About skills_detector.ipynb

This notebook detects skills in log files suchs as CVS. This is a work in progress :)

In [1]:

```
%load_ext autoreload
%autoreload 1
%aimport utils_timeline_viz
from utils_timeline_viz import *
from utils_read_parsing import *
import matplotlib.pyplot as plt
%matplotlib inline
matplotlib.style.use('ggplot')
matplotlib.rcParams['figure.figsize'] = 10, 7
from matplotlib.backends.backend_pdf import PdfPages
pd.set_option('precision',3)
np.set_printoptions(precision=3,suppress=True)
```

In [2]:

```
table_cvs_df = pd.read_csv('table_cvs_results.txt', sep='\t')
graph_cvs_df = pd.read_csv('graph_cvs_results.txt', sep='\t')
```

In [3]:

```
metadf = get_student_metadata()
order = dict(zip(metadf.index,metadf['activity order']))
graph_cvs_df['activity order'] = graph_cvs_df.studentid.apply(lambda sid: order[sid])
table_cvs_df['activity order'] = table_cvs_df.studentid.apply(lambda sid: order[sid])
```

Since we want a more stringent definition of CVS, we keep all instances of CVS where they had a sample or 3 or more points

In [4]:

```
graph_cvs_df = graph_cvs_df.replace(to_replace=2,value=0)
table_cvs_df = table_cvs_df.replace(to_replace=2,value=0)
```

In [5]:

```
table_cvs_df.head()
```

Out[5]:

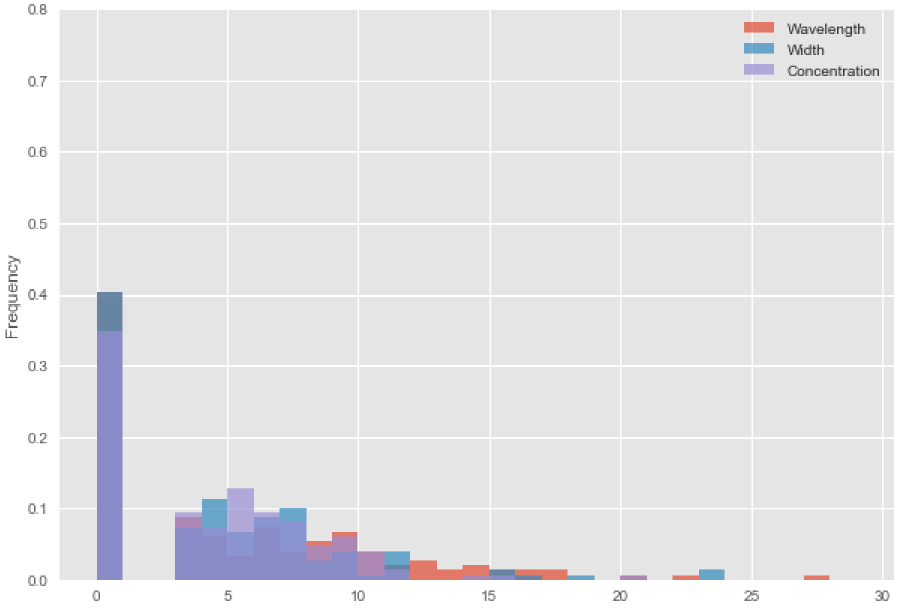
	studentid	Battery voltage	Area	Separation	Wavelength	Width	Concentration	activity order
0	11612162	0	0	0	3	0	3	CL
1	13660166	0	0	0	0	0	14	LC
2	41947147	0	0	0	14	6	7	CL
3	64006159	0	0	0	5	0	6	LC
4	15749160	0	0	3	0	4	10	CL

In [6]:

```
table_cvs_df[['Wavelength','Width','Concentration']].plot.hist(alpha=0.7,bins=range(30),normed =T
rue,ylim=(0,0.8))
```

Out[6]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xc1c20f0>
```

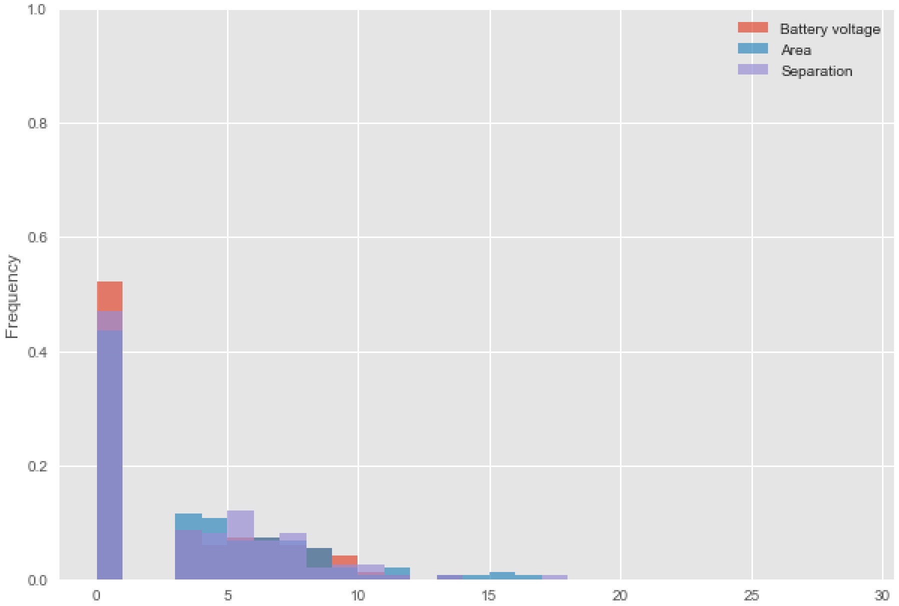


In [7]:

```
table_cvs_df[['Battery voltage','Area','Separation']].plot.hist(alpha=0.7,bins=range(30),normed =
True,ylim=(0,1))
```

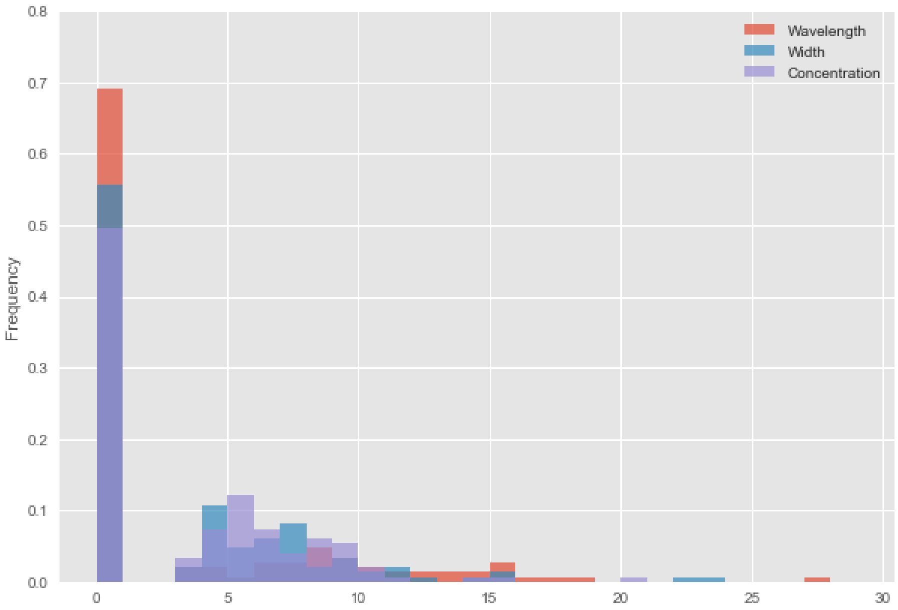
Out[7]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xc57f7f0>
```



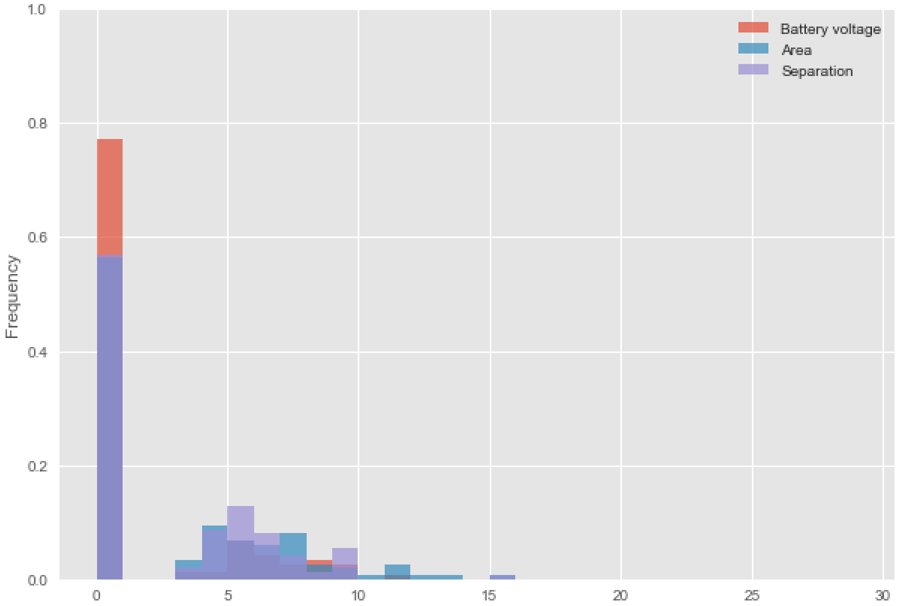
In [8]:
```
graph_cvs_df[['Wavelength','Width','Concentration']].plot.hist(alpha=0.7,bins=range(30),normed =T
rue,ylim=(0,0.8))
```

Out[8]:
```
<matplotlib.axes._subplots.AxesSubplot at 0xd5c57f0>
```



In [9]:
```
graph_cvs_df[['Battery voltage','Area','Separation']].plot.hist(alpha=0.7,bins=range(30),normed =
True,ylim=(0,1))
```

Out[9]:
```
<matplotlib.axes._subplots.AxesSubplot at 0xd8cf390>
```



In [10]:

```
def binarize(number):
    if number >0:
        return 1
    else:
        return 0

graph_cvs_df2 = graph_cvs_df.copy()
for c in graph_cvs_df:
    if c not in  ['studentid','activity order']:
        graph_cvs_df2[c] = graph_cvs_df.apply(lambda row: binarize(row[c]), axis=1)

table_cvs_df2 = table_cvs_df.copy()
for c in table_cvs_df:
     if c not in['studentid','activity order']:
        table_cvs_df2[c] = table_cvs_df.apply(lambda row: binarize(row[c]), axis=1)
```

In [11]:

```
graph_cvs_df2['sum'] = graph_cvs_df2[["Battery voltage","Area","Separation","Wavelength","Width",
"Concentration"]].sum(axis=1)
table_cvs_df2['sum'] = table_cvs_df2[["Battery voltage","Area","Separation","Wavelength","Width",
"Concentration"]].sum(axis=1)
```

ANALYSIS

In [12]:

```
print "Of all {0} students, {1} didn't do CVS in the table and {2} in the graph.".format(len(tabl
e_cvs_df2), sum(table_cvs_df2['sum']==0),sum(graph_cvs_df2['sum']==0))
print "On average, out of a max of six variables, students did CVS on {0}+/-{1} variables in the
 table and {2}+/-{3} in the graph.".format(np.mean(table_cvs_df2['sum'].values),np.std(table_cvs_
df2['sum'].values),np.mean(graph_cvs_df2['sum'].values),np.std(graph_cvs_df2['sum'].values))
```

```
Of all 149 students, 14 didn't do CVS in the table and 47 in the graph.
On average, out of a max of six variables, students did CVS on 3.41610738255+/-2.04020222429 variables in the table and 2.34899328859+/-2.065
78445862 in the graph.
```

In [13]:

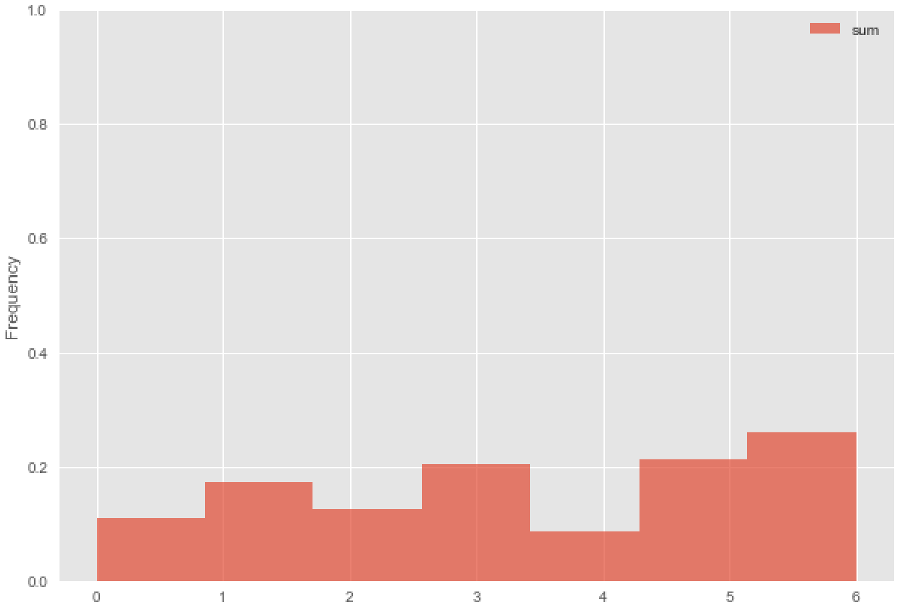
```
table_cvs_df2.head()
```

Out[13]:

	studentid	Battery voltage	Area	Separation	Wavelength	Width	Concentration	activity order	sum
0	11612162	0	0	0	1	0	1	CL	2
1	13660166	0	0	0	0	0	1	LC	1
2	41947147	0	0	0	1	1	1	CL	3
3	64006159	0	0	0	1	0	1	LC	2
4	15749160	0	0	1	0	1	1	CL	3

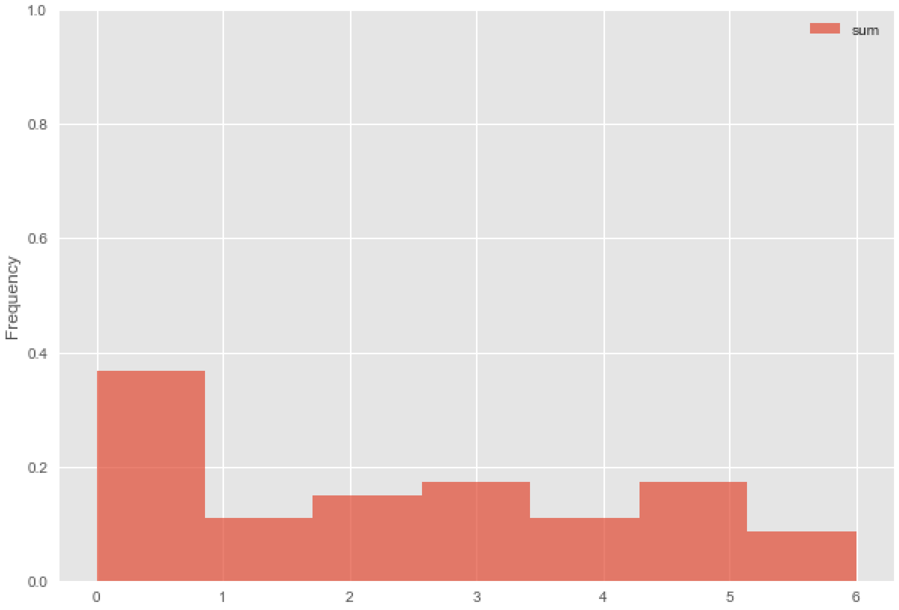
In [14]:
```
table_cvs_df2[['sum']].plot.hist(alpha=0.7,bins=7,normed =True,ylim=(0,1))
```

Out[14]:
```
<matplotlib.axes._subplots.AxesSubplot at 0xc765390>
```



In [15]:
```
graph_cvs_df2[['sum']].plot.hist(alpha=0.7,bins=7,normed =True,ylim=(0,1))
```

Out[15]:
```
<matplotlib.axes._subplots.AxesSubplot at 0xe21b240>
```



In [16]:
```
graph_cvs_df2.mean()
```

Out[16]:
```
studentid          2.200e+07
Battery voltage    2.282e-01
Area               4.362e-01
Separation         4.295e-01
Wavelength         3.087e-01
Width              4.430e-01
Concentration      5.034e-01
sum                2.349e+00
dtype: float64
```

In [17]:

```
print "Percentage of students doing CVS in the table for each variable:"
for c in table_cvs_df2:
    if c not in['studentid','activity order','sum']:
        print '\t',c,":\t", round(np.mean(table_cvs_df2[c].values),2)
print "Percentage of students doing CVS in the graph for each variable:"
for c in graph_cvs_df2:
    if c not in['studentid','activity order','sum']:
        print '\t',c,":\t", round(np.mean(graph_cvs_df2[c].values),2)
```

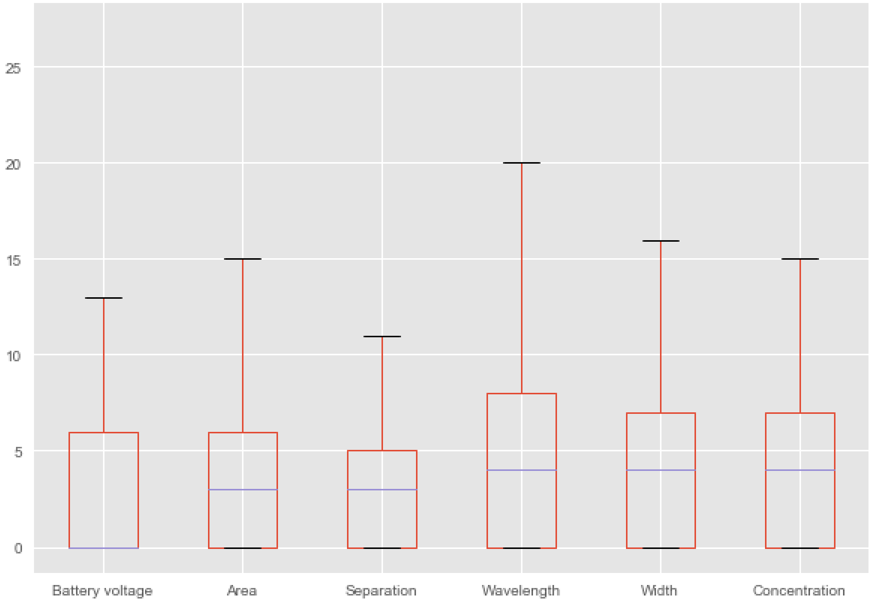
```
Percentage of students doing CVS in the table for each variable:
        Battery voltage :       0.48
        Area :  0.56
        Separation :    0.53
        Wavelength :    0.6
        Width : 0.6
        Concentration : 0.65
Percentage of students doing CVS in the graph for each variable:
        Battery voltage :       0.23
        Area :  0.44
        Separation :    0.43
        Wavelength :    0.31
        Width : 0.44
        Concentration : 0.5
```

In [18]:

```
table_cvs_df[["Battery voltage","Area","Separation","Wavelength","Width","Concentration"]].plot.b
ox()
```

Out[18]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xe110ba8>
```

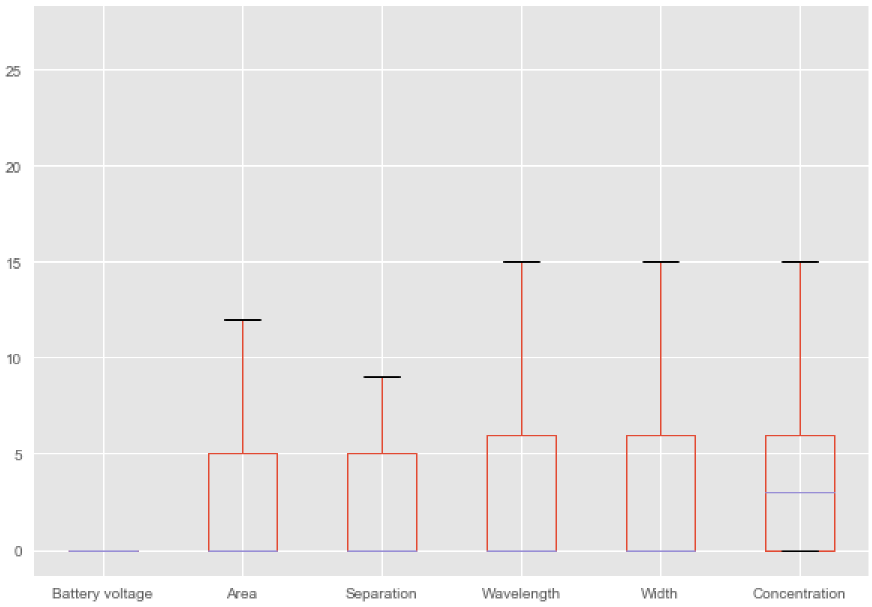


In [19]:

```
graph_cvs_df[["Battery voltage","Area","Separation","Wavelength","Width","Concentration"]].plot.b
ox()
```

Out[19]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xea80828>
```



Difference between CL and LC

In [20]:

```
table_cvs_df.groupby(by='activity order').mean()
```

Out[20]:

	studentid	Battery voltage	Area	Separation	Wavelength	Width	Concentration
activity order							
CL	2.009e+07	2.722	2.819	2.653	5.236	4.514	4.278
LC	2.378e+07	2.922	3.961	3.519	4.662	3.649	4.013

In [21]:

```
graph_cvs_df.groupby(by='activity order').mean()
```

Out[21]:

	studentid	Battery voltage	Area	Separation	Wavelength	Width	Concentration
activity order							
CL	2.009e+07	1.306	2.208	2.097	3.306	3.764	3.667
LC	2.378e+07	1.571	3.286	2.883	2.714	2.571	2.948

In [22]:

```
table_cvs_df_CL = table_cvs_df[table_cvs_df['activity order']=='CL']
table_cvs_df_LC = table_cvs_df[table_cvs_df['activity order']=='LC']
table_cvs_df2_CL = table_cvs_df2[table_cvs_df2['activity order']=='CL']
table_cvs_df2_LC = table_cvs_df2[table_cvs_df2['activity order']=='LC']
graph_cvs_df_CL = graph_cvs_df[graph_cvs_df['activity order']=='CL']
graph_cvs_df_LC = graph_cvs_df[graph_cvs_df['activity order']=='LC']
graph_cvs_df2_CL = graph_cvs_df2[graph_cvs_df2['activity order']=='CL']
graph_cvs_df2_LC = graph_cvs_df2[graph_cvs_df2['activity order']=='LC']
```

```
In [23]: print "In table"
         print "\tPercentage of students doing CVS in the table for each variable for LC:"
         for c in table_cvs_df2_LC:
              if c not in['studentid','activity order','sum']:
                 print '\t\t',c,":\t", round(np.mean(table_cvs_df2_LC[c].values),2)
         print "\tPercentage of students doing CVS in the table for each variable for CL:"
         for c in table_cvs_df2_CL:
              if c not in['studentid','activity order','sum']:
                 print '\t\t',c,":\t", round(np.mean(table_cvs_df2_CL[c].values),2)

         print "In graph"
         print "\tPercentage of students doing CVS in the graph for each variable for LC:"
         for c in graph_cvs_df2_LC:
              if c not in['studentid','activity order','sum']:
                 print '\t\t',c,":\t", round(np.mean(graph_cvs_df2_LC[c].values),2)
         print "\tPercentage of students doing CVS in the graph for each variable for CL:"
         for c in graph_cvs_df2_CL:
              if c not in['studentid','activity order','sum']:
                 print '\t\t',c,":\t", round(np.mean(graph_cvs_df2_CL[c].values),2)
```

```
In table
        Percentage of students doing CVS in the table for each variable for LC:
                Battery voltage :       0.48
                Area :  0.66
                Separation :    0.58
                Wavelength :    0.6
                Width : 0.61
                Concentration : 0.66
        Percentage of students doing CVS in the table for each variable for CL:
                Battery voltage :       0.47
                Area :  0.46
                Separation :    0.47
                Wavelength :    0.6
                Width : 0.58
                Concentration : 0.64
In graph
        Percentage of students doing CVS in the graph for each variable for LC:
                Battery voltage :       0.23
                Area :  0.53
                Separation :    0.49
                Wavelength :    0.27
                Width : 0.39
                Concentration : 0.48
        Percentage of students doing CVS in the graph for each variable for CL:
                Battery voltage :       0.22
                Area :  0.33
                Separation :    0.36
                Wavelength :    0.35
                Width : 0.5
                Concentration : 0.53
```

table + graph combo

In [24]:

```
for var in ["Battery voltage","Area","Separation","Wavelength","Width","Concentration"]:
    print '\n',var, " CL, LC"
    noneCL = len(set(table_cvs_df2_CL[table_cvs_df2_CL[var]==0].index.values).intersection(set(graph_cvs_df2_CL[graph_cvs_df2_CL[var]==0].index.values)))/float(len(table_cvs_df2_CL))
    noneLC = len(set(table_cvs_df2_LC[table_cvs_df2_LC[var]==0].index.values).intersection(set(graph_cvs_df2_LC[graph_cvs_df2_LC[var]==0].index.values)))/float(len(table_cvs_df2_LC))
    print '\t none\t:',round(noneCL,2),round(noneLC,2)
    tableCL = len(set(table_cvs_df2_CL[table_cvs_df2_CL[var]==1].index.values).intersection(set(graph_cvs_df2_CL[graph_cvs_df2_CL[var]==0].index.values)))/float(len(table_cvs_df2_CL))
    tableLC = len(set(table_cvs_df2_LC[table_cvs_df2_LC[var]==1].index.values).intersection(set(graph_cvs_df2_LC[graph_cvs_df2_LC[var]==0].index.values)))/float(len(table_cvs_df2_LC))
    print '\t table\t:',round(tableCL,2),round(tableLC,2)
    graphCL = len(set(table_cvs_df2_CL[table_cvs_df2_CL[var]==0].index.values).intersection(set(graph_cvs_df2_CL[graph_cvs_df2_CL[var]==1].index.values)))/float(len(table_cvs_df2_CL))
    graphLC = len(set(table_cvs_df2_LC[table_cvs_df2_LC[var]==0].index.values).intersection(set(graph_cvs_df2_LC[graph_cvs_df2_LC[var]==1].index.values)))/float(len(table_cvs_df2_LC))
    print '\t graph\t:',round(graphCL,2),round(graphLC,2)
    bothCL = len(set(table_cvs_df2_CL[table_cvs_df2_CL[var]==1].index.values).intersection(set(graph_cvs_df2_CL[graph_cvs_df2_CL[var]==1].index.values)))/float(len(table_cvs_df2_CL))
    bothLC = len(set(table_cvs_df2_LC[table_cvs_df2_LC[var]==1].index.values).intersection(set(graph_cvs_df2_LC[graph_cvs_df2_LC[var]==1].index.values)))/float(len(table_cvs_df2_LC))
    print '\t both\t:',round(bothCL,2),round(bothLC,2)
```

```
Battery voltage  CL, LC
         none   : 0.53 0.52
         table  : 0.25 0.25
         graph  : 0.0 0.0
         both   : 0.22 0.23

Area  CL, LC
         none   : 0.54 0.34
         table  : 0.13 0.13
         graph  : 0.0 0.0
         both   : 0.33 0.53

Separation  CL, LC
         none   : 0.53 0.42
         table  : 0.11 0.09
         graph  : 0.0 0.0
         both   : 0.36 0.49

Wavelength  CL, LC
         none   : 0.4 0.4
         table  : 0.25 0.32
         graph  : 0.0 0.0
         both   : 0.35 0.27

Width  CL, LC
         none   : 0.42 0.39
         table  : 0.08 0.22
         graph  : 0.0 0.0
         both   : 0.5 0.39

Concentration  CL, LC
         none   : 0.36 0.34
         table  : 0.11 0.18
         graph  : 0.0 0.0
         both   : 0.53 0.48
```

In [ ]: