visualisation applied

August 6, 2020

[86]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np

import warnings

warnings.filterwarnings('ignore')
```

[87]:
```
data = pd.read_csv('/Users/khemendrasai/Downloads/haberman (1).csv')
data.head()
```

[87]:

	age	year	nodes	status
0	30	64	1	1
1	30	62	3	1
2	30	65	0	1
3	31	59	2	1
4	31	65	4	1

[88]:
```
data.columns
```

[88]:
```
Index(['age', 'year', 'nodes', 'status'], dtype='object')
```

[89]:
```
data.nunique()
```

[89]:
```
age       49
year      12
nodes     31
status     2
dtype: int64
```

[90]:
```
#calculating no.of rows and columns
data.shape
```

[90]:
```
(306, 4)
```

[91]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 306 entries, 0 to 305
Data columns (total 4 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   age     306 non-null    int64
 1   year    306 non-null    int64
 2   nodes   306 non-null    int64
 3   status  306 non-null    int64
dtypes: int64(4)
memory usage: 9.7 KB
```

[92]:
```
#statistics
data.describe()
```

[92]:

	age	year	nodes	status
count	306.000000	306.000000	306.000000	306.000000
mean	52.457516	62.852941	4.026144	1.264706
std	10.803452	3.249405	7.189654	0.441899
min	30.000000	58.000000	0.000000	1.000000
25%	44.000000	60.000000	0.000000	1.000000
50%	52.000000	63.000000	1.000000	1.000000
75%	60.750000	65.750000	4.000000	2.000000
max	83.000000	69.000000	52.000000	2.000000

[93]:
```
#calculating imbalance
data['status'].value_counts()
```

[93]:
```
1    225
2     81
Name: status, dtype: int64
```

Observations:

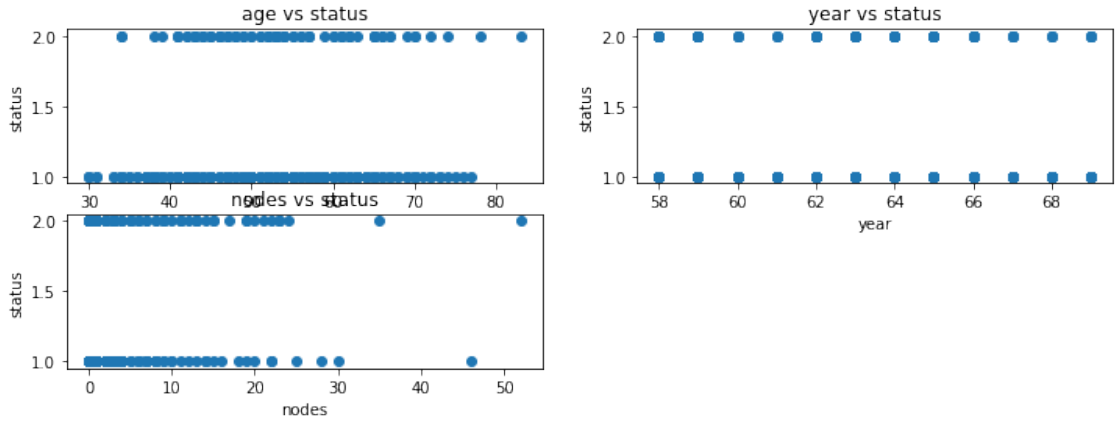
1. Dataset contains data of 306 patients aged between 30 and 83.
2. 75% of the patients have less than 4 nodes.
3. dataset is imbalance with 75% of the patients survived.

Objective:

Find a possible pattern between various attributes such as age,year of operation and no.of lymph nodes in the survival of breast cancer.

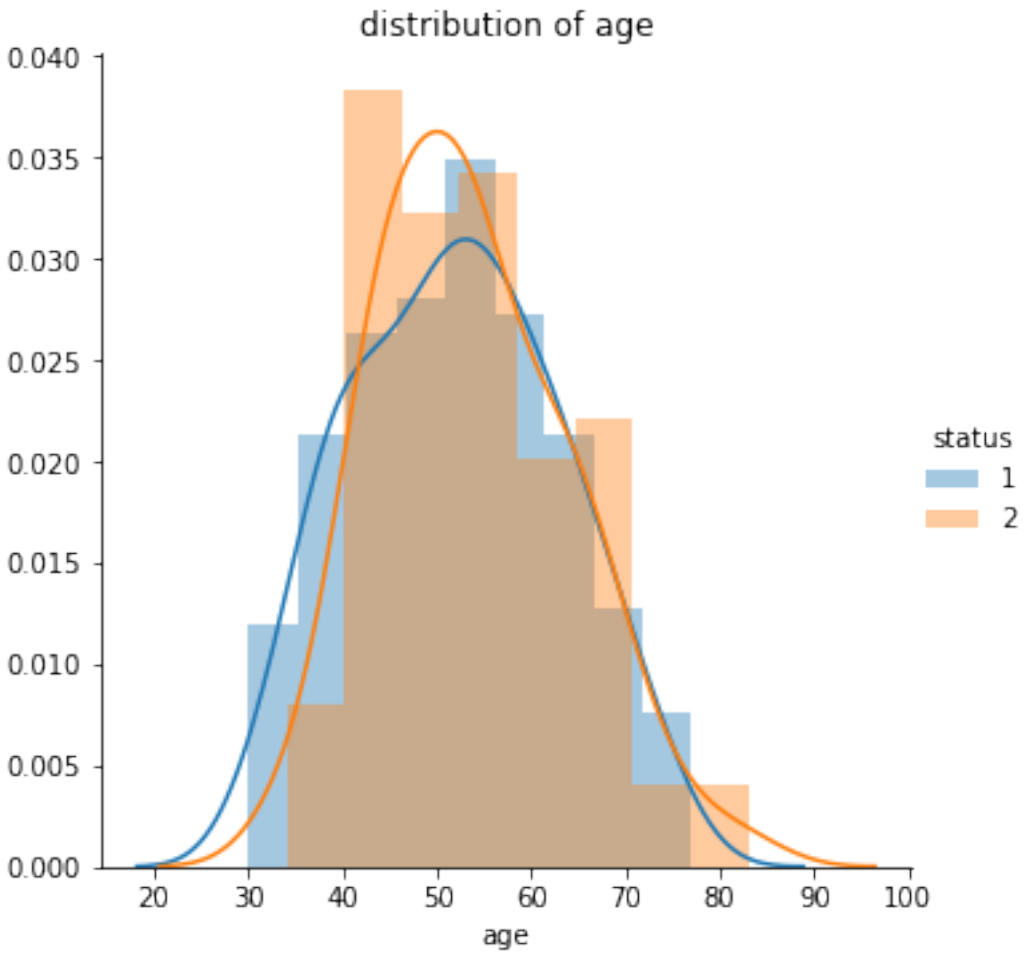
[94]:
```
#plotting the ditribution od various attributes with their status to find␣
 ↪possible link.

plt.figure(figsize=(12,4))
plt.subplot(221)
plt.plot(data['age'],data['status'],'o')
```

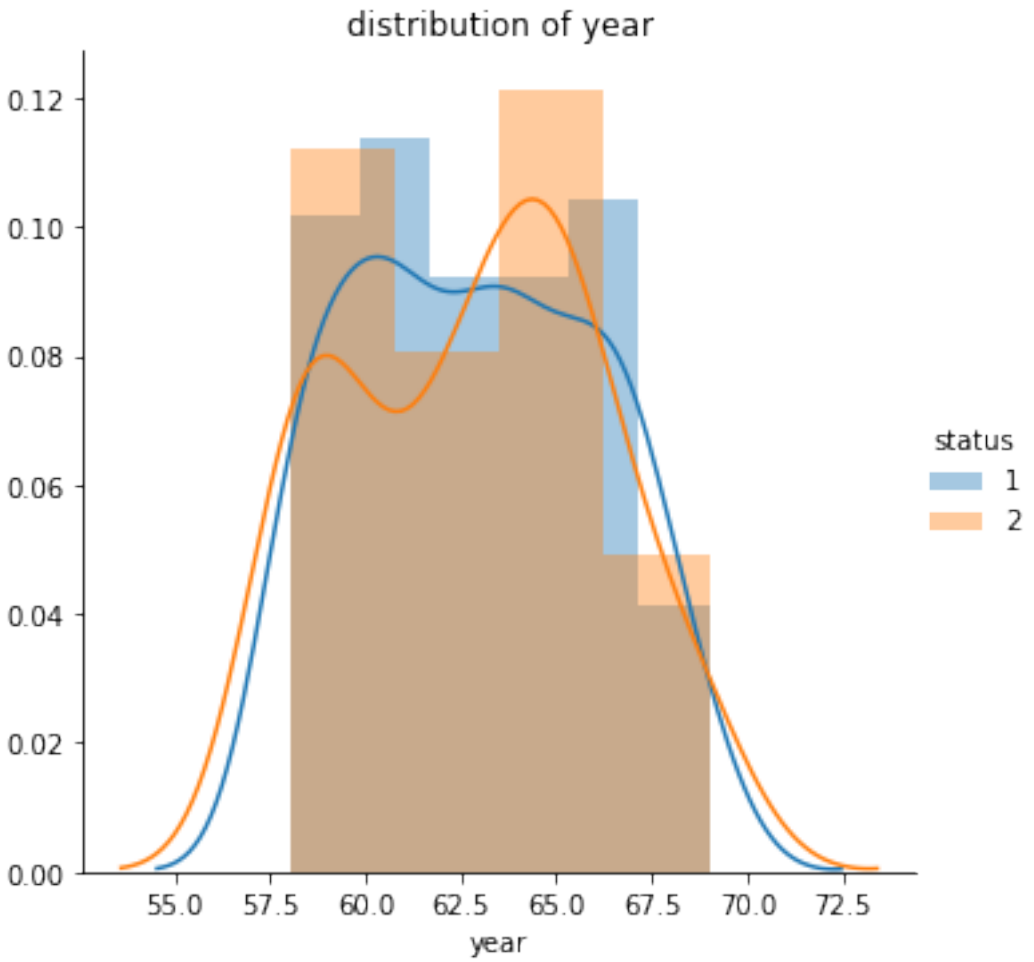
```
plt.xlabel('age')
plt.ylabel('status')
plt.title('age vs status')


plt.subplot(222)
plt.plot(data['year'],data['status'],'o')
plt.xlabel('year')
plt.ylabel('status')
plt.title('year vs status')


plt.subplot(223)
plt.plot(data['nodes'],data['status'],'o')
plt.xlabel('nodes')
plt.ylabel('status')
plt.title('nodes vs status')
plt.show()
```

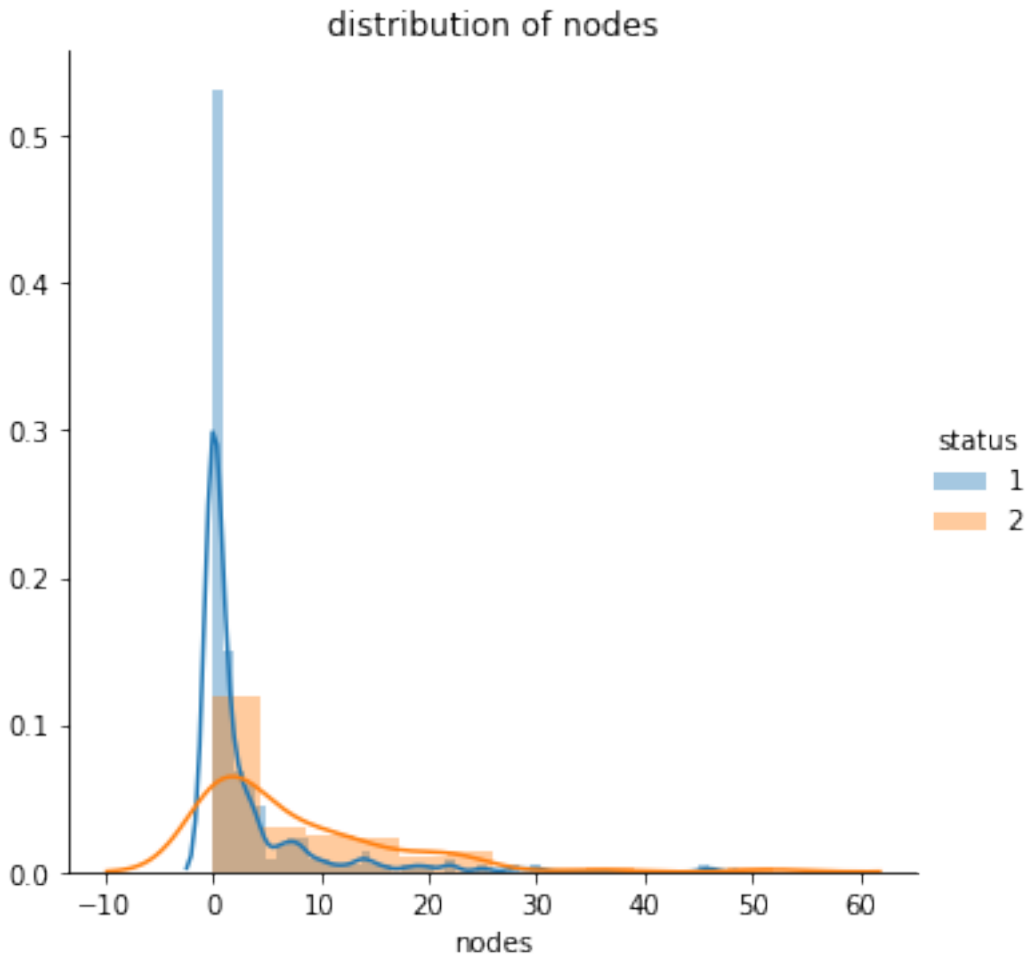


OBSERVATION: All the attributes have similar distribution with survival.

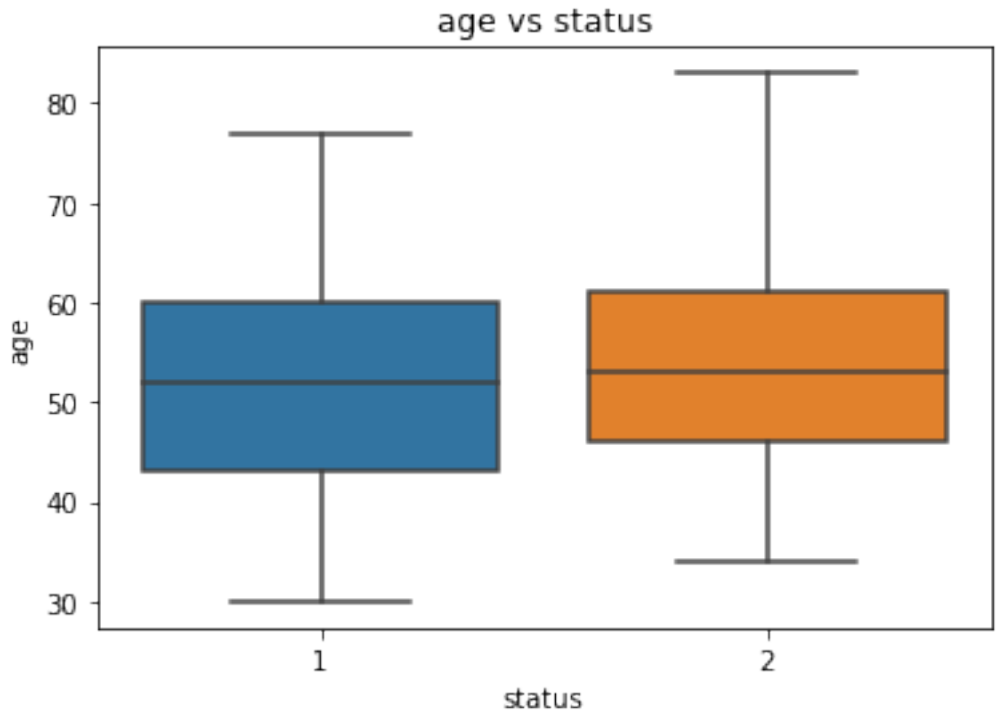
[95]:
```
#Plotting individual attributes w.r.t status. All the distributions are similar␣
↪compared to survival


for i in data.columns[0:3]:
    sns.FacetGrid(data,hue = 'status',size=5)\
       .map(sns.distplot,i)\
       .add_legend()
    plt.title('distribution of' + ' ' + i)
    plt.show()
```

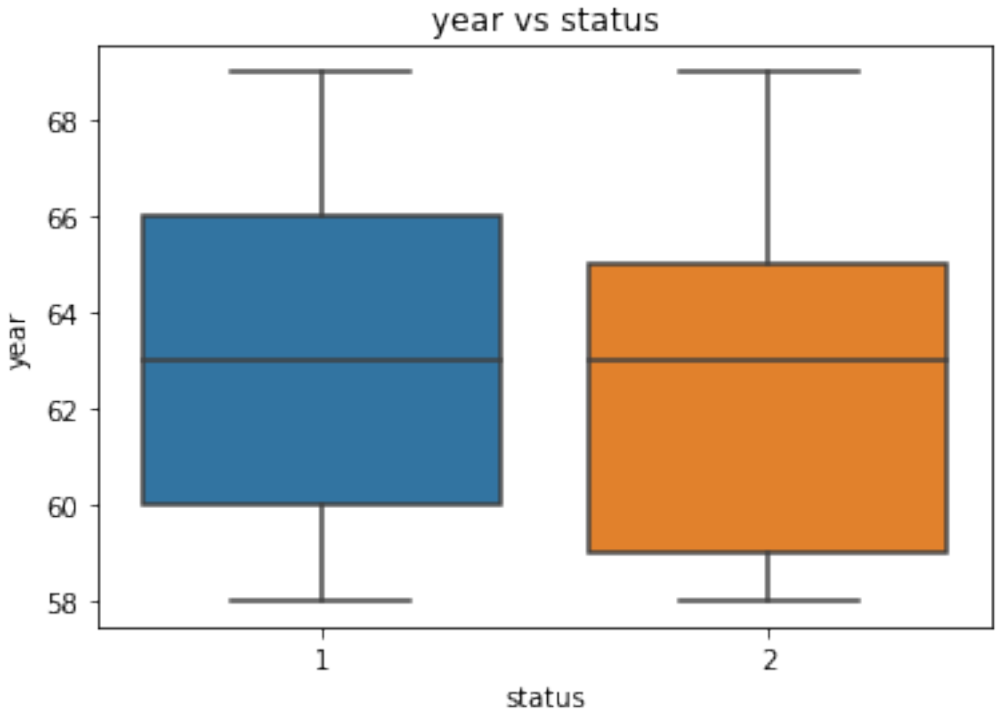

distribution of age
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
20
30
40
50
60
70
80
90
100
age
status
1
2

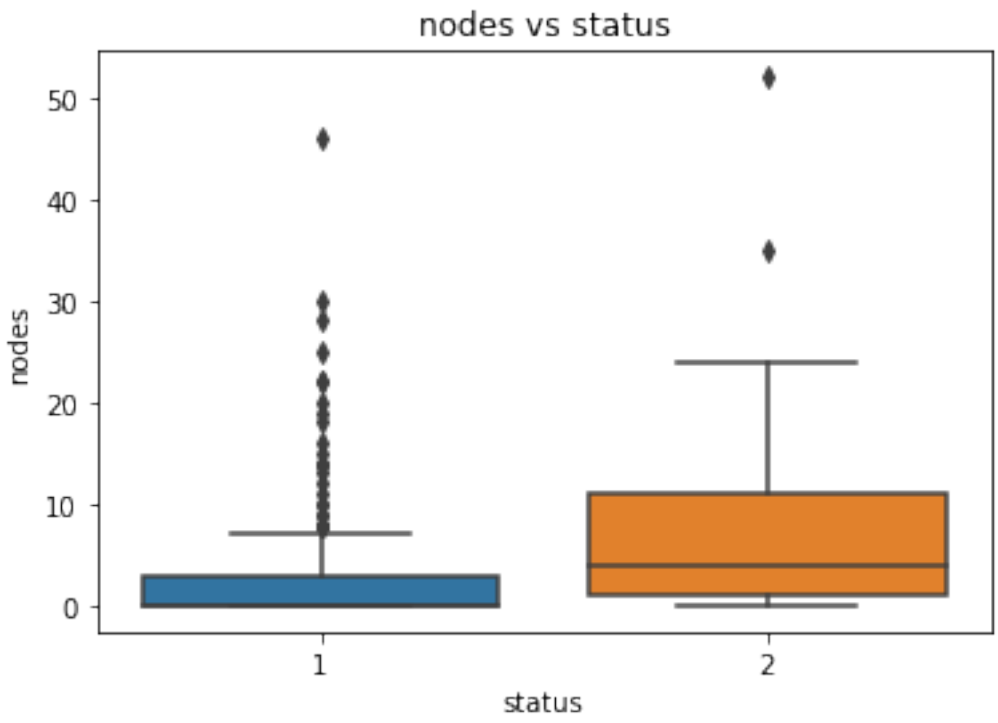

distribution of year
0.12
0.10
0.08
0.06
0.04
0.02
0.00
55.0
57.5
60.0
62.5
65.0
67.5
70.0
72.5
year
status
1
2



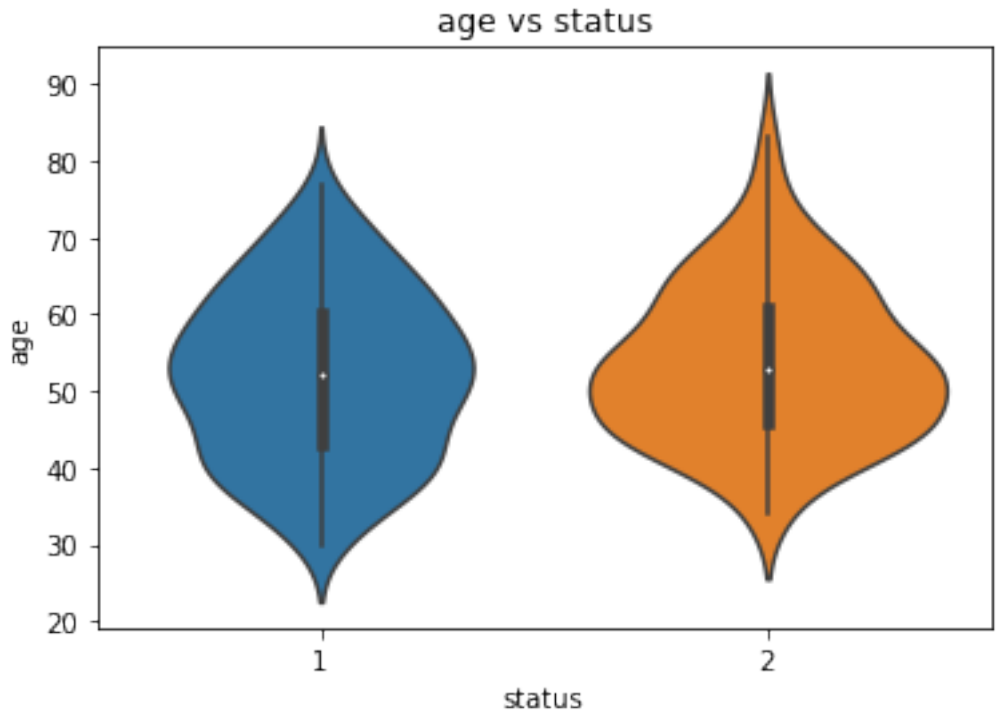
[96]:
```
#plotting boxplot to find the quantiles for each attribute

for i in data.columns[0:3]:
    sns.boxplot(x = 'status',y = i,data = data)
    plt.title(i +' ' +'vs status')
    plt.show()
```

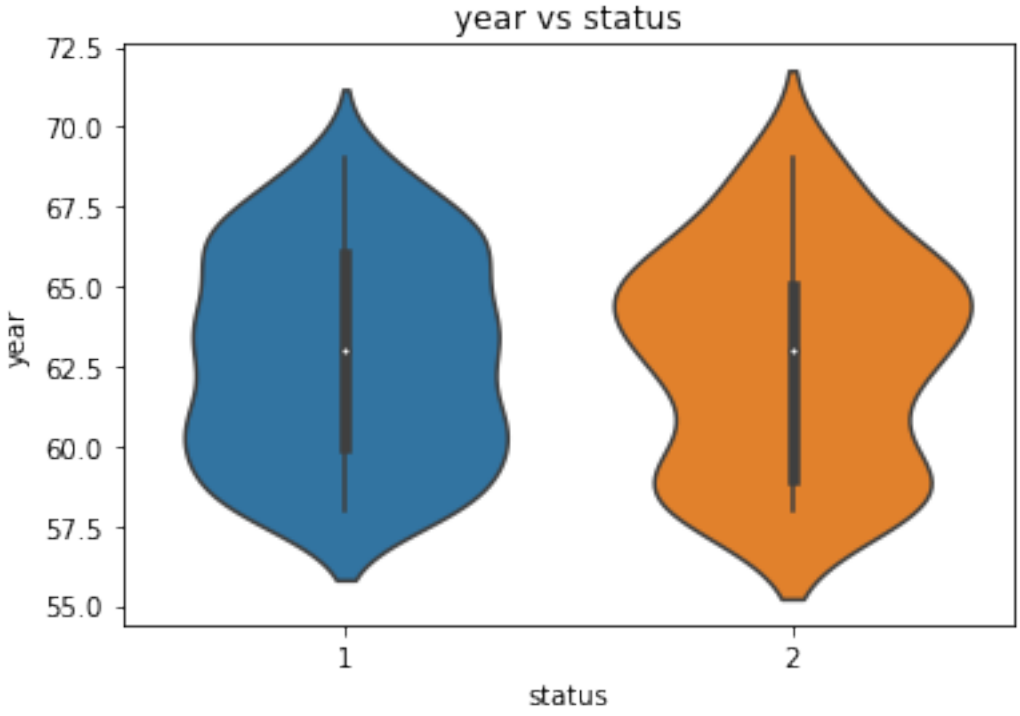

age vs status
80
70
60
50
40
30
age
1
2
status

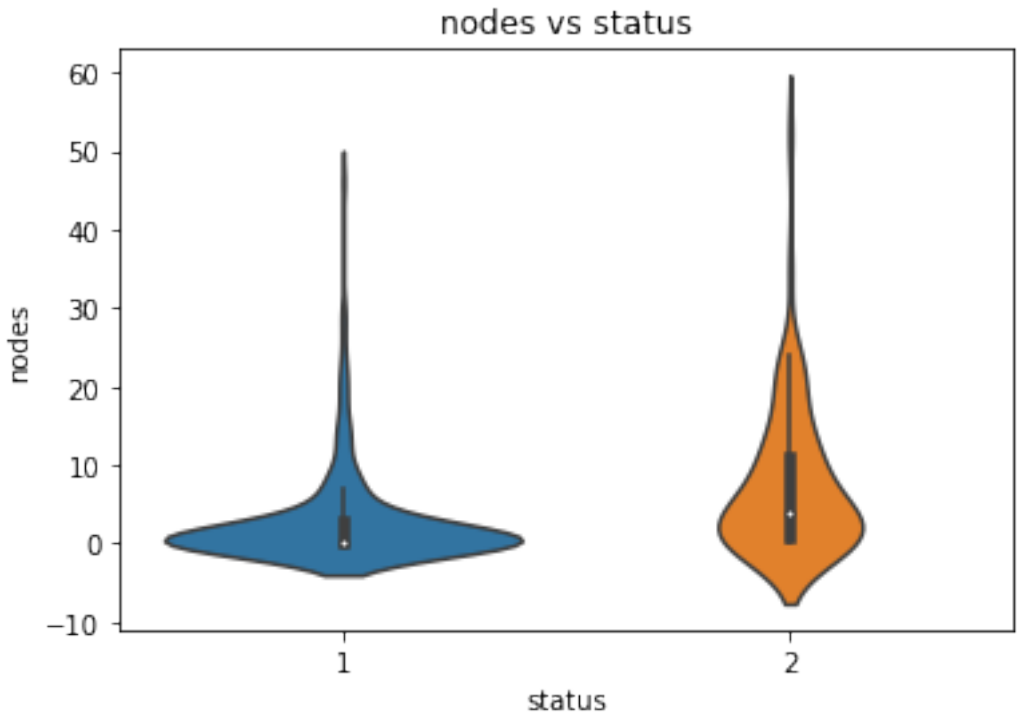

year vs status
68
66
64
62
60
58
year
1
2
status



[97]:
```
#violin plots are a combination of pdf and boxplots
for i in data.columns[0:3]:
    sns.violinplot(x = 'status',y = i,data = data)
    plt.title(i +' ' +'vs status')
    plt.show()
```


age vs status
90
80
70
60
50
40
30
20
age
1
2
status


year vs status
72.5
70.0
67.5
65.0
62.5
60.0
57.5
55.0
year
1
2
status



1 CDF AND PDF

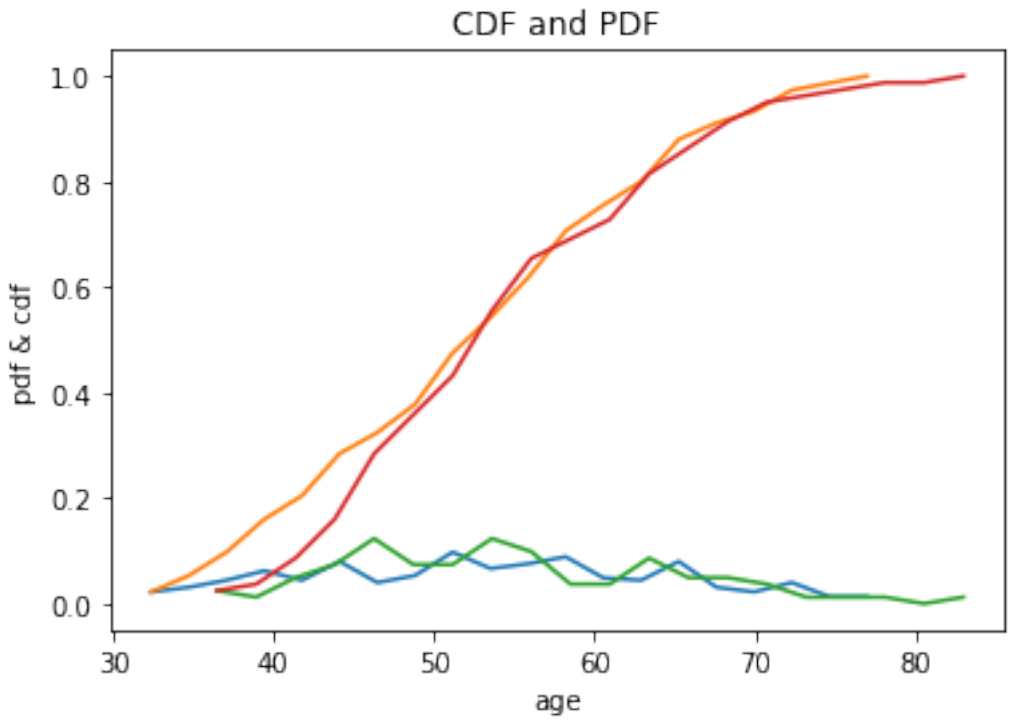
As part of the univariate analysis, PDF and CDF distributions are plottes for each variable with status 1 and status 2 separately

[98]:
```
data1 = data.loc[data['status'] == 1]
data2 = data.loc[data['status'] == 2]
```

[99]:
```
counts,bin_edges = np.histogram(data1['age'],bins=20,density = True)
pdf = counts/(sum(counts))
print(pdf)
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:],cdf)


counts,bin_edges = np.histogram(data2['age'],bins=20,density = True)
pdf = counts/(sum(counts))
print(pdf)
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
```

```
plt.plot(bin_edges[1:],cdf)
plt.xlabel('age')
plt.ylabel('pdf & cdf')
plt.title('CDF and PDF')
plt.show()
```

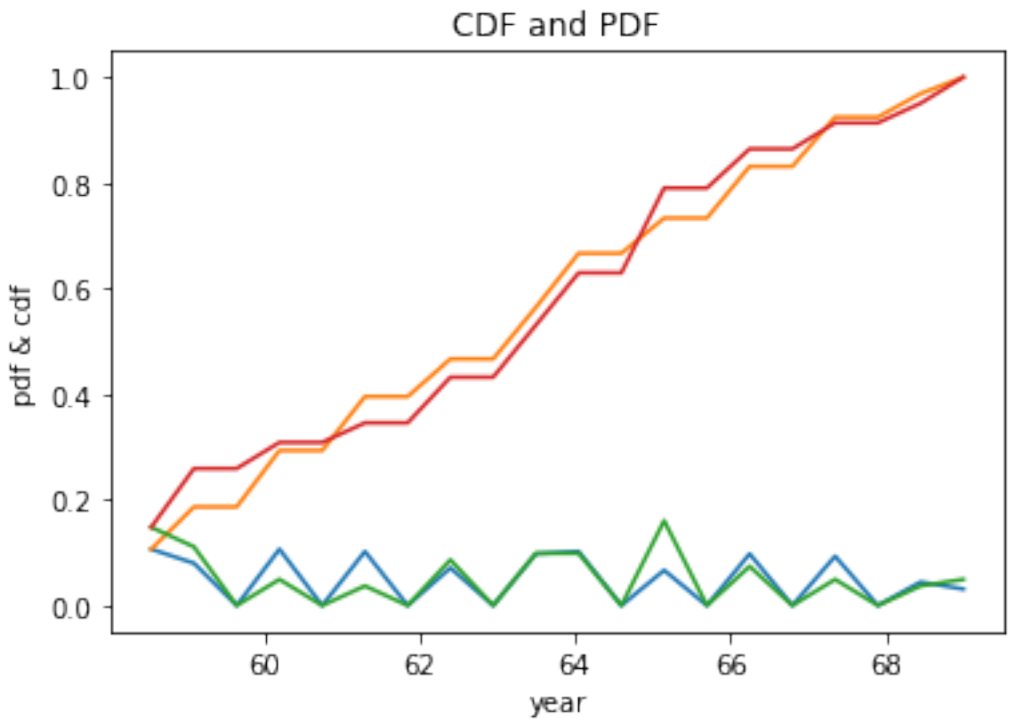
```
[0.02222222 0.03111111 0.04444444 0.06222222 0.04444444 0.08
 0.04       0.05333333 0.09777778 0.06666667 0.07555556 0.08888889
 0.04888889 0.04444444 0.08       0.03111111 0.02222222 0.04
 0.01333333 0.01333333]
[30.   32.35 34.7  37.05 39.4  41.75 44.1  46.45 48.8  51.15 53.5  55.85
 58.2  60.55 62.9  65.25 67.6  69.95 72.3  74.65 77.  ]
[0.02469136 0.01234568 0.04938272 0.07407407 0.12345679 0.07407407
 0.07407407 0.12345679 0.09876543 0.03703704 0.03703704 0.08641975
 0.04938272 0.04938272 0.03703704 0.01234568 0.01234568 0.01234568
 0.         0.01234568]
[34.   36.45 38.9  41.35 43.8  46.25 48.7  51.15 53.6  56.05 58.5  60.95
 63.4  65.85 68.3  70.75 73.2  75.65 78.1  80.55 83.  ]
```



[100]:
```
counts,bin_edges = np.histogram(data1['year'],bins=20,density = True)
pdf = counts/(sum(counts))
print(pdf)
print(bin_edges)
```

```
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:],cdf)


counts,bin_edges = np.histogram(data2['year'],bins=20,density = True)
pdf = counts/(sum(counts))
print(pdf)
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:],cdf)
plt.xlabel('year')
plt.ylabel('pdf & cdf')
plt.title('CDF and PDF')
plt.show()
```

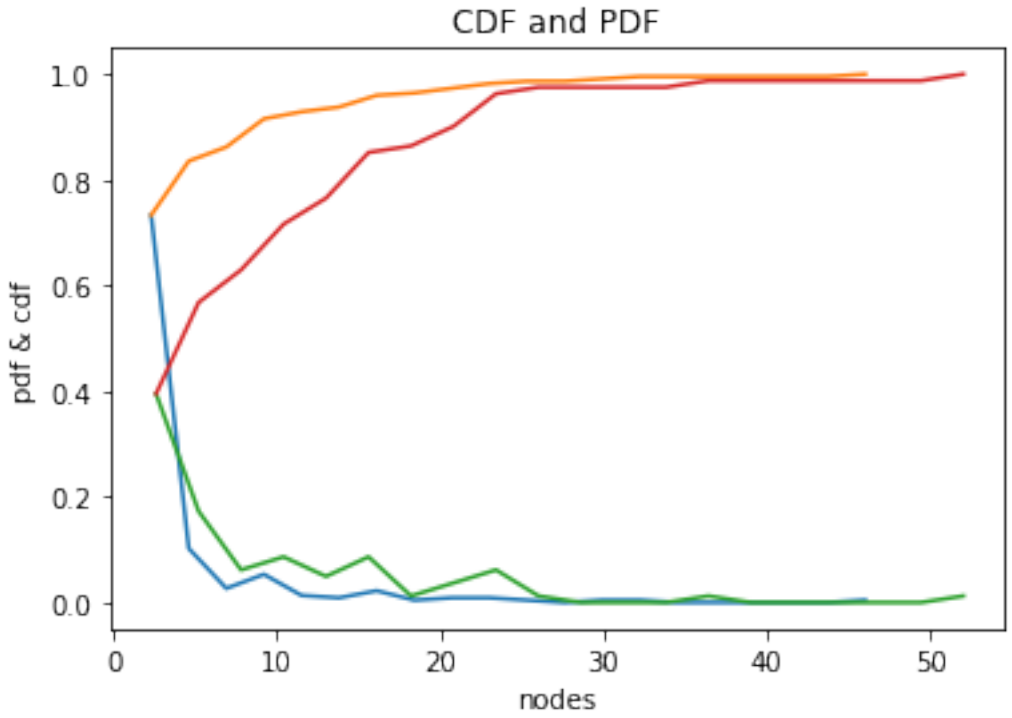
```
[0.10666667 0.08       0.         0.10666667 0.         0.10222222
 0.         0.07111111 0.         0.09777778 0.10222222 0.
 0.06666667 0.         0.09777778 0.         0.09333333 0.
 0.04444444 0.03111111]
[58.   58.55 59.1  59.65 60.2  60.75 61.3  61.85 62.4  62.95 63.5  64.05
 64.6  65.15 65.7  66.25 66.8  67.35 67.9  68.45 69.  ]
[0.14814815 0.11111111 0.         0.04938272 0.         0.03703704
 0.         0.08641975 0.         0.09876543 0.09876543 0.
 0.16049383 0.         0.07407407 0.         0.04938272 0.
 0.03703704 0.04938272]
[58.   58.55 59.1  59.65 60.2  60.75 61.3  61.85 62.4  62.95 63.5  64.05
 64.6  65.15 65.7  66.25 66.8  67.35 67.9  68.45 69.  ]
```



[101]:
```
counts,bin_edges = np.histogram(data1['nodes'],bins=20,density = True)
pdf = counts/(sum(counts))
print(pdf)
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:],cdf)


counts,bin_edges = np.histogram(data2['nodes'],bins=20,density = True)
pdf = counts/(sum(counts))
print(pdf)
print(bin_edges)
cdf = np.cumsum(pdf)
plt.plot(bin_edges[1:],pdf)
plt.plot(bin_edges[1:],cdf)
plt.xlabel('nodes')
plt.ylabel('pdf & cdf')
plt.title('CDF and PDF')
plt.show()
```

```
[0.73333333 0.10222222 0.02666667 0.05333333 0.01333333 0.00888889
 0.02222222 0.00444444 0.00888889 0.00888889 0.00444444 0.
 0.00444444 0.00444444 0.         0.         0.         0.
```

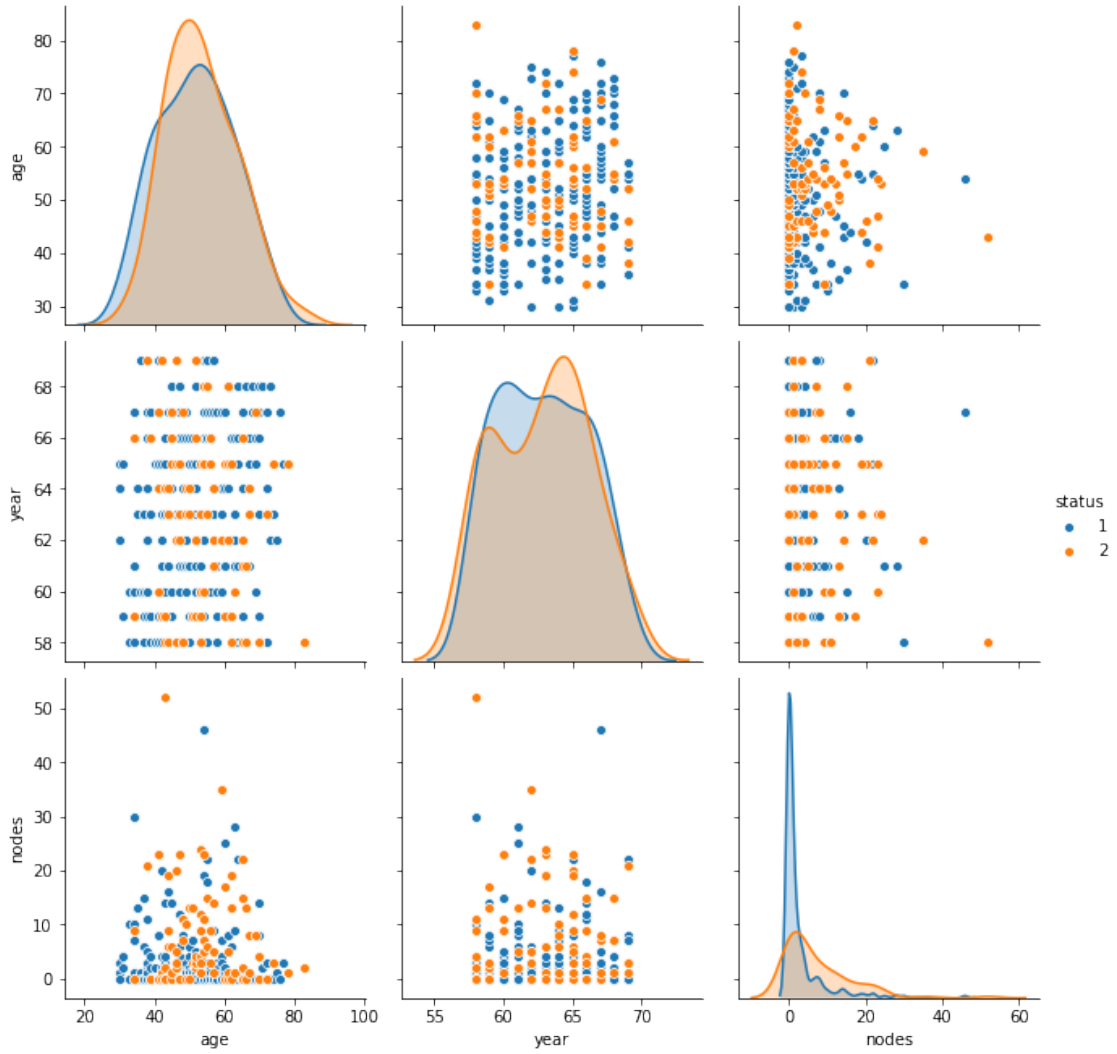
```
 0.          0.00444444]
[ 0.   2.3  4.6  6.9  9.2 11.5 13.8 16.1 18.4 20.7 23.  25.3 27.6 29.9
 32.2 34.5 36.8 39.1 41.4 43.7 46. ]
[0.39506173 0.17283951 0.0617284  0.08641975 0.04938272 0.08641975
 0.01234568 0.03703704 0.0617284  0.01234568 0.         0.
 0.         0.01234568 0.         0.         0.         0.
 0.         0.01234568]
[ 0.   2.6  5.2  7.8 10.4 13.  15.6 18.2 20.8 23.4 26.  28.6 31.2 33.8
 36.4 39.  41.6 44.2 46.8 49.4 52. ]
```



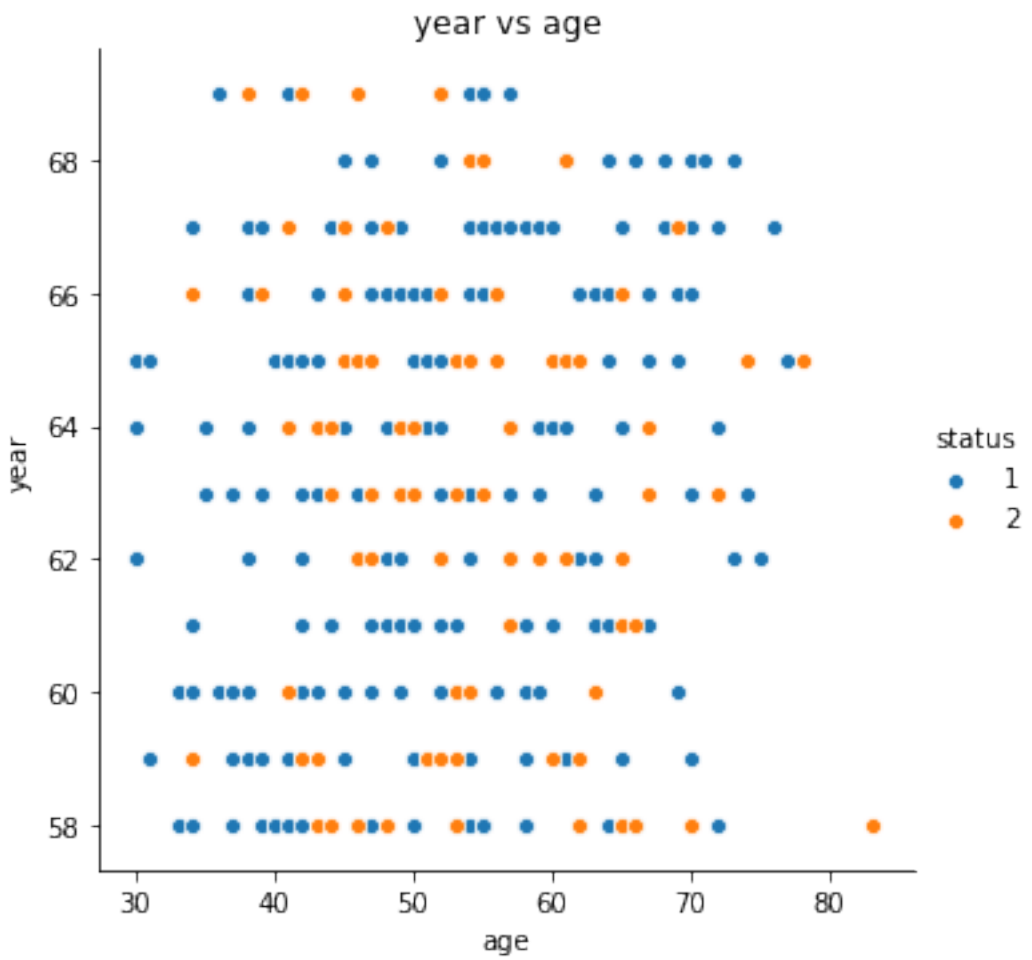
2 Pair Plots for Bivariate Analysis

Pair plots are plotted to find possible relation betwee each variable

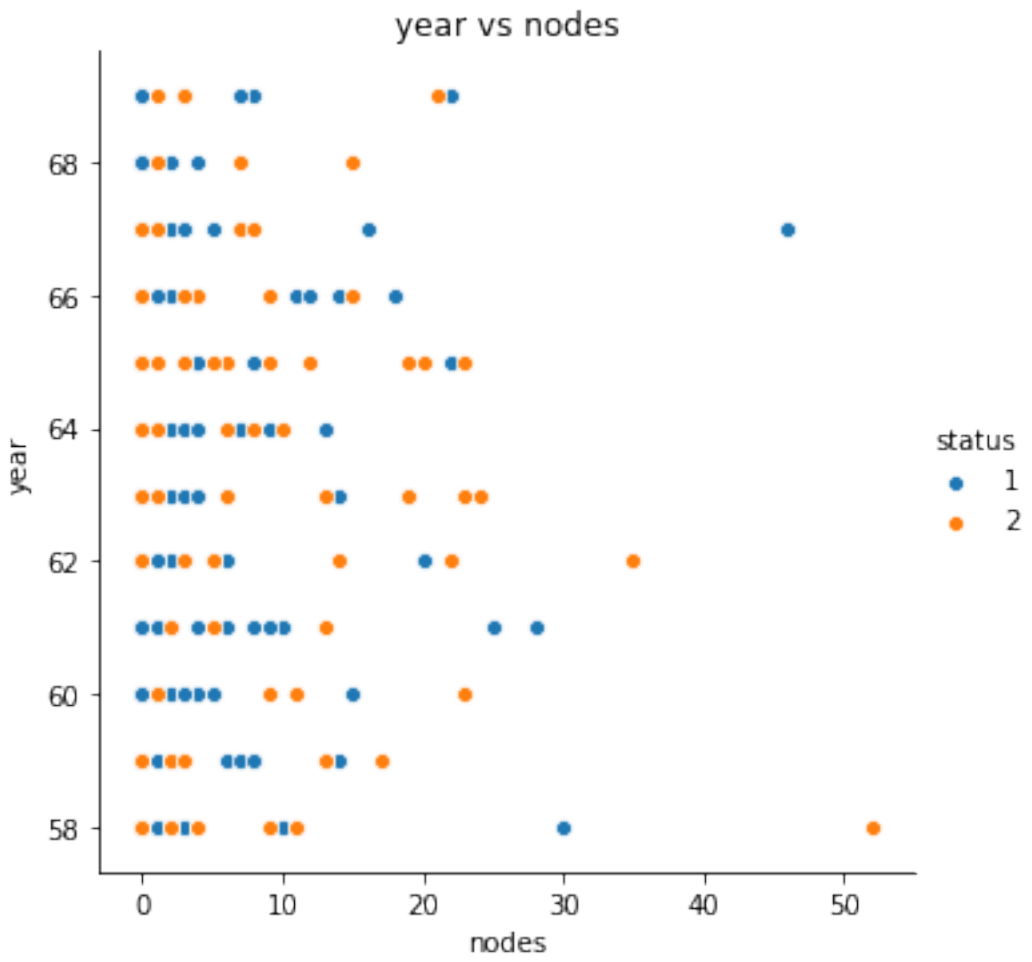
[102]:
```
sns.pairplot(data,hue = 'status',size = 3)
plt.show()
```



[103]:
```
#scatterplots are plotted
for x in data.columns[1:3]:
    sns.FacetGrid(data,hue='status',size =5)\
       .map(sns.scatterplot,'age',x)\
       .add_legend()
    plt.title(x +' ' +'vs age')
    plt.show()
```


year vs age
68
66
64
62
60
58
year
30
40
50
60
70
80
age
status
1
2

[104]:
```
sns.FacetGrid(data,hue='status',size =5)\
    .map(sns.scatterplot,'nodes','year')\
    .add_legend()
plt.title('year vs nodes')
plt.show()
```



3 OBSERVATIONS

Although, we could not make a conclusive statement with the data provided and the distribution of data due to the class imbalance, from the pair plot of year and nodes, we can observe that people with lower no.of nodes have survived. Same can be concluded with distplot of nodes. It is evident that survival chances for people with higher number of nodes is very low.