Test_quadrant

March 26, 2018

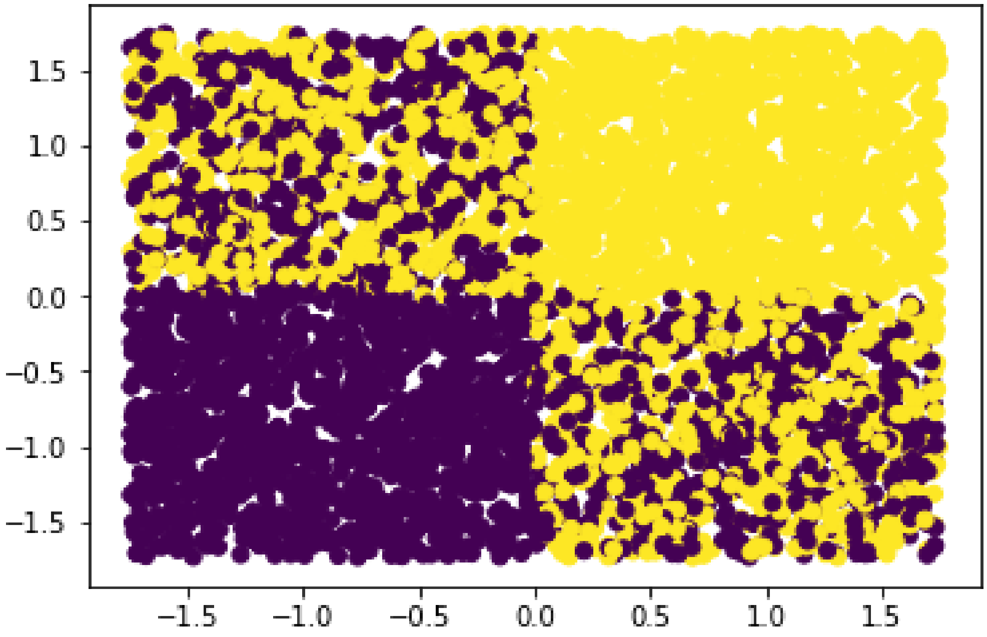
```
In [1]: import sys
        sys.path.append("../dev_scripts/")
        import exp_tools
        import sklearn
        from sklearn.preprocessing import StandardScaler
        import numpy as np
        from fri import bounds,plot_dendrogram_and_intervals
        from fri import *
        from sklearn.metrics import precision_score
        import matplotlib.pyplot as plt
        import pandas as pd

        %matplotlib inline
```

Generate problem data

```
In [32]: state = np.random.RandomState(123)
         X,y = exp_tools.gen_quadrant_problem(random_state=state)
```

Plot of data colored using class assignment

```
In [33]: plt.scatter(X[:,0],X[:,1],c=y)

Out[33]: <matplotlib.collections.PathCollection at 0x7f2962a99400>
```



```
In [34]: pd.DataFrame(X).corr()

Out[34]:           0         1         2         3
         0  1.000000 -0.007414  0.018837 -0.007725
         1 -0.007414  1.000000 -0.001506 -0.005419
         2  0.018837 -0.001506  1.000000 -0.000587
         3 -0.007725 -0.005419 -0.000587  1.000000
```

Feature 1 and 2 are not correlated, feature 3 and 4 are random
Running fri allowing 15% deviation of optimal results weight L1 and high allowed slack

```
In [35]: f = FRIClassification(optimum_deviation=0.15,C=0.000526)

In [36]: f.fit(X,y)
```

Score of model is as expected. We always have 25% misclassifications.

```
In [37]: f.score(X,y)

Out[37]: 0.74697829165438456

In [38]: f.optim_loss_

Out[38]: 3547.9851427464191

In [39]: f.optim_L1_
```

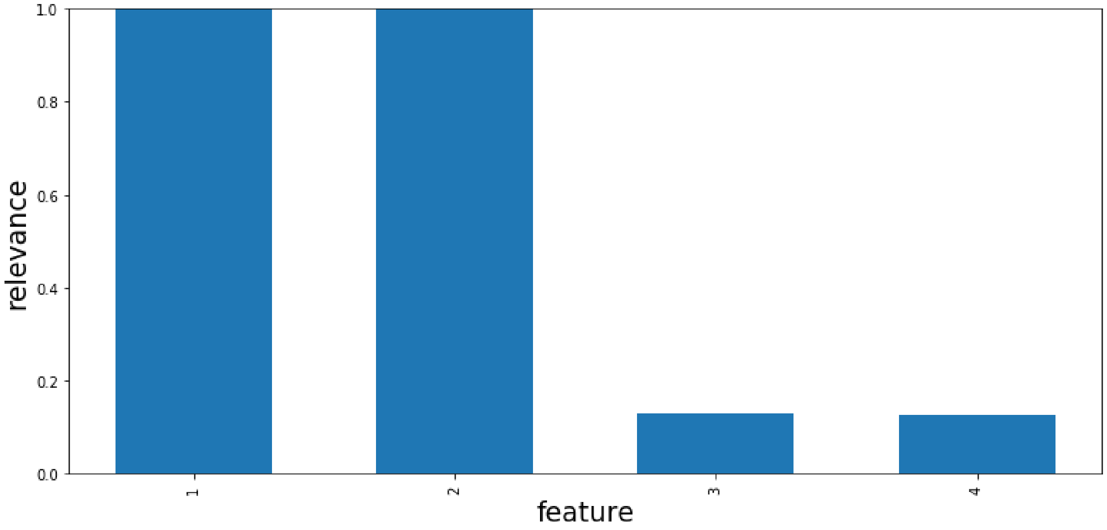
```
Out[39]: 0.77922291018659162
```

Feature 1 and 2 can be completely replaced by each other

```
In [40]: f.interval_
```

```
Out[40]: array([[ 0.        ,  1.        ],
                [ 0.        ,  1.        ],
                [ 0.        ,  0.12910328],
                [ 0.        ,  0.12620992]])
```

```
In [41]: p = plotIntervals(f.interval_)
```



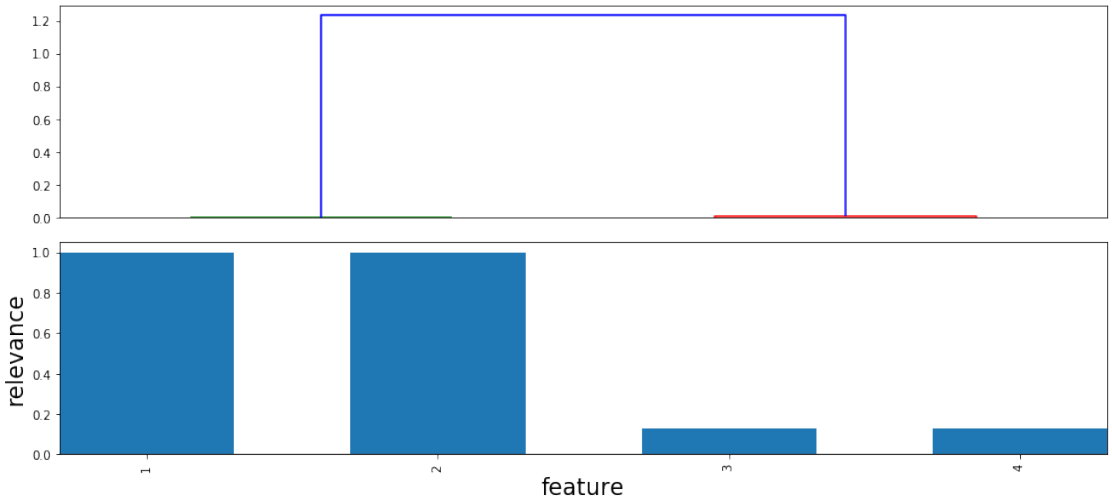
0.1 Groups?

```
In [42]: clust, link, feat_points,dist_mat = f.community_detection2(X,y,mode="both")
```

```
In [43]: clust
```

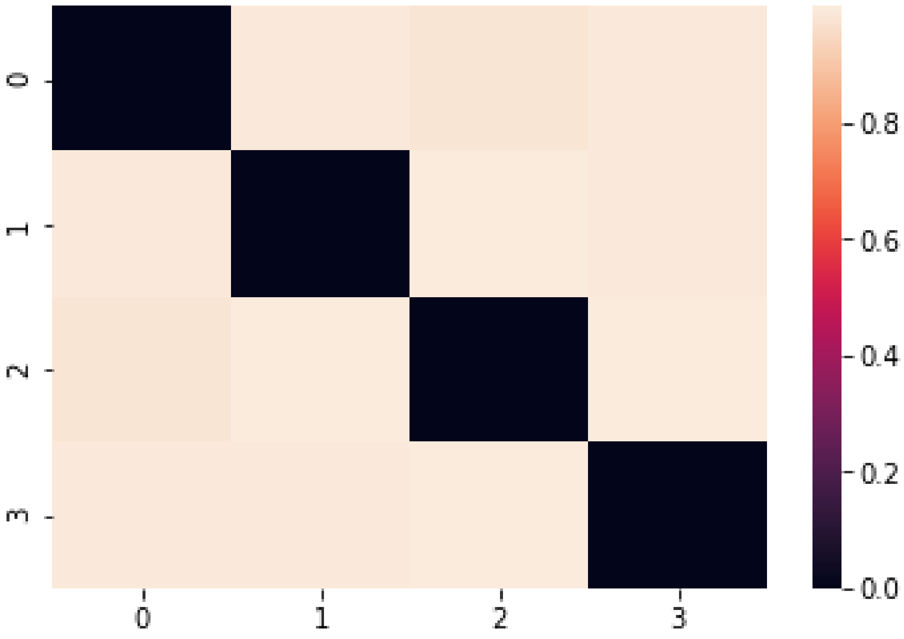
```
Out[43]: array([1, 1, 2, 2], dtype=int32)
```

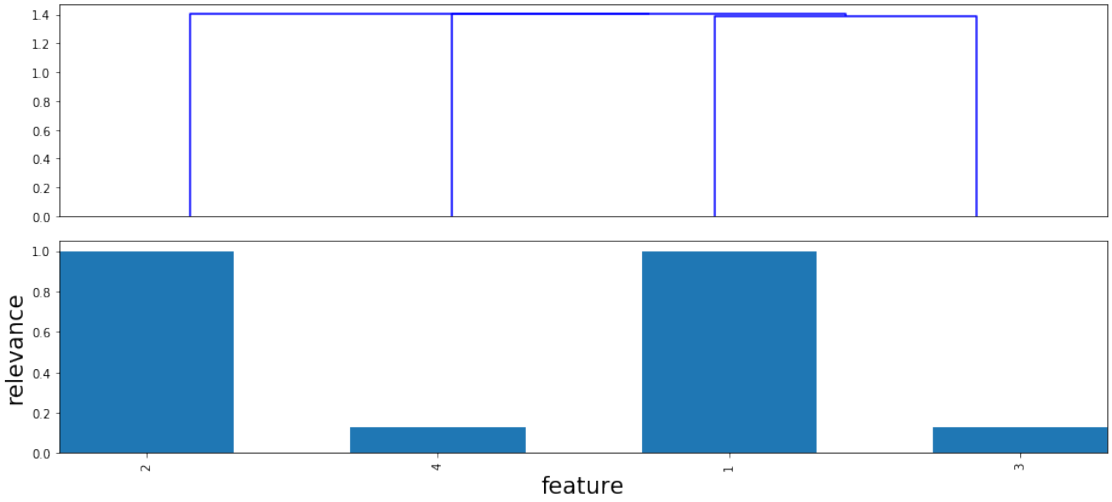
```
In [44]: p = plot_dendrogram_and_intervals(f.interval_,link)
```



```
In [48]: import pandas as pd
         import seaborn as sns
         corr_pd = pd.DataFrame(X).corr()

         corr_pd = 1-corr_pd.abs()
         corr_pd = corr_pd.values

         sns.heatmap(corr_pd)

         from scipy.spatial.distance import squareform
         from scipy.cluster.hierarchy import linkage
         z = linkage(corr_pd,method="single")
         threshold = 0.55*np.max(z[:, 2])
         p = plot_dendrogram_and_intervals(f.interval_,z)
```

```
/home/lpfannschmidt/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:12: ClusterWarni
  if sys.path[0] == '':
```





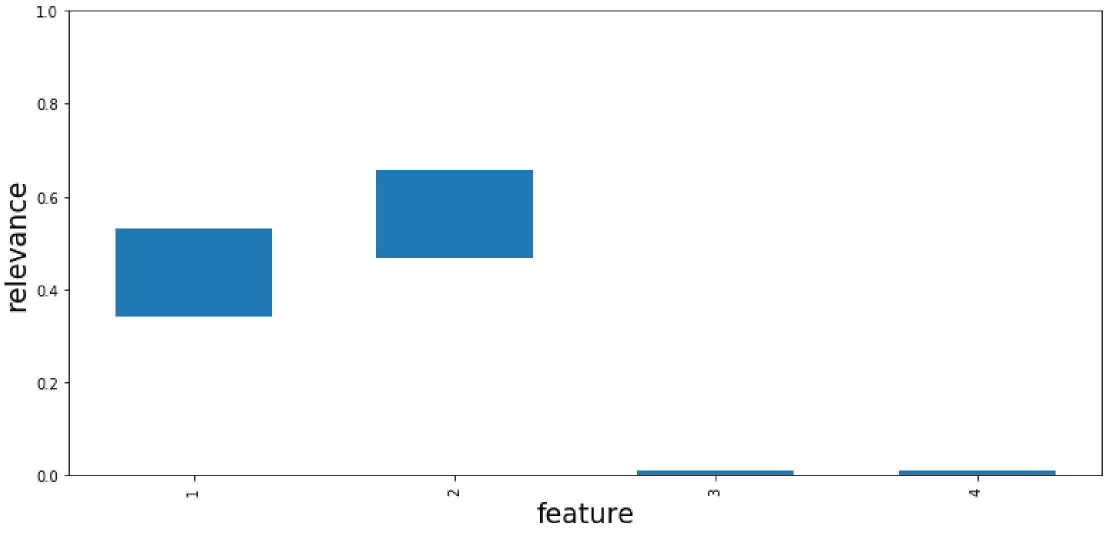
1 For comparison a normal run of fri

```
In [15]: f = FRIClassification(debug=True,C=0.001)
         f.fit(X,y)
```

```
loss 2976.92442918
L1 1.03763881734
```

```
offset -0.0013462985152097088
C 0.001
score 0.759785347434
coef:
[[  4.43706795e-01]
 [  5.83658371e-01]
 [  6.08241591e-16]
 [  1.49576441e-15]]
```

```
In [16]: f.score(X,y)

Out[16]: 0.75978534743368586

In [17]: f.optim_L1_

Out[17]: 1.0376388173382025

In [18]: f.optim_loss_

Out[18]: 2976.9244291774571

In [19]: f.tuned_C_

Out[19]: 0.001

In [20]: p = plotIntervals(f.interval_)
```


relevance
feature