project_sm

November 27, 2017

In [6]:
```
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
%matplotlib inline
```

In [7]:
```
#Read datafiles
adnimerge = pd.read_csv("../Data/foi/ADNIMERGE.csv")
adnimerge = adnimerge[['RID','EXAMDATE','AGE','DX_bl','DX','Month_bl']]
adnimerge.head()

mem_ef = pd.read_csv("../Data/foi/UWNPSYCHSUM_10_27_17.csv")
bl = mem_ef[mem_ef.VISCODE =="bl"]
bl = bl[['RID','ADNI_MEM','ADNI_EF']]
bl.columns = ['RID','ADNI_MEM_bl','ADNI_EF_bl']
m = mem_ef[mem_ef.VISCODE != "bl"]
m = m[['RID','EXAMDATE','ADNI_MEM','ADNI_EF']]
```

In [8]:
```
#Removing rows with NAs
mem = pd.merge(m,bl,on="RID")
mem = mem.dropna(axis=0, how='any')
```

In [9]:
```
#AdNImerge file - removing subjects that had the baseline diagnosis as AD
adnimerge.head()
adnimerge['EXAMDATE'] = pd.to_datetime(adnimerge['EXAMDATE'])
mem['EXAMDATE'] = pd.to_datetime(mem['EXAMDATE'])
x = pd.merge(mem,adnimerge,how='inner',on=['RID','EXAMDATE'])
x = x[x.DX_bl != "AD"]
x.head(10)
```

Out[9]:

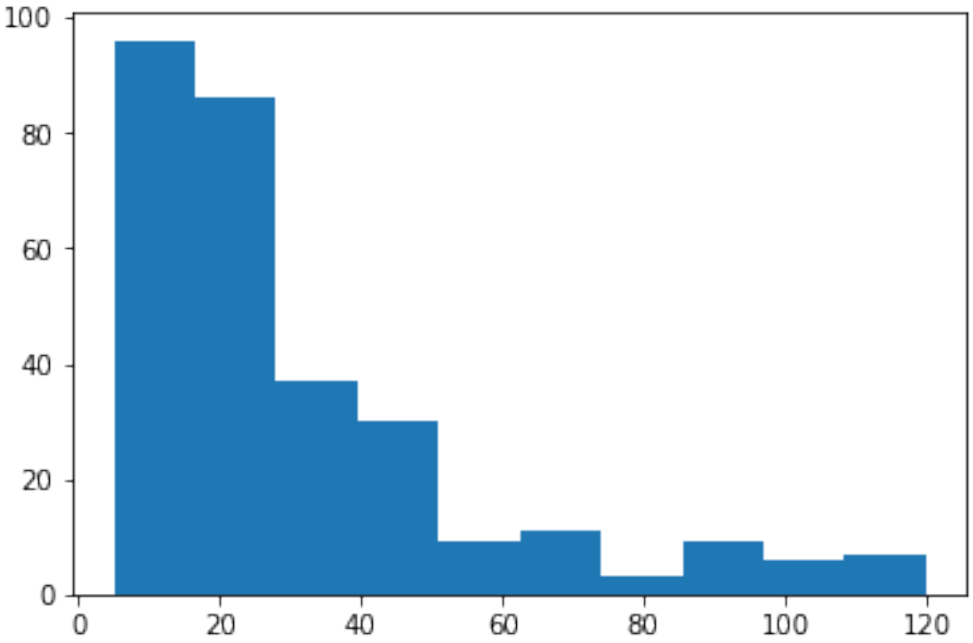
	RID	EXAMDATE	ADNI_MEM	ADNI_EF	ADNI_MEM_bl	ADNI_EF_bl	AGE	DX_bl	\
0	2	2006-03-06	0.585	-0.197	0.503	-0.060	74.3	CN	
1	2	2008-08-27	0.403	-0.008	0.503	-0.060	74.3	CN	
2	2	2013-09-09	0.325	-0.726	0.503	-0.060	74.3	CN	
3	2	2011-09-19	0.349	0.304	0.503	-0.060	74.3	CN	
4	2	2010-09-22	0.352	-0.295	0.503	-0.060	74.3	CN	

```
5     2 2015-09-22     0.384   -0.553        0.503      -0.060  74.3    CN
6     2 2012-09-26     0.425   -0.234        0.503      -0.060  74.3    CN
10    4 2006-05-02     0.315   -0.688        0.116      -0.925  67.5  LMCI
11    4 2007-05-14     0.548   -0.471        0.116      -0.925  67.5  LMCI
12    4 2006-11-14     0.201   -0.743        0.116      -0.925  67.5  LMCI
```

```
     DX   Month_bl
0    CN    5.86885
1    CN   35.54100
2    CN   95.83610
3    CN   72.19670
4    CN   60.32790
5    CN  120.19700
6   MCI   84.42620
10  MCI    5.73770
11  MCI   18.09840
12  MCI   12.16390
```

In [10]:
```
#Extracting subjects that converted to Dementia and checking the distribution of the
# change
x1 = x[x.DX_bl != x.DX]
x2 = x1[x1.DX == "Dementia"]
p = x2.groupby("RID")['Month_bl'].min()
plt.hist(p)
p.describe()
```

Out[10]:
```
count    294.000000
mean      31.891713
std       26.857860
min        5.049180
25%       12.163900
50%       23.819700
75%       39.557400
max      119.869000
Name: Month_bl, dtype: float64
```



In [11]:
```
#Using min and 75% cutoffs
ll = 5.04
ul = 39.55
q = pd.DataFrame({'RID':x2.RID.unique().tolist(), 'Month_bl':p.tolist()})
#Extracting the minimum Month_bl for subjects who convert to Dementia
z1 = pd.merge(x2,q,how='inner',on=['RID','Month_bl'])
z1 = z1[z1.Month_bl >ll]
z1 = z1[z1.Month_bl <ul]
t = p.tolist()
#Removing Dementia patients from the larger dataframe
x1 = x[~x.RID.isin(t)]
x1 = x1[x1.Month_bl >ll]
x1 = x1[x1.Month_bl <ul]
t1 = x1.RID.unique().tolist()
z2 = pd.DataFrame()
for i in t1:
    k = x1[x1.RID ==i]
    z2 = pd.concat([z2,k.sample(1)])
```

In [12]:
```
d = pd.concat([z1,z2])
d.describe()
ef_ch = []
mem_ch = []
#Deviation from baseline
d['EF_change'] = (d['ADNI_EF'] - d['ADNI_EF_bl'])/abs(d['ADNI_EF_bl'])
```

```
d['MEM_change'] = (d['ADNI_MEM'] - d['ADNI_MEM_bl'])/abs(d['ADNI_MEM_bl'])
d.head()
```

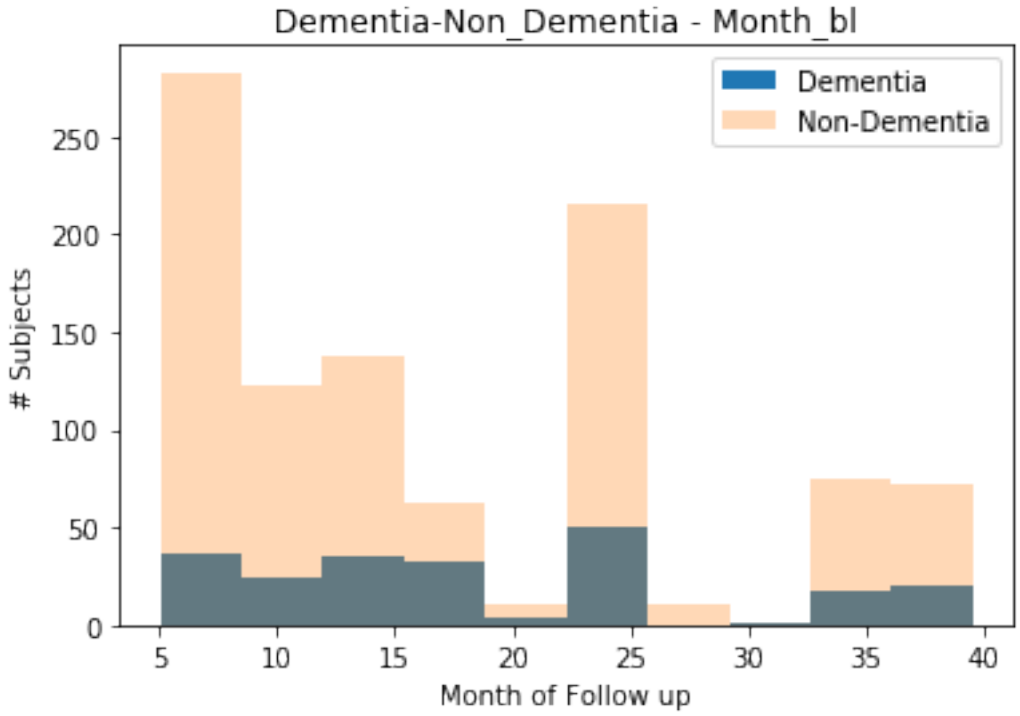
Out[12]:

	RID	EXAMDATE	ADNI_MEM	ADNI_EF	ADNI_MEM_bl	ADNI_EF_bl	AGE	DX_bl	DX	Month_bl	EF_change	MEM_change
0	30	2006-04-13	-0.638	-0.378	-0.261	-0.394	80.0	LMCI	Dementia	5.73770	0.040609	-1.444444
1	41	2007-05-14	-1.575	0.732	-1.268	0.891	70.9	LMCI	Dementia	17.90160	-0.178451	-0.242114
2	42	2006-11-09	-0.030	0.103	-0.050	0.310	72.8	LMCI	Dementia	11.93440	-0.667742	0.400000
3	45	2007-03-07	-1.405	-0.735	-0.511	-0.211	85.9	LMCI	Dementia	13.77050	-2.483412	-1.749511
4	50	2006-06-07	-0.555	-2.384	-0.022	-1.709	77.6	LMCI	Dementia	6.13115	-0.394968	-24.227273

In [ ]:

In [13]:
```
x = z1.Month_bl.tolist()
y = z2.Month_bl.tolist()
plt.hist(x,label="Dementia")
plt.title("Dementia-Non_Dementia - Month_bl")
plt.hist(y,alpha=0.3,label="Non-Dementia")
plt.xlabel('Month of Follow up')
plt.ylabel('# Subjects')
plt.legend()
```

Out[13]: <matplotlib.legend.Legend at 0xa921710>



```
In [20]: d['grp'] = np.where(d.DX == "Dementia", 'Dementia', 'No_Dementia')
         d.head()
```

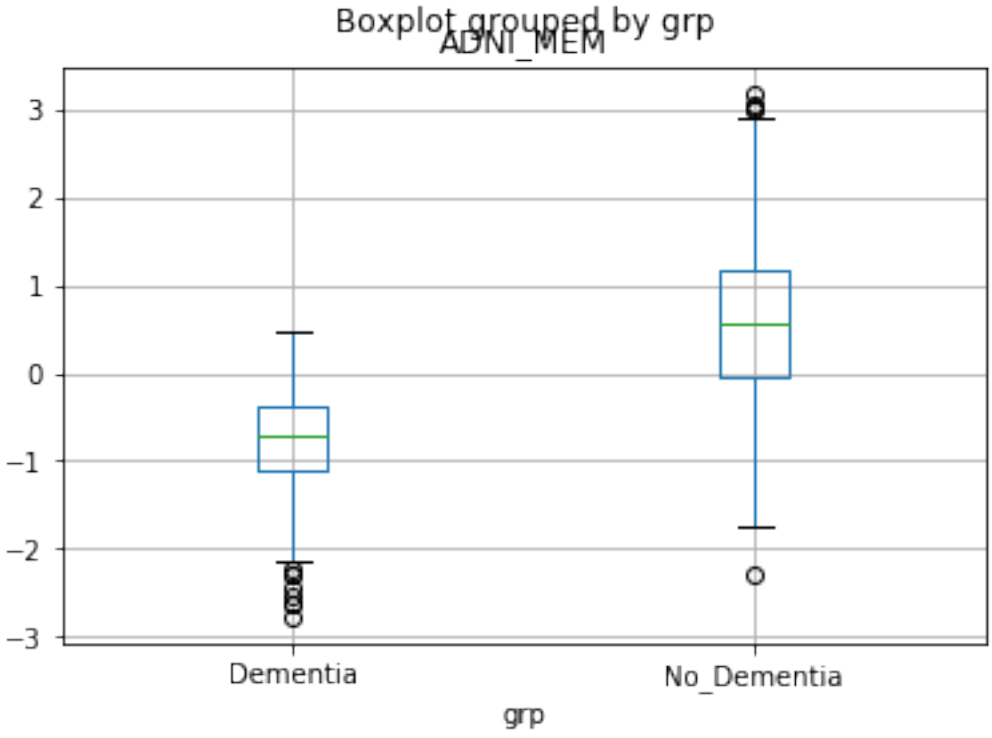
Out[20]:

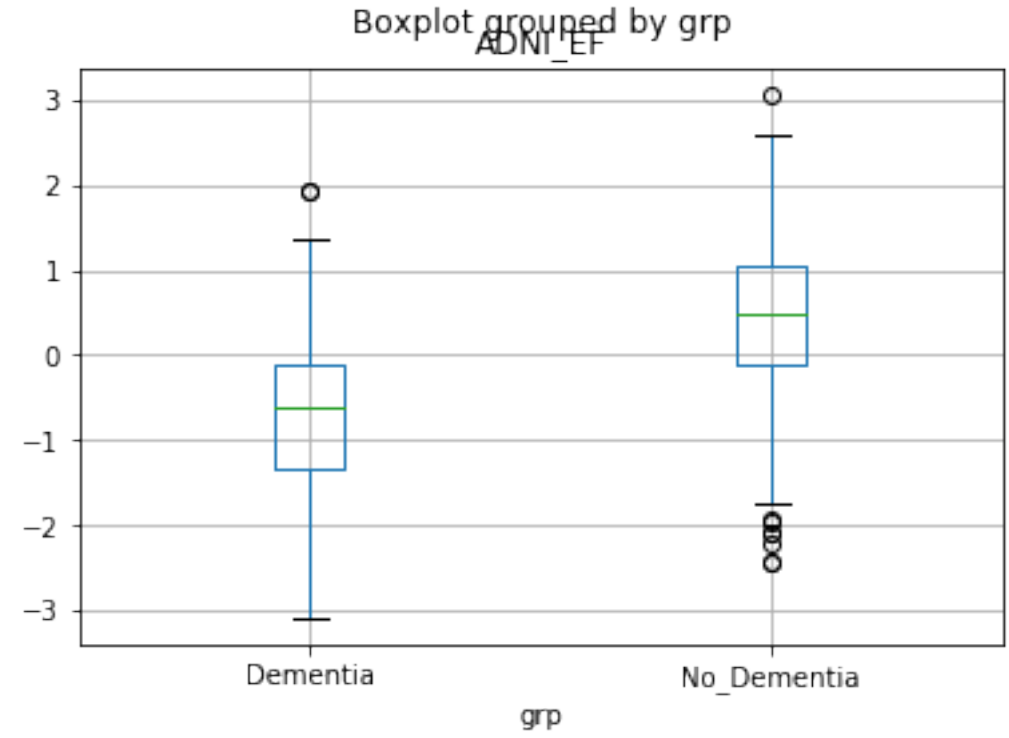
	RID	EXAMDATE	ADNI_MEM	ADNI_EF	ADNI_MEM_bl	ADNI_EF_bl	AGE	DX_bl	\
0	30	2006-04-13	-0.638	-0.378	-0.261	-0.394	80.0	LMCI	
1	41	2007-05-14	-1.575	0.732	-1.268	0.891	70.9	LMCI	
2	42	2006-11-09	-0.030	0.103	-0.050	0.310	72.8	LMCI	
3	45	2007-03-07	-1.405	-0.735	-0.511	-0.211	85.9	LMCI	
4	50	2006-06-07	-0.555	-2.384	-0.022	-1.709	77.6	LMCI	

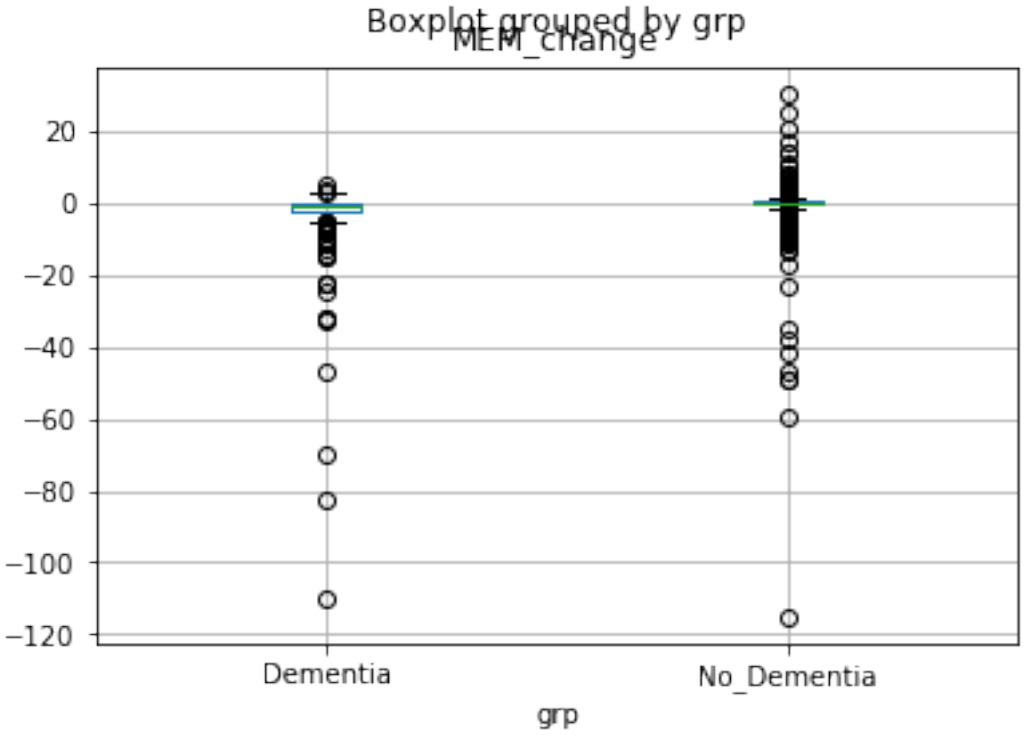
	DX	Month_bl	EF_change	MEM_change	grp
0	Dementia	5.73770	0.040609	-1.444444	Dementia
1	Dementia	17.90160	-0.178451	-0.242114	Dementia
2	Dementia	11.93440	-0.667742	0.400000	Dementia
3	Dementia	13.77050	-2.483412	-1.749511	Dementia
4	Dementia	6.13115	-0.394968	-24.227273	Dementia

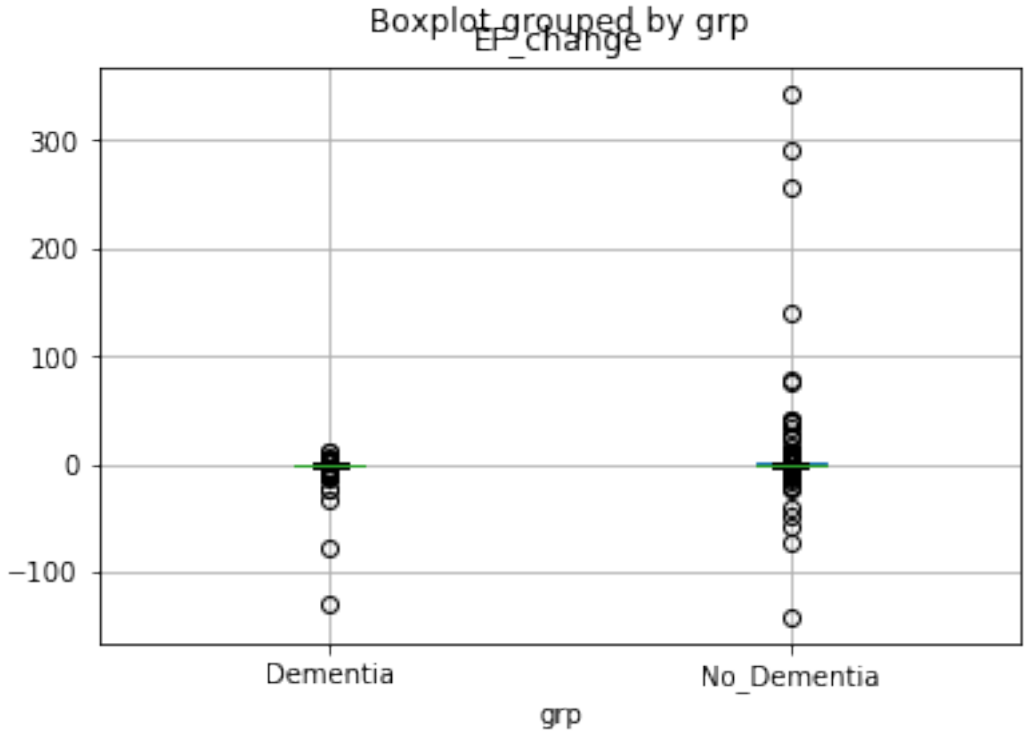
```
In [23]: d.boxplot(column='ADNI_MEM', by='grp')
         d.boxplot(column='ADNI_EF', by='grp')
         d.boxplot(column='MEM_change', by='grp')
         d.boxplot(column='EF_change', by='grp')
```

```
Out[23]: <matplotlib.axes._subplots.AxesSubplot at 0x5f3bfb0>
```




Boxplot grouped by grp
ADNI_EF
3
2
1
0
−1
−2
−3
Dementia
No_Dementia
grp


Boxplot grouped by grp
MEM_change
20
0
−20
−40
−60
−80
−100
−120
Dementia
No_Dementia
grp



In [25]:
```
adnimerge = pd.read_csv("../Data/foi/ADNIMERGE.csv")
adnimerge.columns
```

Out[25]:
```
Index(['RID', 'PTID', 'VISCODE', 'SITE', 'COLPROT', 'ORIGPROT', 'EXAMDATE',
       'DX_bl', 'AGE', 'PTGENDER', 'PTEDUCAT', 'PTETHCAT', 'PTRACCAT',
       'PTMARRY', 'APOE4', 'FDG', 'PIB', 'AV45', 'CDRSB', 'ADAS11', 'ADAS13',
       'MMSE', 'RAVLT_immediate', 'RAVLT_learning', 'RAVLT_forgetting',
       'RAVLT_perc_forgetting', 'FAQ', 'MOCA', 'EcogPtMem', 'EcogPtLang',
       'EcogPtVisspat', 'EcogPtPlan', 'EcogPtOrgan', 'EcogPtDivatt',
       'EcogPtTotal', 'EcogSPMem', 'EcogSPLang', 'EcogSPVisspat', 'EcogSPPlan',
       'EcogSPOrgan', 'EcogSPDivatt', 'EcogSPTotal', 'FLDSTRENG', 'FSVERSION',
       'Ventricles', 'Hippocampus', 'WholeBrain', 'Entorhinal', 'Fusiform',
       'MidTemp', 'ICV', 'DX', 'EXAMDATE_bl', 'CDRSB_bl', 'ADAS11_bl',
       'ADAS13_bl', 'MMSE_bl', 'RAVLT_immediate_bl', 'RAVLT_learning_bl',
       'RAVLT_forgetting_bl', 'RAVLT_perc_forgetting_bl', 'FAQ_bl',
       'FLDSTRENG_bl', 'FSVERSION_bl', 'Ventricles_bl', 'Hippocampus_bl',
       'WholeBrain_bl', 'Entorhinal_bl', 'Fusiform_bl', 'MidTemp_bl', 'ICV_bl',
       'MOCA_bl', 'EcogPtMem_bl', 'EcogPtLang_bl', 'EcogPtVisspat_bl',
       'EcogPtPlan_bl', 'EcogPtOrgan_bl', 'EcogPtDivatt_bl', 'EcogPtTotal_bl',
       'EcogSPMem_bl', 'EcogSPLang_bl', 'EcogSPVisspat_bl', 'EcogSPPlan_bl',
```

```
 'EcogSPOrgan_bl', 'EcogSPDivatt_bl', 'EcogSPTotal_bl', 'FDG_bl',
 'PIB_bl', 'AV45_bl', 'Years_bl', 'Month_bl', 'Month', 'M',
 'update_stamp'],
dtype='object')
```