Assignment1-EDA

September 28, 2018

```
In [1]: import pandas as pd
        import matplotlib.pyplot as plt
        import seaborn as sns
        import numpy as np

In [2]: df=pd.read_csv('./haberman.csv',names=['Age','Op_Year','axil_nodes_det','Surv_status'])

In [3]: df.head()

Out[3]:    Age  Op_Year  axil_nodes_det  Surv_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
```

#We have data of patient who has undergone surgery for breast cancer . #After surgery did the patient survived for 5 years or not?? #with given given data we have to explore that which feature has impact on survival of patient and how much.

Basic Data Intuition

```
In [4]: df.shape
        # Shows 306 data point and 4 feature

Out[4]: (306, 4)

In [5]: df.info()

        # No Null data enteries in any data points

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 306 entries, 0 to 305
Data columns (total 4 columns):
Age               306 non-null int64
Op_Year           306 non-null int64
axil_nodes_det    306 non-null int64
Surv_status       306 non-null int64
dtypes: int64(4)
memory usage: 9.6 KB
```

In [6]:
```
df.columns
```

Out[6]:
```
Index(['Age', 'Op_Year', 'axil_nodes_det', 'Surv_status'], dtype='object')
```

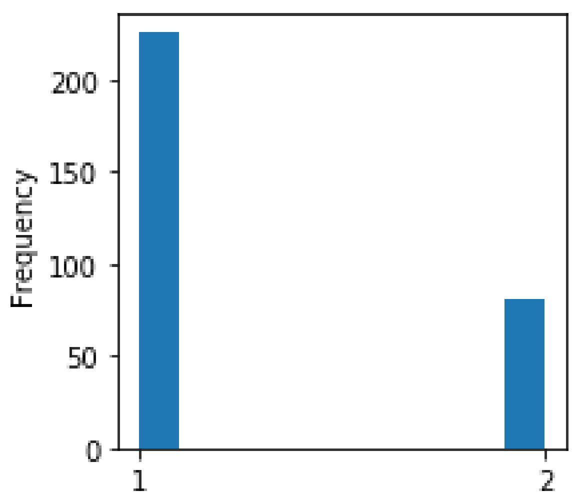
In [11]:
```
df.Surv_status.value_counts()
```

Out[11]:
```
1    225
2     81
Name: Surv_status, dtype: int64
```

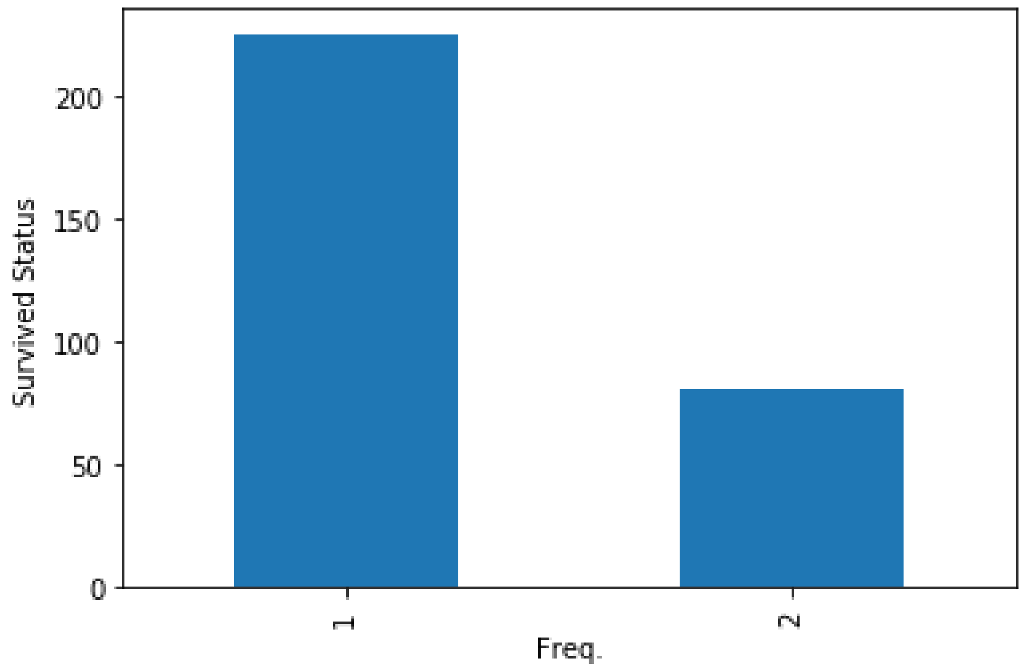
In [7]:
```
df.Surv_status.value_counts()/df.shape[0]

# No of "Not Survived" is almost 1/4 of total data points.
```

Out[7]:
```
1    0.735294
2    0.264706
Name: Surv_status, dtype: float64
```

In [14]:
```
plt.figure()
plt.subplot()
df.Surv_status.plot(kind='hist',xticks=[1,2],figsize=(3,3),)
plt.show()
```



In [22]:
```
df.Surv_status.value_counts().sort_index().plot('bar')
plt.xlabel("Freq.")
plt.ylabel("Survived Status")
plt.show()
```



Bar and Hist plot to see the proportion of data points available to each class

0.0.1 Univaraite analysis(PDF, CDF, Dist-plot)

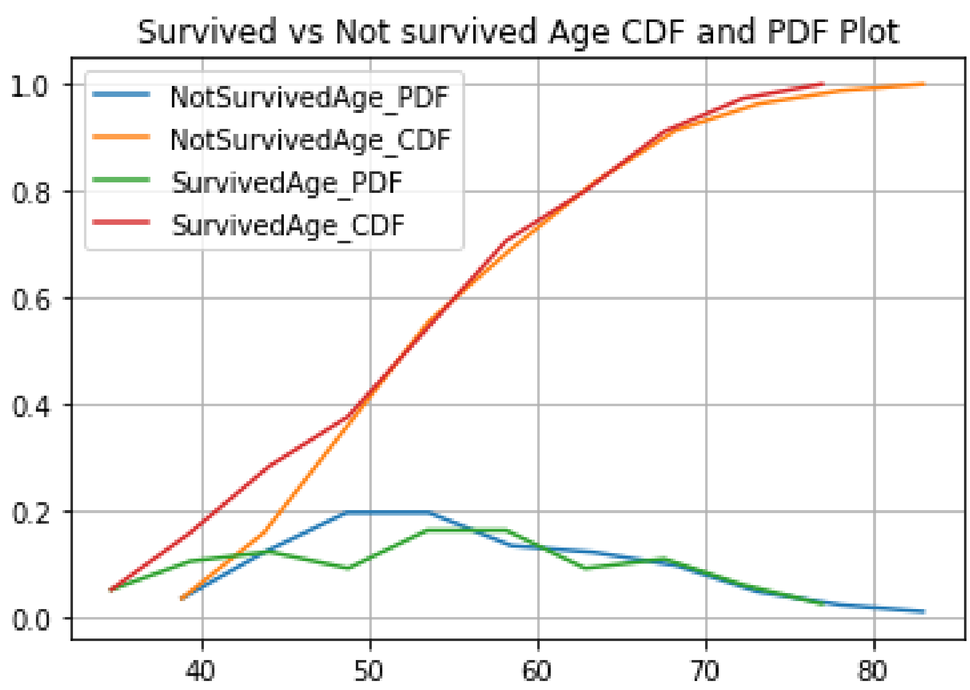
```
In [7]: df_Survived=df.loc[df.Surv_status==1]
        df_Notsurvived=df.loc[df.Surv_status==2]
```

```
In [9]: def plot_pdf_cdf(pdf,cdf,bins_points,title,cdf_title):
            plt.plot(bins_points[1:],pdf,label=title)
            plt.plot(bins_points[1:],cdf,label=cdf_title)
            plt.legend()

        #    plt.grid()
        #    plt.show()

        # bins_point[1:] is used because there are toatal 11 points which is 1 more than pdf s
```

```
In [11]: plt.figure(3)

         age,bins_points_age=np.histogram(a=df_Notsurvived.Age,bins=10)
         pdf_age=age/sum(age)
         print(pdf_age)
         print(bins_points_age)
         cdf_age=np.cumsum(pdf_age)
         plot_pdf_cdf(pdf_age,cdf_age,bins_points_age,"NotSurvivedAge_PDF","NotSurvivedAge_CDF"
```

```
age,bins_points_age=np.histogram(a=df_Survived.Age,bins=10)
pdf_age=age/sum(age)
print(pdf_age)
print(bins_points_age)
cdf_age=np.cumsum(pdf_age)
plot_pdf_cdf(pdf_age,cdf_age,bins_points_age,"SurvivedAge_PDF","SurvivedAge_CDF")
plt.legend()
plt.title("Survived vs Not survived Age CDF and PDF Plot")
plt.grid()
plt.show();
```

```
[ 0.03703704  0.12345679  0.19753086  0.19753086  0.13580247  0.12345679
  0.09876543  0.04938272  0.02469136  0.01234568]
[ 34.   38.9  43.8  48.7  53.6  58.5  63.4  68.3  73.2  78.1  83. ]
[ 0.05333333  0.10666667  0.12444444  0.09333333  0.16444444  0.16444444
  0.09333333  0.11111111  0.06222222  0.02666667]
[ 30.   34.7  39.4  44.1  48.8  53.5  58.2  62.9  67.6  72.3  77. ]
```

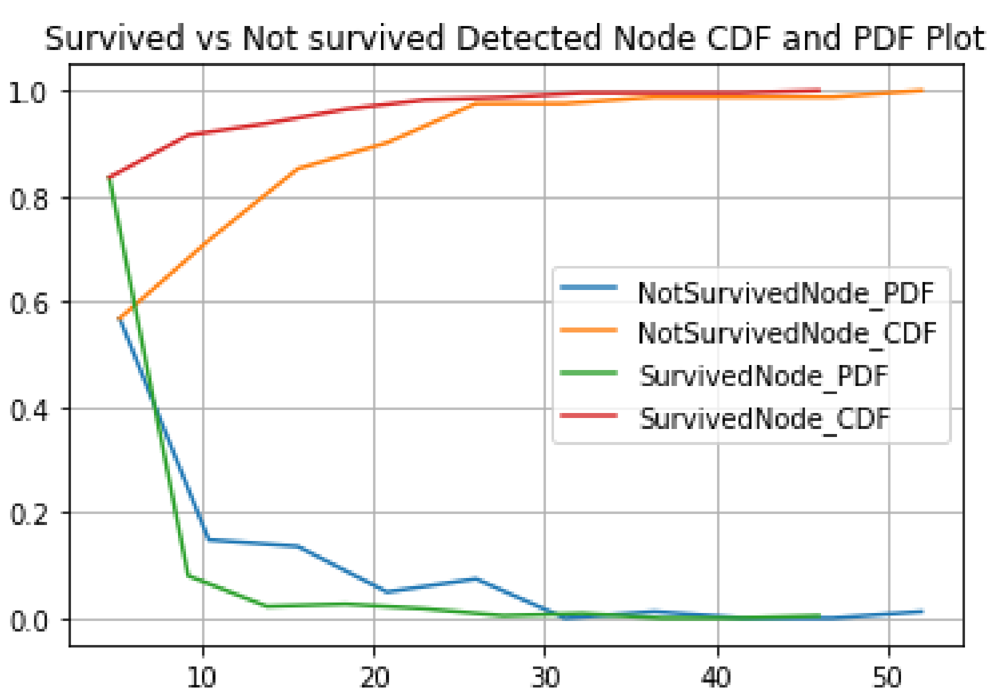


Multiple crossover doesnt give clear insight about age effect but cahnces of "not surving" has more chances compare to "surviving"

```
In [12]: plt.figure(2)
         plt.subplot()
```

```
node,bins_points_node=np.histogram(df_Notsurvived.axil_nodes_det,bins=10)
pdf_node=node/sum(node)
print(pdf_node)
print(bins_points_node)
cdf_node=np.cumsum(pdf_node)
plot_pdf_cdf(pdf_node,cdf_node,bins_points_node,"NotSurvivedNode_PDF","NotSurvivedNod


node,bins_points_node=np.histogram(df_Survived.axil_nodes_det,bins=10)
pdf_node=node/sum(node)
print(pdf_node)
print(bins_points_node)
cdf_node=np.cumsum(pdf_node)
plot_pdf_cdf(pdf_node,cdf_node,bins_points_node,"SurvivedNode_PDF","SurvivedNode_CDF"
plt.legend()
plt.title("Survived vs Not survived Detected Node CDF and PDF Plot")
plt.grid()
plt.show();
```

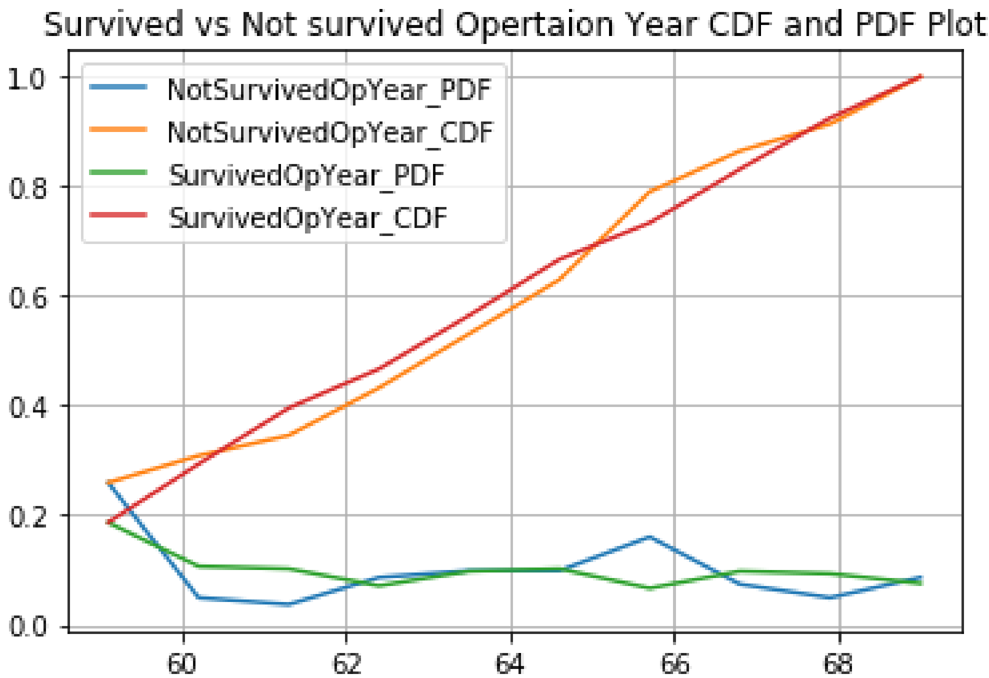
```
[ 0.56790123  0.14814815  0.13580247  0.04938272  0.07407407  0.
  0.01234568  0.          0.          0.01234568]
[  0.    5.2  10.4  15.6  20.8  26.   31.2  36.4  41.6  46.8  52. ]
[ 0.83555556  0.08        0.02222222  0.02666667  0.01777778  0.00444444
  0.00888889  0.          0.          0.00444444]
[  0.    4.6   9.2  13.8  18.4  23.   27.6  32.2  36.8  41.4  46. ]
```



If the "No. of nodes detected" is < 10 then chances of "Surviving" is more than "Not surviving"

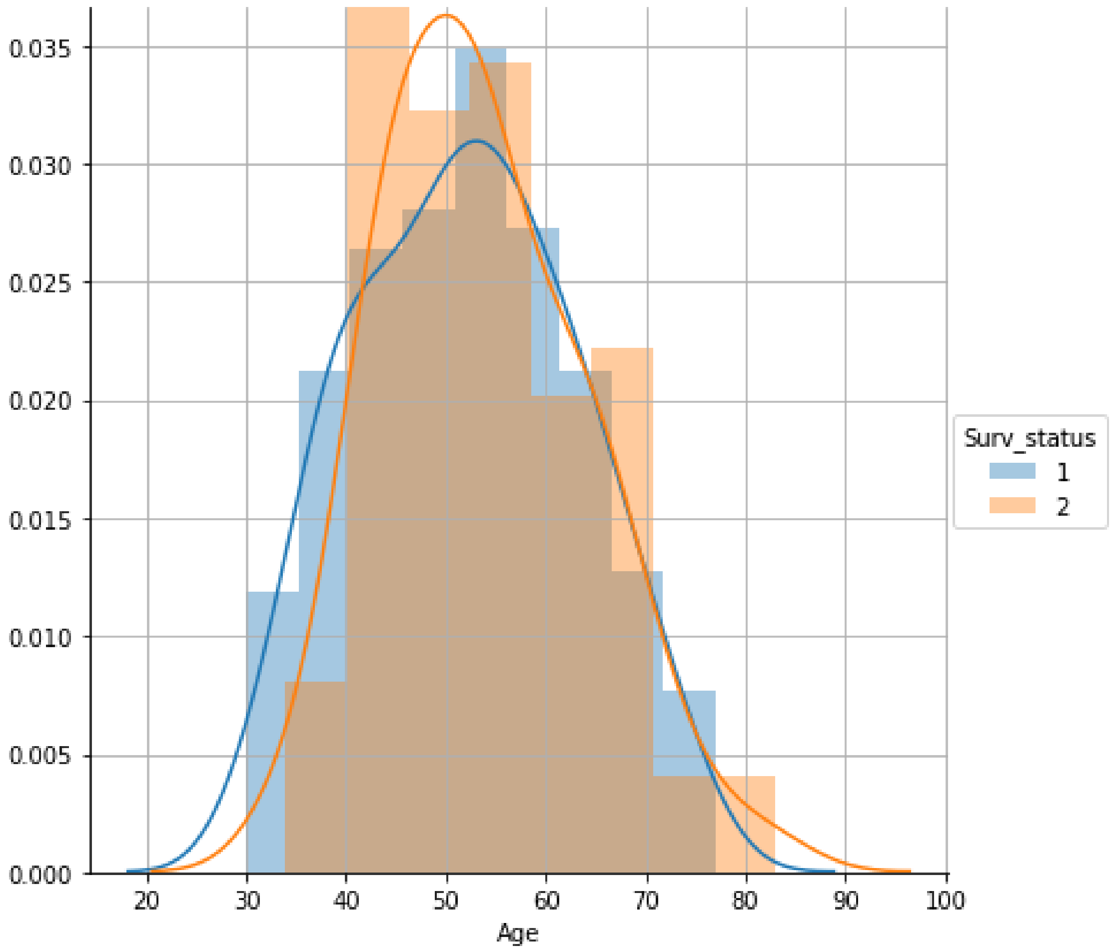
In [13]:
```
plt.figure(1)

yr,bins_points_yr=np.histogram(a=df_Notsurvived.Op_Year,bins=10)
pdf_yr=yr/sum(yr)
print(pdf_yr)
print(bins_points_yr)
cdf_yr=np.cumsum(pdf_yr)
plot_pdf_cdf(pdf_yr,cdf_yr,bins_points_yr,"NotSurvivedOpYear_PDF","NotSurvivedOpYear_(



yr,bins_points_yr=np.histogram(a=df_Survived.Op_Year,bins=10)
pdf_yr=yr/sum(yr)
print(pdf_yr)
print(bins_points_yr)
cdf_yr=np.cumsum(pdf_yr)
plot_pdf_cdf(pdf_yr,cdf_yr,bins_points_yr,"SurvivedOpYear_PDF","SurvivedOpYear_CDF")
plt.legend()
plt.title("Survived vs Not survived Opertaion Year CDF and PDF Plot")
plt.grid()
plt.show();
```

```
[ 0.25925926  0.04938272  0.03703704  0.08641975  0.09876543  0.09876543
  0.16049383  0.07407407  0.04938272  0.08641975]
[ 58.   59.1  60.2  61.3  62.4  63.5  64.6  65.7  66.8  67.9  69. ]
[ 0.18666667  0.10666667  0.10222222  0.07111111  0.09777778  0.10222222
  0.06666667  0.09777778  0.09333333  0.07555556]
[ 58.   59.1  60.2  61.3  62.4  63.5  64.6  65.7  66.8  67.9  69. ]
```

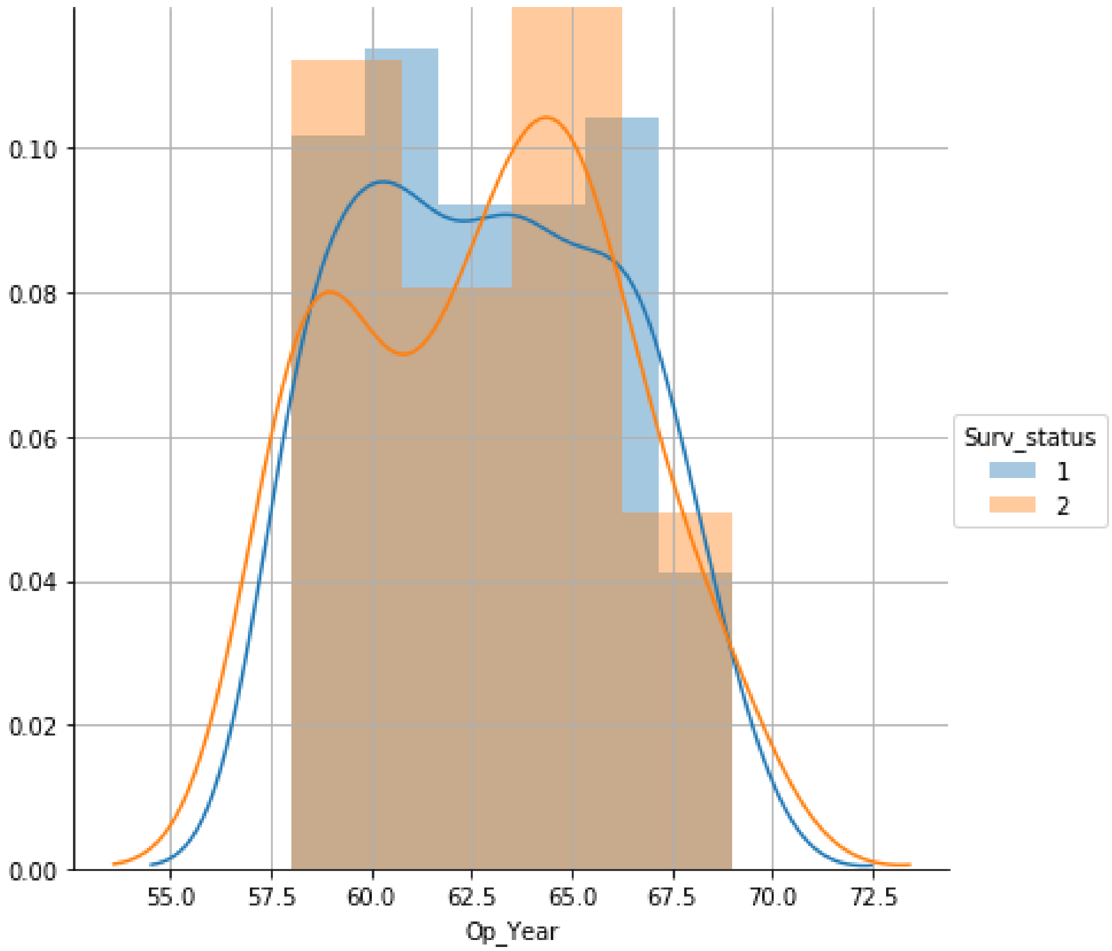


cdf indicates that except some year (65 to 67 and <61) the chance of "surviving" is more

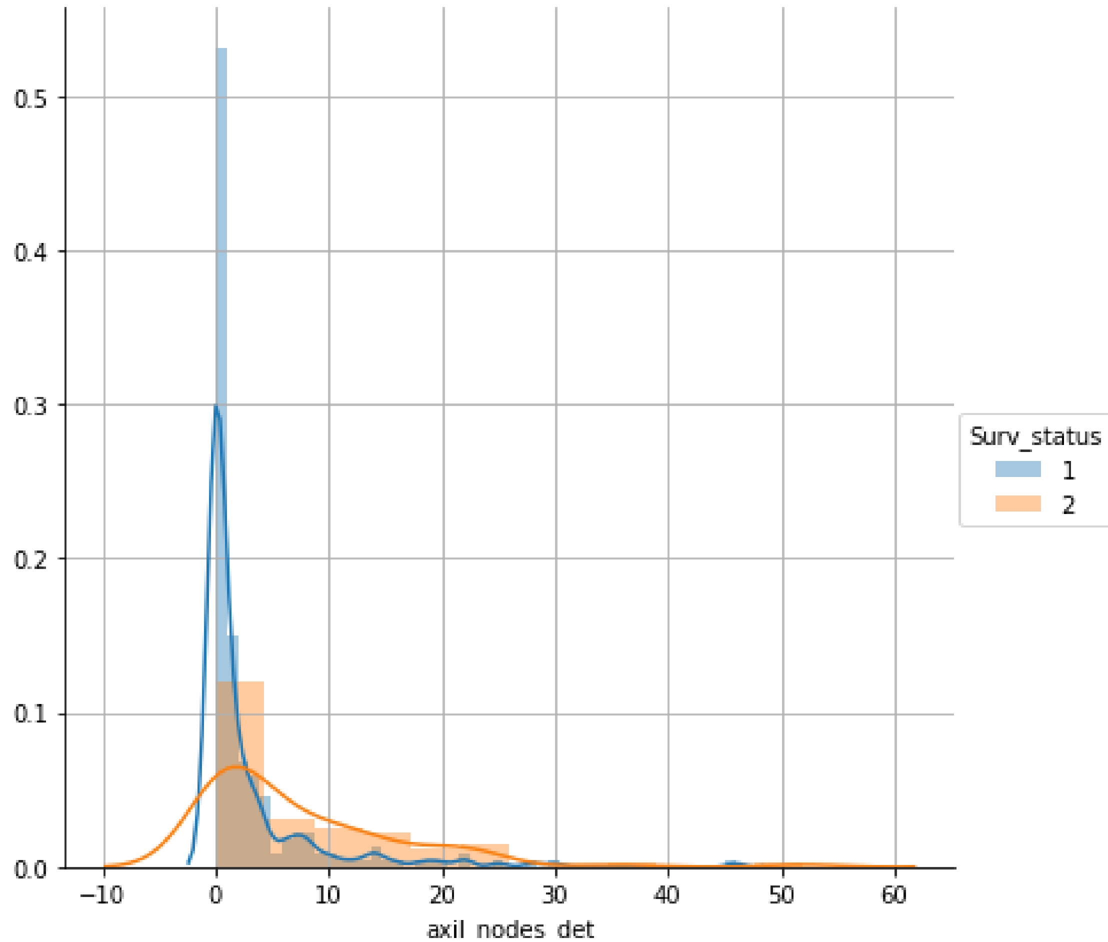
In [23]:
```
sns.FacetGrid(data=df,hue='Surv_status',size=6).map(sns.distplot,"Age").add_legend();
plt.grid()
plt.show();
```




```
In [33]: sns.FacetGrid(data=df,hue="Surv_status",size=6).map(sns.distplot,"Op_Year").add_legend
         plt.grid()
         plt.show()
```



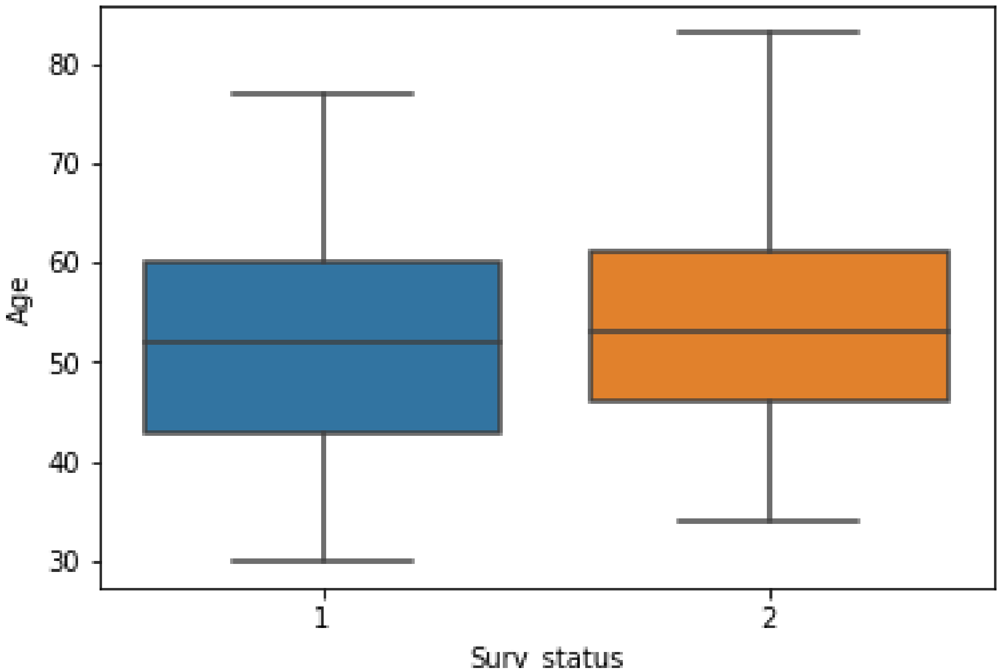
In [30]:
```
sns.FacetGrid(data=df,hue="Surv_status",size=6).map(sns.distplot,"axil_nodes_det").ado
plt.grid()
plt.show()
```



Except the distplot of "axil nodes detected" the other distplots are jumbled and doesnot give clear picture where as "axil_nodes_det"<10 gives more surviving hope.

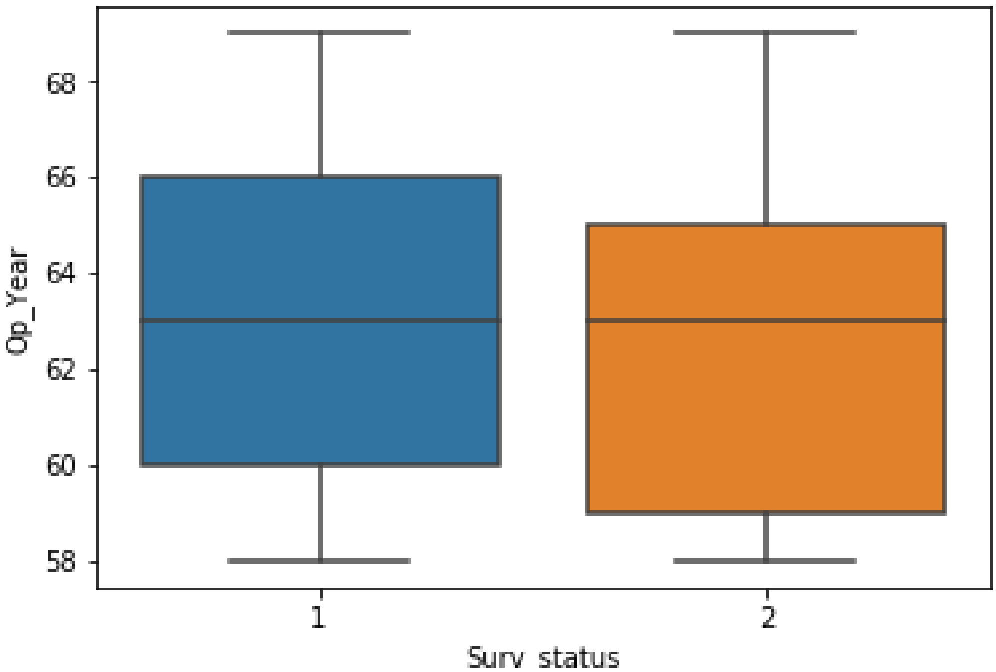
0.0.2 Box Plot and Voilin plot

```
In [26]: sns.boxplot(data=df,x='Surv_status',y='Age')
         plt.show()
```



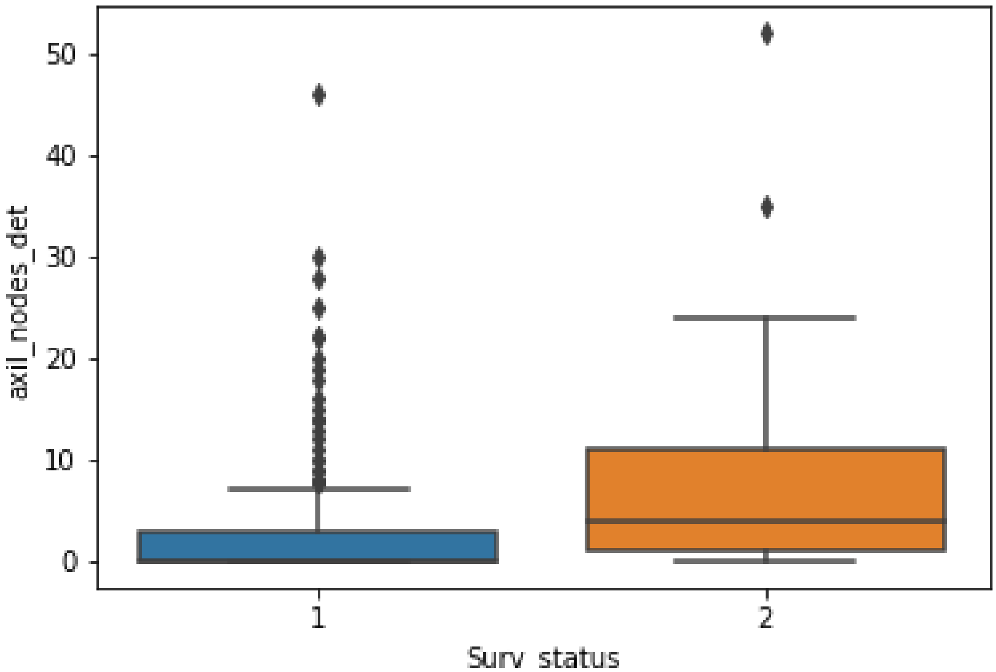
Both looks same but early Age guys have more survival chances while whisker of "not survived" shows late age might lead to fail operation.

```
In [28]: sns.boxplot(data=df,x='Surv_status',y='Op_Year')
         plt.show()
```



Here early opertaions (Intial years of operations) were more failure while later year has more sucess chances

```
In [29]: sns.boxplot(data=df,x='Surv_status',y='axil_nodes_det')
         plt.show()
```

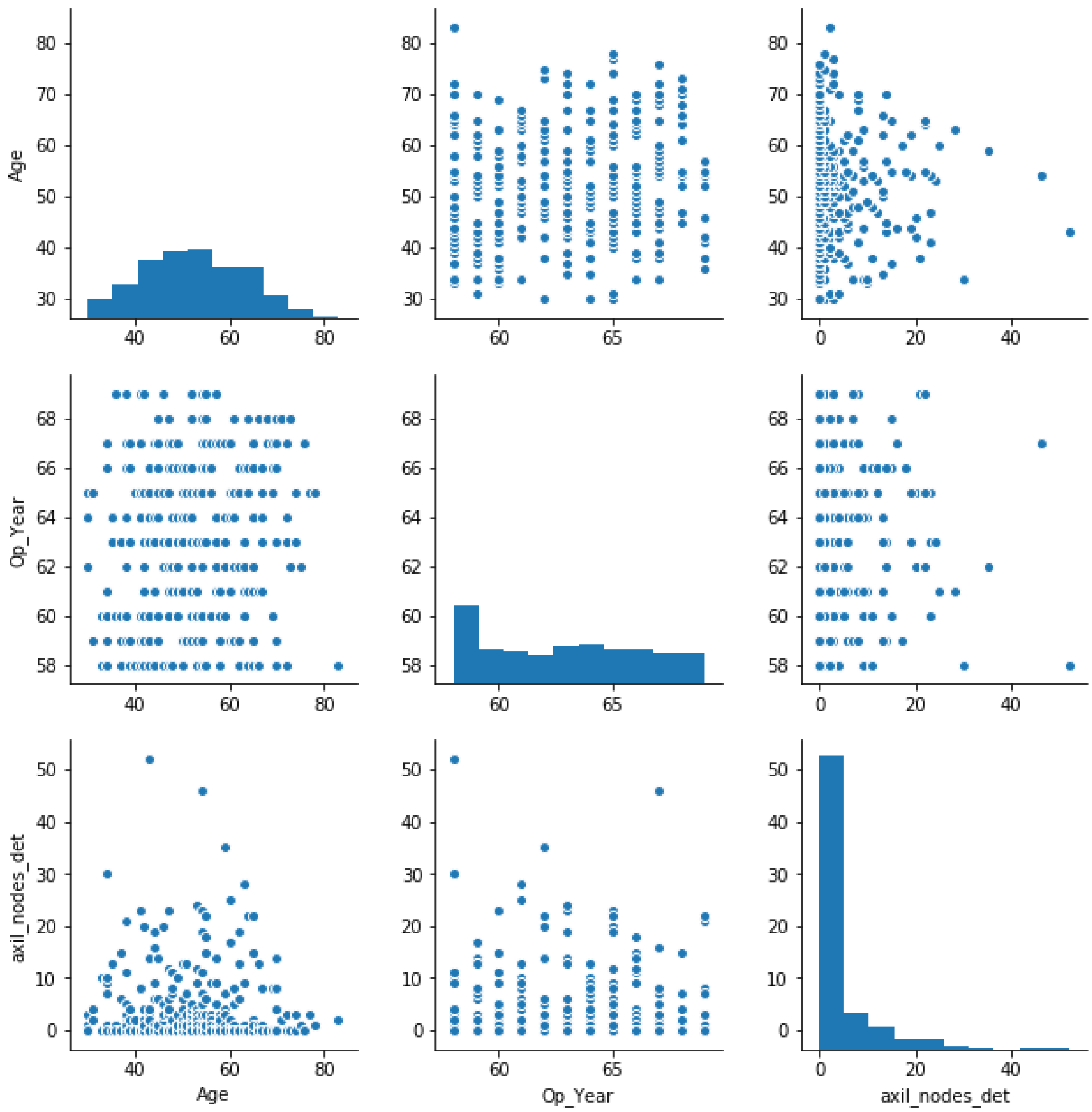


The median of both box's are low this might be outlier issue but more axil nodes detected has more not surving chances.

Data seems nicely distributed for "Age" and "Op_Year" but "axil_nodes_det" has outliers which is impacting the the pattern

0.1 Bi Variate Analysis (Pair Plot)

```
In [23]: sns.pairplot(data=df.iloc[:,0:-1],size=3)
         plt.show()
```



0.2 Conclusion : PDF and CDFs has given below insights :

1) “detected nodes” has more impact on “survival” as lower the nodes , surviving chances are more.
2) as age increases the chance of “not surviving” is more
3) From Box plot there is slight indication of outliers as very few data points belongs to 30+ range..
4) Pair plots indicates relation between axil_nodes_det and age.
5) Based on feature importance above visualization shows importance in following order: “axil_nodes_det”> “Age”>“Op_Year”