CMD_plots

February 18, 2020

This notebook will attempt to repicate the graph from Welcome to the twilight Zone: The Mid-infrared Properties of Post-starburst Galaxies

The SPOGS survey was nice enough to release their data publicly here: http://www.spogs.org/spogtable.txt

In [1]:
```
#packages needed to get this notebook to run

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from astroquery.vizier import Vizier
from marvin.tools.query import Query
from scipy.optimize import curve_fit
from pylab import *
from scipy.optimize import curve_fit


plt.rcParams.update({'font.size': 20})
```

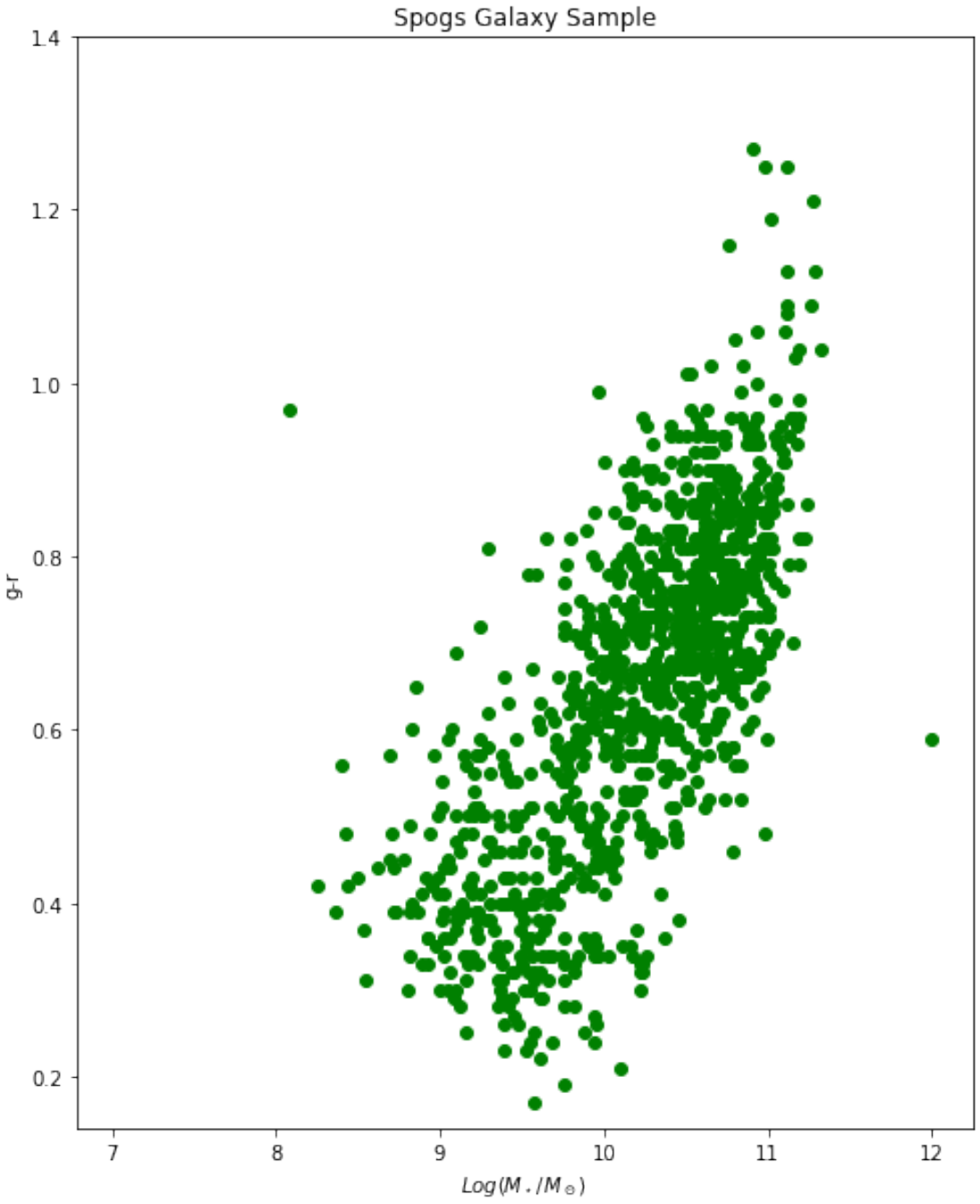
```
INFO: No release version set. Setting default to DR15


/home/gonzalo/anaconda3/envs/astroconda/lib/python3.5/site-packages/marvin/__init__.py:369: Ma
  .format(value), MarvinUserWarning)
```

In [2]:
```
#useful functions

def gauss(mx,mu,sigma,A):
    return A*exp(-(mx-mu)**2/2/sigma**2)

def bimodal(mx,mu1,sigma1,A1,mu2,sigma2,A2):
    return gauss(mx,mu1,sigma1,A1)+gauss(mx,mu2,sigma2,A2)
```

In [3]:
```
Vizier.ROW_LIMIT = -1 # we have to put this so we can get all the rows
table = Vizier.get_catalogs(catalog='J/ApJS/224/38/table2')[0] #Query with Vizer with
```

In [4]:
```
color = table['gmag'] - table['rmag']
mass = table['logM_']

#galaxies representated in the Green valley (maybe)
plt.figure(figsize=(8,10))
plt.plot(mass,color,'go')
plt.ylim(0.14,1.4)
plt.xlabel(r'$Log(M_\star / M_\odot)$')
plt.ylabel('g-r')
plt.title('Spogs Galaxy Sample')
```

Out[4]:
```
Text(0.5,1,'Spogs Galaxy Sample')
```



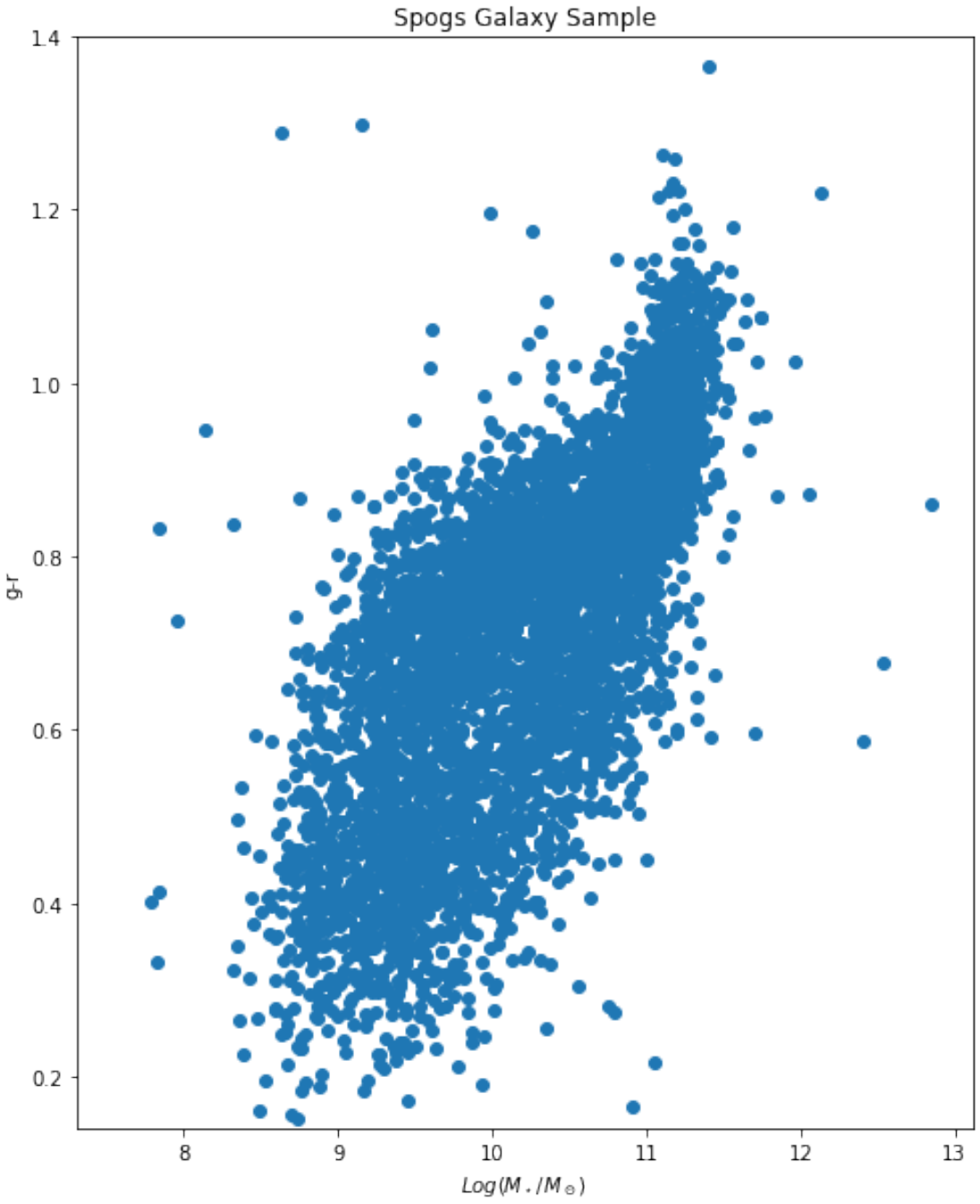

```
In [5]: #now we have the table. I want to know select galaxies from the MaNGA survey
        sf = 'nsa.z > 0'
        q = Query(search_filter=sf, limit=10000,return_params=['nsa.iauname','nsa.sersic_logmas

        r = q.run()
```

```
        manga_data = r.toTable() #sample of 4679 galaxies
        manga_mass = manga_data['nsa.sersic_logmass']
        manga_color = manga_data['nsa.elpetro_mag_g_r']
```

```
/home/gonzalo/anaconda3/envs/astroconda/lib/python3.5/site-packages/marvin/tools/query.py:241:
  warnings.warn('No local database found. Cannot perform queries.', MarvinUserWarning)
```

In [6]:
```
#galaxies in MaNGA survey

        plt.figure(figsize=(8,10))
        plt.plot(manga_mass,manga_color,'o')
        plt.ylim(0.14,1.4)
        plt.xlabel(r'$Log(M_\star / M_\odot)$')
        plt.ylabel('g-r')
        plt.title('Spogs Galaxy Sample')
```

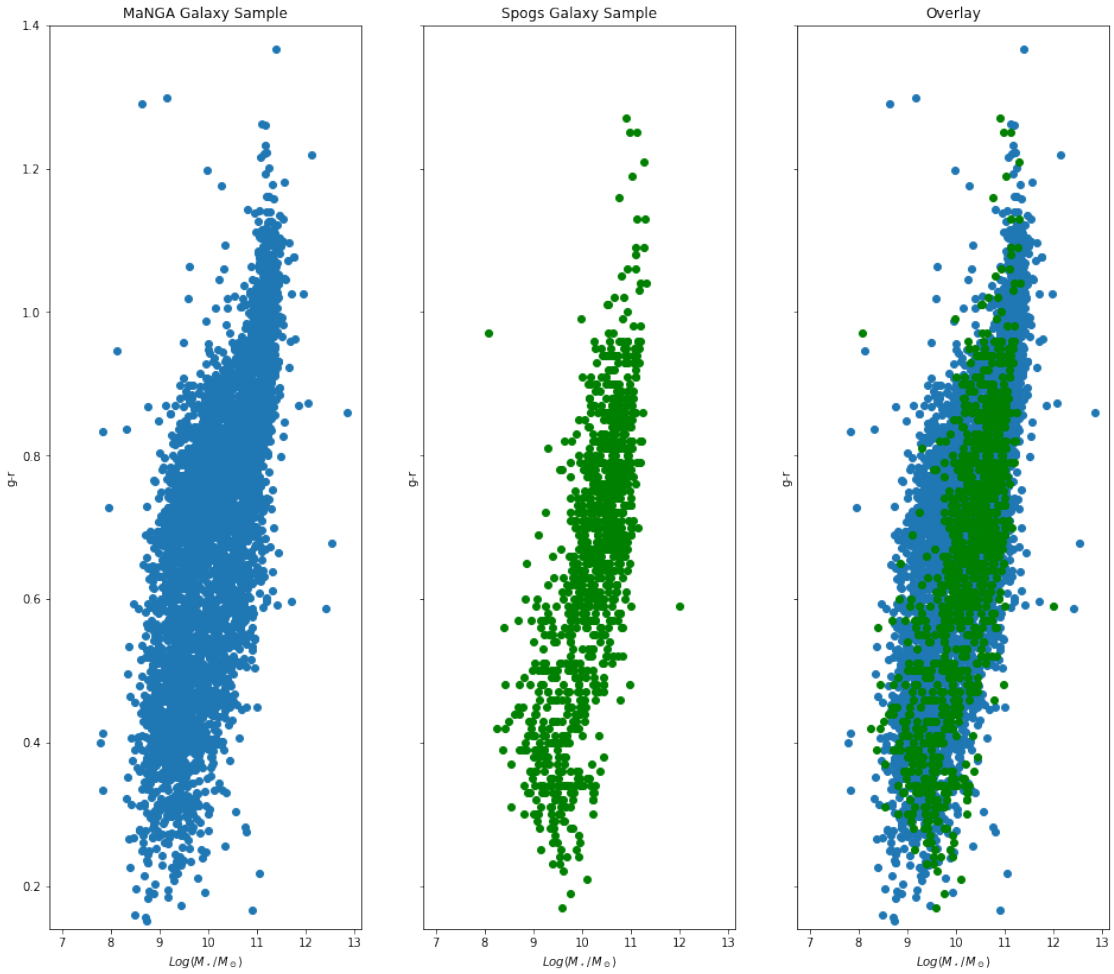
Out[6]:
```
Text(0.5,1,'Spogs Galaxy Sample')
```



In [7]: *#create a 1 x 3 plot for MaNGA, SPOGS, and each overlayed*

```
fig, axes = plt.subplots(figsize=(16,14),nrows=1, ncols=3, sharex=True,sharey=True)

axes[0].plot(manga_mass,manga_color,'o')
axes[0].set_ylim(0.14,1.4)
```

```
axes[0].set_xlabel(r'$Log(M_\star / M_\odot)$')
axes[0].set_ylabel('g-r')
axes[0].set_title('MaNGA Galaxy Sample')

axes[1].plot(mass,color,'go')
axes[1].set_ylim(0.14,1.4)
axes[1].set_xlabel(r'$Log(M_\star / M_\odot)$')
axes[1].set_ylabel('g-r')
axes[1].set_title('Spogs Galaxy Sample')


axes[2].plot(manga_mass,manga_color,'o')
axes[2].set_ylim(0.14,1.4)
axes[2].set_xlabel(r'$Log(M_\star / M_\odot)$')
axes[2].set_ylabel('g-r')
axes[2].set_title('Overlay')
axes[2].plot(mass,color,'go')

plt.savefig('CMD_plots')
```



In [8]:
```
#Plot a histogram
y,x,_=hist(manga_color,150,alpha=1,label='data')
mx=(x[1:]+x[:-1])/2 # for len(x)==len(y)
expected=(0.4,.1,110,0.7,.1,300) #guess parameters for each gaussian : mean, std, amp

#solve for parameters using scipy curvy fit, guess values and the data
params,cov=curve_fit(bimodal,mx,y,expected)
sigma=sqrt(diag(cov))
plot(mx,bimodal(mx,*params),color='red',lw=3,label='model') #plotting the double gauss
legend()
print(params,'\n',sigma)

#plot parameters
plt.title('MaNGA Survey Sample')
plt.xlabel('g-r')
plt.ylabel('Number of Galaxies')
plt.xlim(0,1.4)
plt.tight_layout()
plt.savefig('MaNGA_hist.png')
```

```
[4.73624101e-01 1.15155705e-01 1.20485463e+02 8.00715333e-01
 1.14723469e-01 2.66294731e+02]
 [6.65922307e-03 5.99568907e-03 3.29276011e+00 3.00616513e-03
 2.70226984e-03 3.30324010e+00]
```