Buz_God_spec

March 16, 2016

0.1 Import modules and Costumize Graphics

```
In [76]: %matplotlib inline
         import pandas as pd
         import matplotlib.pyplot as plt
         import numpy as np
         import seaborn as sb
         import os, time, math, datetime
         import matplotlib
         from scipy import stats
         import warnings
         warnings.simplefilter(action = "ignore", category = FutureWarning)
         sb.set_context("talk", font_scale=1.8)
         sb.set_style("whitegrid", {"grid.linewidth": .3,’grid.color’: " .95"})
         sb.set_style("whitegrid", {"grid.linewidth": .3,’grid.color’: " .95"})
         matplotlib.rc(’font’, family=’FreeSerif’)
         plt.rcParams.update({’figure.max_open_warning’: 0})
```

0.2 Import ‘Raw’ and ‘setting’ sheets and preprocess them

```
In [77]: # path to file
         mypath  = ’/home/theodor/MEGAsync/Buz_God_spec/Anastatica 10.3.16_test.xlsx’

         # import setting sheet
         setting = pd.read_excel(mypath,sheetname=’setting’, skip_footer=11, parse_cols=’C:Z’)
         # number of treatments and repetitions
         num_of_treats = len(setting.loc[’B’])- 2
         num_of_repet = np.diff([ord(char) for char in setting[setting[2]==’Lb’].index])[0]-1

         # Read ’Raw’ sheet
         rows2skip = range(40) # rows to skip
         rows2skip.extend(range(40+3+(num_of_treats+2)*(num_of_repet+2),300))

         raw = pd.read_excel(mypath,sheetname=’Raw’, skiprows=rows2skip)
         raw = raw.transpose()  # transpose dataframe
         raw.columns = raw.iloc[0,:].tolist()
         raw = raw.ix[1:]
         raw.iloc[:,2:] = raw.iloc[:,2:] - raw.iloc[0,2:]
```

0.3 Calculate stats

```
In [78]: #  create dictionary of number -> treatment name
         keys_  = setting.columns[1:-1]
         values_ = [str(u) for u in setting.iloc[1,1:-1].values]
```

```
treat_dict = dict(zip(keys_, values_))
treat_dict.values()

# letters of repetitions (e.g.:  B, C, D)
reps_letters = [str(s) for s in setting.ix[1:1+num_of_repet].index]
stats_df = raw.iloc[:,0:2].copy(deep=True)
cols = [str(s) for s in raw.columns[2:]]
cols = [c for c in cols if c[0] in reps_letters] #columns containing our data
for i,j in treat_dict.iteritems():
    tr_columns = [c  for c in cols if c[1:]==str(i)]     # columns that belong to  treat
    stats_df[j +'_mean'] = raw[tr_columns].mean(axis=1) # mean of each treat
    stats_df[j +'_std'] = raw[tr_columns].std(axis=1) # std
    stats_df[j +'_stderr'] = raw[tr_columns].std(axis=1)/np.sqrt(len(tr_columns)) # stderror
stats_df['Time [h]'] = stats_df['Time [s]']/3600.0

# P_VALUE for each cycle

treats_list = list()  # list ocolumns that belong to  each treat
for i,j in treat_dict.iteritems():
    treats_list.append([c  for c in cols if c[1:]==str(i)])

#  create empty series for p_value
p = np.empty(len(stats_df))
p[:] = np.nan
stats_df['p_value'] = pd.Series(p, index=stats_df.index)

# calculate p_value for each row
for i,row in raw.iterrows():
    data =[pd.to_numeric(row[cls]).values for cls in treats_list]
    stats_df.loc[i,'p_value'] = stats.f_oneway(*data)[1]

# save stats_df in Excel file
stats_df.to_excel(os.path.join(os.path.dirname(mypath),'python_stats_output.xlsx'))
```

0.4 Plot all Results

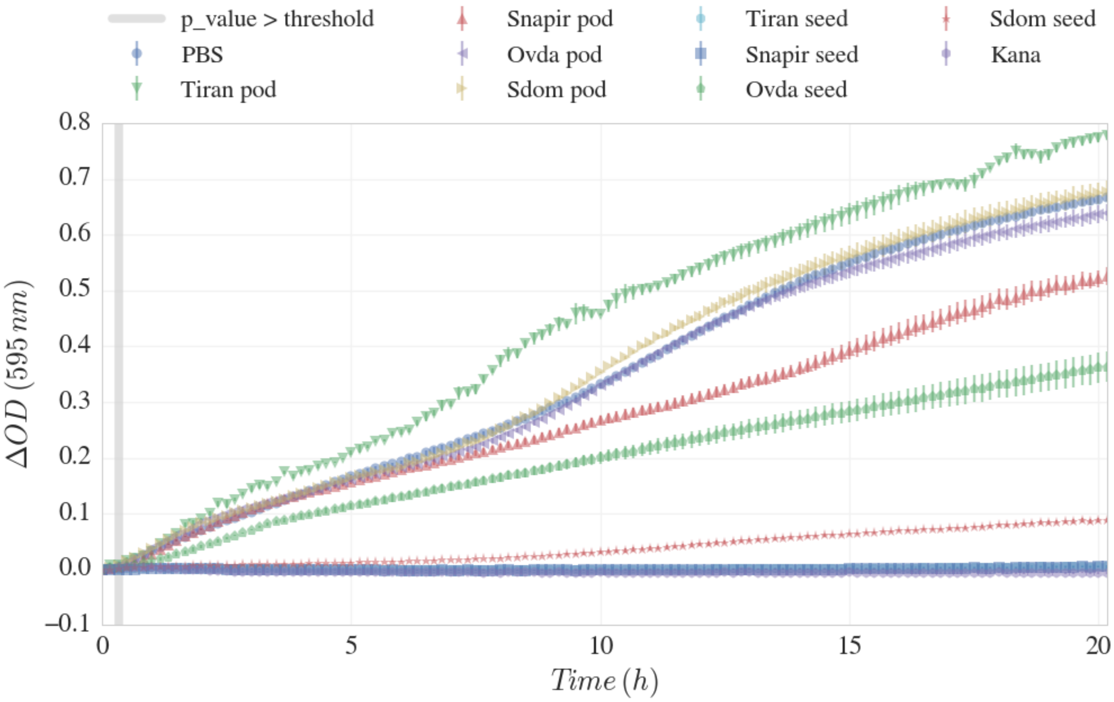
```
In [96]: # plot treatments with std error bars

         marks =  ('o', 'v', '^', '<', '>', '8', 's', 'p', '*', 'h', 'H', 'D', 'd')

         fig, ax = plt.subplots(figsize=(16,8))
         x=stats_df['Time [h]'].values
         for i,tr in enumerate(treat_dict.itervalues()):
             y=stats_df[tr+'_mean'].values
             ax.errorbar(x,y,yerr=stats_df[tr+'_stderr'].values,fmt=marks[i],alpha=0.5,label=tr);
         ax.set_xlim([0,np.max(stats_df['Time [h]'])])
         ax.set_ylabel('$\Delta OD \,\, (595\,nm)$')
         ax.set_xlabel('$Time \, (h)$')

         # plot vertical line where p_value above threshold
         thresh = 0.05 # significance level
         boolp = stats_df.p_value > thresh # boolean if pvalue< threshold
         b, t =ax.get_ylim()
         xi = stats_df['Time [h]'][boolp].values
```

```
# plot vertical line
ax.vlines(xi,b,t,'lightgray',alpha=0.7,linewidth=7.5,label='p_value > threshold')
_ = ax.legend(bbox_to_anchor=(0., 1.02, 1., .102), loc=3,
           ncol=4, mode="expand", borderaxespad=0.,fontsize=22);
fig.savefig(os.path.join(os.path.dirname(mypath),'result1.png'),dpi=300,bbox_inches='tight')
```


p_value > threshold
PBS
Tiran pod
Snapir pod
Ovda pod
Sdom pod
Tiran seed
Snapir seed
Ovda seed
Sdom seed
Kana
$\Delta OD\ (595\,nm)$
$Time\,(h)$