all_score

December 10, 2019

[66]:
```
import os
from IPython.display import display, Image
import pandas as pd
import numpy as np
import seaborn as sns
%matplotlib inline
import matplotlib.pyplot as plt
from matplotlib import colors
from matplotlib.ticker import PercentFormatter
from scipy.stats import linregress
import math
from functools import reduce
import argparse
from Bio import SeqIO, Entrez, pairwise2
Entrez.email = 'hongyingsun1101@gmail.com'
from Bio.SeqRecord import SeqRecord
import re, time
import os, sys, glob
import random
import uuid
# from skbio.tree import TreeNode
# from skbio import read
# from skbio.stats.distance import DistanceMatrix
# from skbio.stats.distance import DissimilarityMatrix

from scipy import stats
from ast import literal_eval
import sqlite3
import statsmodels.api as sm
from sklearn import linear_model
from matplotlib import pyplot
```

[2]:
```
df =pd.read_csv("pplacer_stats_score_merged.csv", index_col='unique_index')
```

```
d:\program files (x86)\python37-32\lib\site-
packages\IPython\core\interactiveshell.py:3049: DtypeWarning: Columns
(1,7,8,10,13,19,20,21,24,30,31,32,35,41,42,43) have mixed types. Specify dtype
```

```
option on import or set low_memory=False.
  interactivity=interactivity, compiler=compiler, result=result)
```

[3]:
```
df.columns
```

[3]:
```
Index(['Unnamed: 0', 'index_x', 'RDP_10398_adcl', 'RDP_5224_adcl',
       'RDP_1017_adcl', 'RDP_92_adcl', 'RDP_12_adcl', 'community_x',
       'sourceSeq_x', 'organism_x', 'ncbi_tax_id_x', 'multiplicity_x',
       'index_y', 'RDP_10398_edpl', 'RDP_5224_edpl', 'RDP_1017_edpl',
       'RDP_92_edpl', 'RDP_12_edpl', 'community_y', 'sourceSeq_y',
       'organism_y', 'ncbi_tax_id_y', 'multiplicity_y', 'index_x.1',
       'RDP_10398_mindistl', 'RDP_5224_mindistl', 'RDP_1017_mindistl',
       'RDP_92_mindistl', 'RDP_12_mindistl', 'community_x.1', 'sourceSeq_x.1',
       'organism_x.1', 'ncbi_tax_id_x.1', 'multiplicity_x.1', 'index_y.1',
       'RDP_10398_prichness', 'RDP_5224_prichness', 'RDP_1017_prichness',
       'RDP_92_prichness', 'RDP_12_prichness', 'community_y.1',
       'sourceSeq_y.1', 'organism_y.1', 'ncbi_tax_id_y.1', 'multiplicity_y.1',
       'RDP_10398_score', 'RDP_5224_score', 'RDP_1017_score', 'RDP_92_score',
       'RDP_12_score'],
      dtype='object')
```

[18]:
```
df=df.fillna(method='ffill')
```

[ ]:
```

```

[28]:
```
df_rdp_10398_CC11CM0=df.loc[df["community_x"]=="CC11CM0",["RDP_10398_adcl",␣
↪"RDP_10398_edpl",␣
↪"RDP_10398_mindistl","RDP_10398_prichness","RDP_10398_score","community_x"]]
```

[34]:
```
df_rdp_10398_CC11CM0.RDP_10398_score.isna()
```

[34]:
```
unique_index
CC11CM0SCR00cdec97c058446e83e0ef032e61806d    True
CC11CM0SCR35529da454f0497fa16e04841e8e1639    True
CC11CM0SCR1083e70ce28e4961b8298356c0d69000    True
CC11CM0SCR8898bf89e307445282cd2fb3acb183a0    True
CC11CM0SCRfc7f700b82e44da39405162a7e5b8b77    True
CC11CM0SCRbb008cff8b87453b9ed228be5d008673    True
CC11CM0SCR3e39a5fc61b6420cac1c2dd465292aec    True
CC11CM0SCRb15eac580de84cfd8e55224087a7b676    True
CC11CM0SCR1e06de32f41c414aaa57f33949f4905c    True
CC11CM0SCRaf64d873b07c43e18a82b0be7ef37e3a    True
CC11CM0SCRf7daacc404cb4eb9a49ba1de3996a898    True
CC11CM0SCRb70978c24c1a4fab8659357b833938e6    True
CC11CM0SCRe9f5fb9ad3e5407fb686716731557fb8    True
CC11CM0SCRade8cd02ba724e42b455e0ced33aba32    True
CC11CM0SCRd526be427f7d40d99ca20d6b9ffc434d    True
CC11CM0SCR4fb0d8fe4a4f42d598229f7496ec6c09    True
CC11CM0SCR374d88a64290415ba45a37a3e99e9405    True
CC11CM0SCR2ae719dea83c49169b6cb67e532d1fbf    True
```

```
CC11CM0SCR4220806246c9445f9abbf3606a5a56a1    True
CC11CM0SCR5f7af4e63f104f02a310f226bcb3eba4    True
CC11CM0SCR89ad905da6c34fb087c878aa4d409a2c    True
CC11CM0SCR1beb97d3e3bb418b9843d9afdc14e7bf    True
CC11CM0SCR5d0910eba67847e79b3cb42c12631ebc    True
CC11CM0SCRabb7b9b009944a9ba1d1db4c868741af    True
CC11CM0SCR5c24420214de48e2bae6693c53d442af    True
CC11CM0SCRd32581f0a84a430985ca339a20df58ff    True
CC11CM0SCRda69a360140c4f6da522f9245a9f5db3    True
CC11CM0SCR295d55115ed64b7b87a6e1d5d0858b11    True
CC11CM0SCRfc1acb97fe7e4e9aa7ed3305a7b7b39a    True
CC11CM0SCR6d4aac78b0d242779e124ddd2ab22394    True
CC11CM0SCR49c33904b91a42b28626c772a112d3ff    True
CC11CM0SCR2398a7ab2bf14cd9bf4f493cd92dca7f    True
CC11CM0SCR5cedb8a7e1bf473d99e12728f04a173c    True
CC11CM0SCR3823cad73fba408b8b4a7cda1eb5e493    True
CC11CM0SCR0a33595fd49e47acb027d6c82aa45efd    True
CC11CM0SCR5ff6206ff4d94c8f86932306fb9b4535    True
CC11CM0SCRd38f3e00f04b4a2ebf6626b1899a38fa    True
CC11CM0SCR6793c1fe87f940a28c62ca45b275741f    True
CC11CM0SCRcd7237d670bc46b29f6289e56b4b6c9d    True
CC11CM0SCR828e2a45138c4a598abd19e72801818c    True
CC11CM0SCR1cfc4024617f454881035fb1bfd55cbc    True
CC11CM0SCRf4609d1b137d4abfa11af2713e075214    True
CC11CM0SCR06770c5a7fe2475f8059ee919d70eeb5    True
CC11CM0SCRa805e58fa65d440fbb0d08558326dff6    True
CC11CM0SCR38d38820115f4fbba6d14b09a6cba6a2    True
CC11CM0SCR8e7653535a7e4378994c3519fe151150    True
CC11CM0SCR8b2096c800db4548bed42a6d71bfe922    True
CC11CM0SCR7590e26c76214a0091249bb2e74d3ea6    True
CC11CM0SCR6f14135fa1ba41f49b480f6973684fb2    True
CC11CM0SCR4b00f7bde5c34317a74ff4bd6e5c594f    True
CC11CM0SCRec63631bcd1c474083a6d4bc0ba5ce7c    True
CC11CM0SCRc168f76390fb4e7c9f4809f8d0100c39    True
CC11CM0SCR660eae0fe6f94d0b95e1bff8fc7a6ff5    True
CC11CM0SCRf811279ee40c406e9795ebc76e29a3d0    True
CC11CM0SCR00a5f19edcba4a52affb746001888dcb    True
Name: RDP_10398_score, dtype: bool
```

[5]:
```
df_rdp_10398=df[["RDP_10398_adcl", "RDP_10398_edpl",␣
 ↪"RDP_10398_mindistl","RDP_10398_prichness","RDP_10398_score", "community_x"]]
df_rdp_10398=df_rdp_10398.dropna(how='any')
x_rdp_10398=df_rdp_10398[["RDP_10398_adcl", "RDP_10398_edpl",␣
 ↪"RDP_10398_mindistl","RDP_10398_prichness"]]
y_rdp_10398=df_rdp_10398[["RDP_10398_score"]]
model_rdp_10398=sm.OLS(y_rdp_10398,x_rdp_10398).fit()
pridictions_rdp_10398=model_rdp_10398.predict(x_rdp_10398)
```

```
model_rdp_10398.summary()
```

```
d:\program files (x86)\python37-32\lib\site-
packages\statsmodels\regression\linear_model.py:1657: RuntimeWarning: divide by
zero encountered in double_scalars
  return self.ess/self.df_model
```

[5]:
```
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:        RDP_10398_score   R-squared:                       0.000
Model:                            OLS   Adj. R-squared:                  0.000
Method:                 Least Squares   F-statistic:                       inf
Date:                Tue, 10 Dec 2019   Prob (F-statistic):                nan
Time:                        08:57:40   Log-Likelihood:            -5.4743e+05
No. Observations:              182991   AIC:                         1.095e+06
Df Residuals:                  182990   BIC:                         1.095e+06
Df Model:                           0
Covariance Type:            nonrobust
==============================================================================
=======
                           coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
-------
RDP_10398_adcl       4.627e-06   1.97e-08    234.673      0.000    4.59e-06
4.67e-06
RDP_10398_edpl       2.347e-05      1e-07    234.673      0.000    2.33e-05
2.37e-05
RDP_10398_mindistl   4.551e-06   1.94e-08    234.673      0.000    4.51e-06
4.59e-06
RDP_10398_prichness     1.3219      0.006    234.673      0.000       1.311
1.333
==============================================================================
Omnibus:                   210366.952   Durbin-Watson:                   0.019
Prob(Omnibus):                  0.000   Jarque-Bera (JB):         13970473.803
Skew:                           6.331   Prob(JB):                         0.00
Kurtosis:                      43.890   Cond. No.                     4.29e+40
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
[2] The smallest eigenvalue is 3.98e-76. This might indicate that there are
strong multicollinearity problems or that the design matrix is singular.
"""
```

[6]:
```
df_rdp_5224=df[["RDP_5224_adcl", "RDP_5224_edpl",␣
 ↪"RDP_5224_mindistl","RDP_5224_prichness","RDP_5224_score", "community_x"]]
df_rdp_5224=df_rdp_5224.dropna(how='any')
x_rdp_5224=df_rdp_5224[["RDP_5224_adcl", "RDP_5224_edpl",␣
 ↪"RDP_5224_mindistl","RDP_5224_prichness"]]
y_rdp_5224=df_rdp_5224[["RDP_5224_score"]]
model_rdp_5224=sm.OLS(y_rdp_5224,x_rdp_5224).fit()
pridictions_rdp_5224=model_rdp_5224.predict(x_rdp_5224)
model_rdp_5224.summary()
```

[6]:
```
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:         RDP_5224_score   R-squared:                       -0.000
Model:                            OLS   Adj. R-squared:                  -0.000
Method:                 Least Squares   F-statistic:                       -inf
Date:                Tue, 10 Dec 2019   Prob (F-statistic):                nan
Time:                        08:57:40   Log-Likelihood:            -6.3882e+05
No. Observations:              182991   AIC:                         1.278e+06
Df Residuals:                  182990   BIC:                         1.278e+06
Df Model:                           0
Covariance Type:            nonrobust
==============================================================================
======
                          coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
------
RDP_5224_adcl        8.55e-07   3.71e-09    230.286      0.000    8.48e-07
8.62e-07
RDP_5224_edpl       1.113e-05   4.83e-08    230.286      0.000     1.1e-05
1.12e-05
RDP_5224_mindistl   8.682e-07   3.77e-09    230.286      0.000    8.61e-07
8.76e-07
RDP_5224_prichness     0.8550      0.004    230.286      0.000       0.848
0.862
==============================================================================
Omnibus:                   131297.941   Durbin-Watson:                   0.019
Prob(Omnibus):                  0.000   Jarque-Bera (JB):          1416540.181
Skew:                           3.575   Prob(JB):                         0.00
Kurtosis:                      14.605   Cond. No.                     6.90e+41
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
```

```
[2] The smallest eigenvalue is 9.6e-78. This might indicate that there are
strong multicollinearity problems or that the design matrix is singular.
"""
```

[7]:
```
df_rdp_1017=df[["RDP_1017_adcl", "RDP_1017_edpl",␣
 ↪"RDP_1017_mindistl","RDP_1017_prichness","RDP_1017_score", "community_x"]]
df_rdp_1017=df_rdp_1017.dropna(how='any')
x_rdp_1017=df_rdp_1017[["RDP_1017_adcl", "RDP_1017_edpl",␣
 ↪"RDP_1017_mindistl","RDP_1017_prichness"]]
y_rdp_1017=df_rdp_1017[["RDP_1017_score"]]
model_rdp_1017=sm.OLS(y_rdp_1017,x_rdp_1017).fit()
pridictions_rdp_1017=model_rdp_1017.predict(x_rdp_1017)
model_rdp_1017.summary()
```

[7]:
```
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:         RDP_1017_score   R-squared:                       0.000
Model:                            OLS   Adj. R-squared:                  0.000
Method:                 Least Squares   F-statistic:                       inf
Date:                Tue, 10 Dec 2019   Prob (F-statistic):                nan
Time:                        08:57:40   Log-Likelihood:            -7.7595e+05
No. Observations:              182991   AIC:                         1.552e+06
Df Residuals:                  182990   BIC:                         1.552e+06
Df Model:                           0
Covariance Type:            nonrobust
==============================================================================
======
                           coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
------
RDP_1017_adcl        6.44e-06   2.62e-08    245.943      0.000    6.39e-06
6.49e-06
RDP_1017_edpl          0.0003   1.16e-06    245.943      0.000       0.000
0.000
RDP_1017_mindistl   6.054e-06   2.46e-08    245.943      0.000    6.01e-06
6.1e-06
RDP_1017_prichness     3.2199      0.013    245.943      0.000       3.194
3.246
==============================================================================
Omnibus:                    91636.426   Durbin-Watson:                   0.019
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           458124.874
Skew:                           2.510   Prob(JB):                         0.00
Kurtosis:                       8.907   Cond. No.                     3.76e+41
==============================================================================
```

```
Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
[2] The smallest eigenvalue is 1.17e-77. This might indicate that there are
strong multicollinearity problems or that the design matrix is singular.
"""
```

[8]:
```
df_rdp_92=df[["RDP_92_adcl", "RDP_92_edpl",␣
 ↪"RDP_92_mindistl","RDP_92_prichness","RDP_92_score", "community_x"]]
df_rdp_92=df_rdp_92.dropna(how='any')
x_rdp_92=df_rdp_92[["RDP_92_adcl", "RDP_92_edpl",␣
 ↪"RDP_92_mindistl","RDP_92_prichness"]]
y_rdp_92=df_rdp_92[["RDP_92_score"]]
model_rdp_92=sm.OLS(y_rdp_92,x_rdp_92).fit()
pridictions_rdp_92=model_rdp_92.predict(x_rdp_92)
model_rdp_92.summary()
```

[8]:
```
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:           RDP_92_score   R-squared:                       -0.000
Model:                            OLS   Adj. R-squared:                  -0.000
Method:                 Least Squares   F-statistic:                    -0.07012
Date:                Tue, 10 Dec 2019   Prob (F-statistic):               1.00
Time:                        08:57:40   Log-Likelihood:            -8.2034e+05
No. Observations:              182991   AIC:                             1.641e+06
Df Residuals:                  182989   BIC:                             1.641e+06
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
====
                        coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----
RDP_92_adcl      -3.367e+10    1.2e+11     -0.281      0.779   -2.68e+11
2.01e+11
RDP_92_edpl      -6.384e+10   2.27e+11     -0.281      0.779   -5.09e+11
3.81e+11
RDP_92_mindistl  -1.182e+06   4.21e+06     -0.281      0.779   -9.43e+06
7.06e+06
RDP_92_prichness  6.562e+08   2.33e+09      0.281      0.779   -3.92e+09
5.23e+09
==============================================================================
Omnibus:                    19407.154   Durbin-Watson:                   0.019
Prob(Omnibus):                  0.000   Jarque-Bera (JB):            25955.988
Skew:                           0.916   Prob(JB):                         0.00
```

```
Kurtosis:                       2.778   Cond. No.                     2.04e+42
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
[2] The smallest eigenvalue is 1.42e-77. This might indicate that there are
strong multicollinearity problems or that the design matrix is singular.
"""
```

[9]:
```
df_rdp_12=df[["RDP_12_adcl", "RDP_12_edpl",␣
 ↪"RDP_12_mindistl","RDP_12_prichness","RDP_12_score", "community_x"]]
df_rdp_12=df_rdp_12.dropna(how='any')
x_rdp_12=df_rdp_12[["RDP_12_adcl", "RDP_12_edpl",␣
 ↪"RDP_12_mindistl","RDP_12_prichness"]]
y_rdp_12=df_rdp_12[["RDP_12_score"]]
model_rdp_12=sm.OLS(y_rdp_12,x_rdp_12).fit()
pridictions_rdp_12=model_rdp_12.predict(x_rdp_12)
model_rdp_12.summary()
```

[9]:
```
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:           RDP_12_score   R-squared:                       -0.000
Model:                            OLS   Adj. R-squared:                  -0.000
Method:                 Least Squares   F-statistic:                     -19.70
Date:                Tue, 10 Dec 2019   Prob (F-statistic):               1.00
Time:                        08:57:40   Log-Likelihood:            -8.3694e+05
No. Observations:              182991   AIC:                         1.674e+06
Df Residuals:                  182989   BIC:                         1.674e+06
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
====
                        coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
----
RDP_12_adcl       1.109e+11   5.59e+10      1.983      0.047    1.31e+09
2.2e+11
RDP_12_edpl       8.424e+11   4.25e+11      1.983      0.047    9.95e+09
1.67e+12
RDP_12_mindistl  -1.828e+07   9.22e+06     -1.983      0.047   -3.64e+07
-2.16e+05
RDP_12_prichness  -3.47e+09   1.75e+09     -1.983      0.047    -6.9e+09
-4.1e+07
==============================================================================
```

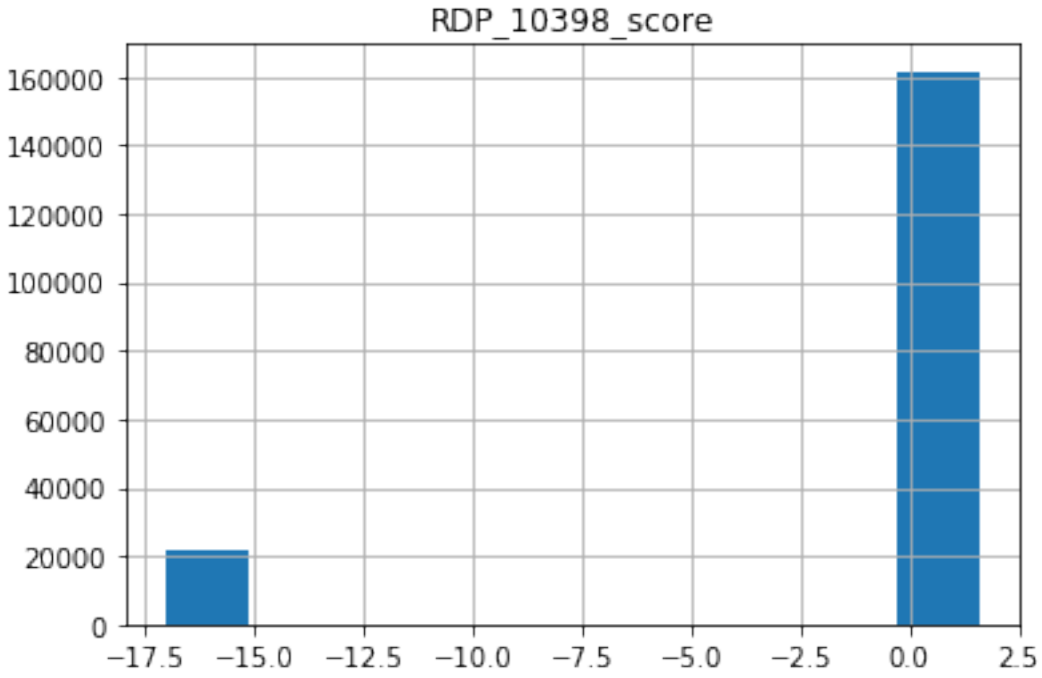
```
Omnibus:                    29156.440   Durbin-Watson:                   0.020
Prob(Omnibus):                  0.000   Jarque-Bera (JB):            39609.033
Skew:                           1.109   Prob(JB):                         0.00
Kurtosis:                       2.479   Cond. No.                     3.42e+43
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
[2] The smallest eigenvalue is 2.65e-80. This might indicate that there are
strong multicollinearity problems or that the design matrix is singular.
"""
```

[ ]:
```
df_rdp_10398=df[["RDP_10398_adcl", "RDP_10398_edpl",␣
 ↪"RDP_10398_mindistl","RDP_10398_prichness","RDP_10398_score", "community_x"]]
df_rdp_10398=df_rdp_10398.dropna(how='any')
x_rdp_10398=df_rdp_10398[["RDP_10398_adcl", "RDP_10398_edpl",␣
 ↪"RDP_10398_mindistl","RDP_10398_prichness"]]
y_rdp_10398=df_rdp_10398[["RDP_10398_score"]]
model_rdp_10398=sm.OLS(y_rdp_10398,x_rdp_10398).fit()
pridictions_rdp_10398=model_rdp_10398.predict(x_rdp_10398)
model_rdp_10398.summary()
```

[43]:
```
y_rdp_10398_log = np.log10(y_rdp_10398+0.00000000000000001)
```

[55]:
```
y_rdp_10398_log.hist()
```

[55]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x015E6290>]],
      dtype=object)
```



[56]:
```
y_rdp_10398.describe()
```

[56]:
```
       RDP_10398_score
count    182991.000000
mean          2.643835
std           4.819320
min           0.000000
25%           2.000000
50%           2.000000
75%           2.000000
max          38.000000
```

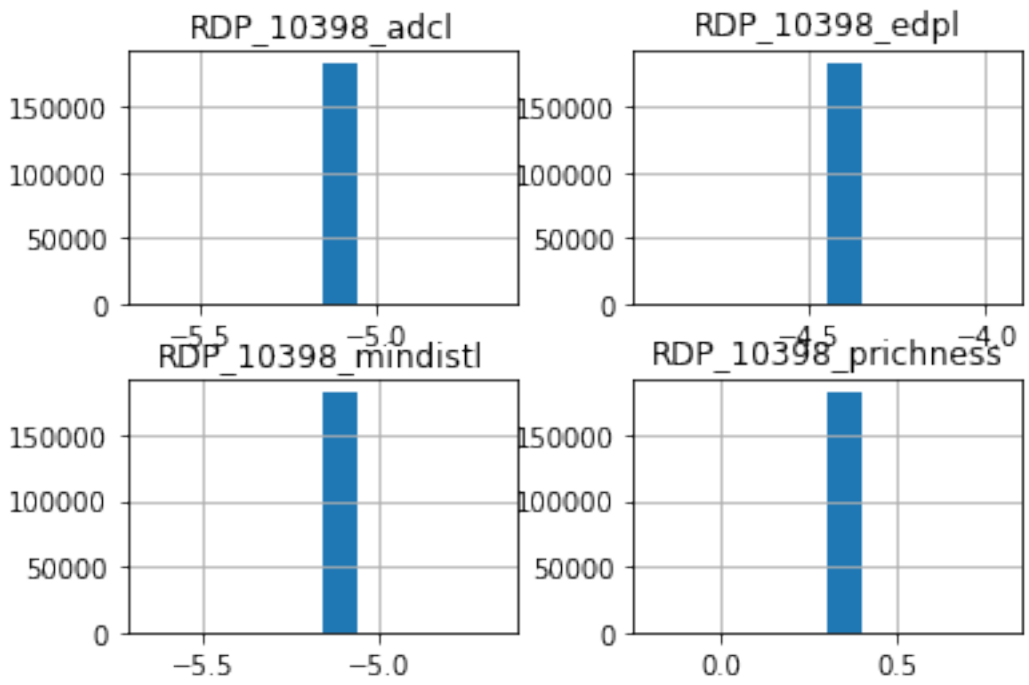
[ ]:
```

```

[51]:
```
x_rdp_10398_log = np.log10(x_rdp_10398+0.00000000000000001)
x_rdp_10398_log.describe()
```

[51]:
```
       RDP_10398_adcl  RDP_10398_edpl  RDP_10398_mindistl  RDP_10398_prichness
count    1.829910e+05    1.829910e+05        1.829910e+05         182991.00000
mean    -5.154902e+00   -4.449680e+00       -5.162034e+00              0.30103
std      1.776362e-15    1.776362e-15        2.664543e-15              0.00000
min     -5.154902e+00   -4.449680e+00       -5.162034e+00              0.30103
25%     -5.154902e+00   -4.449680e+00       -5.162034e+00              0.30103
50%     -5.154902e+00   -4.449680e+00       -5.162034e+00              0.30103
75%     -5.154902e+00   -4.449680e+00       -5.162034e+00              0.30103
max     -5.154902e+00   -4.449680e+00       -5.162034e+00              0.30103
```

[53]:
```
x_rdp_10398_log.hist()
```

[53]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x015F2AD0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x2BB6FF10>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x2BBA0FF0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x2BBBFB30>]],
      dtype=object)
```

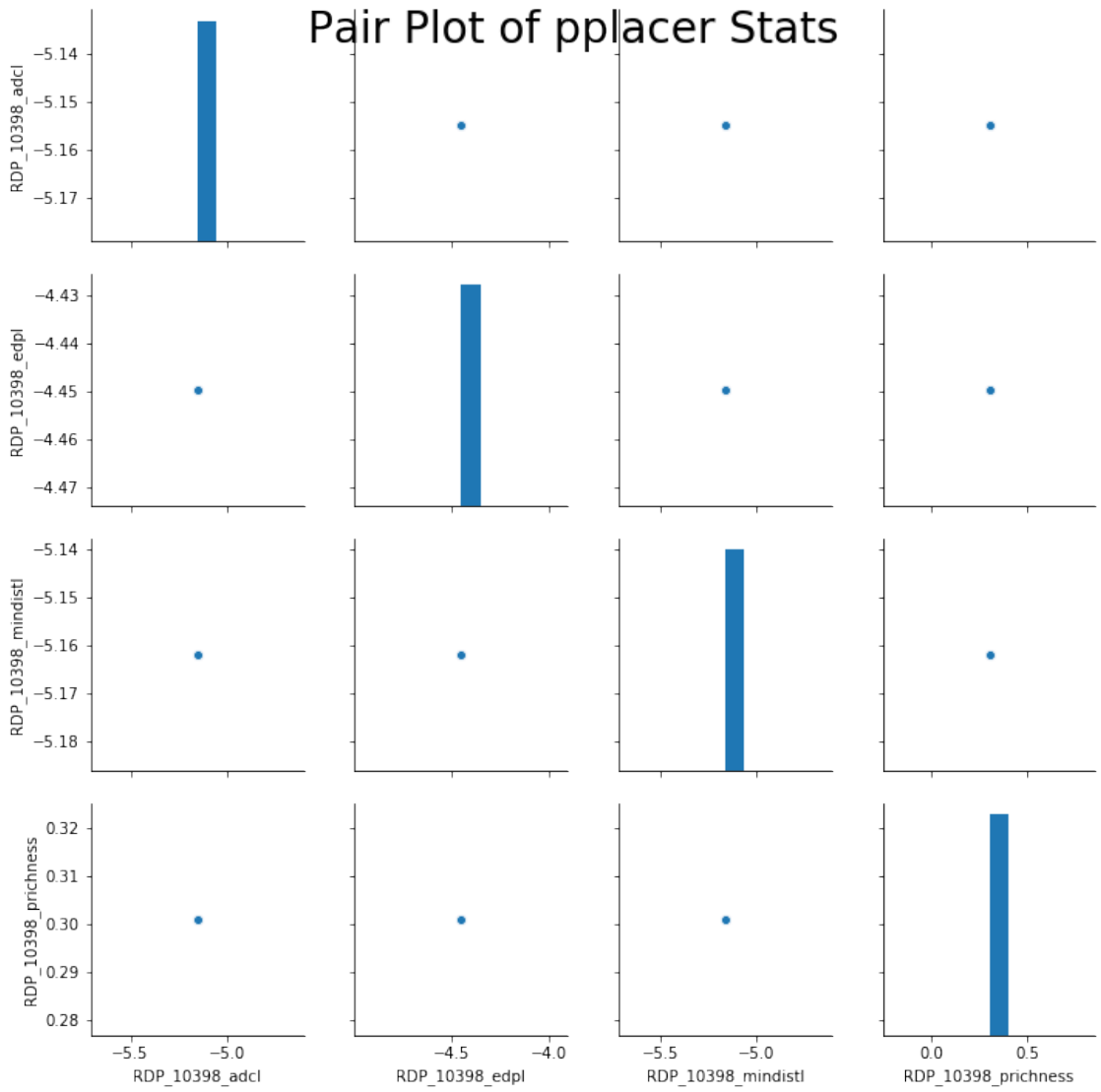


[54]:
```
model_rdp_10398_log=sm.OLS(y_rdp_10398_log,x_rdp_10398_log).fit()
pridictions_rdp_10398_log=model_rdp_10398_log.predict(x_rdp_10398_log)
model_rdp_10398_log.summary()
```

[54]:
```
<class 'statsmodels.iolib.summary.Summary'>
"""
                            OLS Regression Results
==============================================================================
Dep. Variable:        RDP_10398_score   R-squared:                       -0.000
Model:                            OLS   Adj. R-squared:                  -0.000
Method:                 Least Squares   F-statistic:                     -0.5303
Date:                Tue, 10 Dec 2019   Prob (F-statistic):               1.00
Time:                        09:37:59   Log-Likelihood:            -5.7433e+05
No. Observations:              182991   AIC:                             1.149e+06
Df Residuals:                  182989   BIC:                             1.149e+06
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
=======
                           coef    std err          t      P>|t|      [0.025
0.975]
------------------------------------------------------------------------------
-------
RDP_10398_adcl       3.275e+08   7.46e+08      0.439      0.661   -1.13e+09
1.79e+09
```

```
RDP_10398_edpl      -4.271e+08   9.72e+08     -0.439      0.661   -2.33e+09
1.48e+09
RDP_10398_mindistl   4.346e+07    9.9e+07      0.439      0.661    -1.5e+08
2.37e+08
RDP_10398_prichness  4.043e+07   9.21e+07      0.439      0.661    -1.4e+08
2.21e+08
==============================================================================
Omnibus:                    80641.233   Durbin-Watson:                   0.020
Prob(Omnibus):                  0.000   Jarque-Bera (JB):           274672.779
Skew:                          -2.377   Prob(JB):                         0.00
Kurtosis:                       6.664   Cond. No.                     3.00e+36
==============================================================================

Warnings:
[1] Standard Errors assume that the covariance matrix of the errors is correctly
specified.
[2] The smallest eigenvalue is 1.48e-66. This might indicate that there are
strong multicollinearity problems or that the design matrix is singular.
"""
```

[73]:
```
sns.pairplot(x_rdp_10398_log)
# Title
plt.suptitle('Pair Plot of pplacer Stats',
             size = 28);
```



[70]:
```
x_rdp_10398_log.describe()
```

[70]:

	RDP_10398_adcl	RDP_10398_edpl	RDP_10398_mindistl	RDP_10398_prichness
count	1.829910e+05	1.829910e+05	1.829910e+05	182991.00000
mean	-5.154902e+00	-4.449680e+00	-5.162034e+00	0.30103
std	1.776362e-15	1.776362e-15	2.664543e-15	0.00000
min	-5.154902e+00	-4.449680e+00	-5.162034e+00	0.30103
25%	-5.154902e+00	-4.449680e+00	-5.162034e+00	0.30103
50%	-5.154902e+00	-4.449680e+00	-5.162034e+00	0.30103
75%	-5.154902e+00	-4.449680e+00	-5.162034e+00	0.30103
max	-5.154902e+00	-4.449680e+00	-5.162034e+00	0.30103

[ ]: