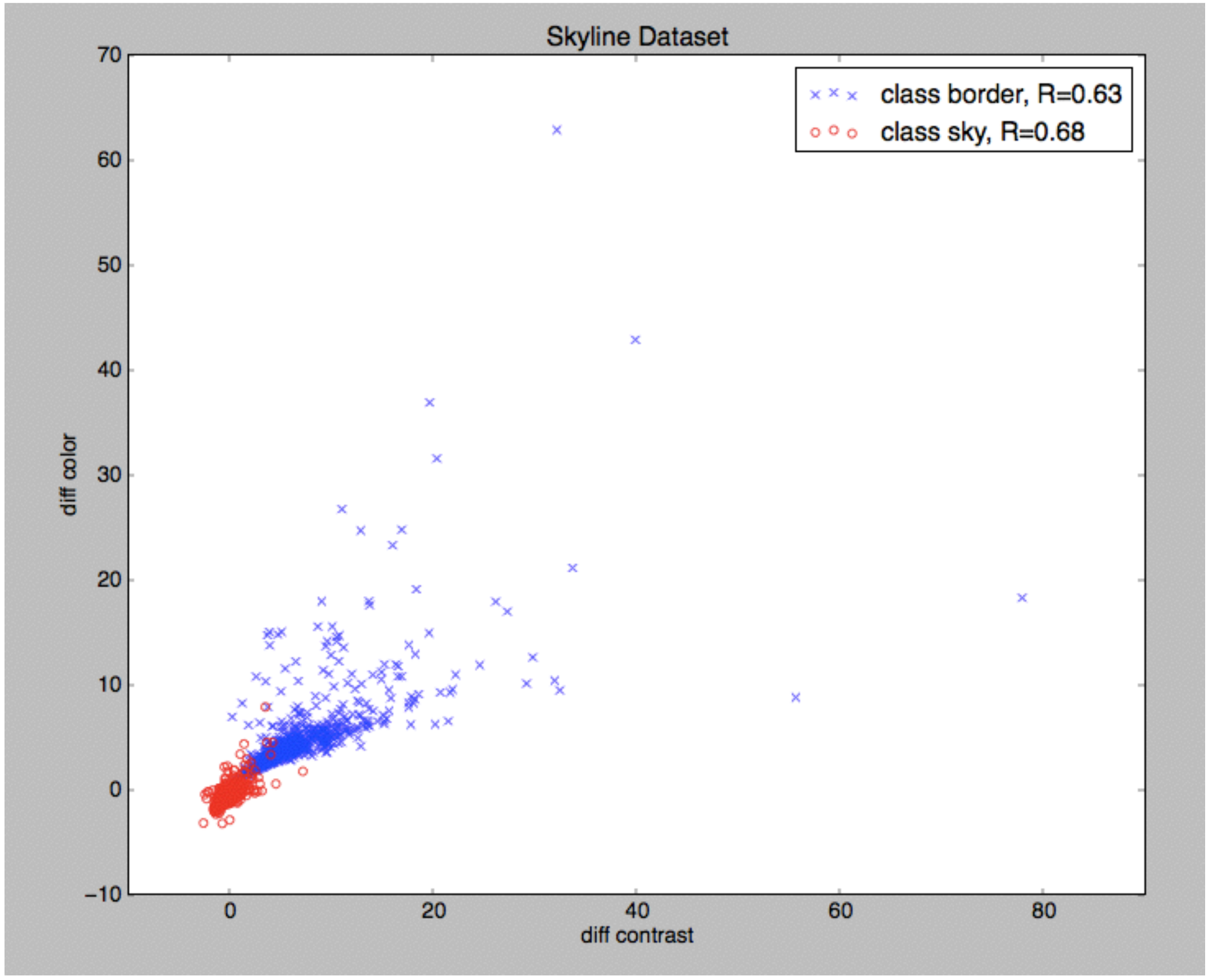
*note: the largest
contrasts
were removed
from analysis
for plot visibility



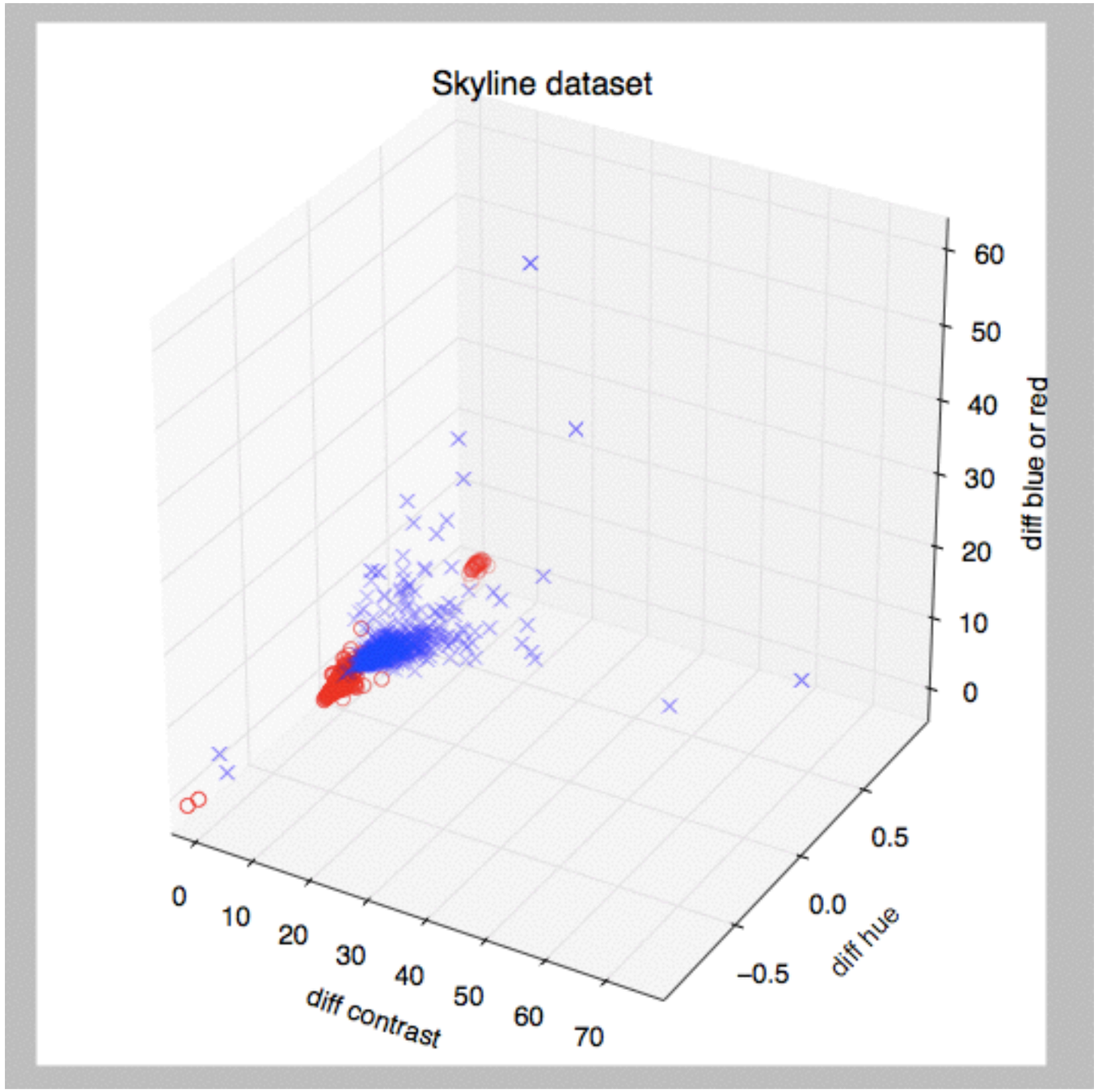
[half dome test image]



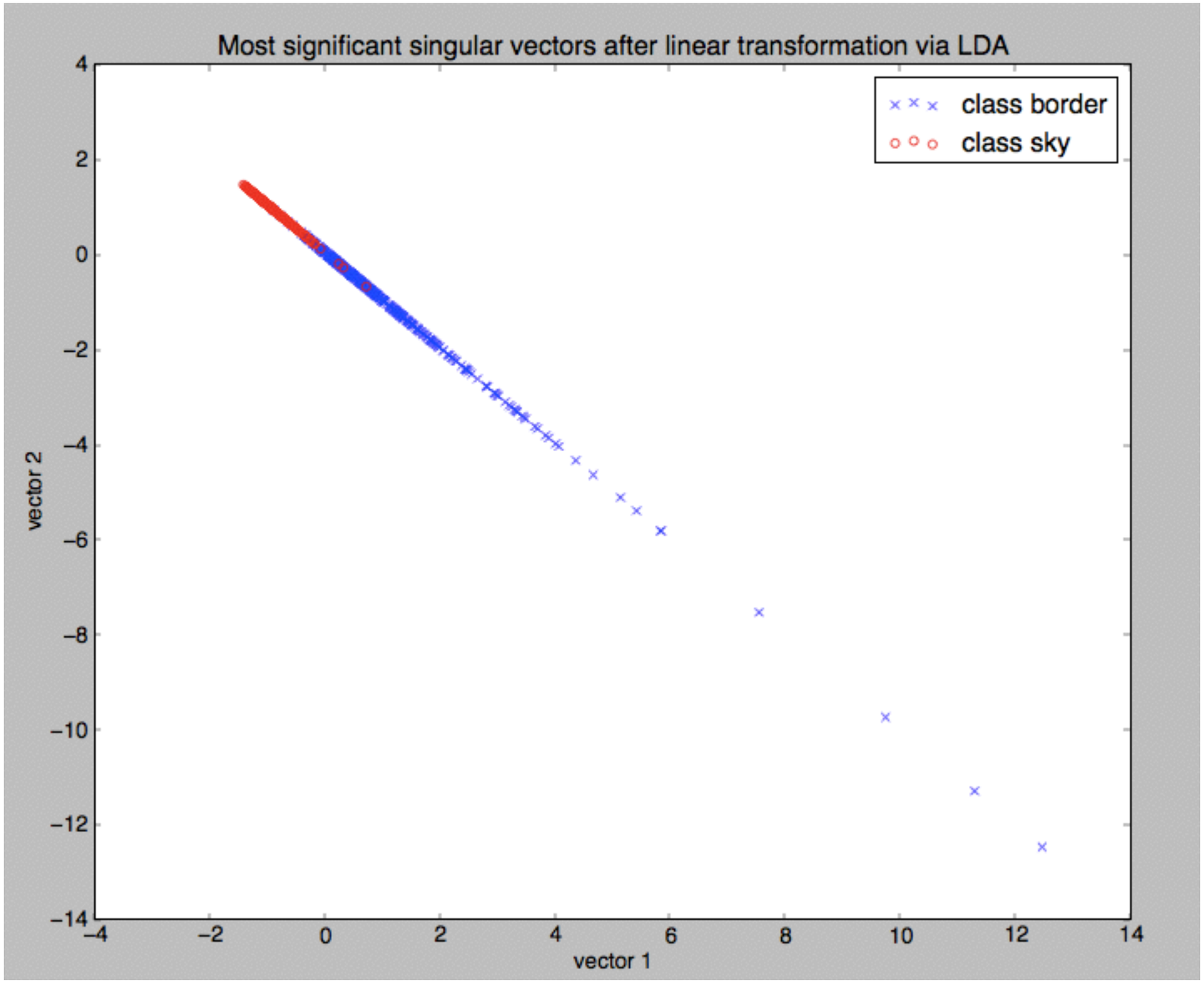
[half dome test image]



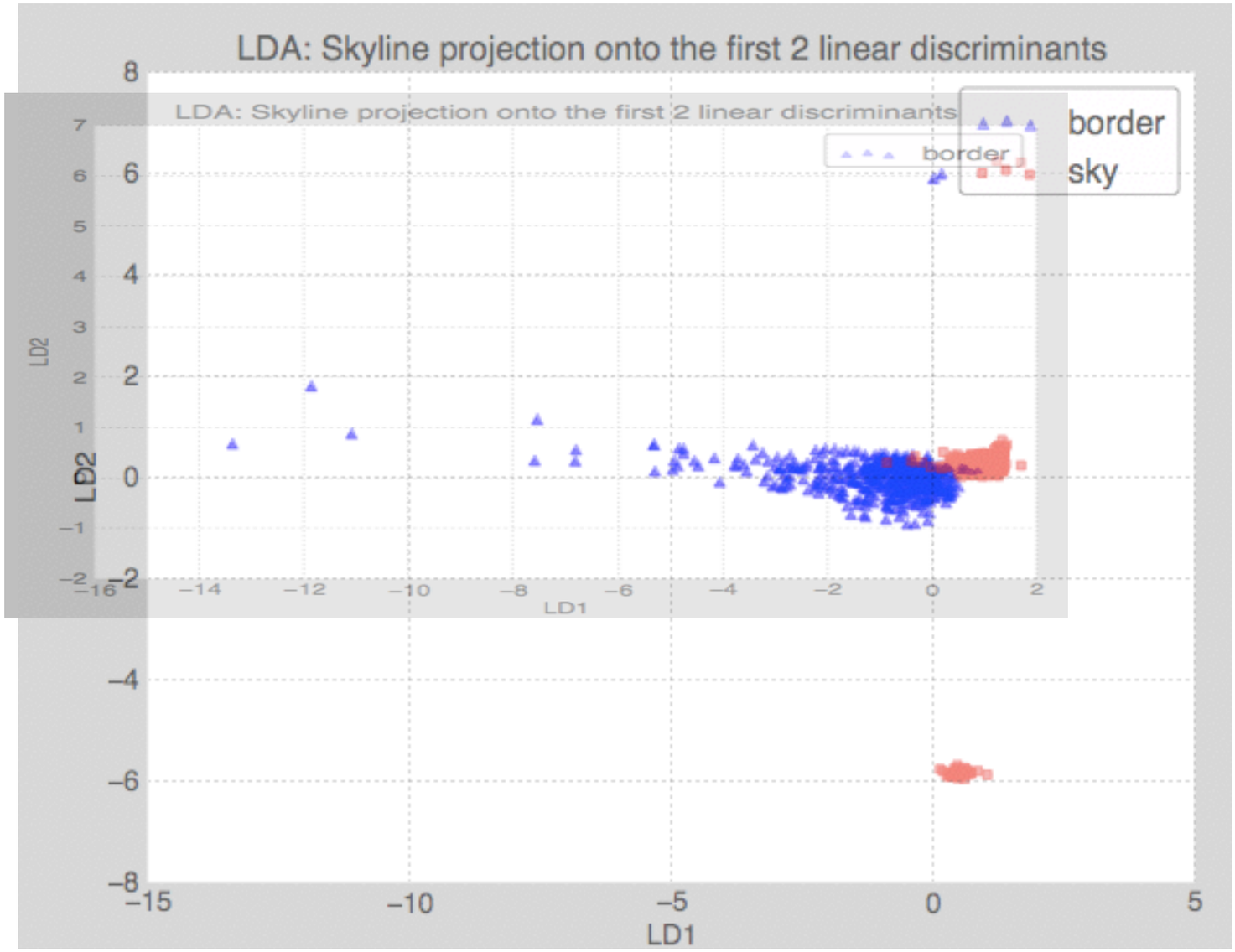
half dome test image



[half dome test image]



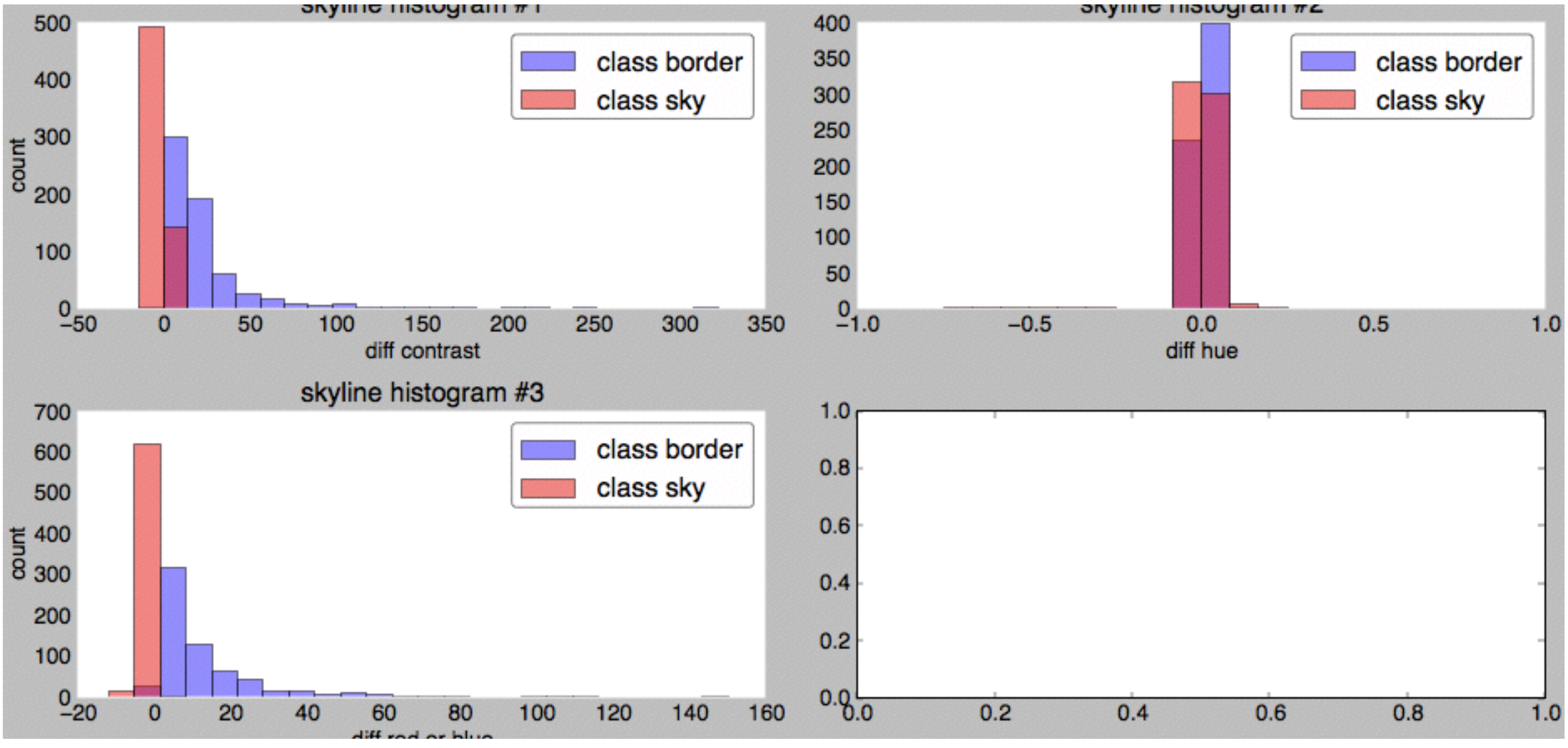
half dome test image




```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.6417  0.0902  0.642 ]

Mean Vector class 2: [-0.6496 -0.0913 -0.6499]

('within-class Scatter Matrix:\n',
array([[  761.5521,    44.8379,   477.9533],
       [   44.8379,  1295.2502,     5.0539],
       [  477.9533,     5.0539,   761.1327]]))
('between-class Scatter Matrix:\n',
array([[ 1633.3849,   229.5507,  1634.0138],
       [  229.5507,    32.2908,   229.6391],
       [ 1634.0138,   229.6391,  1634.6431]]))

Eigenvector 1:
[[-0.6996]
 [-0.068 ]
 [-0.7113]]
Eigenvalue 1: 2.65e+00

Eigenvector 2:
[[ -7.0727e-01]
 [  3.1674e-04]
 [  7.0695e-01]]
Eigenvalue 2: 3.25e-16

Eigenvector 3:
[[ 0.138 ]
 [-0.9904]
 [ 0.0012]]
Eigenvalue 3: 2.35e-05
ok
Eigenvalues in decreasing order:

2.6497347051
2.34976030589e-05
3.24516324072e-16
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.6996, -0.068 , -0.7113],
       [ 0.138 , -0.9904,  0.0012]]))
```

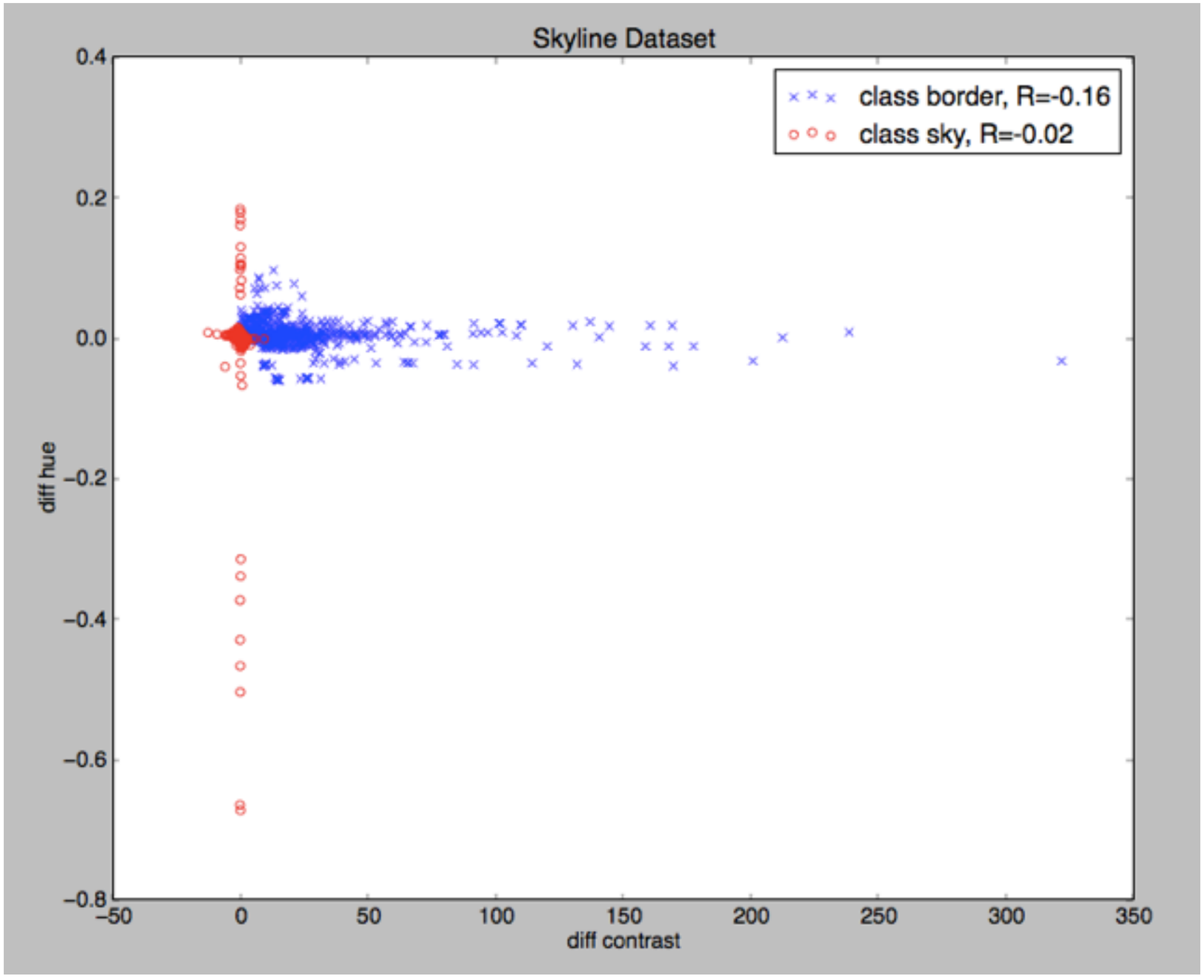
costa rica test image

[costa rica test image]

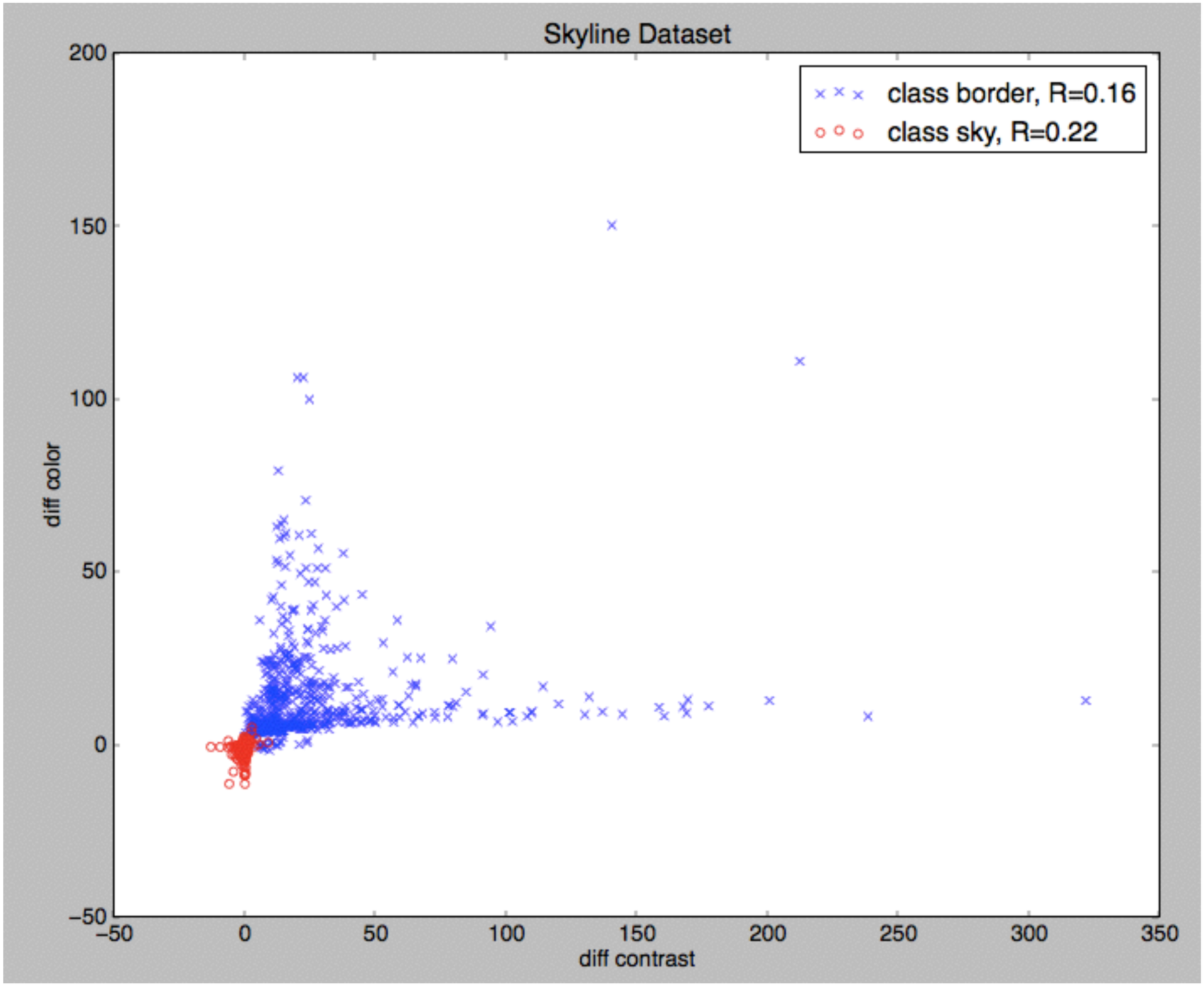


costa rica test image

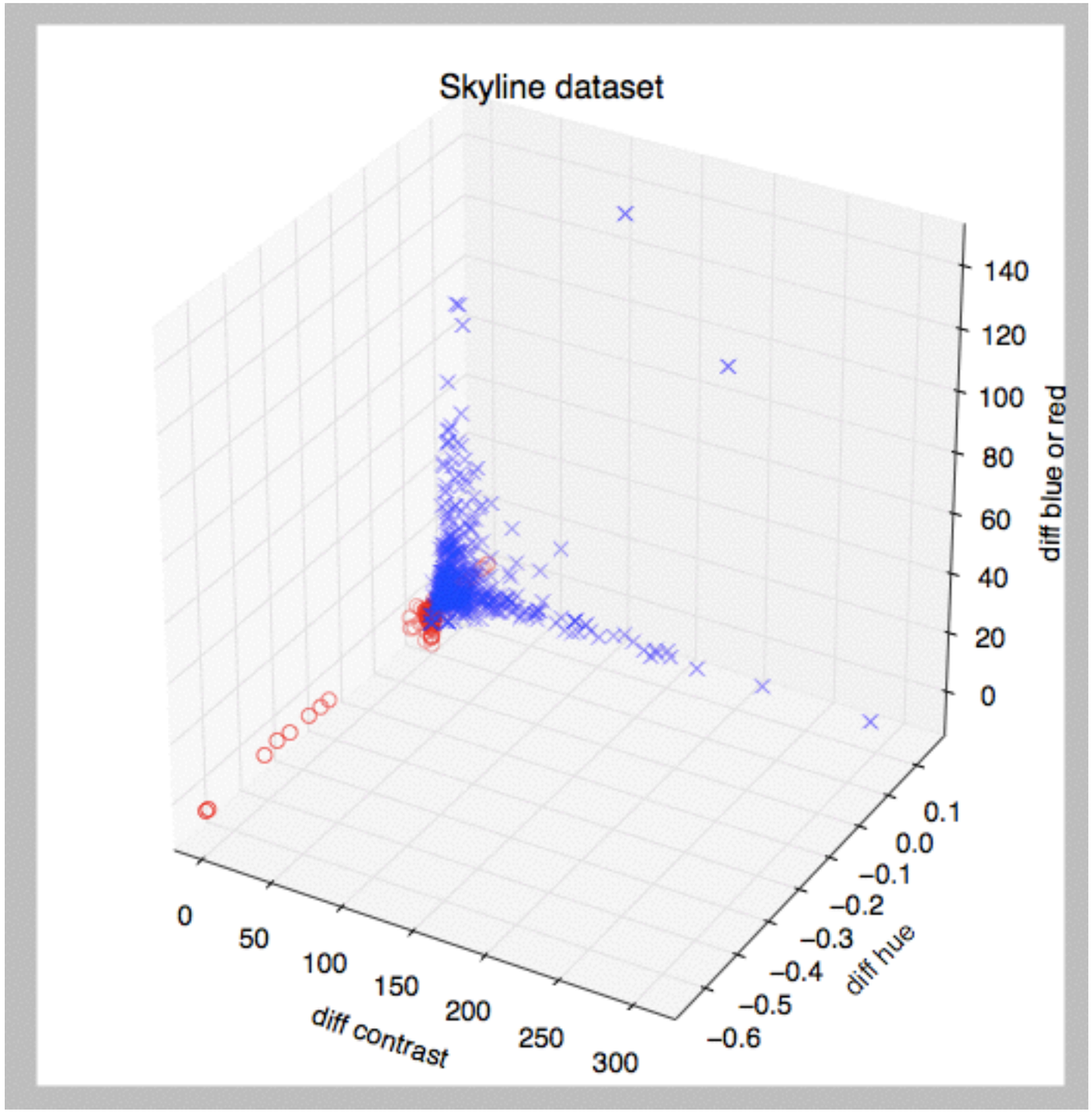
*note: the largest
contrasts
were removed
from analysis
for plot visibility



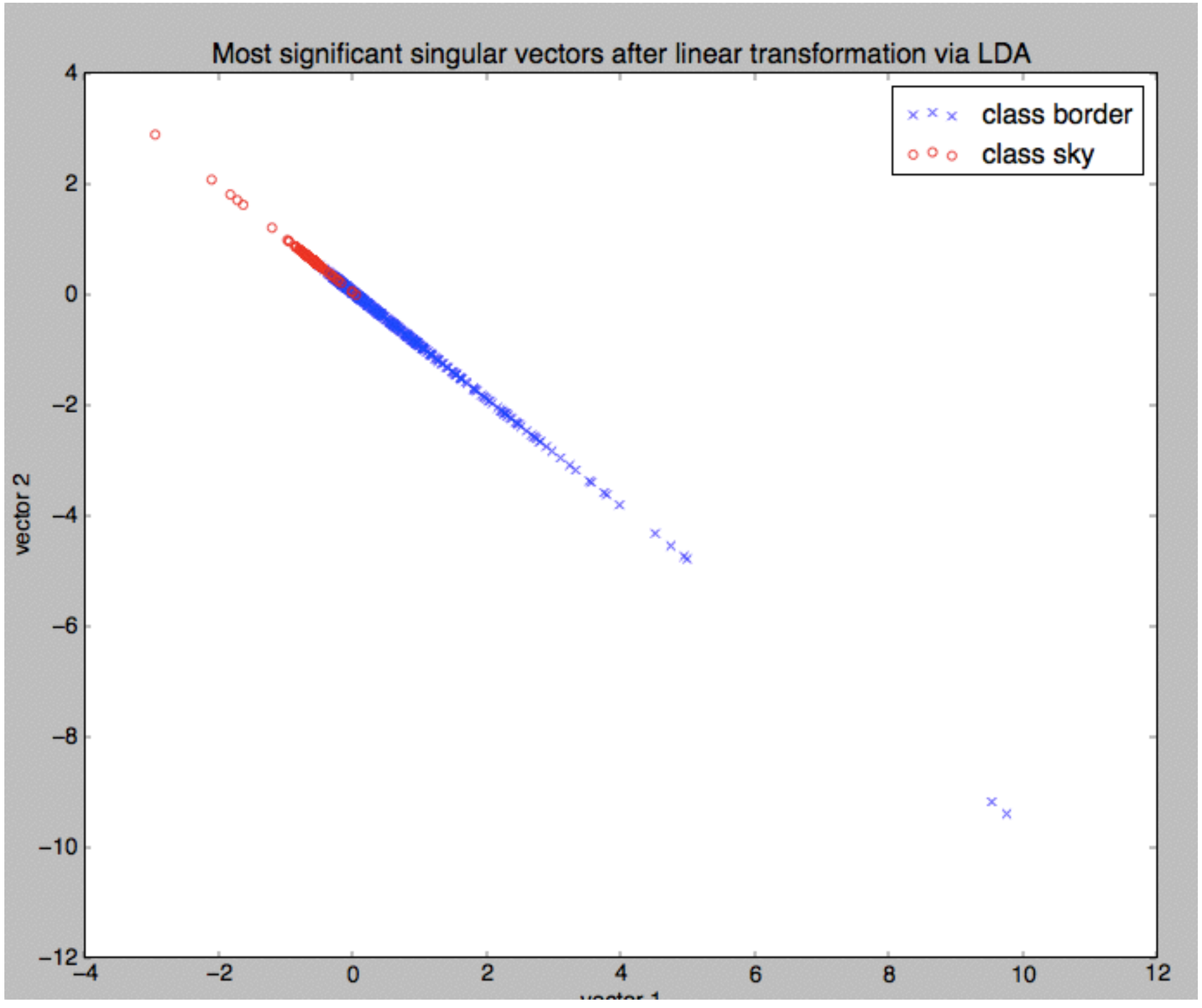
[costa rica test image]



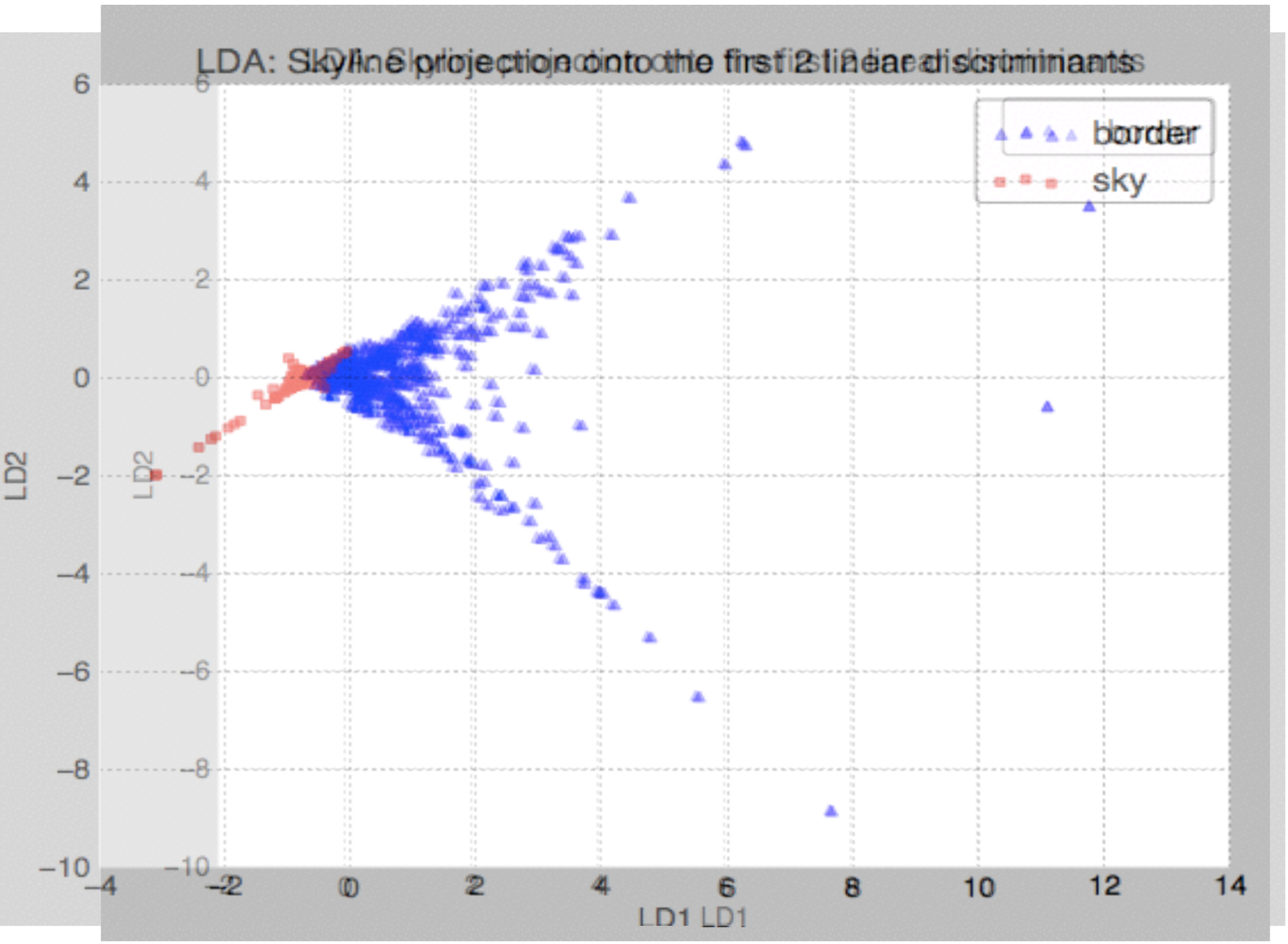
costa rica test image



[costa rica test image]



costa rica test image

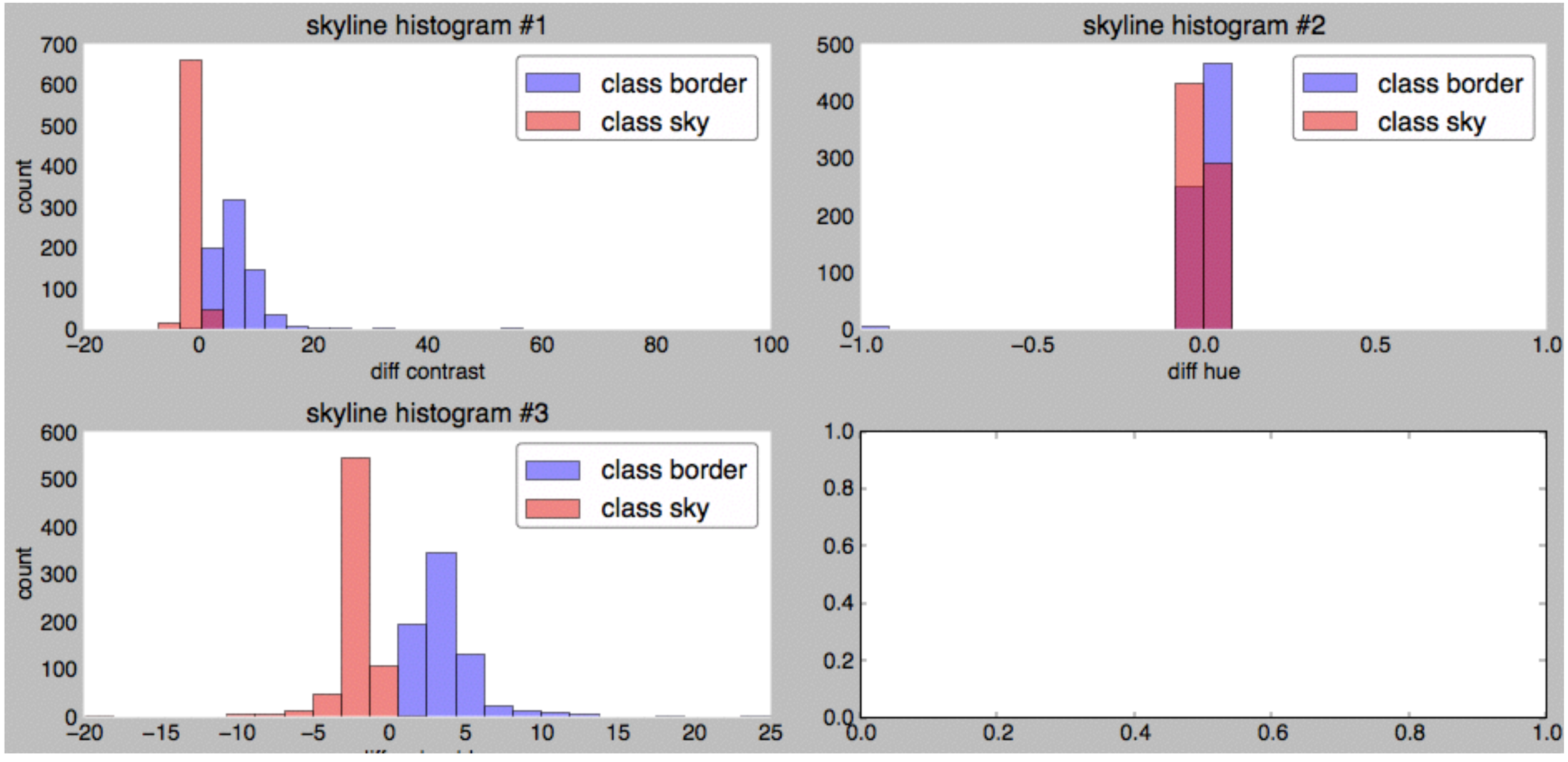



```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.4859  0.0796  0.5429]

Mean Vector class 2: [-0.4859 -0.0796 -0.5429]

('within-class Scatter Matrix:\n',
array([[  973.2139,   -57.7232,   150.8659],
       [  -57.7232,  1265.9211,   -60.9599],
       [  150.8659,   -60.9599,   898.4743]]))
('between-class Scatter Matrix:\n',
array([[  902.3582,   147.8859,  1008.2539],
       [  147.8859,    24.2368,   165.241 ],
       [ 1008.2539,   165.241 ,  1126.577 ]]))

Eigenvector 1:
[[-0.7482]
 [ 0.1301]
 [ 0.6506]]
Eigenvalue 1: -2.22e-16

Eigenvector 2:
[[ 0.6076]
 [ 0.1558]
 [ 0.7788]]
Eigenvalue 2: 1.94e+00

Eigenvector 3:
[[ 0.4266]
 [-0.8679]
 [-0.2545]]
Eigenvalue 3: 0.00e+00
ok
Eigenvalues in decreasing order:

1.93847827798
2.22044604925e-16
0.0
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[ 0.6076,  0.1558,  0.7788],
       [-0.7482,  0.1301,  0.6506]]))
```

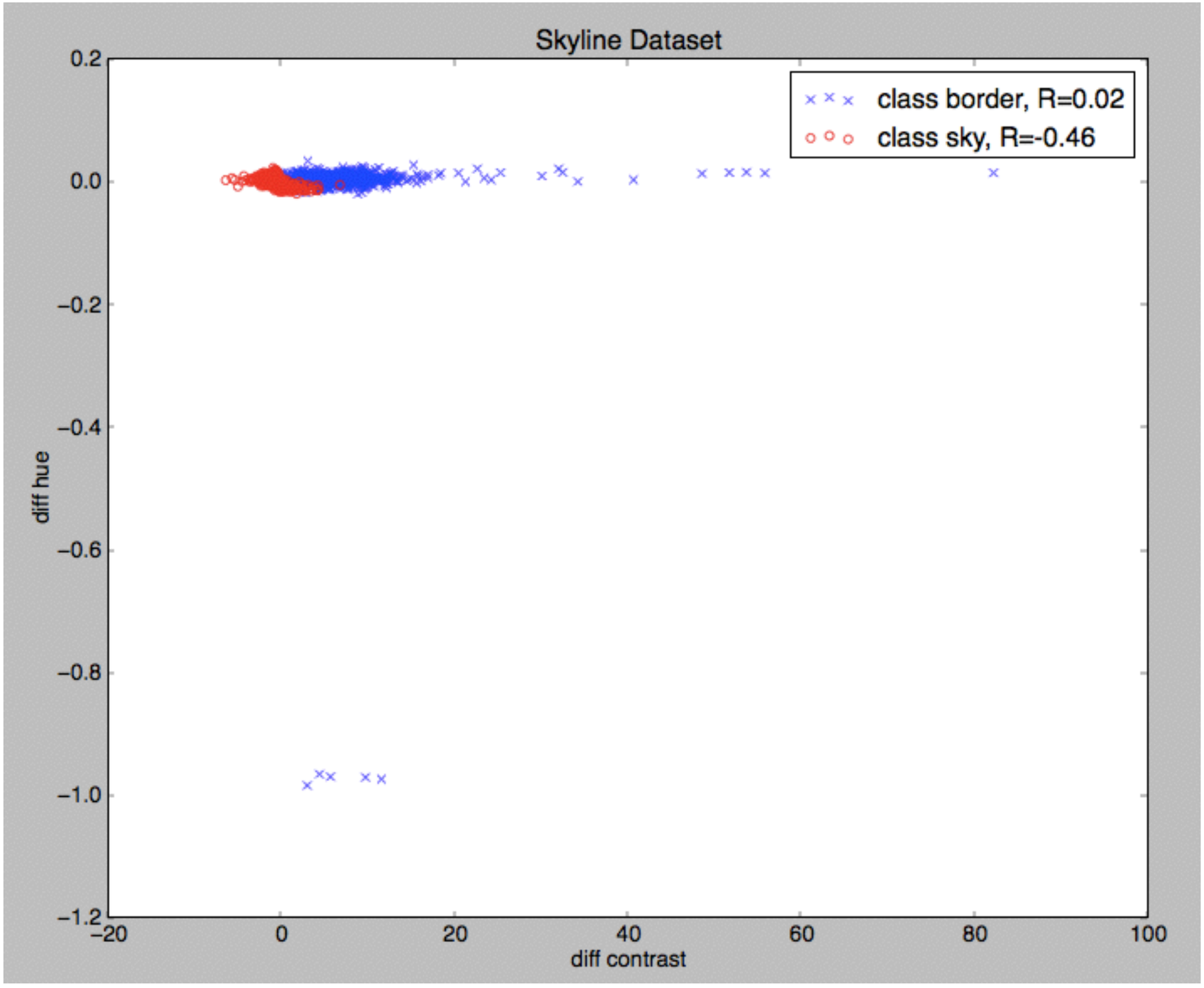
new mexico test image

new mexico test image

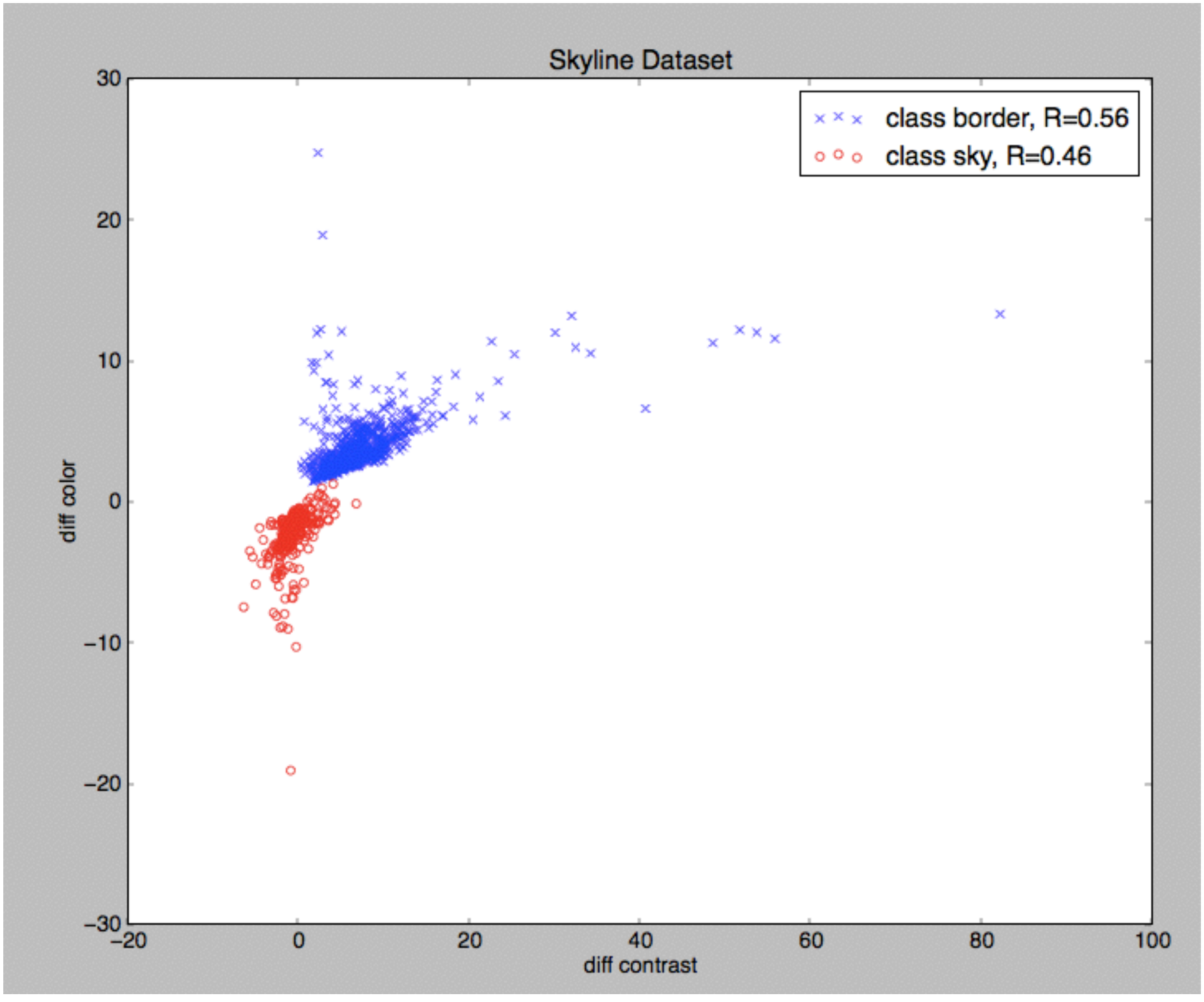
*note: the largest
contrasts
were removed
from analysis
for plot visibility



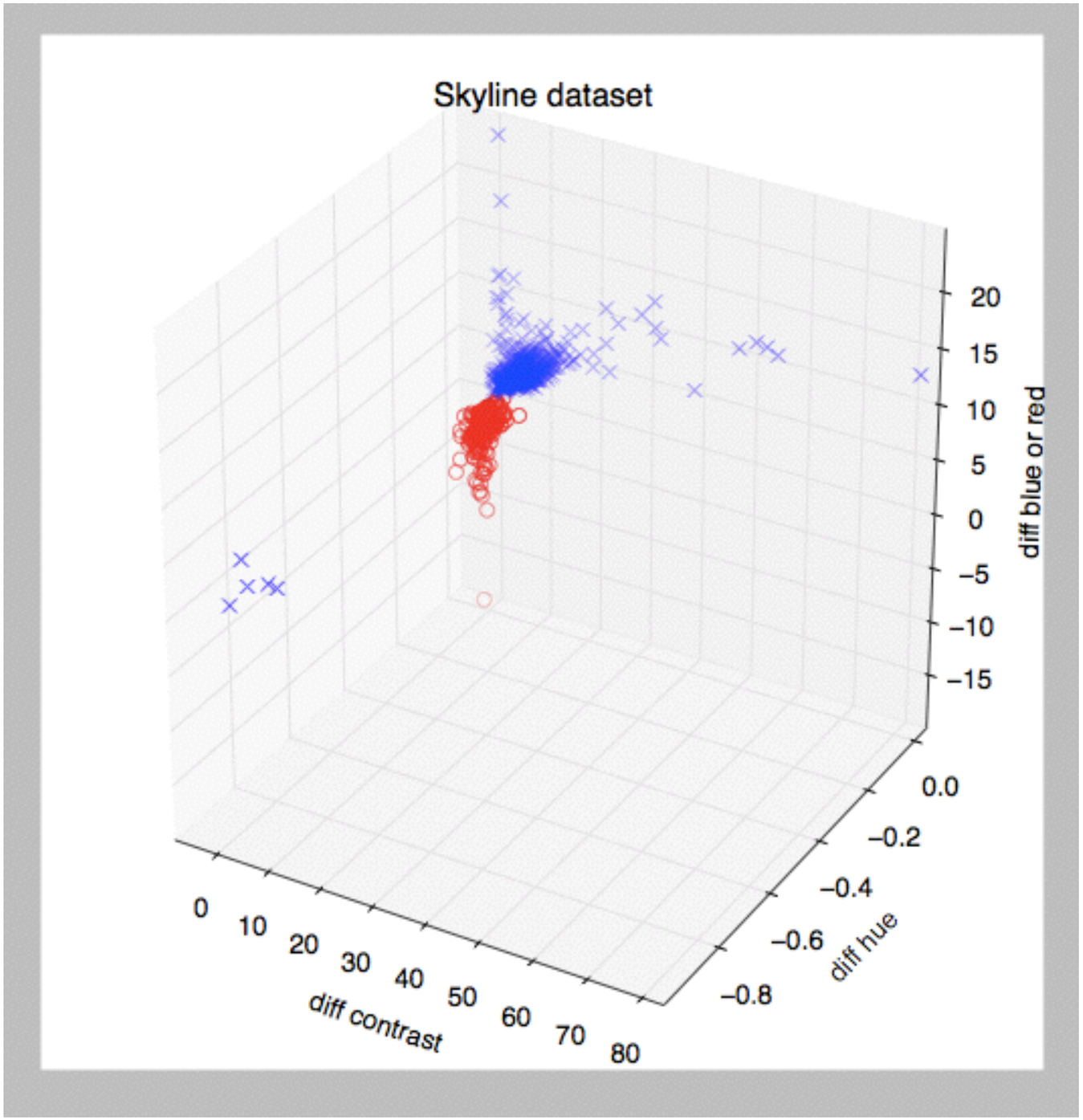
[new mexico test image]



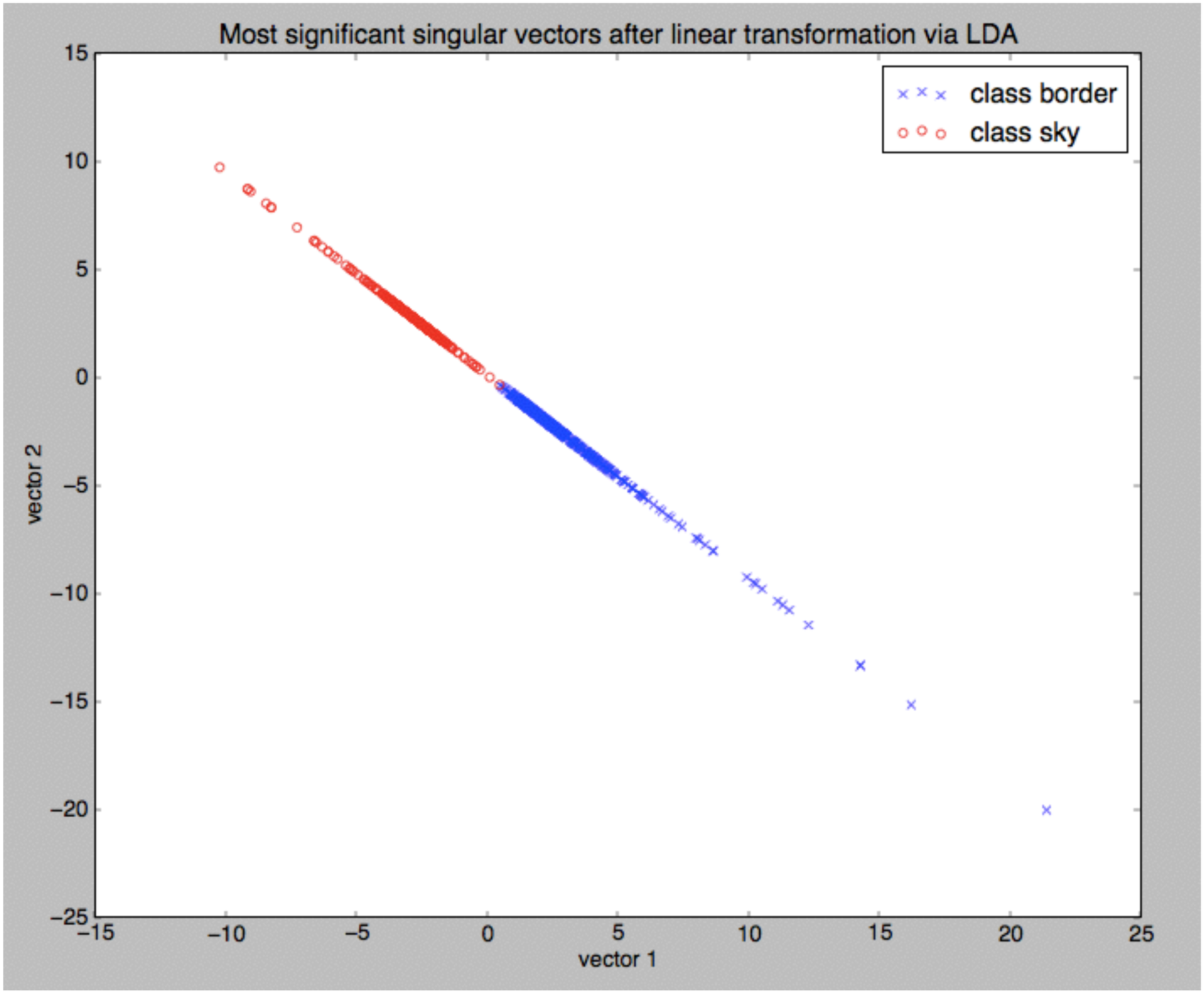
[new mexico test image]



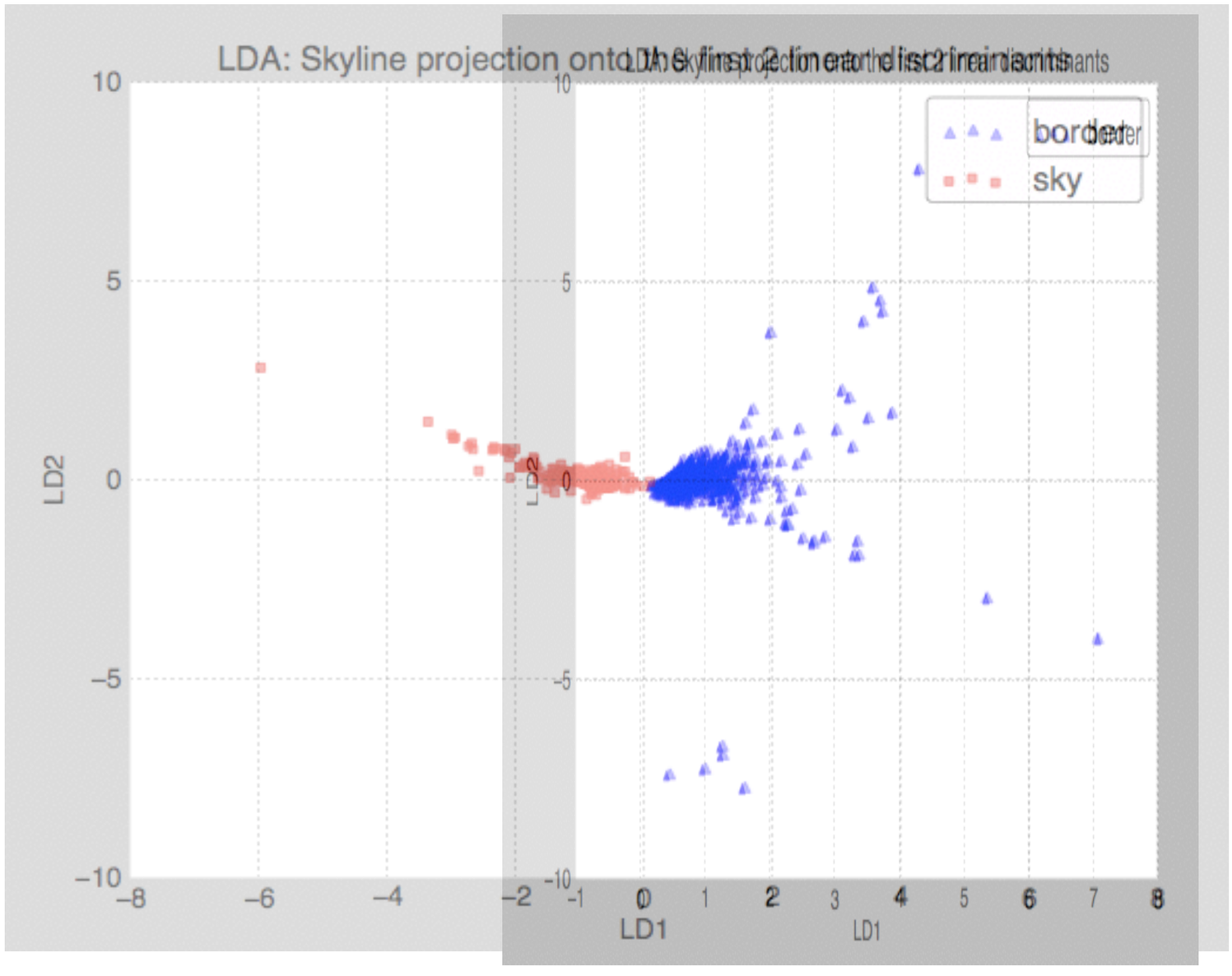
new mexico test image



[new mexico test image]



new mexico test image

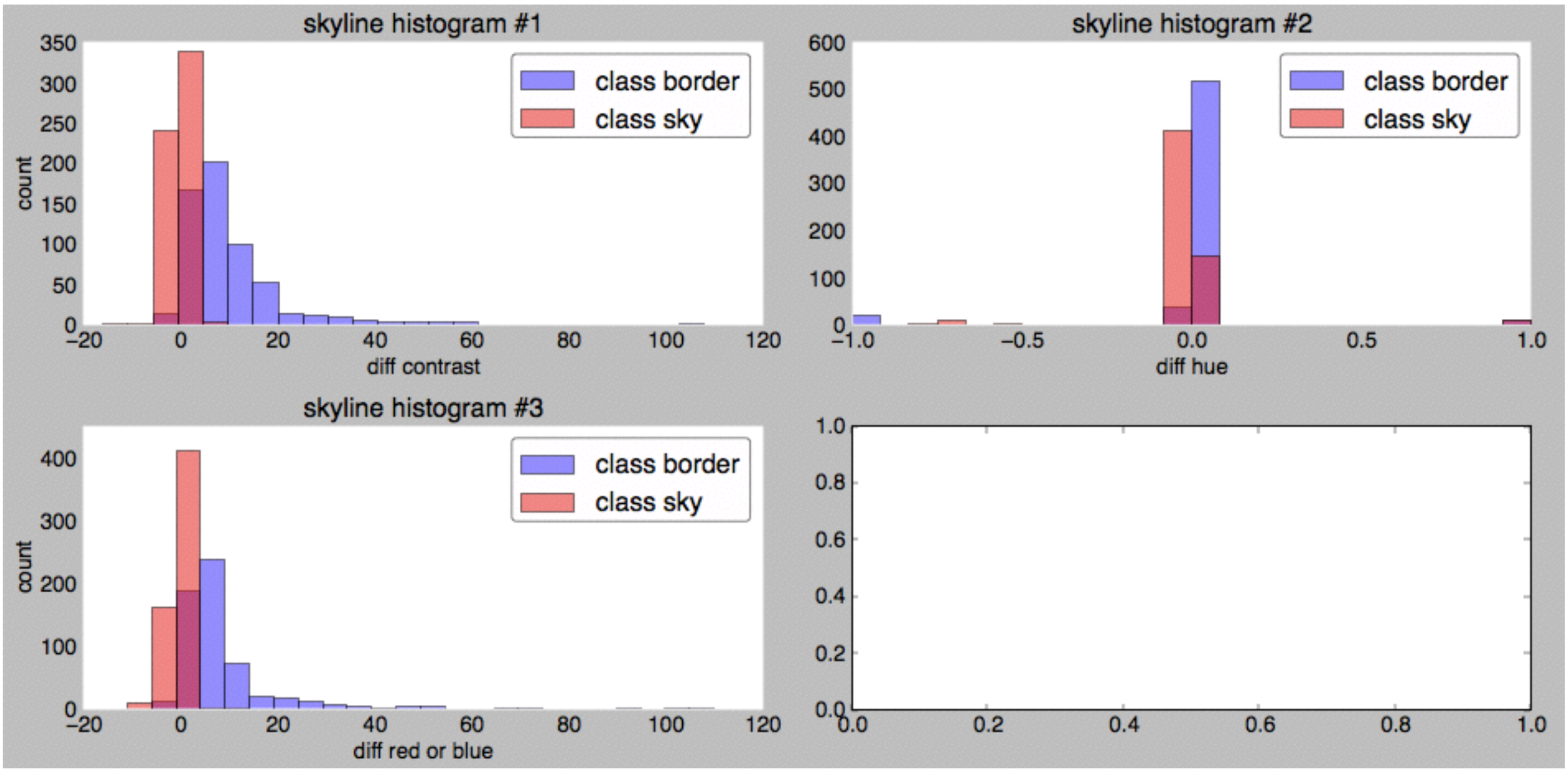



```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.6753 -0.0221  0.855 ]

Mean Vector class 2: [-0.6753  0.0221 -0.855 ]

('within-class Scatter Matrix:\n',
array([[  788.788 ,     9.6141,   282.9405],
       [    9.6141,  1449.2931,   -22.6902],
       [  282.9405,   -22.6902,   390.0885]]))
('between-class Scatter Matrix:\n',
array([[  1.9836e+03,  -6.4859e+01,   2.5115e+03],
       [ -6.4859e+01,   2.1207e+00,  -8.2118e+01],
       [  2.5115e+03,  -8.2118e+01,   3.1797e+03]]))

Eigenvector 1:
[[ 0.0441]
 [ 0.0082]
 [ 0.999 ]]
Eigenvalue 1: 8.18e+00

Eigenvector 2:
[[-0.2189]
 [-0.9645]
 [ 0.148 ]]
Eigenvalue 2: -5.35e-17

Eigenvector 3:
[[ 0.7191]
 [ 0.4153]
 [-0.5572]]
Eigenvalue 3: -5.75e-16
ok
Eigenvalues in decreasing order:

8.1758993237
5.74979825745e-16
5.35110530569e-17
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[ 0.0441,  0.0082,  0.999 ],
       [ 0.7191,  0.4153, -0.5572]]))
```

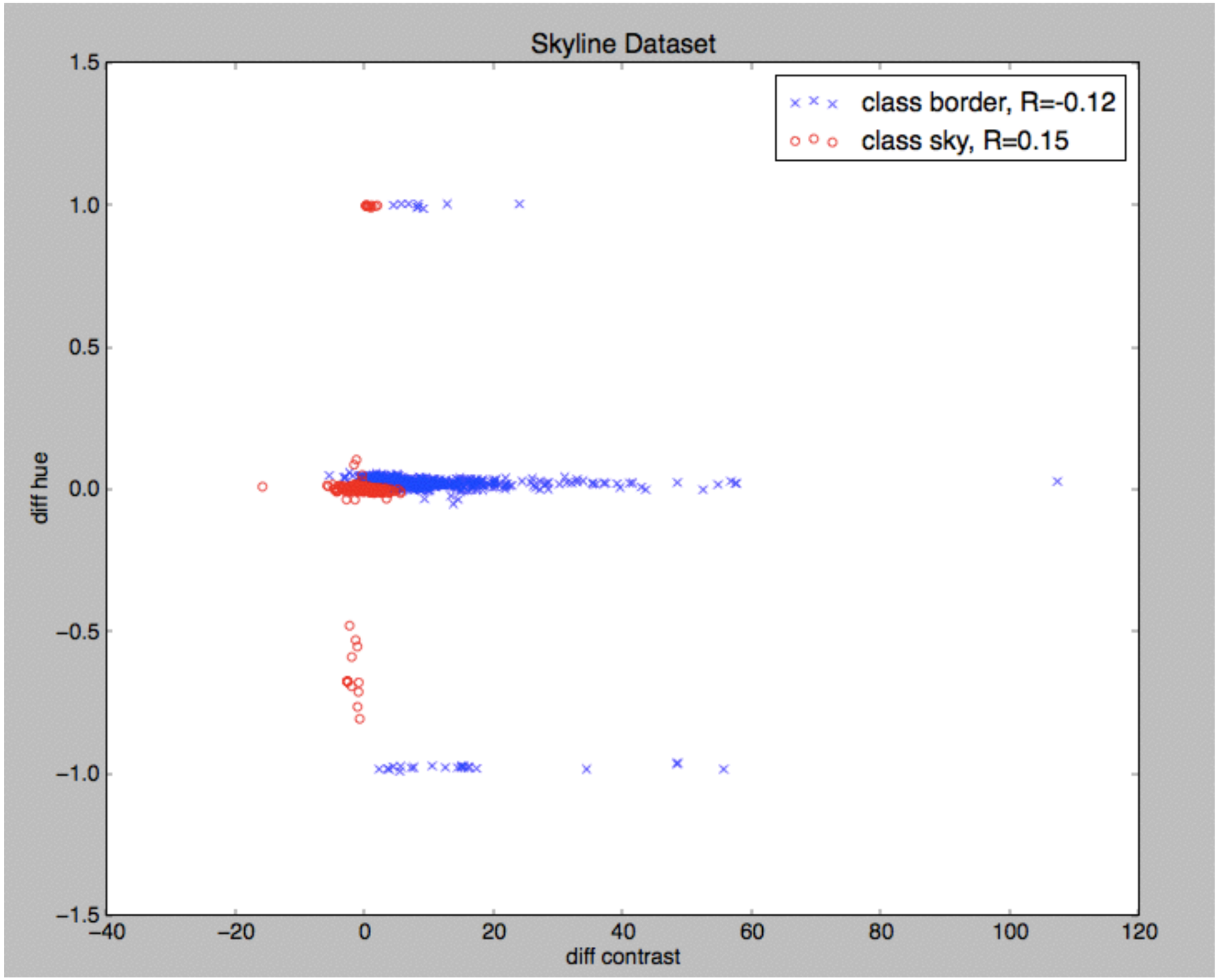
arizona test image

arizona test image

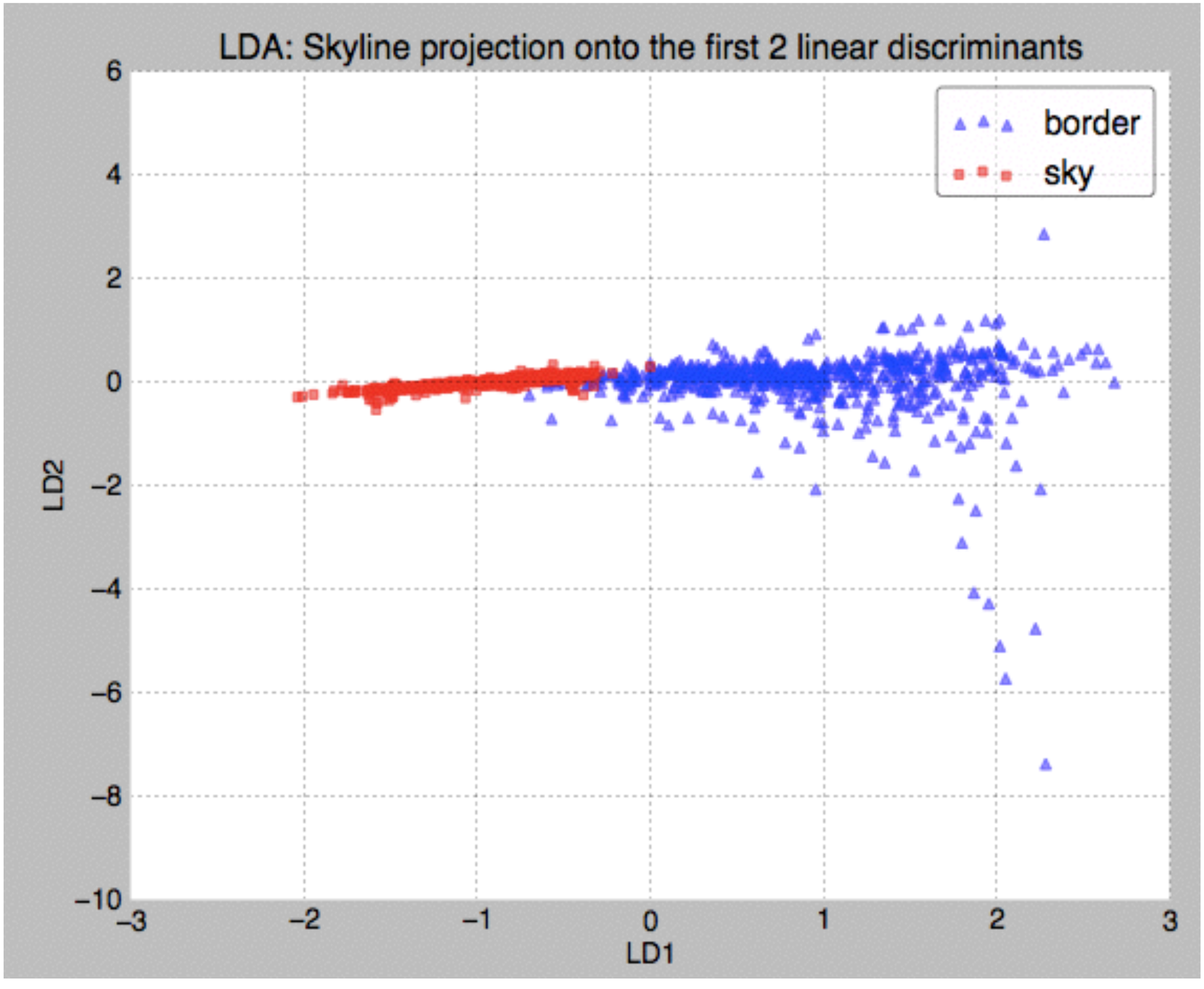
*note: the largest
contrasts
were removed
from analysis
for plot visibility



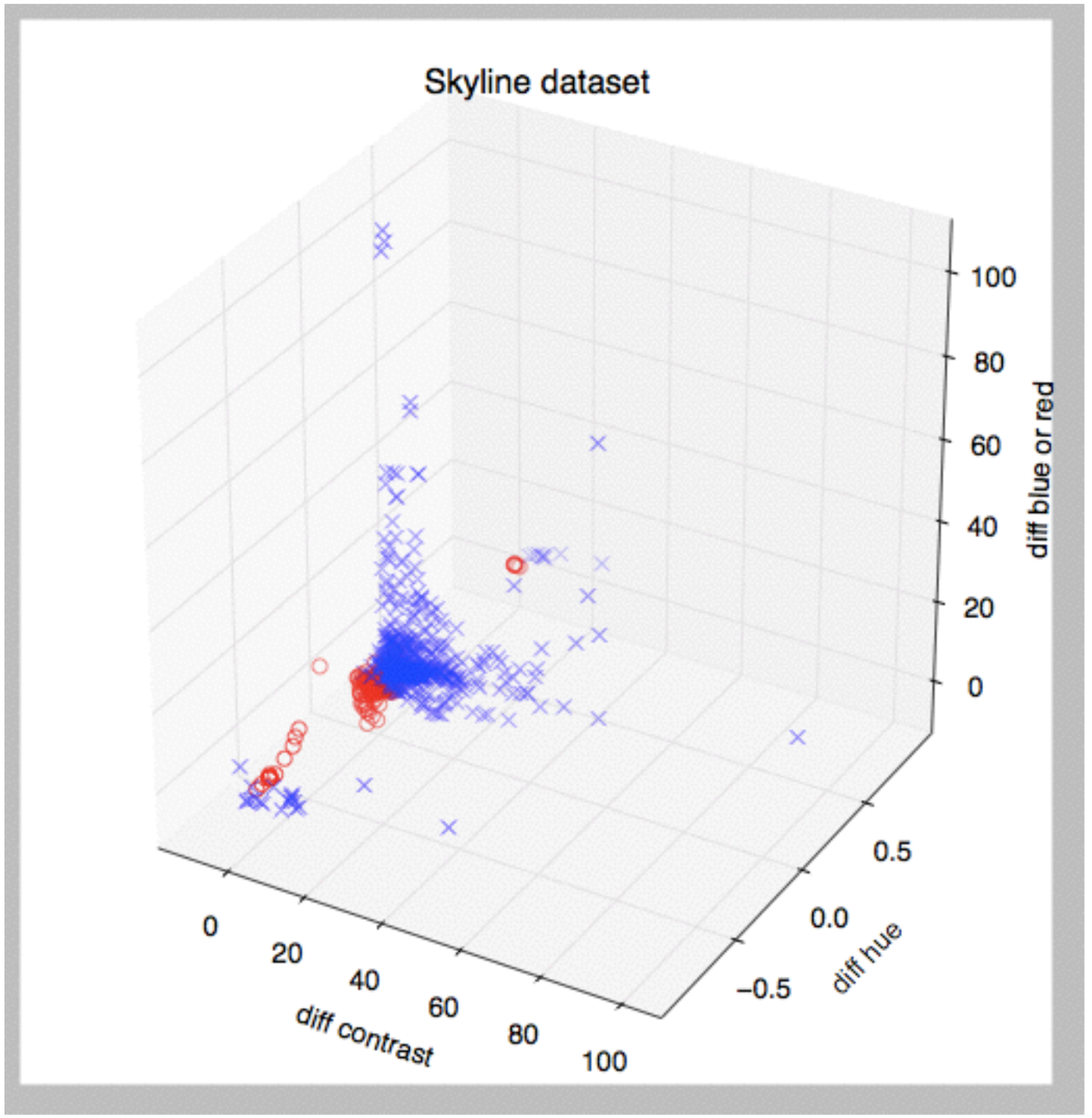
[arizona test image]



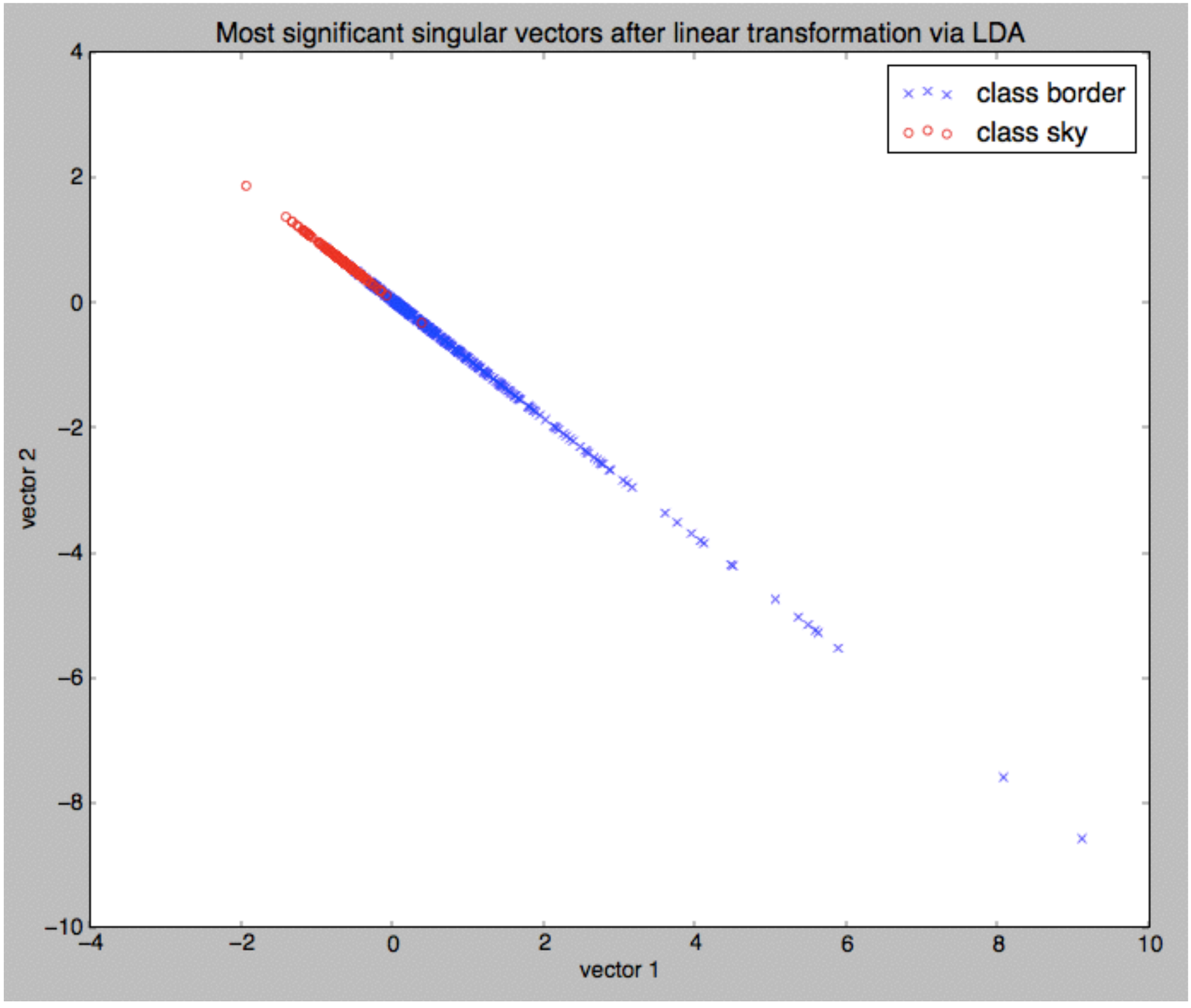
[arizona test image]



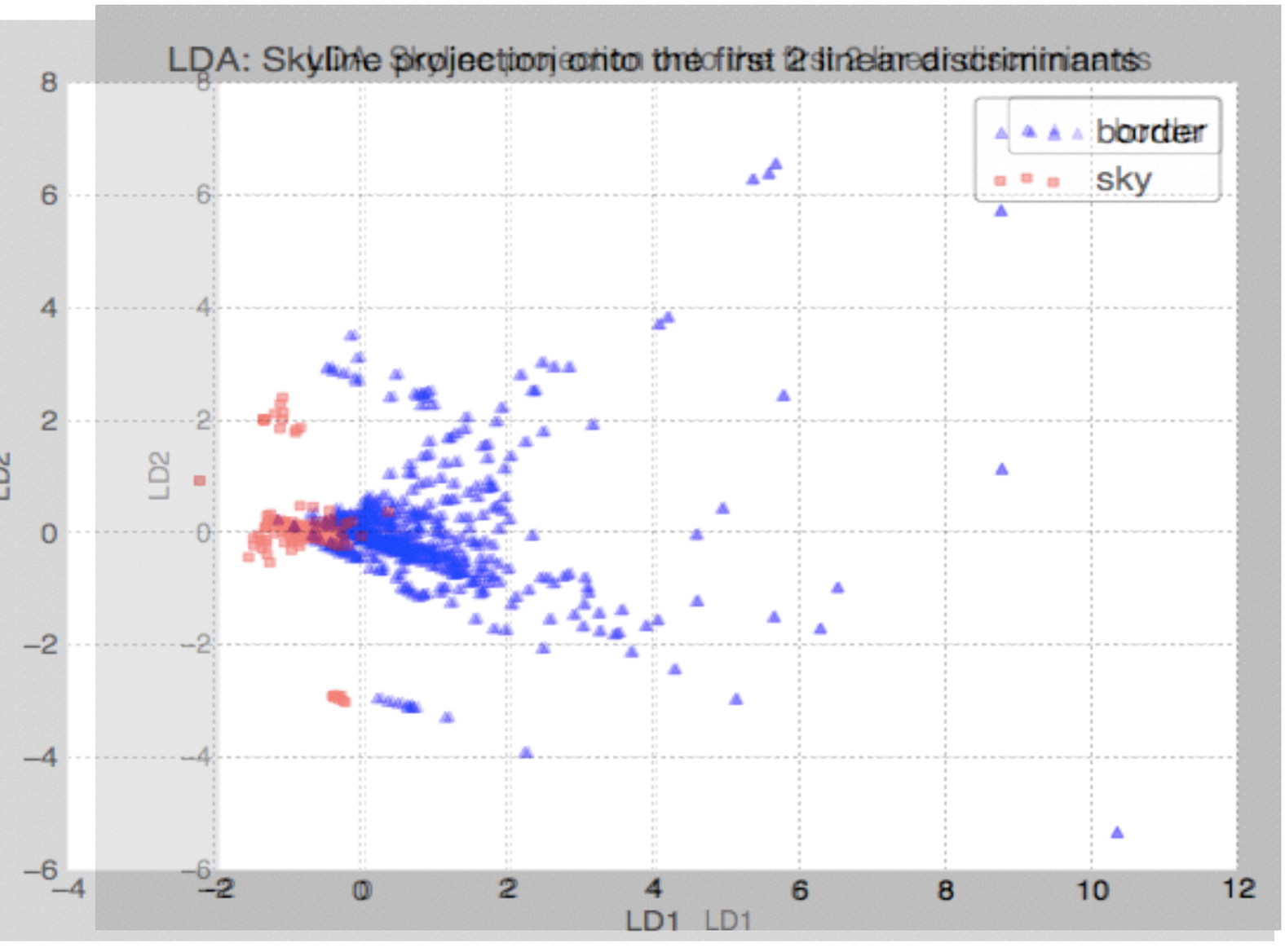
arizona test image



[arizona test image]



arizona test image

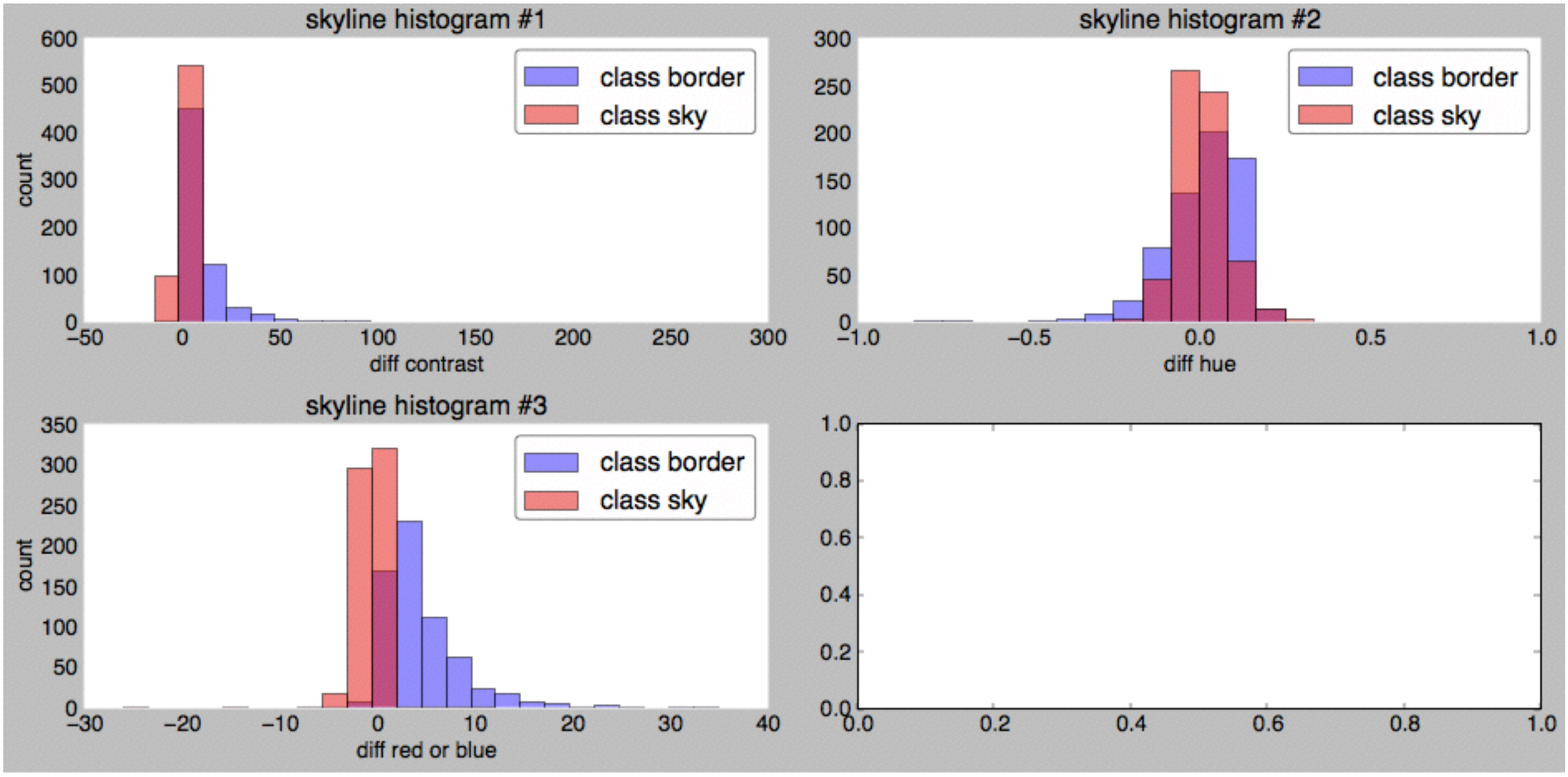



```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.5665 -0.0133  0.4794]

Mean Vector class 2: [-0.5665  0.0133 -0.4794]

('within-class Scatter Matrix:\n',
array([[  797.197 ,   -81.2466,   148.9749],
       [  -81.2466,  1173.7936,   -53.2171],
       [  148.9749,   -53.2171,   904.2197]]))
('between-class Scatter Matrix:\n',
array([[  1.1304e+03,  -2.6457e+01,   9.5650e+02],
       [ -2.6457e+01,   6.1922e-01,  -2.2387e+01],
       [  9.5650e+02,  -2.2387e+01,   8.0934e+02]]))

Eigenvector 1:
[[ 0.8274]
 [ 0.0678]
 [ 0.5575]]
Eigenvalue 1: 1.99e+00

Eigenvector 2:
[[ 0.1211]
 [-0.9779]
 [-0.1702]]
Eigenvalue 2: 4.64e-17

Eigenvector 3:
[[-0.5307]
 [-0.5874]
 [ 0.611 ]]
Eigenvalue 3: -1.99e-16
ok
Eigenvalues in decreasing order:

1.98975976216
1.98998572492e-16
4.6372972206e-17
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[ 0.8274,  0.0678,  0.5575],
       [-0.5307, -0.5874,  0.611 ]]))
```

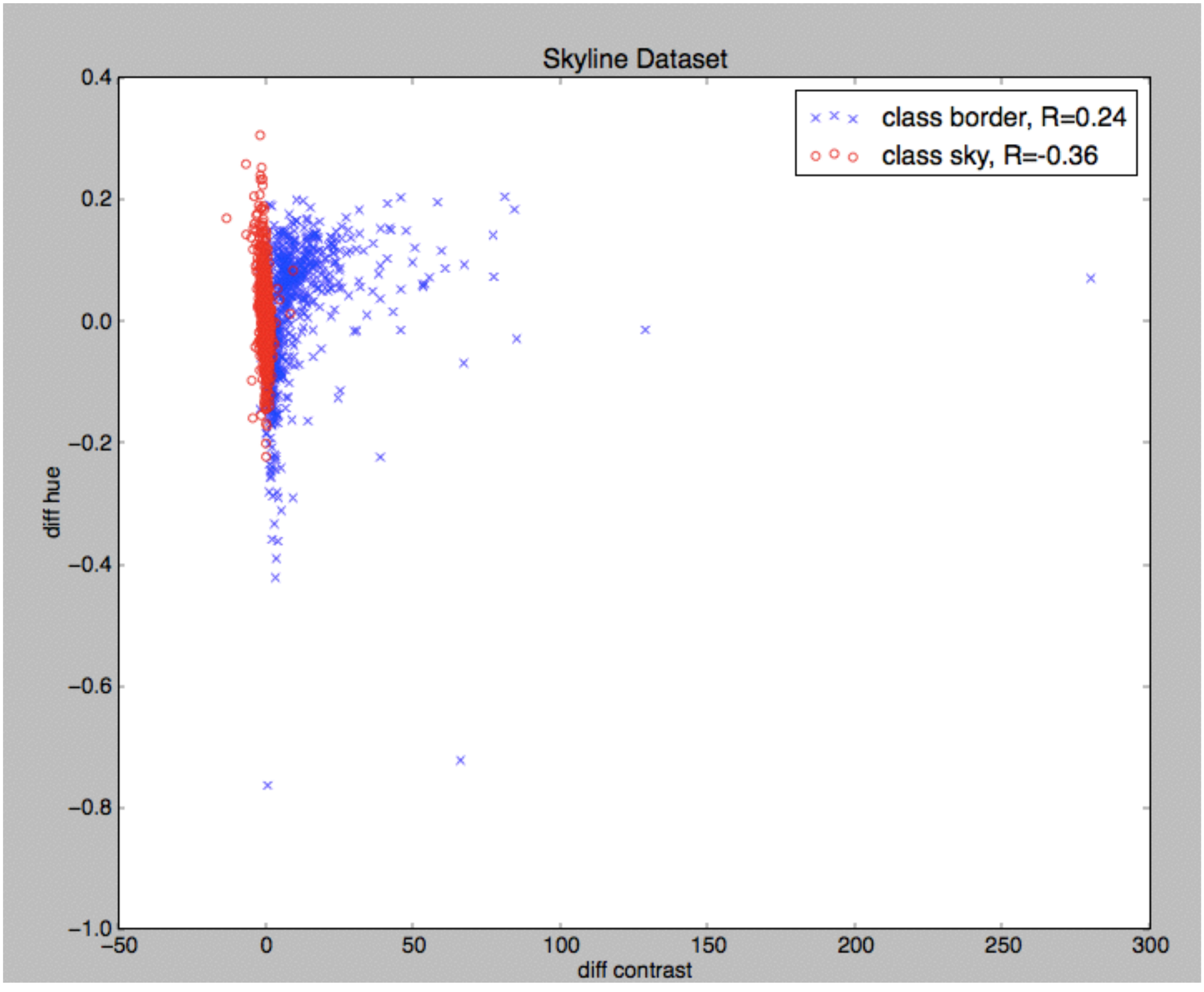
rainbow test image

rainbow test image

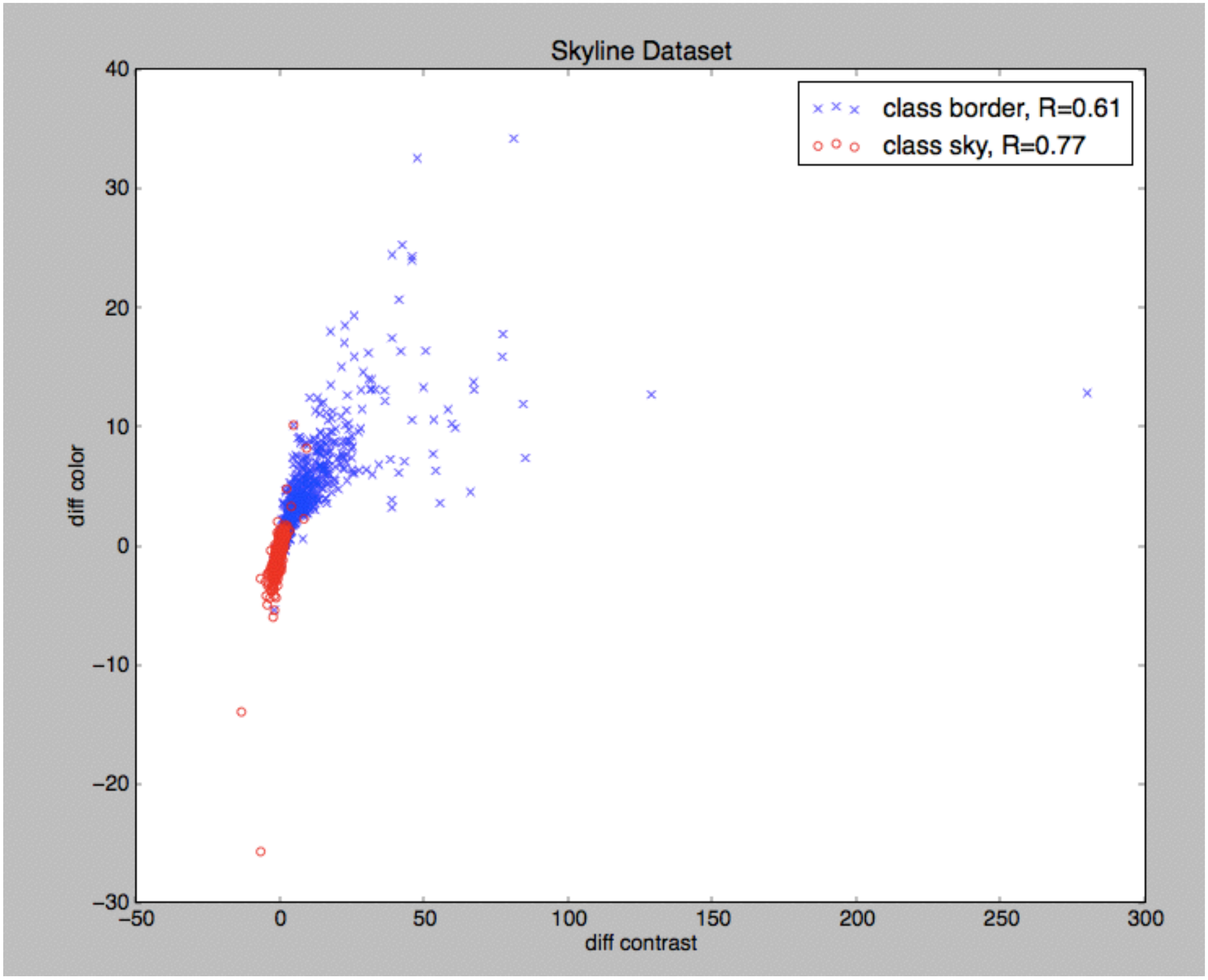
*note: the largest
contrasts
were removed
from analysis
for plot visibility



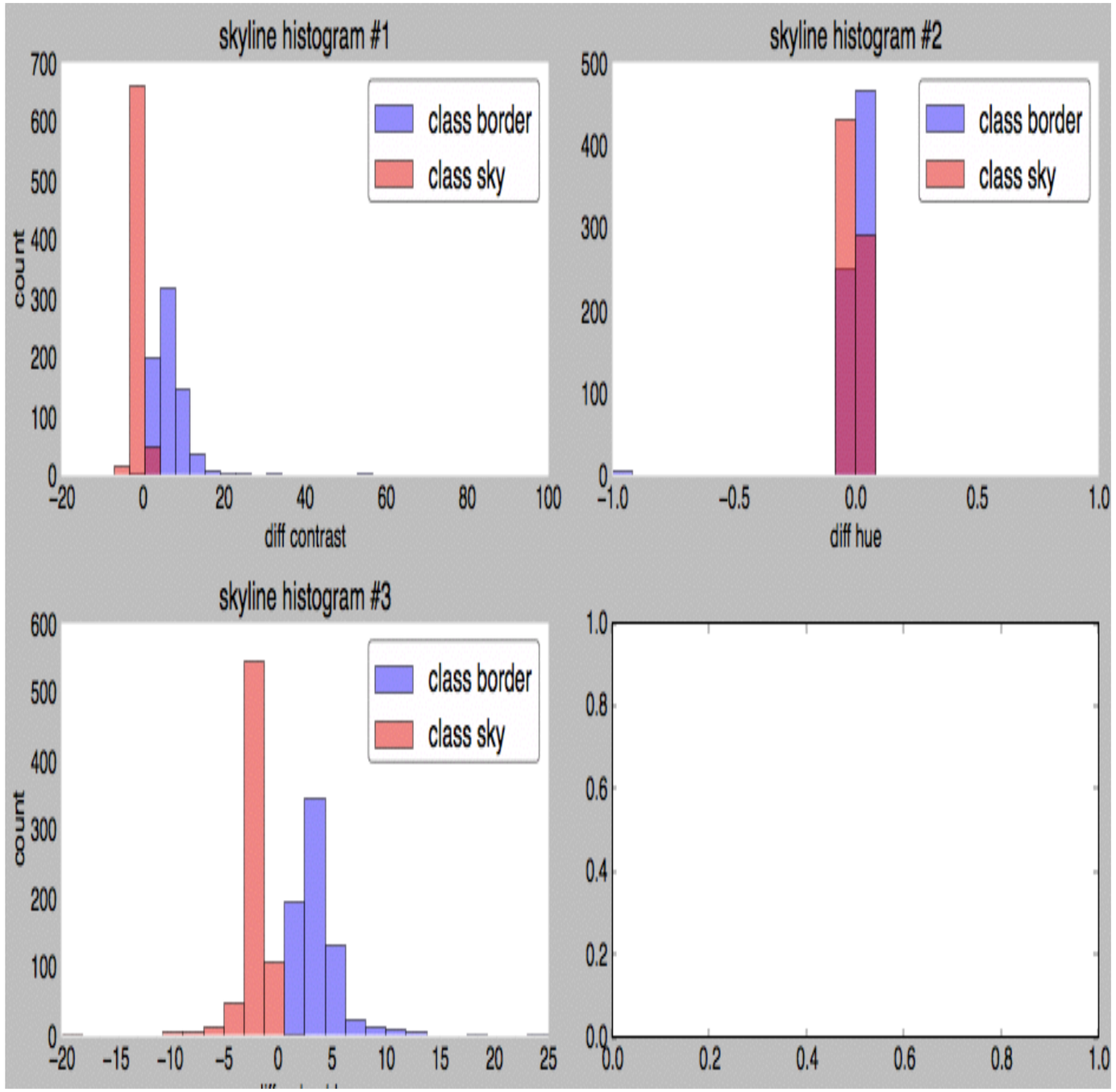
[rainbow test image]



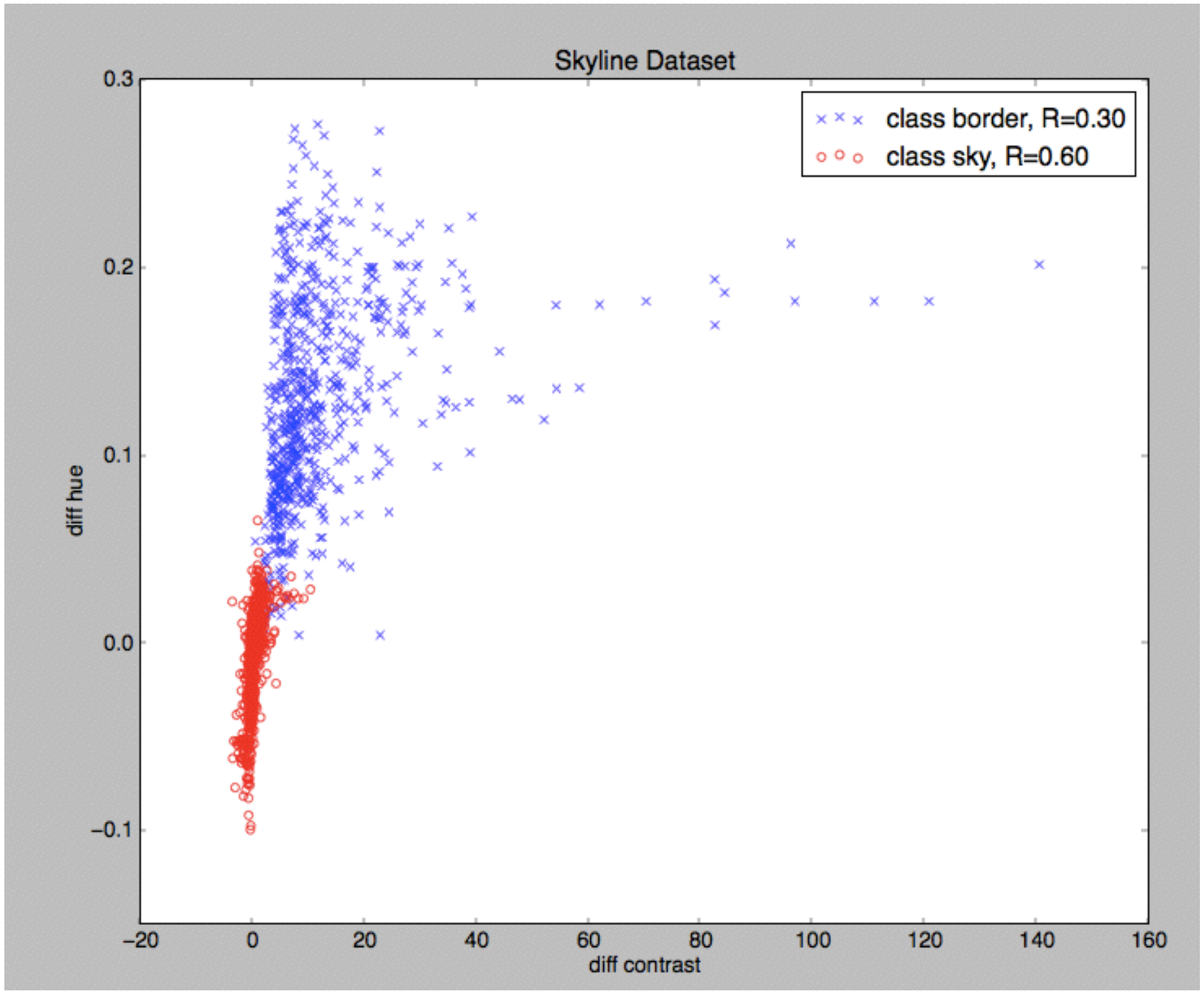
[rainbow test image]



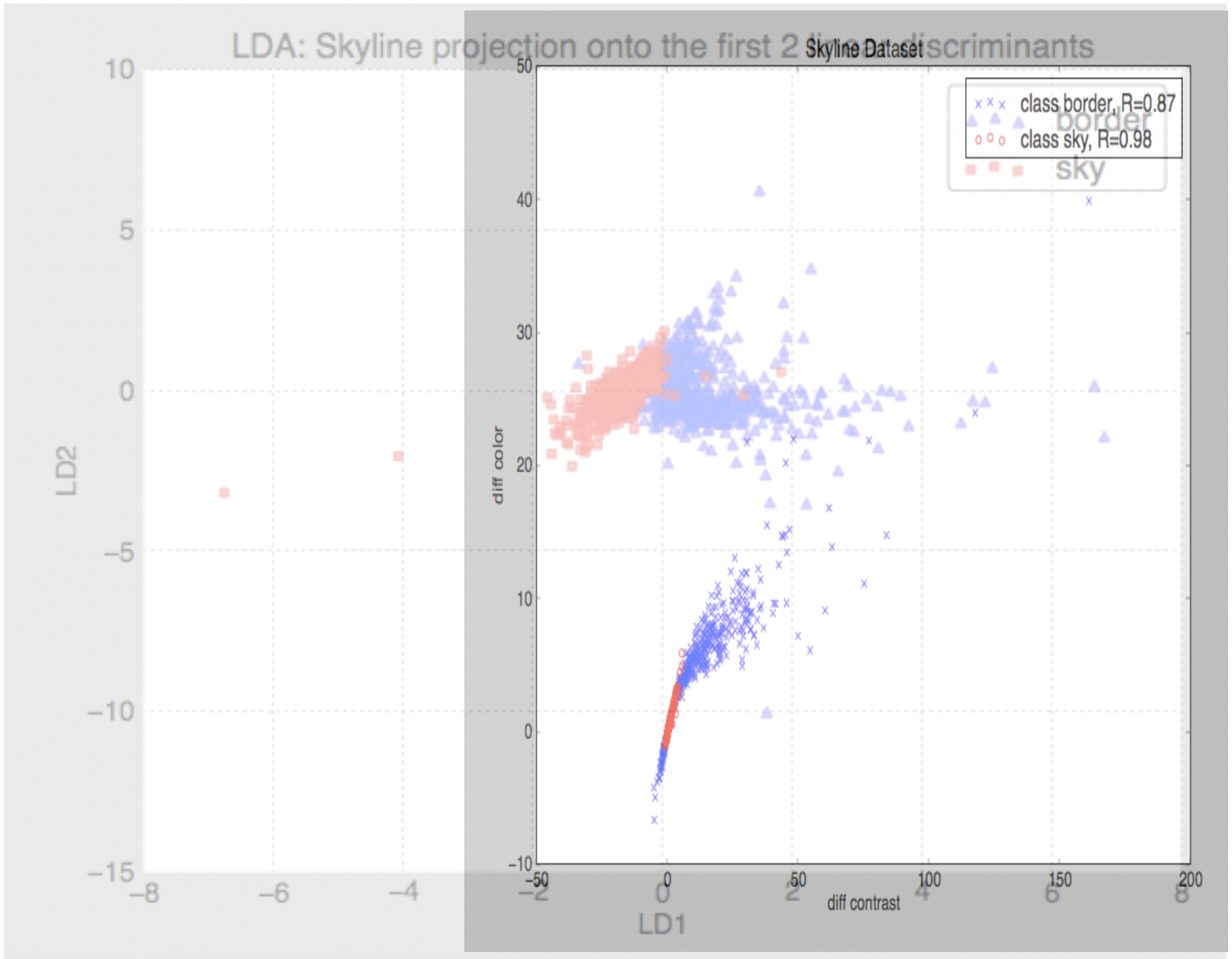
[rainbow test image]



[rainbow test image]

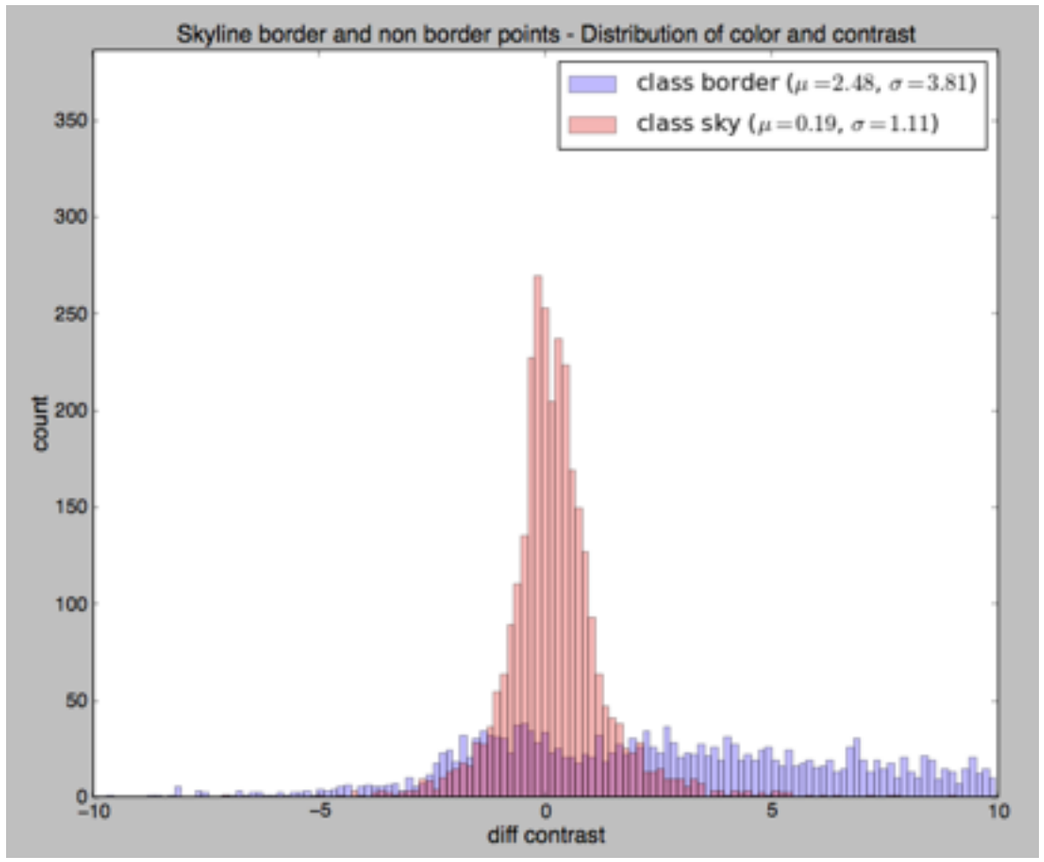


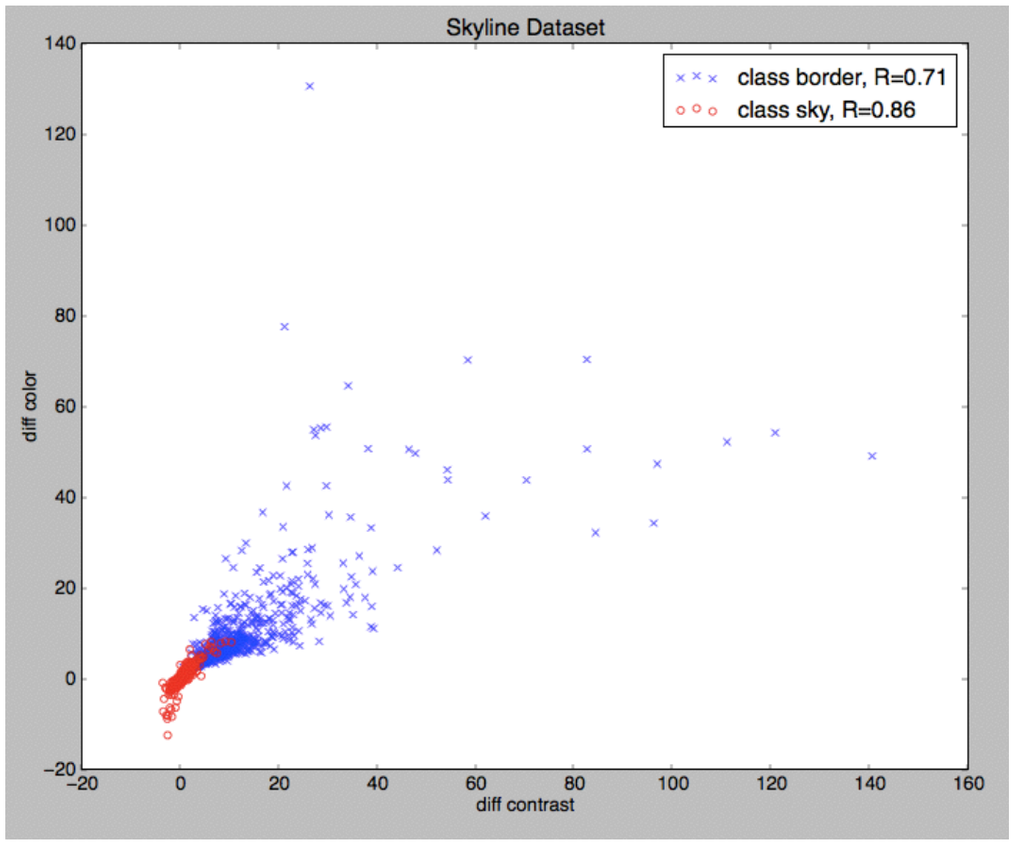
rainbow test image

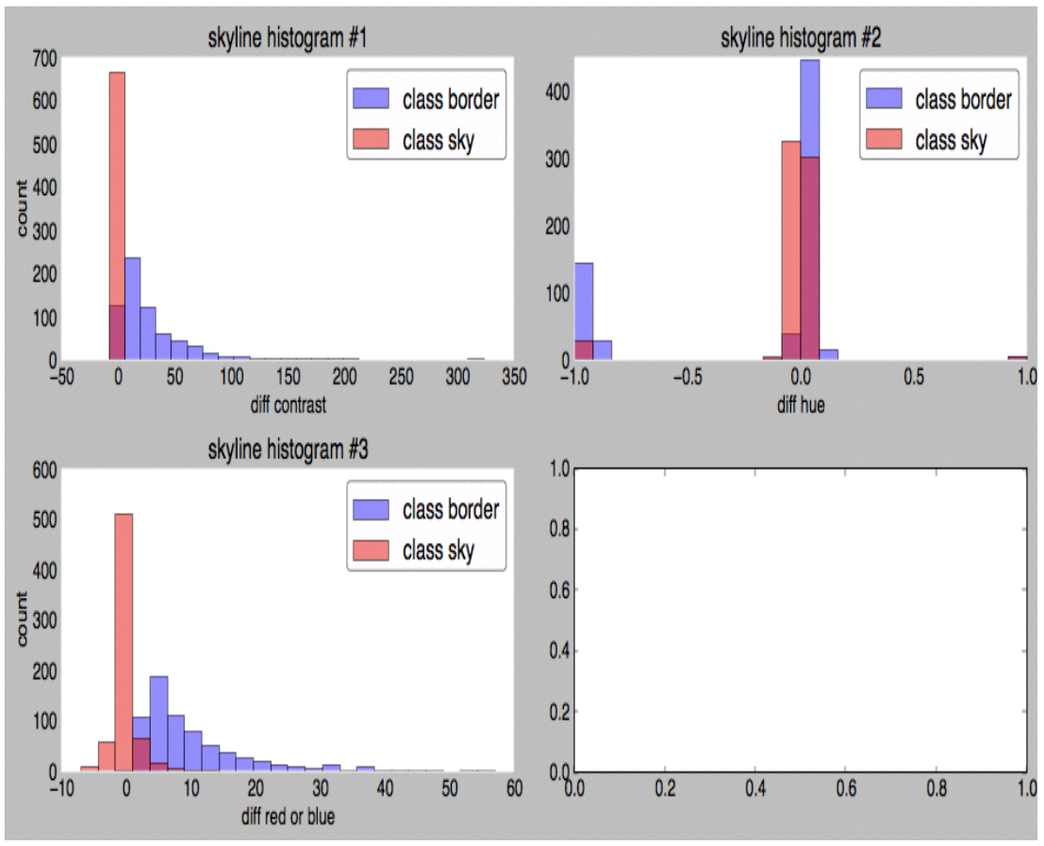



```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.417   0.0386  0.6287]

Mean Vector class 2: [-0.4183 -0.0387 -0.6306]

('within-class Scatter Matrix:\n',
array([[ 1060.0511,   216.3349,   534.3489],
       [  216.3349,  1282.0819,   368.6035],
       [  534.3489,   368.6035,   774.9677]]))
('between-class Scatter Matrix:\n',
array([[  671.8484,    62.179 ,  1012.906 ],
       [   62.179 ,     5.7561,    93.7428],
       [ 1012.906 ,    93.7428,  1527.0986]]))

Eigenvector 1:
[[-0.0376]
 [-0.2417]
 [ 0.9696]]
Eigenvalue 1: 2.21e+00

Eigenvector 2:
[[ 0.8058]
 [-0.2891]
 [-0.5168]]
Eigenvalue 2: -1.62e-16

Eigenvector 3:
[[-0.5153]
 [-0.7638]
 [ 0.3887]]
Eigenvalue 3: 1.60e-06
ok
Eigenvalues in decreasing order:

2.21091666338
1.59936271488e-06
1.61816115452e-16
Variance explained:

eigenvalue 1: 100.00%
eigenvalue 2: 0.00%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.0376, -0.2417,  0.9696],
       [-0.5153, -0.7638,  0.3887]]))
```

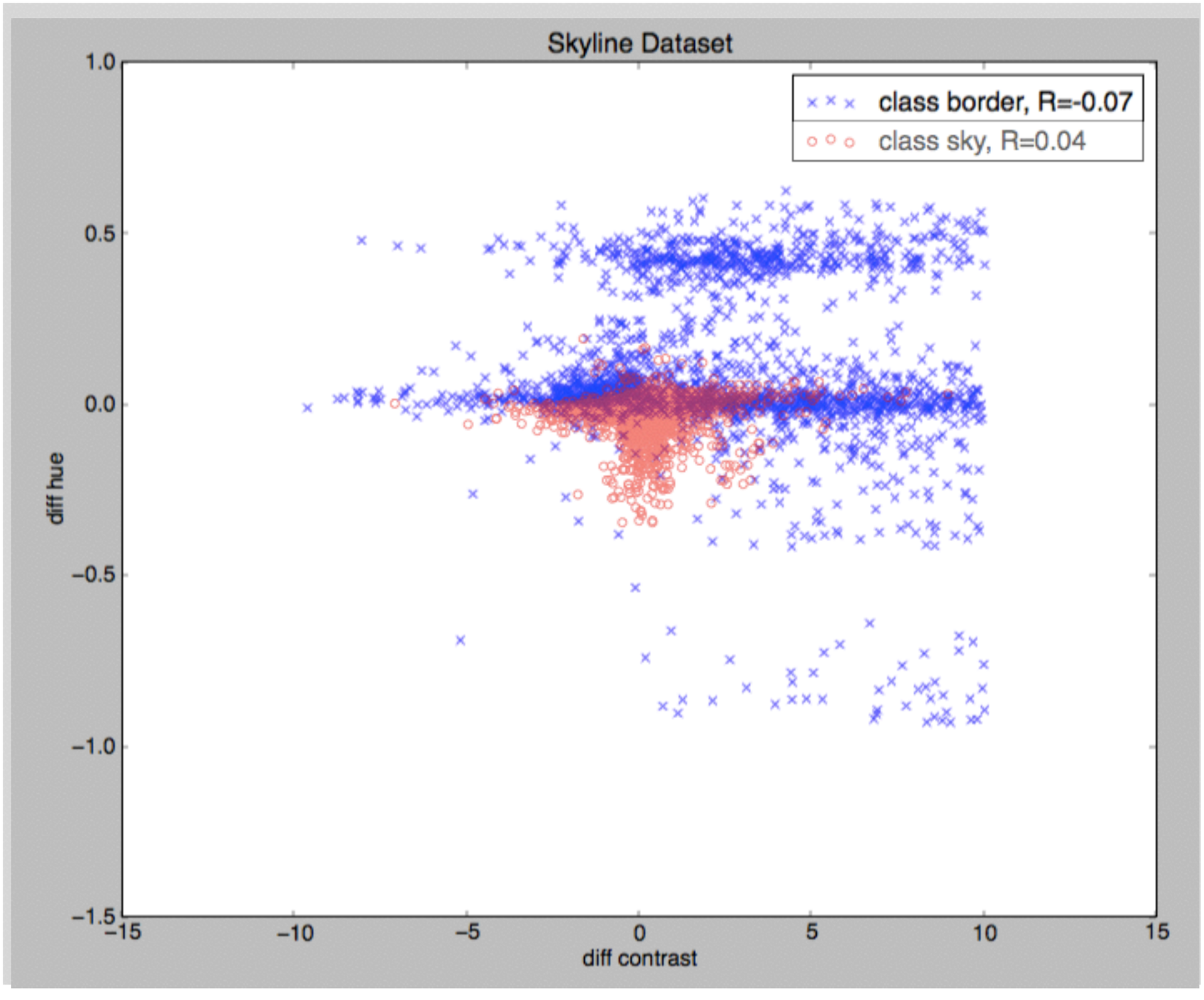
All BLUE SKY data in one:



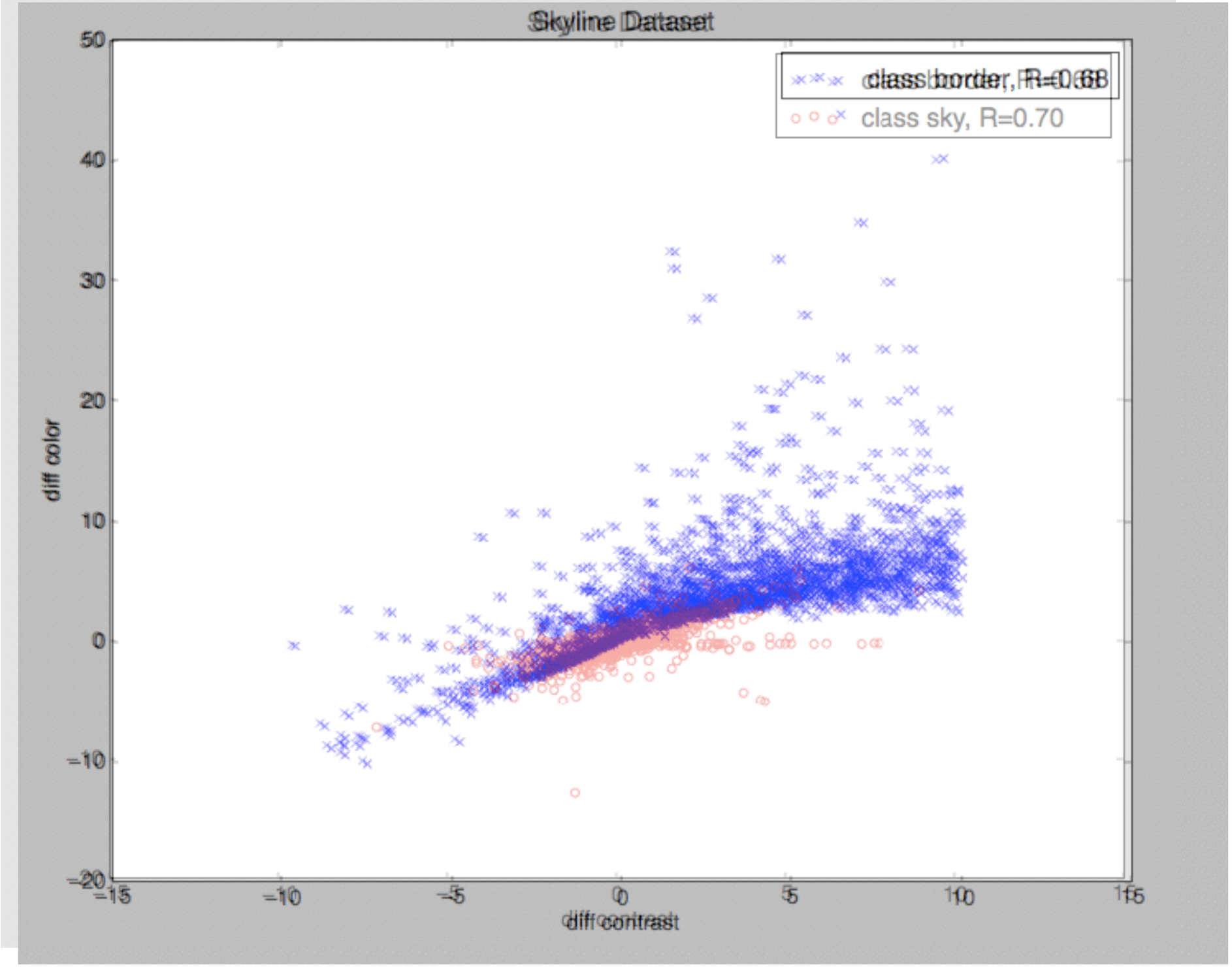




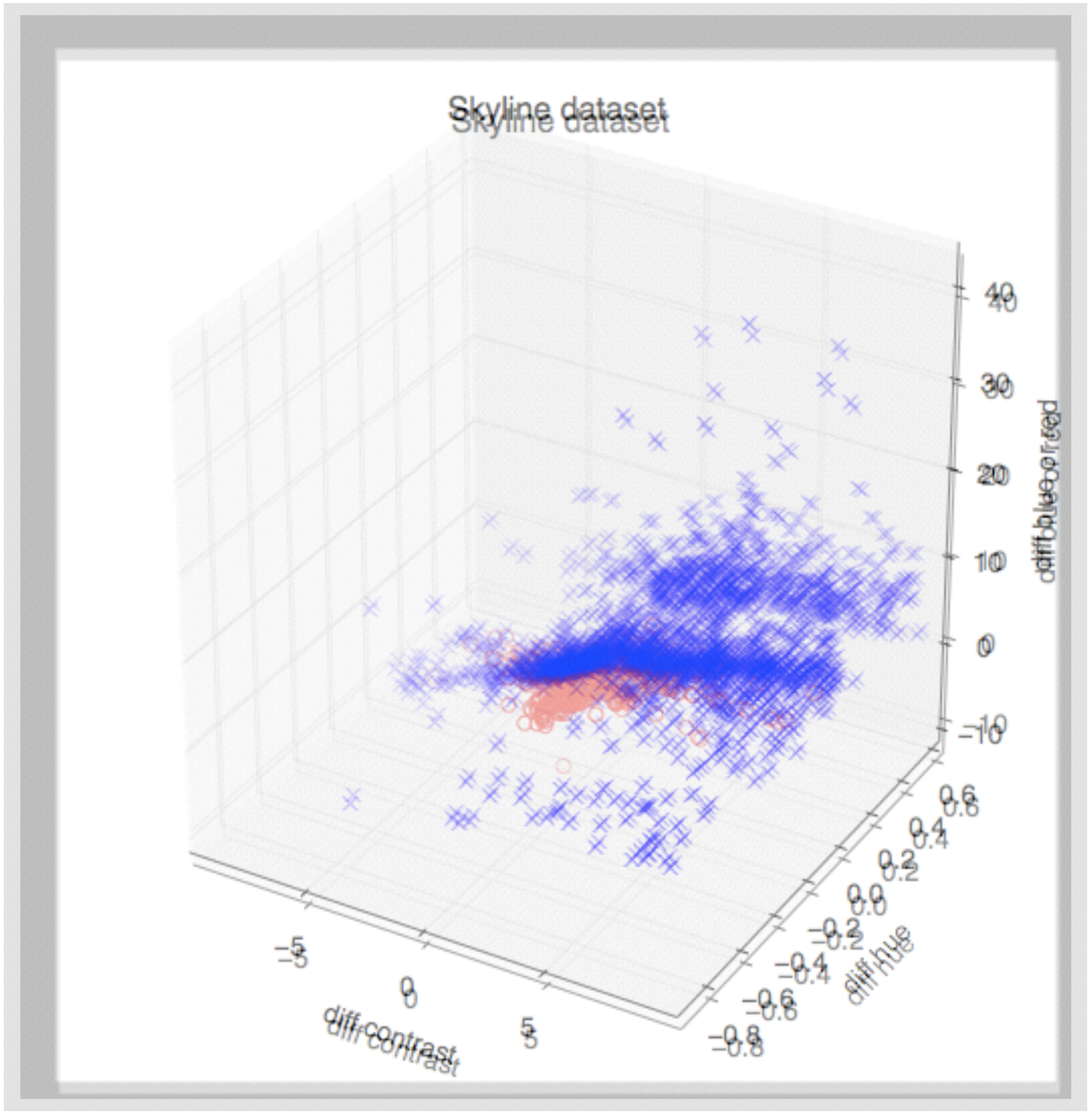
All BLUE SKY data in one:



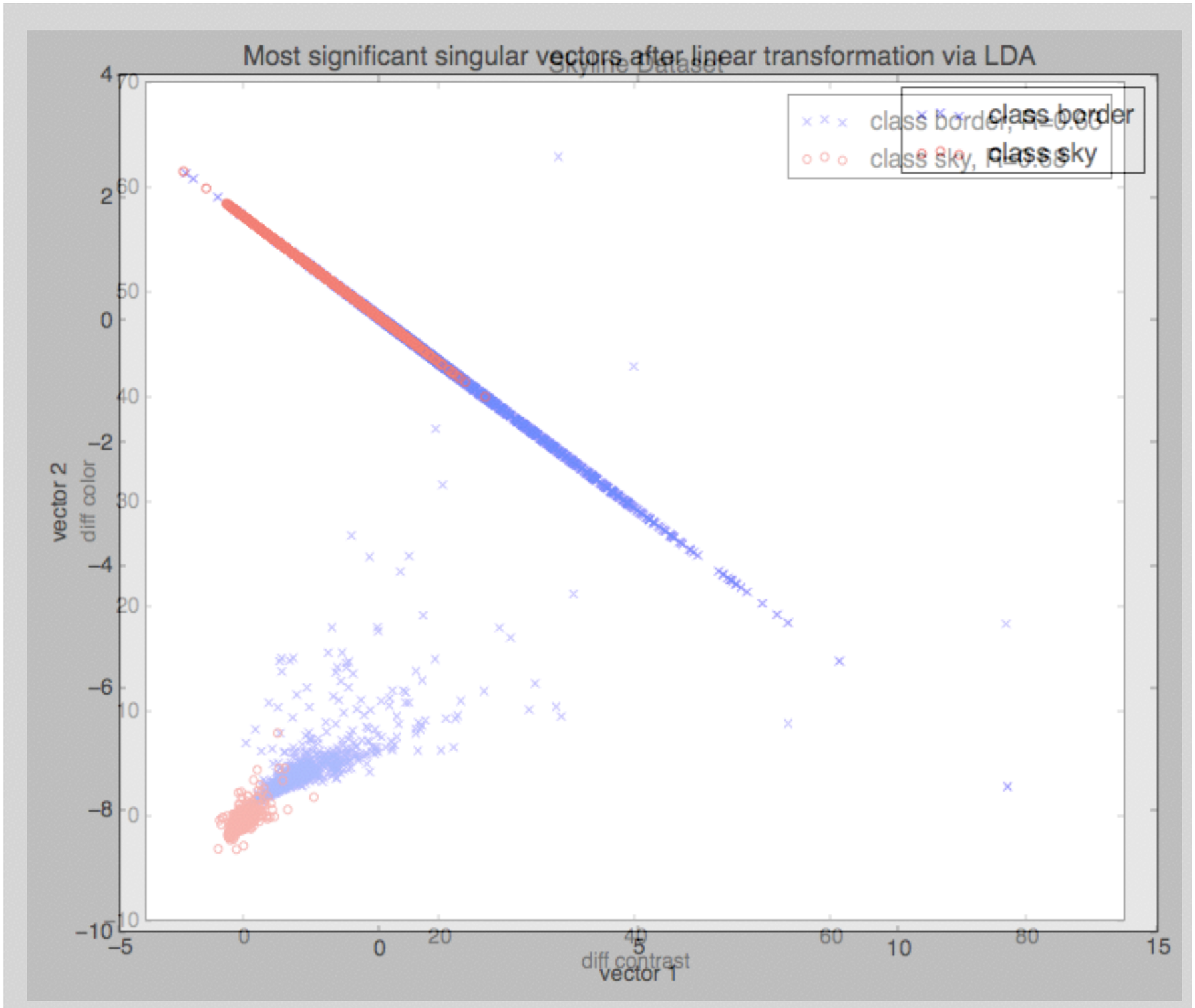
All BLUE SKY data in one:



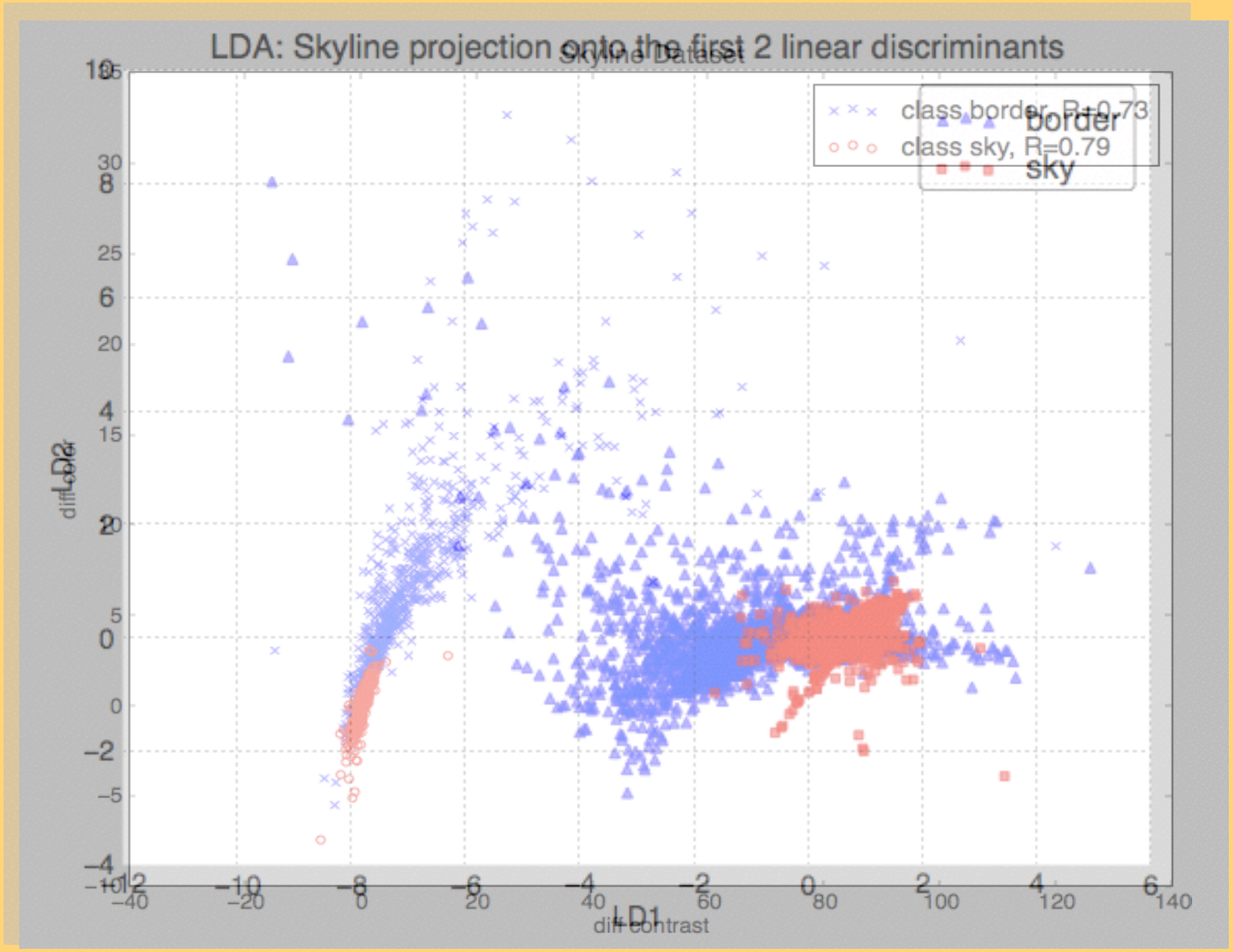
All BLUE SKY data in one:



All BLUE SKY data in one:



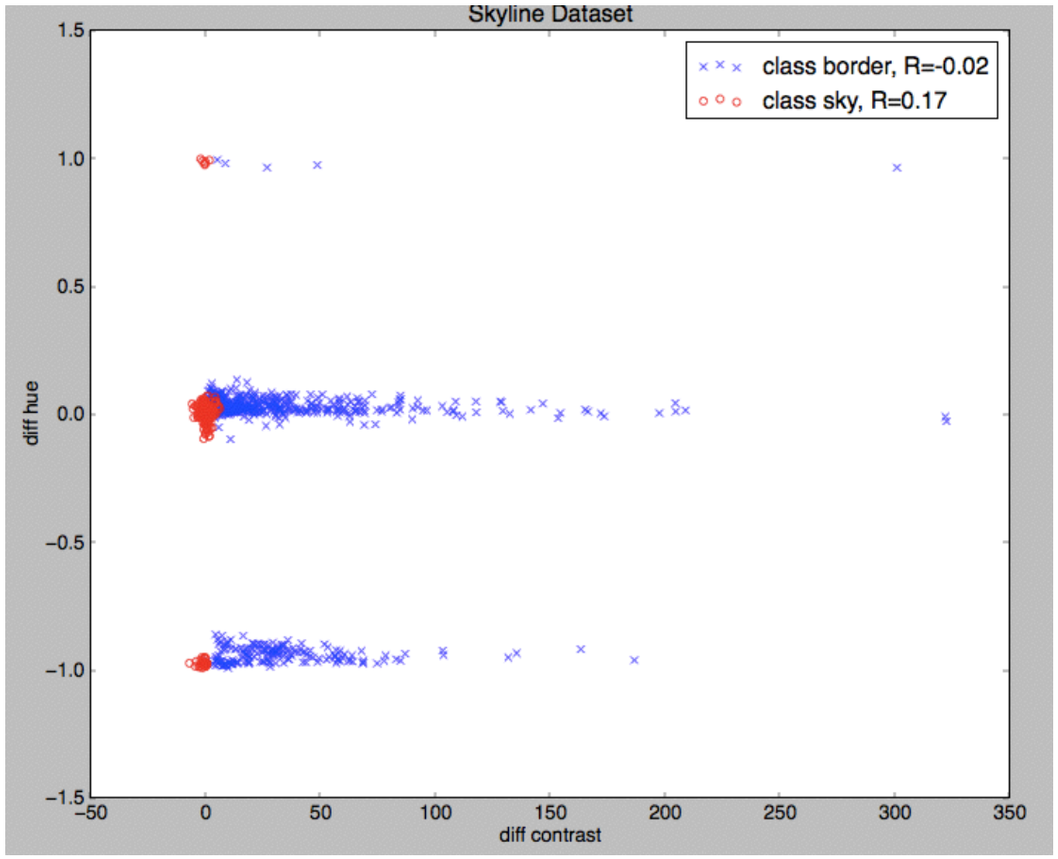
All BLUE SKY data in one:

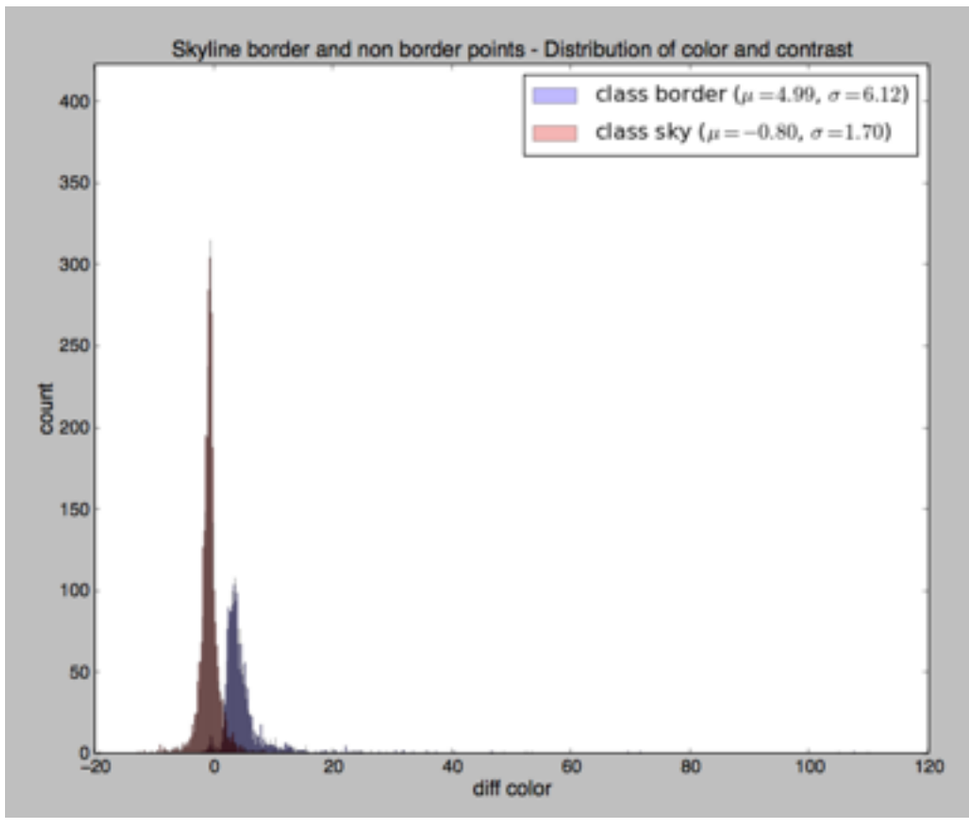



```
                        contrast  hue     BorR
Mean Vector class 1: [ 0.4994  0.4135  0.6045]

Mean Vector class 2: [-0.3249 -0.269  -0.3932]

('within-class Scatter Matrix:\n',
array([[ 4138.3828,  -261.7825,  2666.6696],
       [ -261.7825,  4390.4972,   471.8655],
       [ 2666.6696,   471.8655,  3765.877 ]]))
('between-class Scatter Matrix:\n',
array([[ 2523.383 ,  2109.6162,  3028.991 ],
       [ 2109.6162,  1767.04  ,  2528.2317],
       [ 3028.991 ,  2528.2317,  3640.9005]]))

Eigenvector 1:
[[-0.3751]
 [-0.5788]
 [-0.7241]]
Eigenvalue 1: 1.31e+00

Eigenvector 2:
[[-0.8151]
 [ 0.4483]
 [ 0.3669]]
Eigenvalue 2: -2.76e-17

Eigenvector 3:
[[-0.5464]
 [-0.4018]
 [ 0.7348]]
Eigenvalue 3: 3.92e-03
ok
Eigenvalues in decreasing order:

1.30887987016
0.00391540335694
2.76230855281e-17
Variance explained:

eigenvalue 1: 99.70%
eigenvalue 2: 0.30%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.3751, -0.5788, -0.7241],
       [-0.5464, -0.4018,  0.7348]]))
```

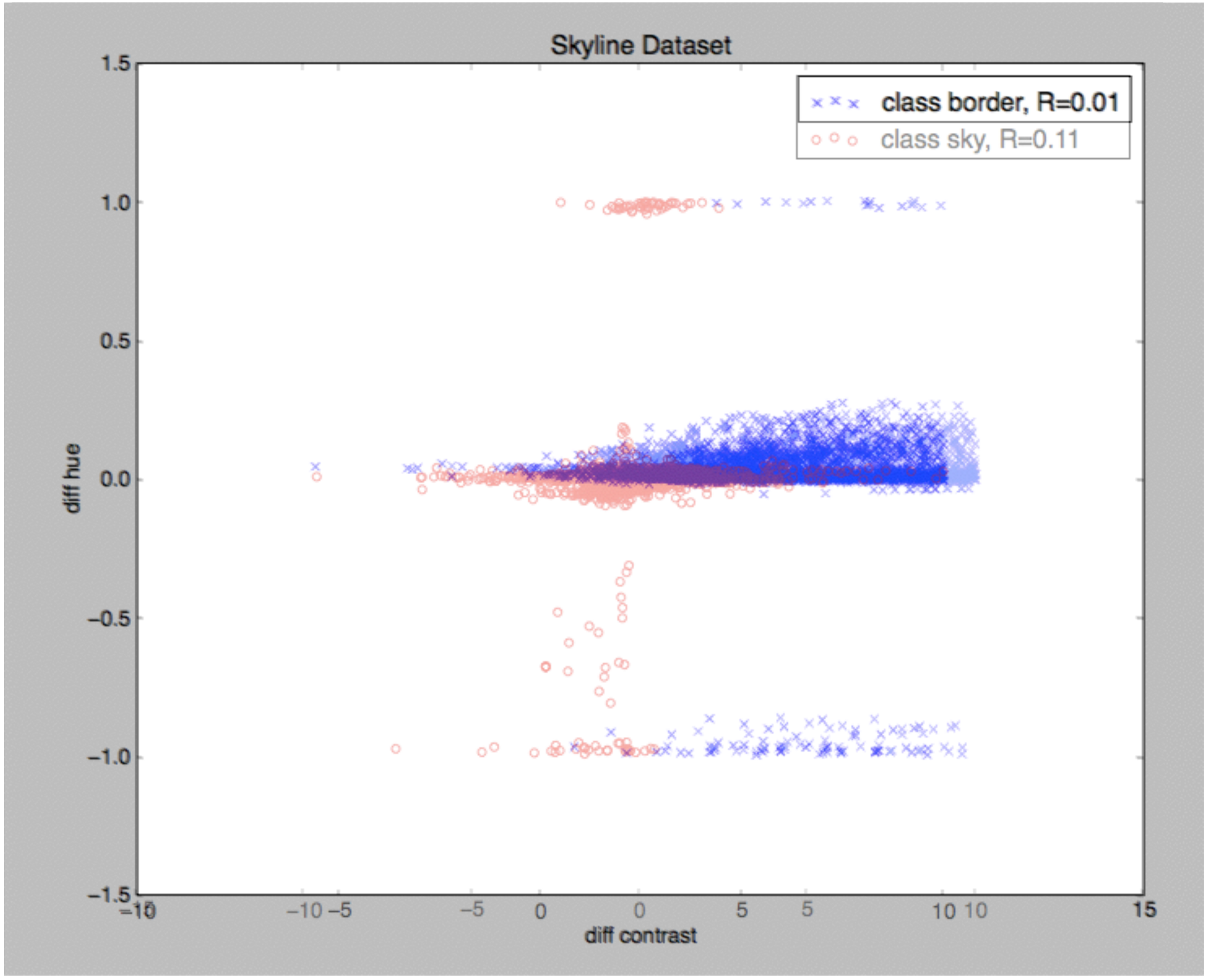
unfortunately, not separable when all blue sky image data is combined

All RED SKY data in one

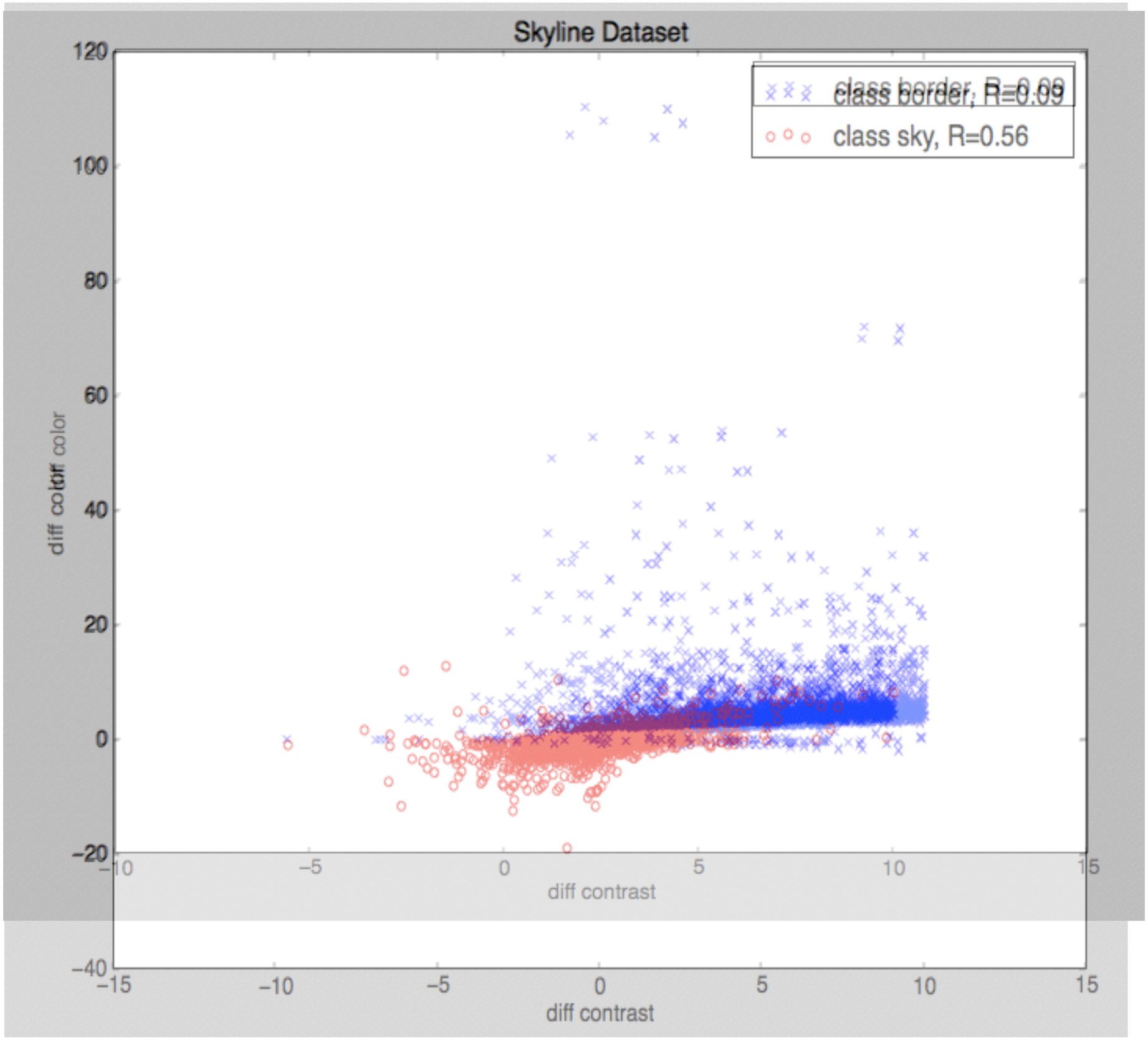




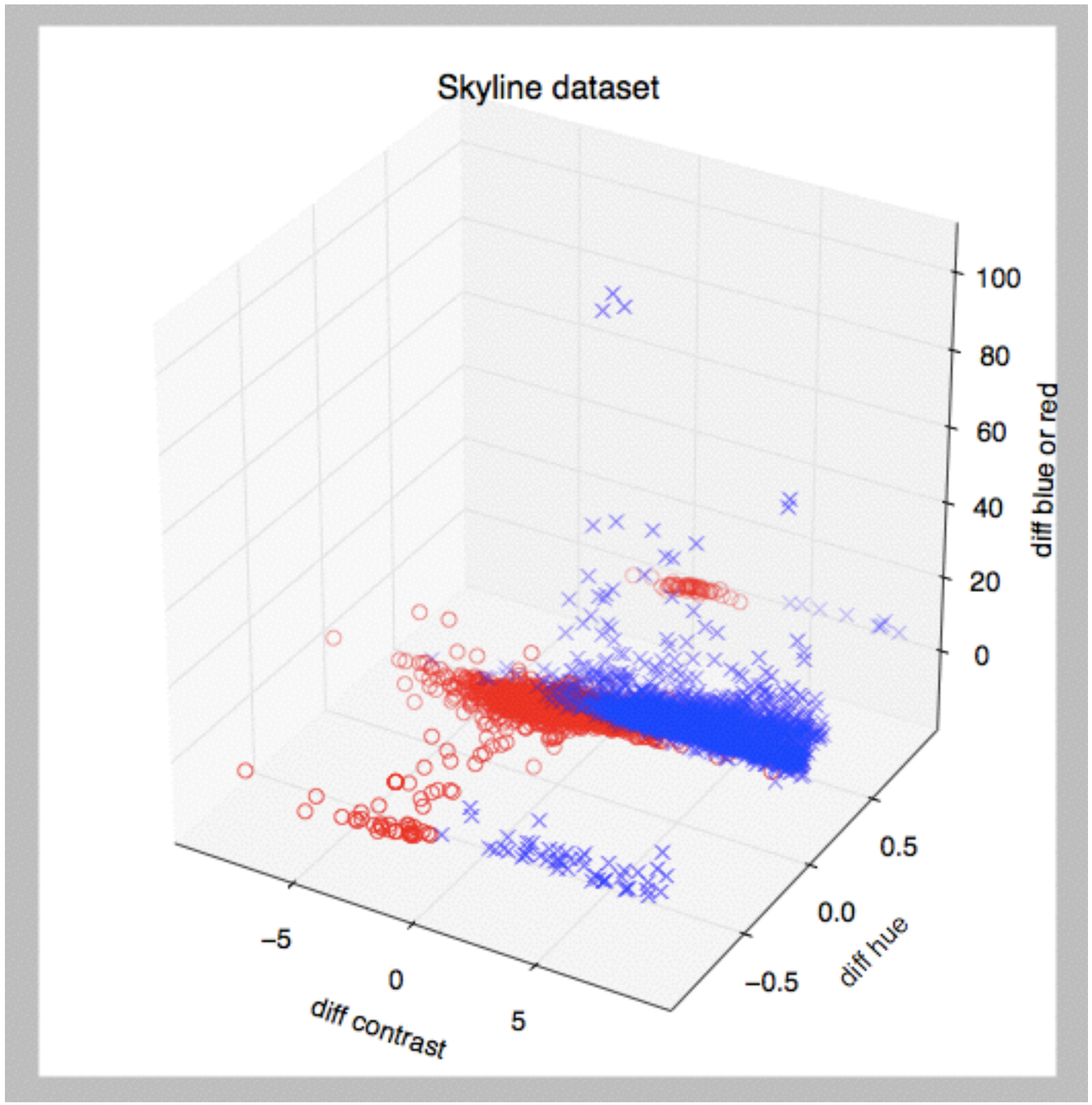
All RED SKY data in one



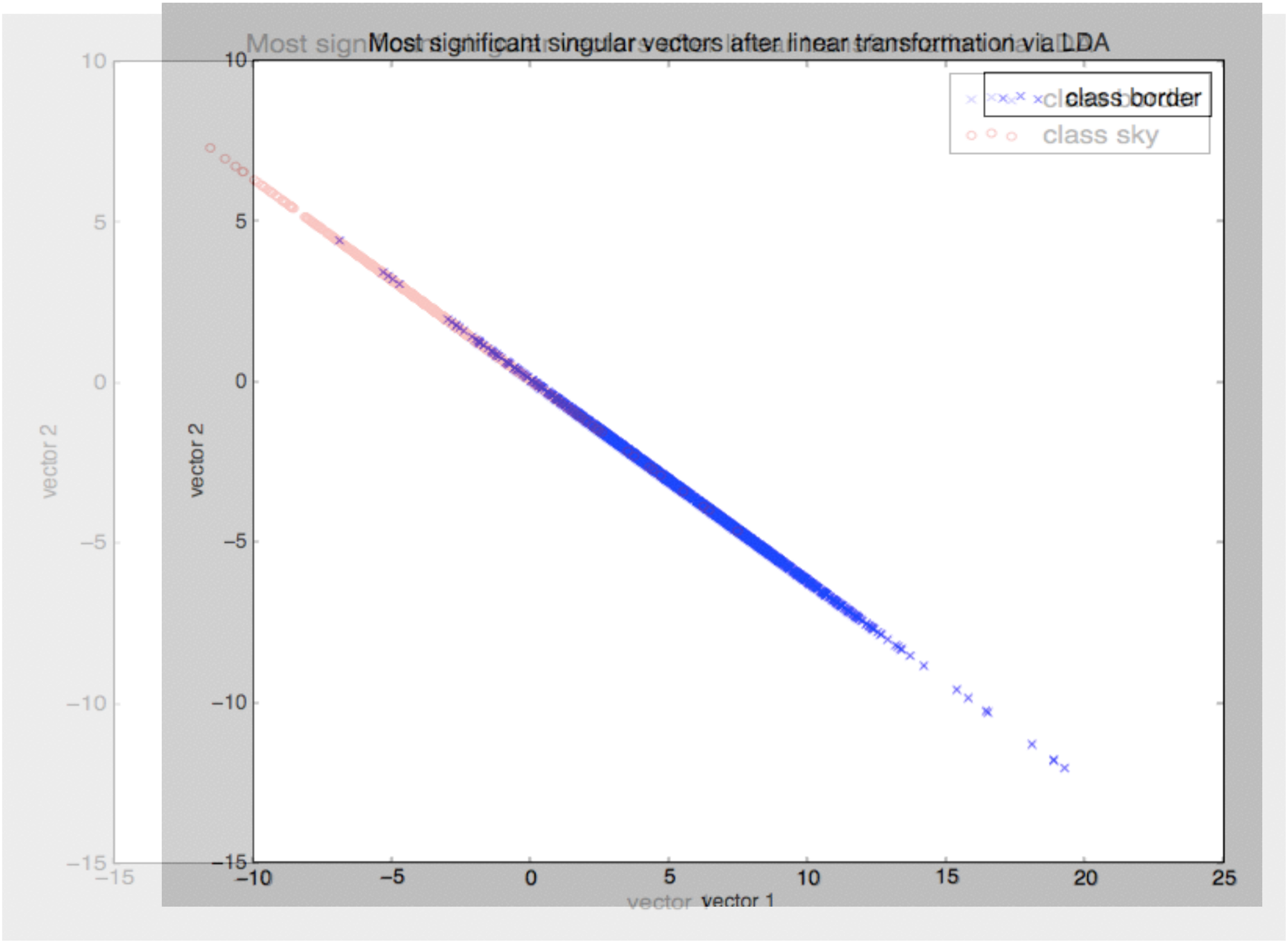
All RED SKY data in one



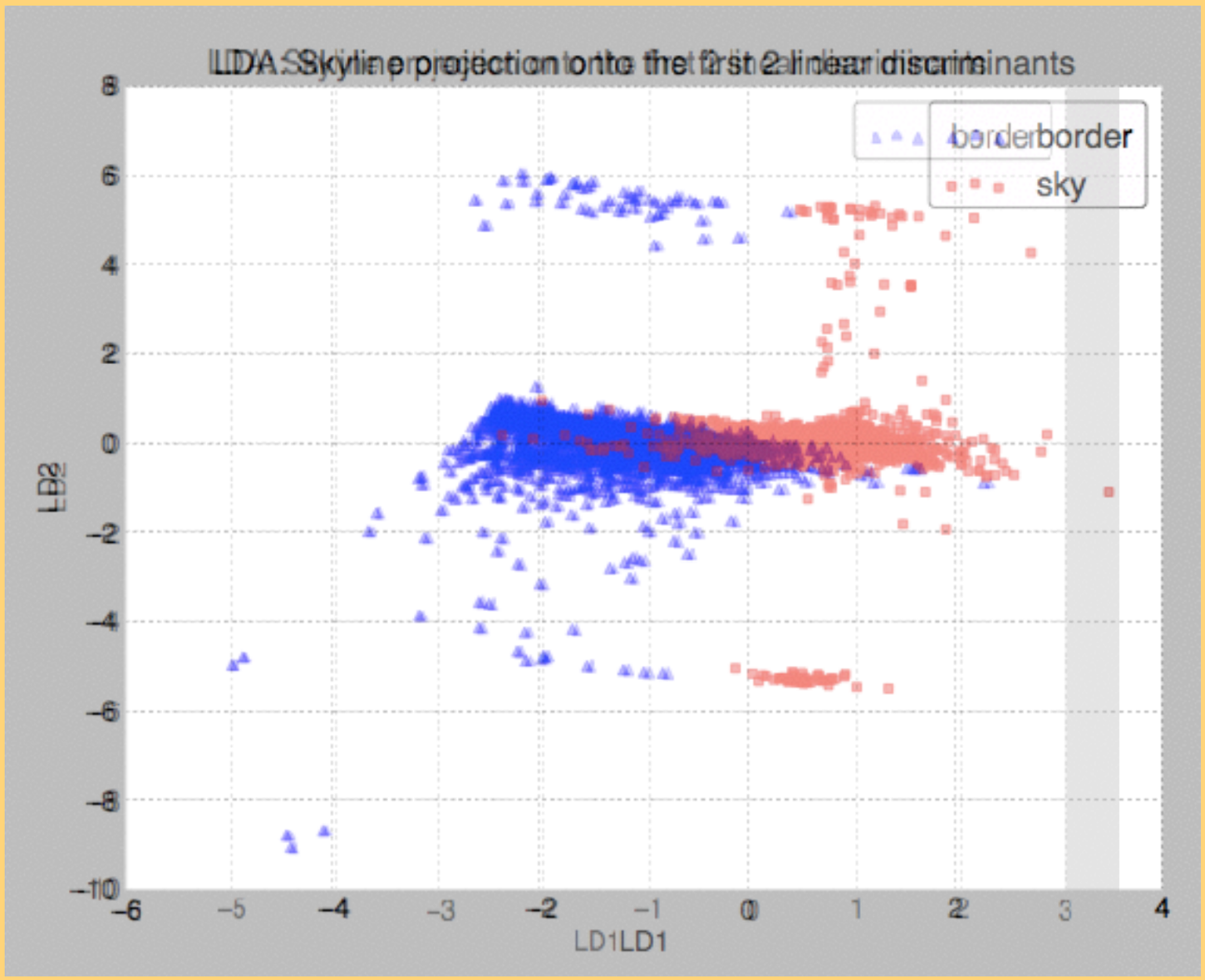
All RED SKY data in one



All RED SKY data in one,



<u>All RED SKY data in one</u>, filtered for math.abs(contrastDiff) > 1 AND math.abs(blueOrRedDiff) > 1 for border points and the opposite for sky points<u>:</u>



unfortunately, not separable when all blue sky image data is combined

```
                          contrast  hue     BorR
Mean Vector class 1: [ 1.0824  0.1032  0.7375]

Mean Vector class 2: [-0.6573 -0.0627 -0.4479]

('within-class Scatter Matrix:\n',
array([[ 1809.2505,   175.4663,   476.6231],
       [  175.4663,  6229.4697,    77.5903],
       [  476.6231,    77.5903,  4199.1555]]))
('between-class Scatter Matrix:\n',
array([[ 13799.5234,   1692.8768,   9535.2608],
       [  1692.8768,    538.8659,   1286.4054],
       [  9535.2608,   1286.4054,   6629.8085]]))

Eigenvector 1:
[[-0.9805]
 [-0.0072]
 [-0.1964]]
Eigenvalue 1: 8.25e+00

Eigenvector 2:
[[-0.5214]
 [-0.2835]
 [ 0.8049]]
Eigenvalue 2: -2.90e-16

Eigenvector 3:
[[ 0.3829]
 [-0.8305]
 [-0.4044]]
Eigenvalue 3: 6.22e-02
ok
Eigenvalues in decreasing order:

8.24847354789
0.062191641456
2.89500454678e-16
Variance explained:

eigenvalue 1: 99.25%
eigenvalue 2: 0.75%
eigenvalue 3: 0.00%
('Matrix W:\n', array([[-0.9805, -0.0072, -0.1964],
       [ 0.3829, -0.8305, -0.4044]]))
```