

1.Descriptive-Statistics

May 15, 2023

```
[267]: import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import time
from subprocess import check_output
from scipy import stats
```

```
[268]: data=pd.read_csv('wdbc.data',header=None)
```

data.head()

```
[269]: data.head()
```

```
[269]:      0      1      2      3      4      5      6      7      8
0  842302    M  17.99  10.38  122.80  1001.0  0.11840  0.27760  0.3001 \
1  842517    M  20.57  17.77  132.90  1326.0  0.08474  0.07864  0.0869
2  84300903   M  19.69  21.25  130.00  1203.0  0.10960  0.15990  0.1974
3  84348301   M  11.42  20.38   77.58   386.1  0.14250  0.28390  0.2414
4  84358402   M  20.29  14.34  135.10  1297.0  0.10030  0.13280  0.1980

         9      22      23      24      25      26      27      28      29
0  0.14710   ...  25.38  17.33  184.60  2019.0  0.1622  0.6656  0.7119  0.2654 \
1  0.07017   ...  24.99  23.41  158.80  1956.0  0.1238  0.1866  0.2416  0.1860
2  0.12790   ...  23.57  25.53  152.50  1709.0  0.1444  0.4245  0.4504  0.2430
3  0.10520   ...  14.91  26.50   98.87   567.7  0.2098  0.8663  0.6869  0.2575
4  0.10430   ...  22.54  16.67  152.20  1575.0  0.1374  0.2050  0.4000  0.1625

      30      31
0  0.4601  0.11890
1  0.2750  0.08902
2  0.3613  0.08758
3  0.6638  0.17300
4  0.2364  0.07678

[5 rows x 32 columns]
```

```
[270]: headers=['id','diagnosis','mean_radius','mean_texture','mean_perimeter','mean_area','mean_smoothness','mean_compactness','mean_concavity','mean_concave_points','worst_radius','worst_texture','worst_perimeter','worst_area','worst_smoothness','worst_compactness','worst_concavity','worst_concave_points','worst_symmetry','worst_fractal_dimension']

[271]: data.to_csv('labeledData.csv',header=headers,index=False)

[272]: data=pd.read_csv('labeledData.csv')
data.head()

[272]:      id diagnosis  mean_radius  mean_texture  mean_perimeter  mean_area
0    842302        M       17.99       10.38      122.80     1001.0 \
1    842517        M       20.57       17.77      132.90     1326.0
2   84300903        M       19.69       21.25      130.00     1203.0
3   84348301        M       11.42       20.38       77.58      386.1
4   84358402        M       20.29       14.34      135.10     1297.0

      mean_smoothness  mean_compactness  mean_concavity  mean_concave points
0            0.11840          0.27760         0.3001           0.14710 \
1            0.08474          0.07864         0.0869           0.07017
2            0.10960          0.15990         0.1974           0.12790
3            0.14250          0.28390         0.2414           0.10520
4            0.10030          0.13280         0.1980           0.10430

      ...  worst_radius  worst_texture  worst_perimeter  worst_area
0   ...       25.38       17.33       184.60      2019.0 \
1   ...       24.99       23.41       158.80      1956.0
2   ...       23.57       25.53       152.50      1709.0
3   ...       14.91       26.50       98.87       567.7
4   ...       22.54       16.67       152.20      1575.0

      worst_smoothness  worst_compactness  worst_concavity  worst_concave points
0            0.1622          0.6656         0.7119           0.2654 \
1            0.1238          0.1866         0.2416           0.1860
2            0.1444          0.4245         0.4504           0.2430
3            0.2098          0.8663         0.6869           0.2575
4            0.1374          0.2050         0.4000           0.1625

      worst_symmetry  worst_fractal dimension
0            0.4601          0.11890
1            0.2750          0.08902
2            0.3613          0.08758
3            0.6638          0.17300
4            0.2364          0.07678
```

[5 rows x 32 columns]

[273]: data.shape

[273]: (569, 32)

[274]: data.describe()

	id	mean_radius	mean_texture	mean_perimeter	mean_area	
count	5.690000e+02	569.000000	569.000000	569.000000	569.000000	\
mean	3.037183e+07	14.127292	19.289649	91.969033	654.889104	
std	1.250206e+08	3.524049	4.301036	24.298981	351.914129	
min	8.670000e+03	6.981000	9.710000	43.790000	143.500000	
25%	8.692180e+05	11.700000	16.170000	75.170000	420.300000	
50%	9.060240e+05	13.370000	18.840000	86.240000	551.100000	
75%	8.813129e+06	15.780000	21.800000	104.100000	782.700000	
max	9.113205e+08	28.110000	39.280000	188.500000	2501.000000	
	mean_smoothness	mean_compactness	mean_concavity	mean_concave points		
count	569.000000	569.000000	569.000000	569.000000	569.000000	\
mean	0.096360	0.104341	0.088799	0.048919		
std	0.014064	0.052813	0.079720	0.038803		
min	0.052630	0.019380	0.000000	0.000000		
25%	0.086370	0.064920	0.029560	0.020310		
50%	0.095870	0.092630	0.061540	0.033500		
75%	0.105300	0.130400	0.130700	0.074000		
max	0.163400	0.345400	0.426800	0.201200		
	mean_symmetry	...	worst_radius	worst_texture	worst_perimeter	
count	569.000000	...	569.000000	569.000000	569.000000	\
mean	0.181162	...	16.269190	25.677223	107.261213	
std	0.027414	...	4.833242	6.146258	33.602542	
min	0.106000	...	7.930000	12.020000	50.410000	
25%	0.161900	...	13.010000	21.080000	84.110000	
50%	0.179200	...	14.970000	25.410000	97.660000	
75%	0.195700	...	18.790000	29.720000	125.400000	
max	0.304000	...	36.040000	49.540000	251.200000	
	worst_area	worst_smoothness	worst_compactness	worst_concavity		
count	569.000000	569.000000	569.000000	569.000000	569.000000	\
mean	880.583128	0.132369	0.254265	0.272188		
std	569.356993	0.022832	0.157336	0.208624		
min	185.200000	0.071170	0.027290	0.000000		
25%	515.300000	0.116600	0.147200	0.114500		
50%	686.500000	0.131300	0.211900	0.226700		
75%	1084.000000	0.146000	0.339100	0.382900		
max	4254.000000	0.222600	1.058000	1.252000		

	worst_concave points	worst_symmetry	worst_fractal dimension
count	569.000000	569.000000	569.000000
mean	0.114606	0.290076	0.083946
std	0.065732	0.061867	0.018061
min	0.000000	0.156500	0.055040
25%	0.064930	0.250400	0.071460
50%	0.099930	0.282200	0.080040
75%	0.161400	0.317900	0.092080
max	0.291000	0.663800	0.207500

[8 rows x 31 columns]

[275]: data.dtypes

[275]:	id	int64
	diagnosis	object
	mean_radius	float64
	mean_texture	float64
	mean_perimeter	float64
	mean_area	float64
	mean_smoothness	float64
	mean_compactness	float64
	mean_concavity	float64
	mean_concave points	float64
	mean_symmetry	float64
	mean_fractal dimension	float64
	SE_radius	float64
	SE_texture	float64
	SE_perimeter	float64
	SE_area	float64
	SE_smoothness	float64
	SE_compactness	float64
	SE_concavity	float64
	SE_concave points	float64
	SE_symmetry	float64
	SE_fractal dimension	float64
	worst_radius	float64
	worst_texture	float64
	worst_perimeter	float64
	worst_area	float64
	worst_smoothness	float64
	worst_compactness	float64
	worst_concavity	float64
	worst_concave points	float64
	worst_symmetry	float64
	worst_fractal dimension	float64

```
dtype: object
```

```
[276]: data=data.drop('id',axis=1)
data.head()
```

```
[276]:   diagnosis  mean_radius  mean_texture  mean_perimeter  mean_area
0          M       17.99        10.38       122.80      1001.0  \
1          M       20.57        17.77       132.90      1326.0
2          M       19.69        21.25       130.00      1203.0
3          M       11.42        20.38        77.58      386.1
4          M       20.29        14.34       135.10     1297.0

    mean_smoothness  mean_compactness  mean_concavity  mean_concave points
0           0.11840          0.27760         0.3001        0.14710  \
1           0.08474          0.07864         0.0869        0.07017
2           0.10960          0.15990         0.1974        0.12790
3           0.14250          0.28390         0.2414        0.10520
4           0.10030          0.13280         0.1980        0.10430

    mean_symmetry  ...  worst_radius  worst_texture  worst_perimeter
0           0.2419  ...       25.38        17.33       184.60  \
1           0.1812  ...       24.99        23.41       158.80
2           0.2069  ...       23.57        25.53       152.50
3           0.2597  ...       14.91        26.50        98.87
4           0.1809  ...       22.54        16.67       152.20

    worst_area  worst_smoothness  worst(compactness)  worst_concavity
0      2019.0           0.1622            0.6656        0.7119  \
1      1956.0           0.1238            0.1866        0.2416
2      1709.0           0.1444            0.4245        0.4504
3      567.7            0.2098            0.8663        0.6869
4      1575.0           0.1374            0.2050        0.4000

    worst_concave points  worst_symmetry  worst_fractal dimension
0           0.2654          0.4601        0.11890
1           0.1860          0.2750        0.08902
2           0.2430          0.3613        0.08758
3           0.2575          0.6638        0.17300
4           0.1625          0.2364        0.07678
```

```
[5 rows x 31 columns]
```

```
[277]: data['diagnosis'].value_counts()
```

```
[277]: diagnosis
B      357
M      212
```

```
Name: count, dtype: int64
```

```
[278]: y=data.diagnosis
```

```
[279]: x=data.drop('diagnosis',axis=1)
```

```
[280]: data=x  
dx=y
```

```
[281]: data_n=(data-data.mean())/(data.std())  
data_n.describe()
```

```
mean_radius  mean_texture  mean_perimeter  mean_area  
count      5.690000e+02  5.690000e+02  5.690000e+02  5.690000e+02  \  
mean       -1.311195e-16 6.243785e-17  -1.248757e-16 -2.185325e-16  
std        1.000000e+00  1.000000e+00  1.000000e+00  1.000000e+00  
min        -2.027864e+00 -2.227289e+00  -1.982759e+00 -1.453164e+00  
25%       -6.887793e-01 -7.253249e-01  -6.913472e-01 -6.666089e-01  
50%       -2.148925e-01 -1.045442e-01  -2.357726e-01 -2.949274e-01  
75%       4.689800e-01  5.836621e-01   4.992377e-01  3.631877e-01  
max        3.967796e+00  4.647799e+00   3.972634e+00  5.245913e+00  
  
mean_smoothness  mean_compactness  mean_concavity  mean_concave points  
count      5.690000e+02          5.690000e+02  5.690000e+02  5.690000e+02  \  
mean       -8.366672e-16         1.998011e-16  3.746271e-17  -4.995028e-17  
std        1.000000e+00          1.000000e+00  1.000000e+00  1.000000e+00  
min        -3.109349e+00         -1.608721e+00 -1.113893e+00 -1.260710e+00  
25%       -7.103378e-01         -7.464292e-01  -7.430941e-01  -7.372951e-01  
50%       -3.486040e-02         -2.217454e-01  -3.419391e-01  -3.973715e-01  
75%       6.356397e-01          4.934227e-01   5.255994e-01  6.463664e-01  
max        4.766717e+00          4.564409e+00   4.239858e+00  3.924477e+00  
  
mean_symmetry  mean_fractal dimension ... worst_radius  
count      5.690000e+02          5.690000e+02  ... 5.690000e+02  \  
mean       1.748260e-16          4.838933e-16  ... -8.241796e-16  
std        1.000000e+00          1.000000e+00  ... 1.000000e+00  
min        -2.741705e+00         -1.818265e+00  ... -1.725382e+00  
25%       -7.026215e-01         -7.220040e-01  ... -6.743279e-01  
50%       -7.156354e-02         -1.781226e-01  ... -2.688030e-01  
75%       5.303125e-01          4.705693e-01   ... 5.215568e-01  
max        4.480808e+00          4.906602e+00  ... 4.090590e+00  
  
worst_texture  worst_perimeter  worst_area  worst_smoothness  
count      5.690000e+02          5.690000e+02  569.000000  5.690000e+02  \  
mean       1.248757e-17          -3.496520e-16  0.000000  -2.122887e-16  
std        1.000000e+00          1.000000e+00  1.000000  1.000000e+00  
min        -2.222039e+00         -1.691872e+00 -1.221348  -2.680337e+00
```

```

25% -7.479711e-01 -6.889721e-01 -0.641571 -6.906227e-01
50% -4.347738e-02 -2.857288e-01 -0.340881 -4.680159e-02
75% 6.577623e-01 5.398040e-01 0.357275 5.970195e-01
max 3.882489e+00 4.283568e+00 5.924959 3.951897e+00

      worst_compactness worst_concavity worst_concave points
count 5.690000e+02    5.690000e+02    5.690000e+02 \
mean -3.621395e-16   8.741299e-17   2.122887e-16
std  1.000000e+00   1.000000e+00   1.000000e+00
min -1.442609e+00   -1.304683e+00 -1.743529e+00
25% -6.804845e-01   -7.558491e-01 -7.557349e-01
50% -2.692639e-01   -2.180402e-01 -2.232725e-01
75% 5.391944e-01    5.306742e-01  7.118836e-01
max 5.108382e+00    4.696536e+00  2.683516e+00

      worst_symmetry worst_fractal dimension
count 5.690000e+02    5.690000e+02
mean 2.622390e-16    -5.744282e-16
std  1.000000e+00    1.000000e+00
min -2.159060e+00    -1.600431e+00
25% -6.412994e-01    -6.913035e-01
50% -1.272975e-01    -2.162538e-01
75% 4.497425e-01     4.503661e-01
max 6.040726e+00     6.840837e+00

```

[8 rows x 30 columns]

[282]: `data_n_mean=pd.concat([y,data_n.iloc[:,0:10]],axis=1)`

[283]: `data_n_mean=pd.melt(data_n_mean,id_vars='diagnosis',var_name='features',value_name='value')`

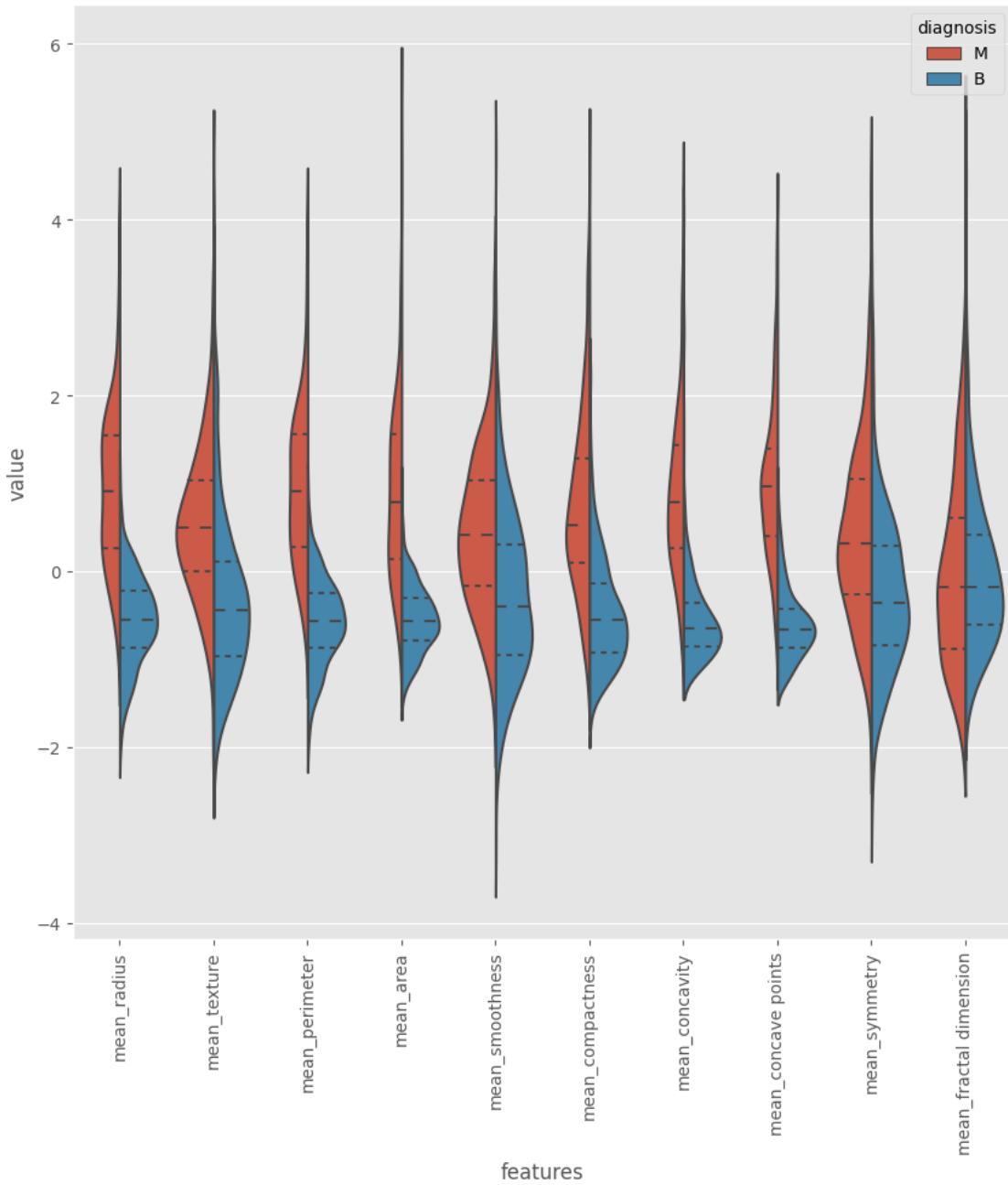
[284]: `plt.figure(figsize=(10,10))
sns.violinplot(x='features',y='value',hue='diagnosis',data=data_n_mean,split=True,inner='quart')
plt.xticks(rotation=90)
#appears to be significant difference between distribution of means of
#variables of radius, texture, perimeter, area, smoothness, compactness,
#concavity, concave points, and to a lesser degree symmetry in benign vs
#malignant tumors' cell nuclei. The distribution of measurements indicates
#malignant cell nuclei have larger values for each of these variables than
#benign tumor cell nuclei. Only means of fractal dimension in malignant tumor
#cell nuclei does not show a significant difference from mean of fractal
#dimension in benign tumor cell nuclei.`

[284]: `(array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9]),
[Text(0, 0, 'mean_radius'),`

```

Text(1, 0, 'mean_texture'),
Text(2, 0, 'mean_perimeter'),
Text(3, 0, 'mean_area'),
Text(4, 0, 'mean_smoothness'),
Text(5, 0, 'mean_compactness'),
Text(6, 0, 'mean_concavity'),
Text(7, 0, 'mean_concave_points'),
Text(8, 0, 'mean_symmetry'),
Text(9, 0, 'mean_fractal_dimension')])

```

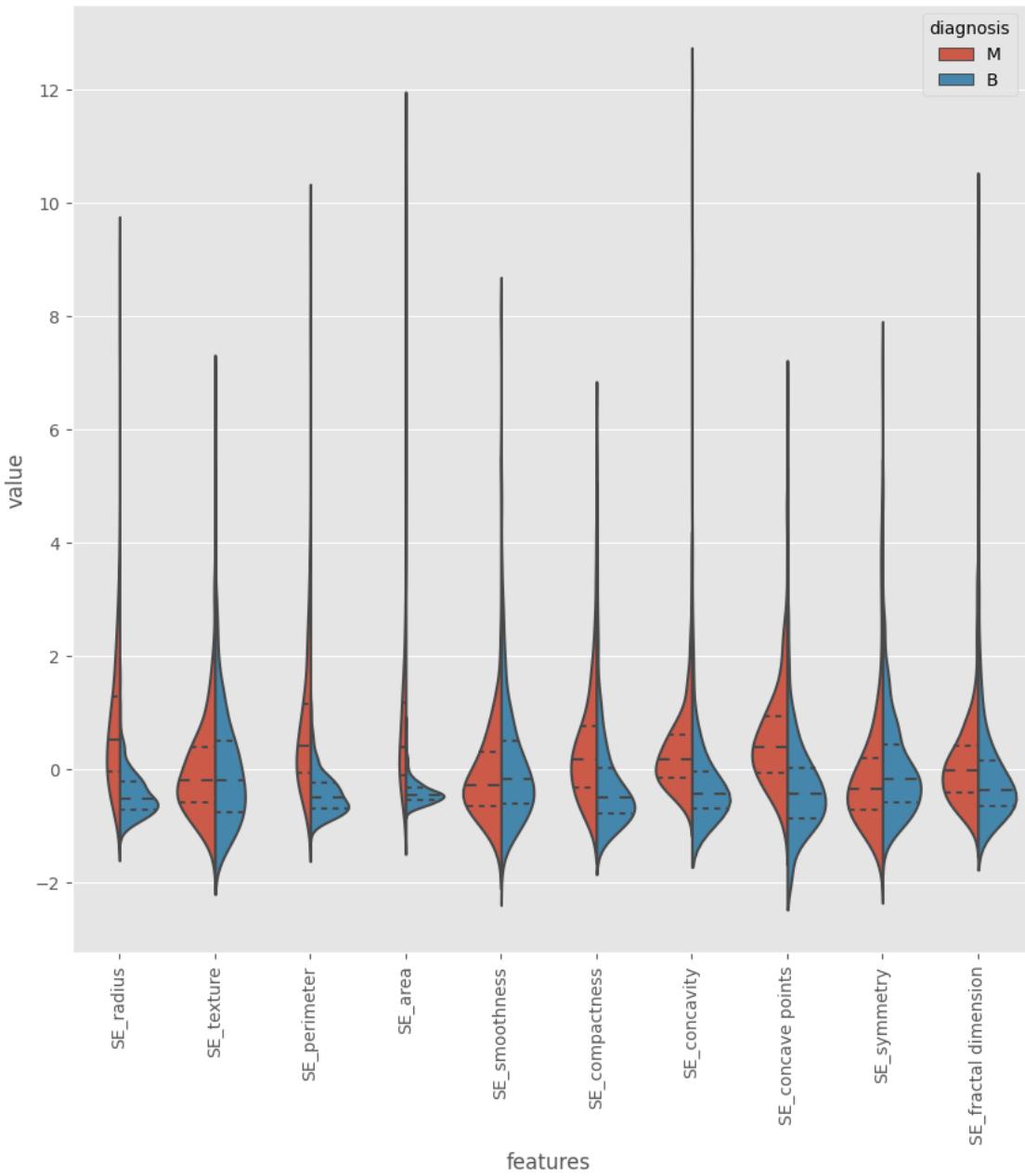


```
[285]: data_n_se=pd.concat([y,data_n.iloc[:,10:20]],axis=1)

[286]: data_n_se=pd.
        melt(data_n_se,id_vars='diagnosis',var_name='features',value_name='value')

[287]: plt.figure(figsize=(10,10))
sns.
    violinplot(x='features',y='value',hue='diagnosis',data=data_n_se,split=True,inner='quart')
plt.xticks(rotation=90)
#Distributions of SE of texture, smoothness, symmetry, and fractal dimension
    ↵are not as markedly different in benign vs malignant tumor cell nuclei.
    ↵Smoothness and symmetry differ noticeably in their means, but perhaps the
    ↵degree of their divergence around their respective means is not very
    ↵different. Fractal dimension itself did not differ greatly for malignant and
    ↵benign tumor cell nuclei populations.
#SE of radius, area, perimeter show the greatest difference in distributions
    ↵(inner lines show the first quartile, median, and third quartile) between
    ↵benign and malignant cell nuclei.
```

[287]: (array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9]),
 [Text(0, 0, 'SE_radius'),
 Text(1, 0, 'SE_texture'),
 Text(2, 0, 'SE_perimeter'),
 Text(3, 0, 'SE_area'),
 Text(4, 0, 'SE_smoothness'),
 Text(5, 0, 'SE_compactness'),
 Text(6, 0, 'SE_concavity'),
 Text(7, 0, 'SE_concave points'),
 Text(8, 0, 'SE_symmetry'),
 Text(9, 0, 'SE_fractal dimension')])



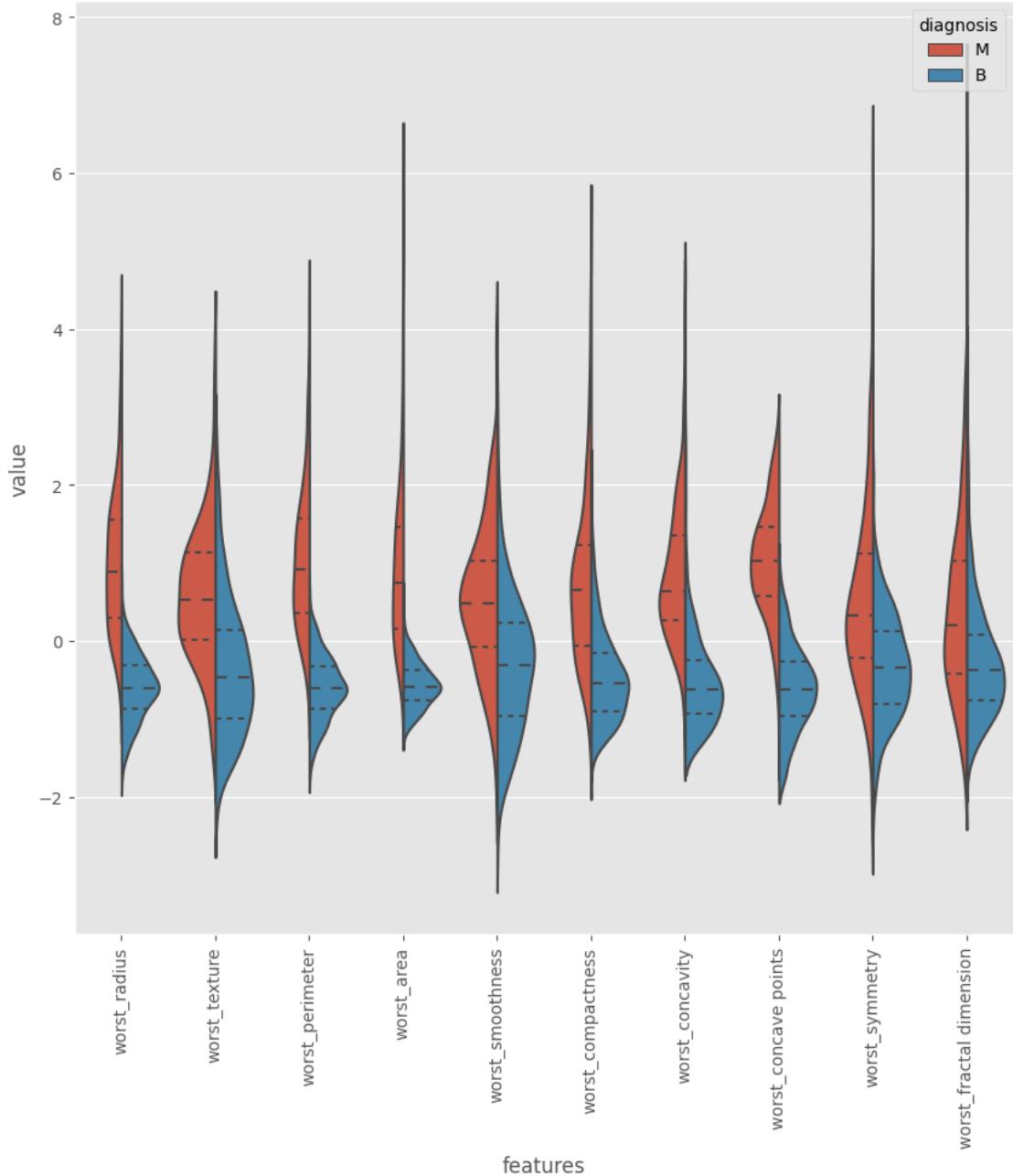
```
[288]: data_n_worst=pd.concat([y,data_n.iloc[:,20:30]],axis=1)
```

```
[289]: data_n_worst=pd.
    ↪melt(data_n_worst,id_vars='diagnosis',var_name='features',value_name='value')
```

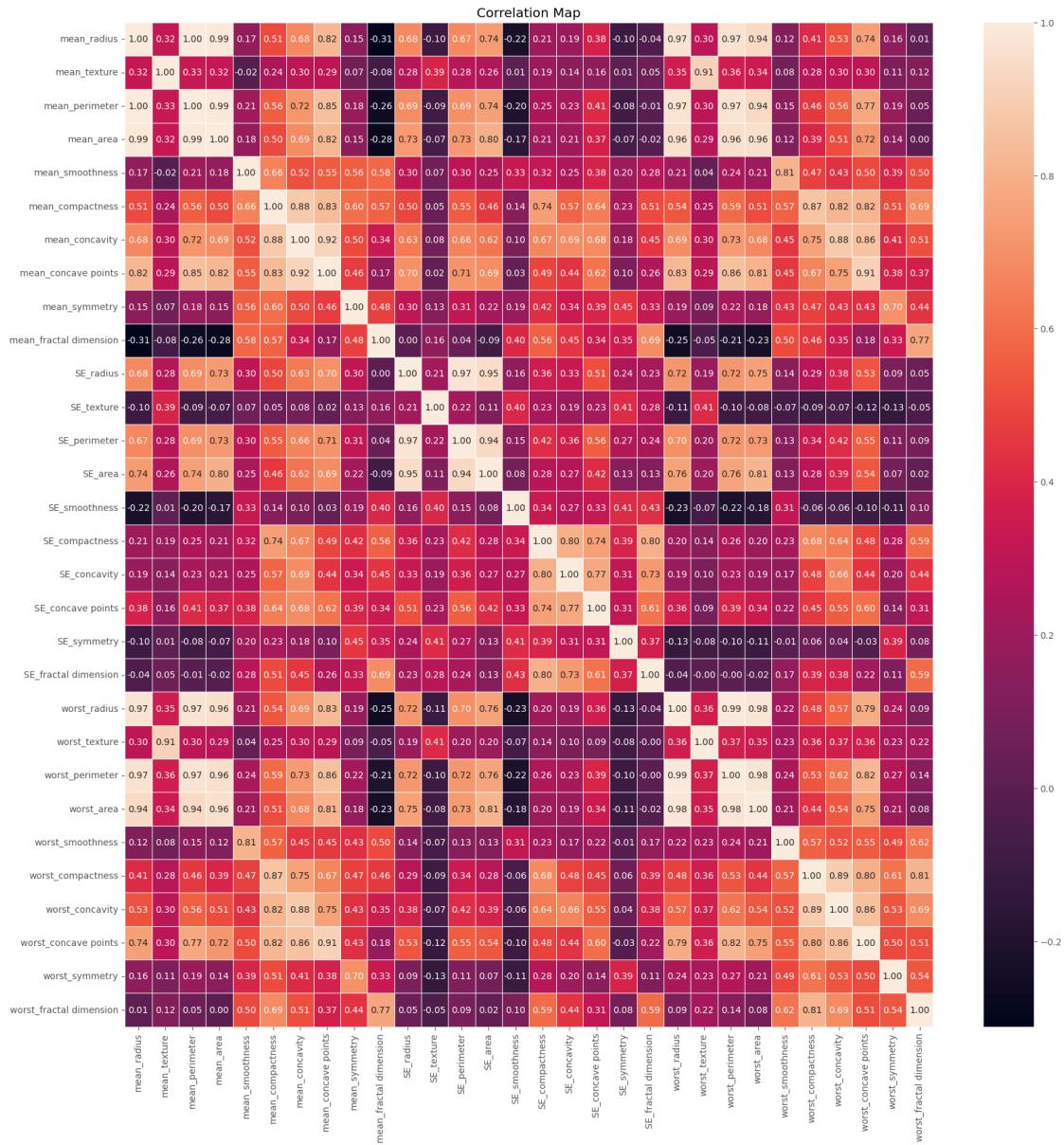
```
[290]: plt.figure(figsize=(10,10))
sns.
    ↪violinplot(x='features',y='value',hue='diagnosis',data=data_n_worst,split=True,inner='quart')
```

```
plt.xticks(rotation=90)
#appears to be significant difference between distribution of means of
↳variables of radius, texture, perimeter, area, smoothness, compactness,
↳concavity, concave points, and to a lesser degree symmetry in benign vs
↳malignant tumors' cell nuclei. The distribution of measurements indicates
↳malignant cell nuclei have larger values for each of these variables than
↳benign tumor cell nuclei. Only means of fractal dimension in malignant tumor
↳cell nuclei does not show a significant difference from mean of fractal
↳dimension in benign tumor cell nuclei.
```

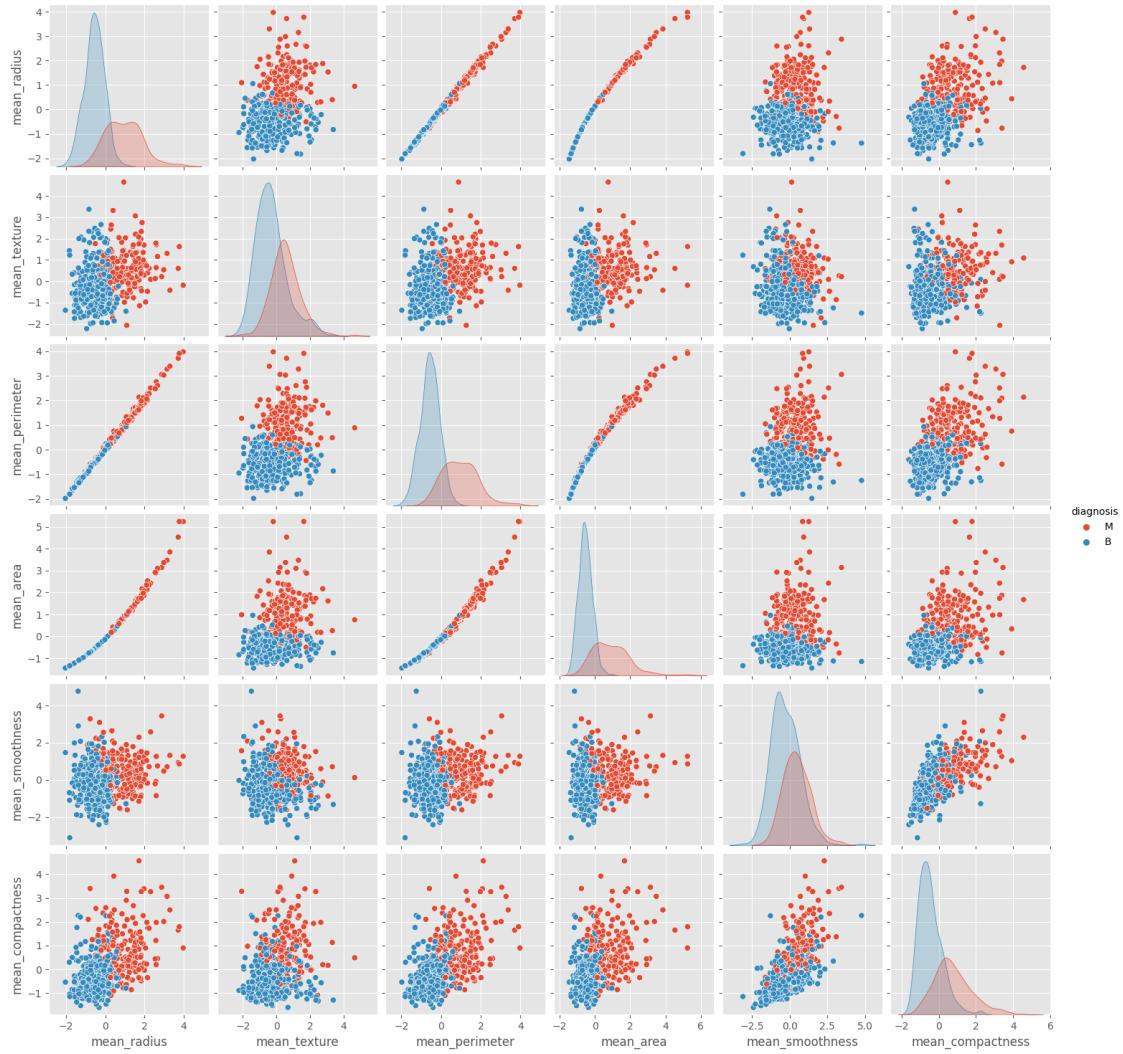
```
[290]: (array([0, 1, 2, 3, 4, 5, 6, 7, 8, 9]),
[Text(0, 0, 'worst_radius'),
Text(1, 0, 'worst_texture'),
Text(2, 0, 'worst_perimeter'),
Text(3, 0, 'worst_area'),
Text(4, 0, 'worst_smoothness'),
Text(5, 0, 'worst(compactness)'),
Text(6, 0, 'worst_concavity'),
Text(7, 0, 'worst_concave points'),
Text(8, 0, 'worst_symmetry'),
Text(9, 0, 'worst_fractal dimension')])
```



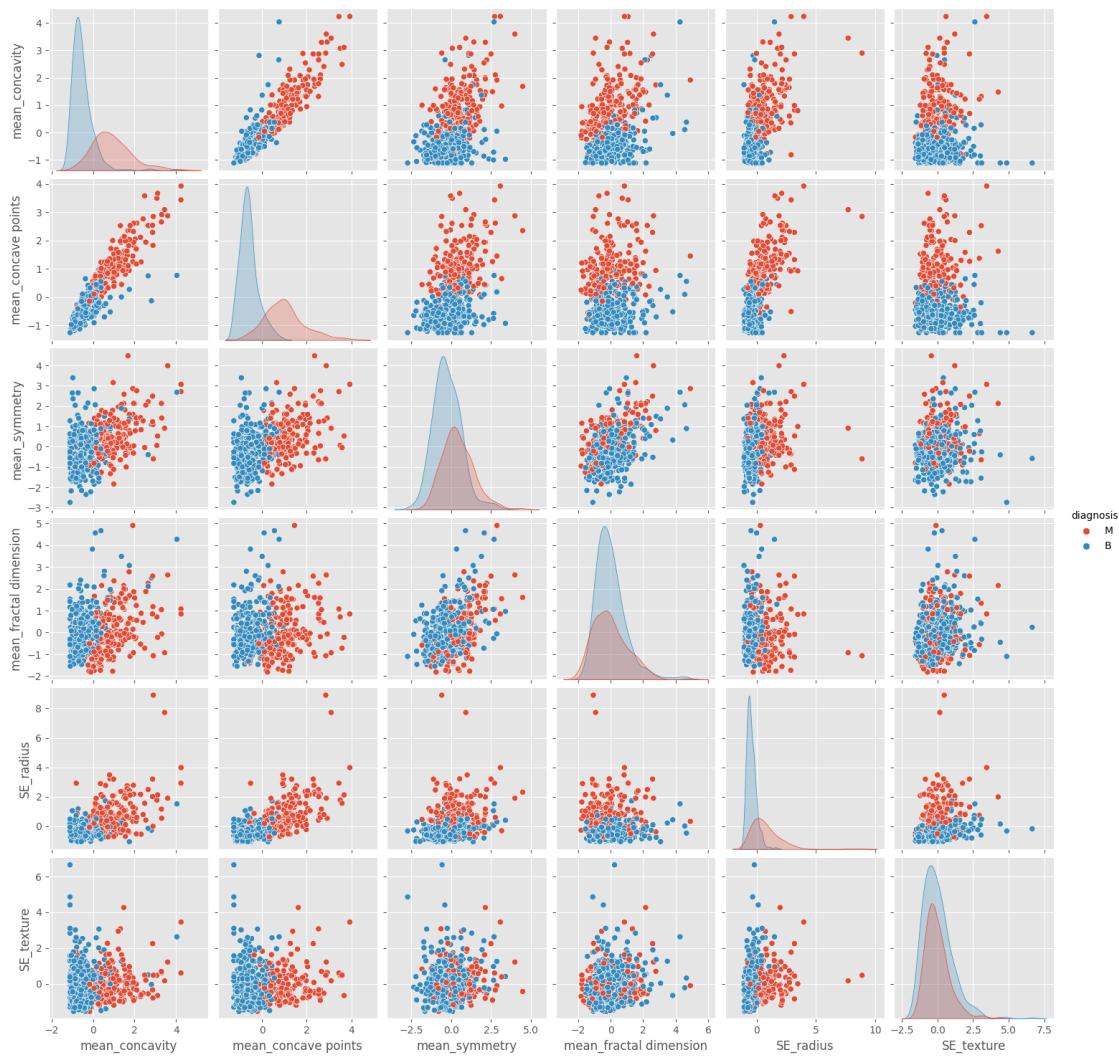
```
[291]: f,ax=plt.subplots(figsize=(20,20))
sns.heatmap(data_n.corr(), annot=True, linewidths=0.5, fmt='%.2f', ax=ax)
plt.xticks(rotation=90)
plt.yticks(rotation=0)
plt.title('Correlation Map')
plt.show()
```



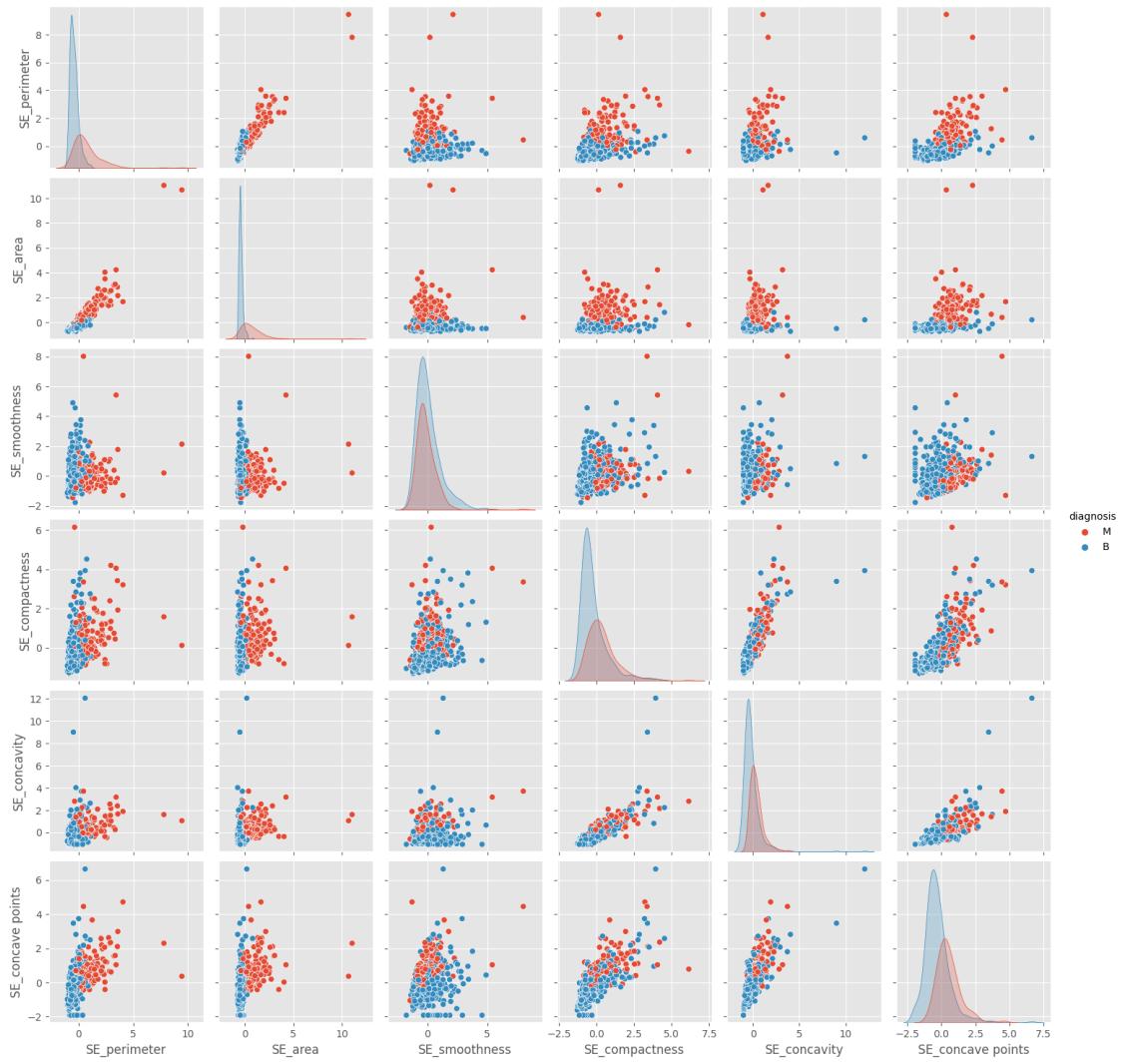
```
[292]: data_corr1=pd.concat([y,data_n.iloc[:,0:6]],axis=1)
sns.pairplot(data_corr1,hue='diagnosis')
plt.show()
```



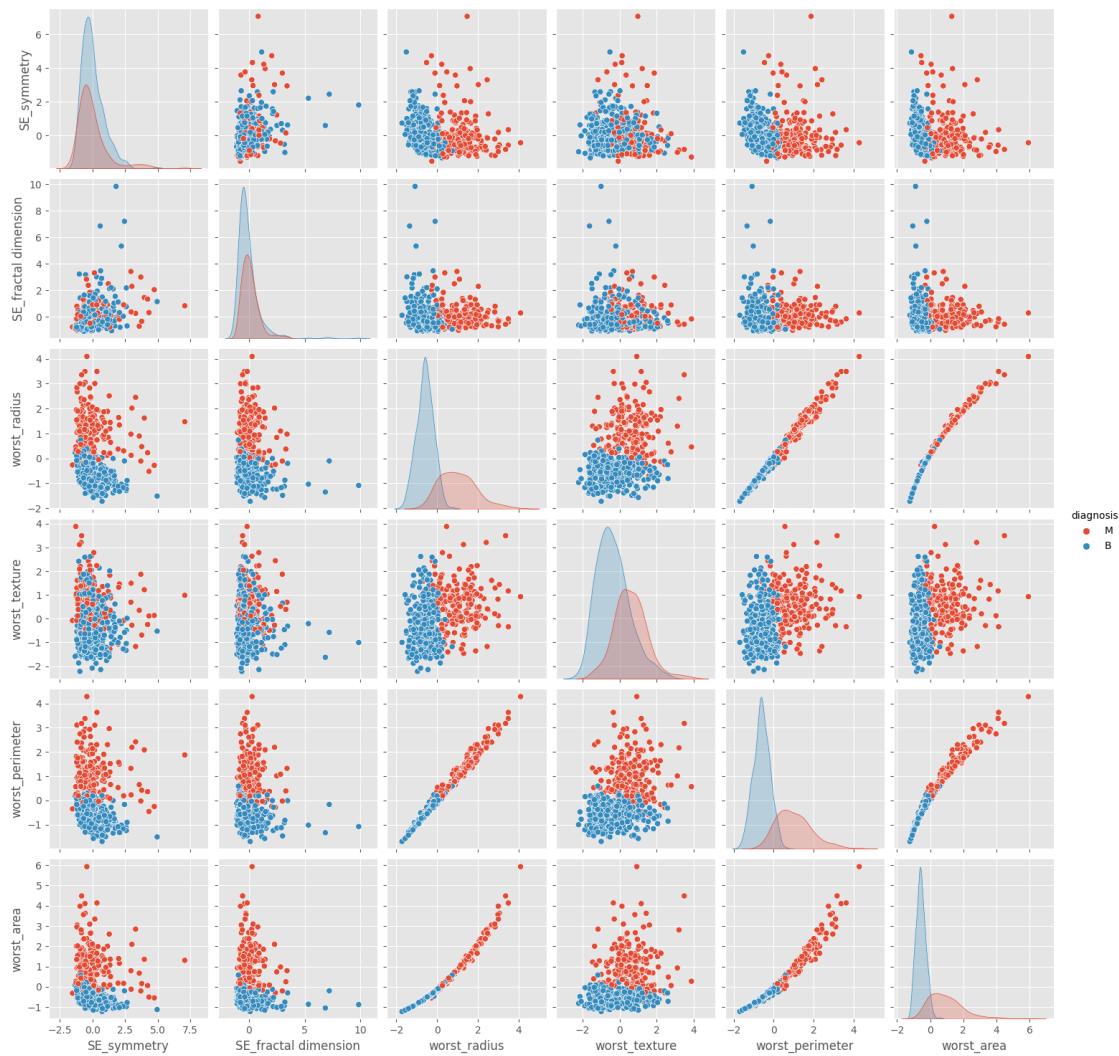
```
[293]: data_corr2=pd.concat([y,data_n.iloc[:,6:12]],axis=1)
sns.pairplot(data_corr2,hue='diagnosis')
plt.show()
```



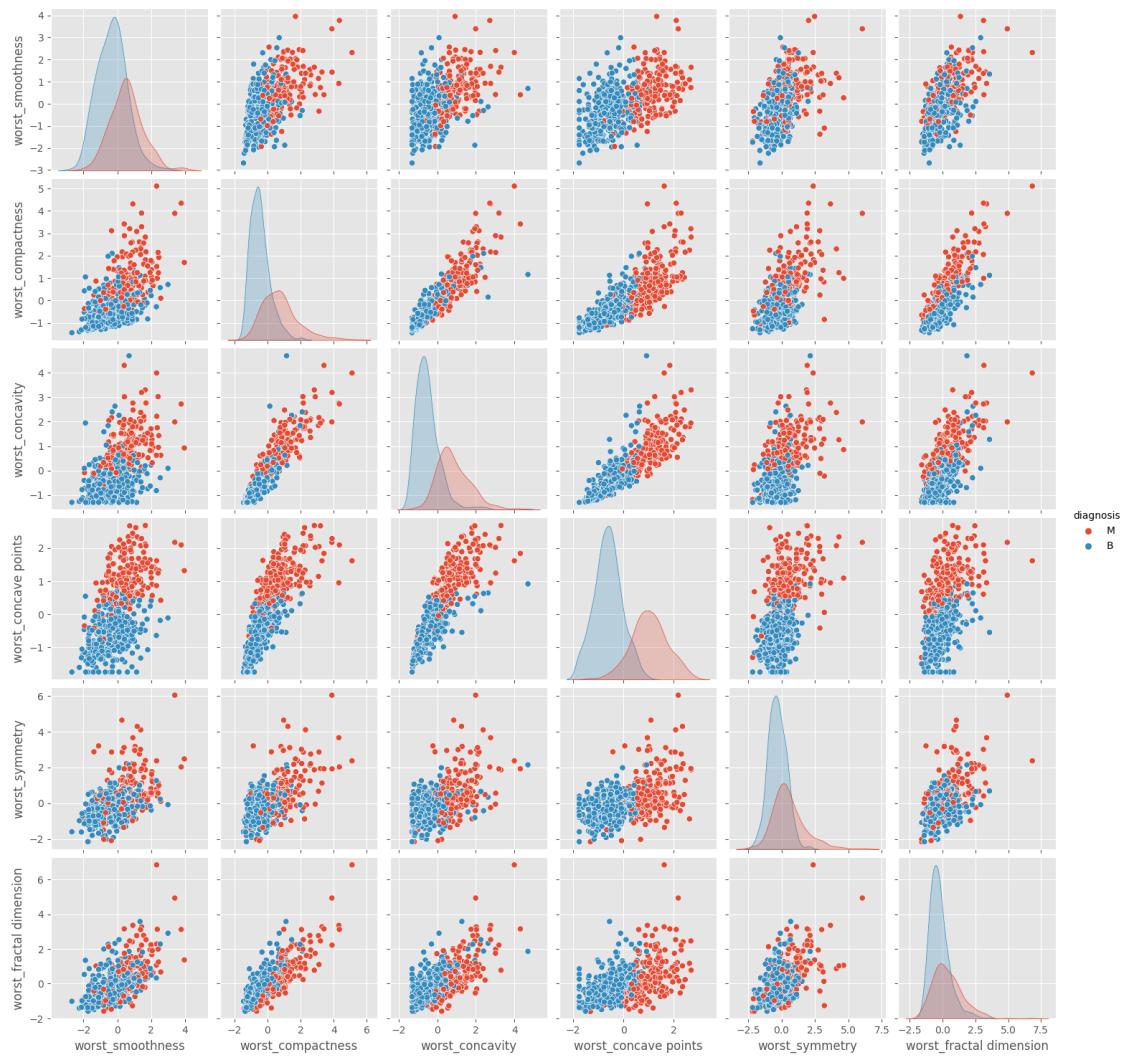
```
[294]: data_corr3=pd.concat([y,data_n.iloc[:,12:18]],axis=1)
sns.pairplot(data_corr3,hue='diagnosis')
plt.show()
```



```
[296]: data_corr4=pd.concat([y,data_n.iloc[:,18:24]],axis=1)
sns.pairplot(data_corr4,hue='diagnosis')
plt.show()
```

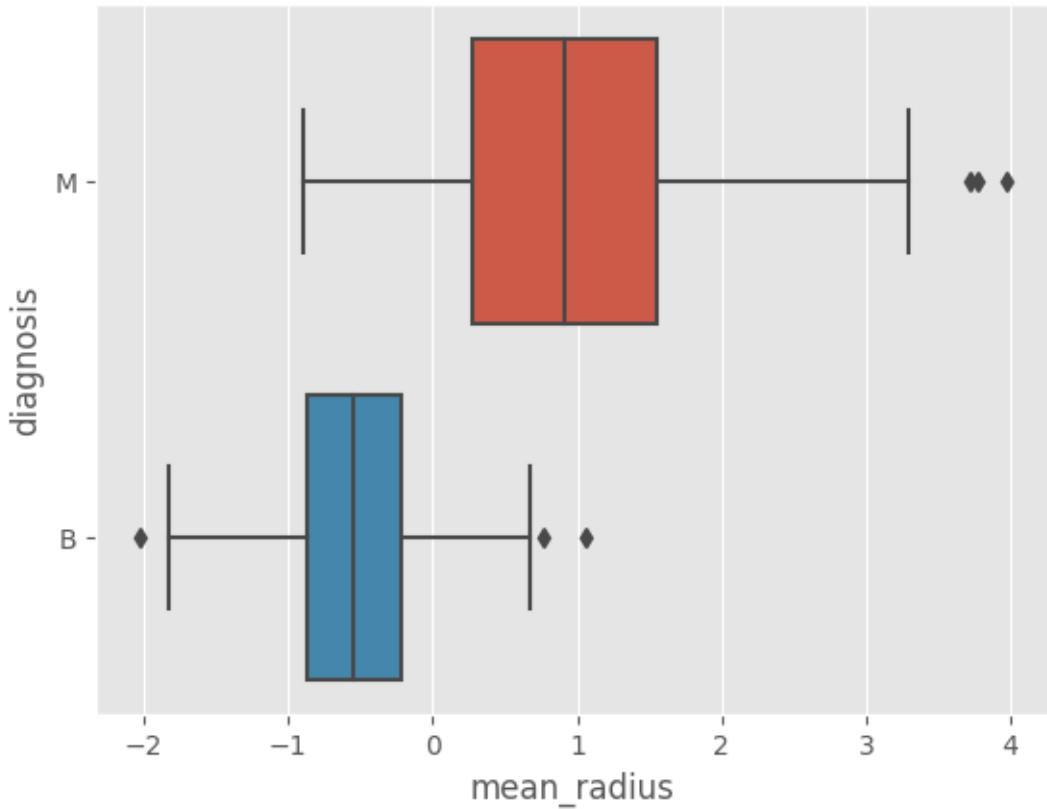


```
[ ]: data_corr5=pd.concat([y,data_n.iloc[:,24:30]],axis=1)
sns.pairplot(data_corr5,hue='diagnosis')
plt.show()
```



```
[297]: sns.boxplot(data=data_n,x='mean_radius',y=dx)
```

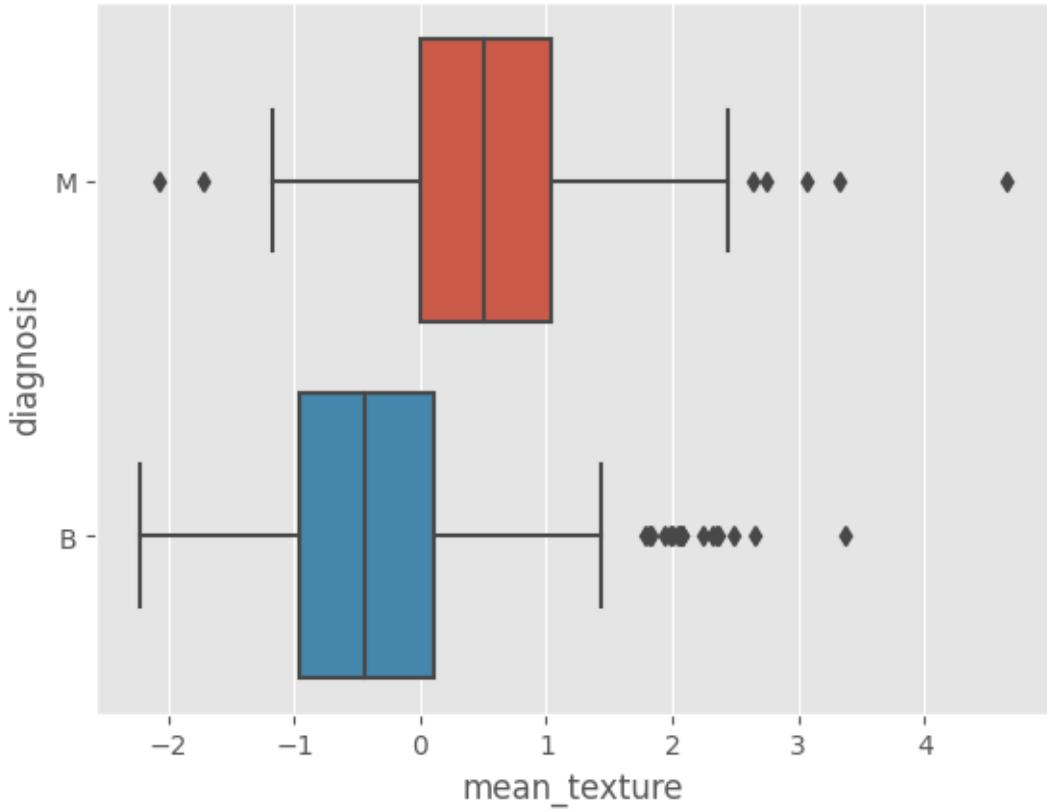
```
[297]: <Axes: xlabel='mean_radius', ylabel='diagnosis'>
```



```
[298]: #loop to plot boxplots of all features vs. diagnosis  
#t-values for all features in relation to diagnosis
```

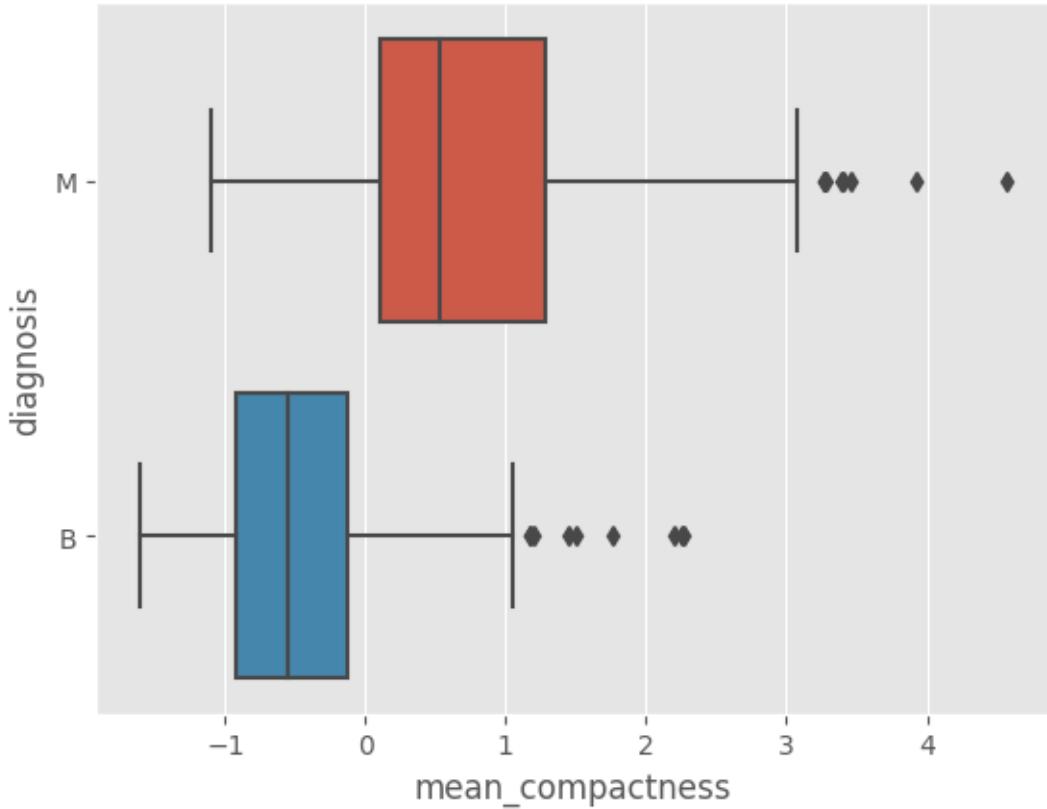
```
[299]: sns.boxplot(data=data_n,x='mean_texture',y=dx)
```

```
[299]: <Axes: xlabel='mean_texture', ylabel='diagnosis'>
```



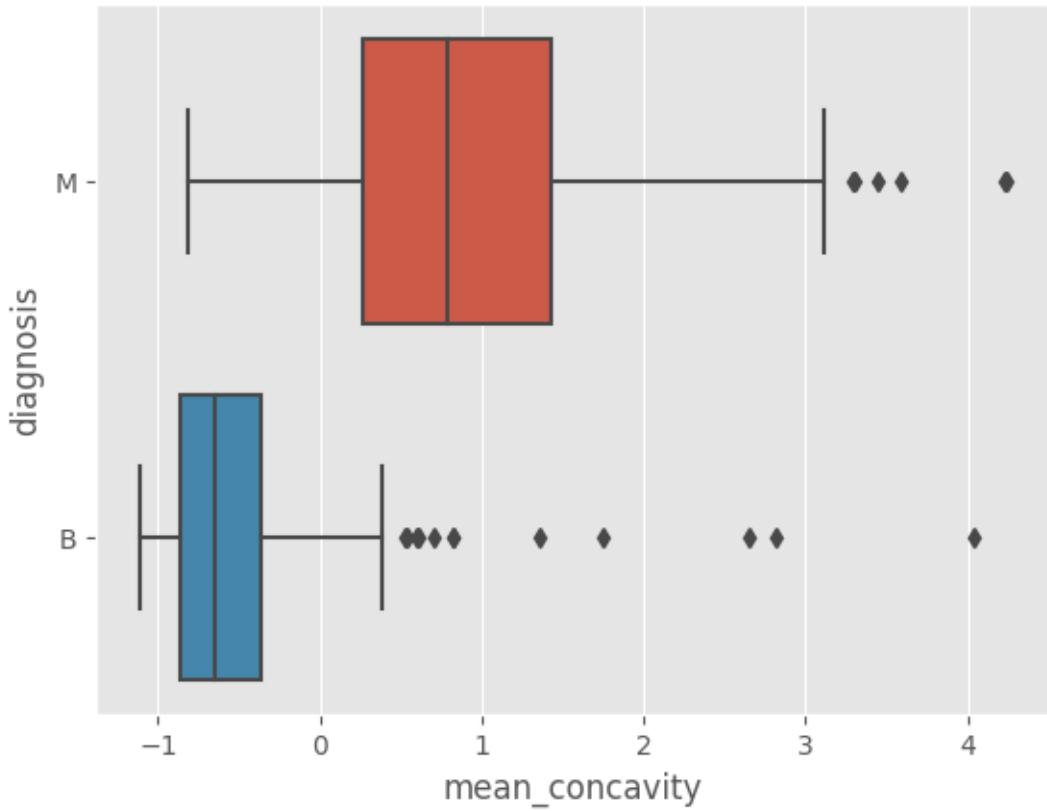
```
[ ]: sns.boxplot(data=data_n,x='mean_compactness',y=dx)
```

```
[ ]: <Axes: xlabel='mean_compactness', ylabel='diagnosis'>
```



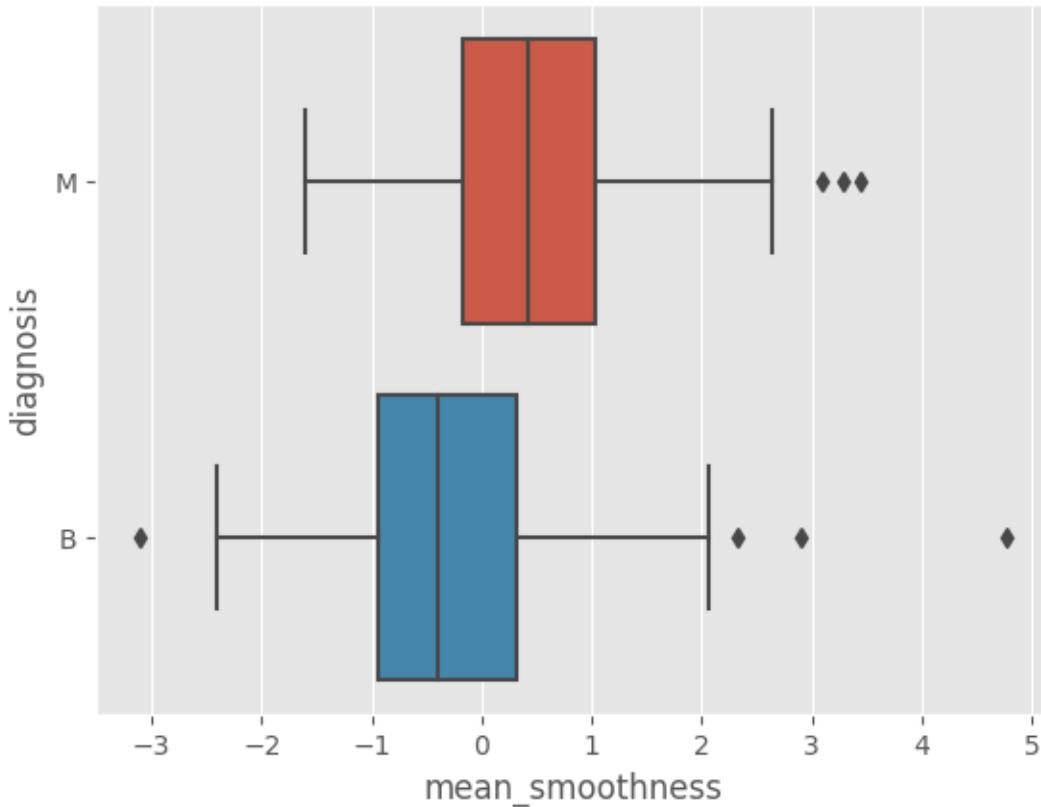
```
[300]: sns.boxplot(data=data_n,x='mean_concavity',y=dx)
```

```
[300]: <Axes: xlabel='mean_concavity', ylabel='diagnosis'>
```



```
[ ]: sns.boxplot(data=data_n,x='mean_smoothness',y=dx)
```

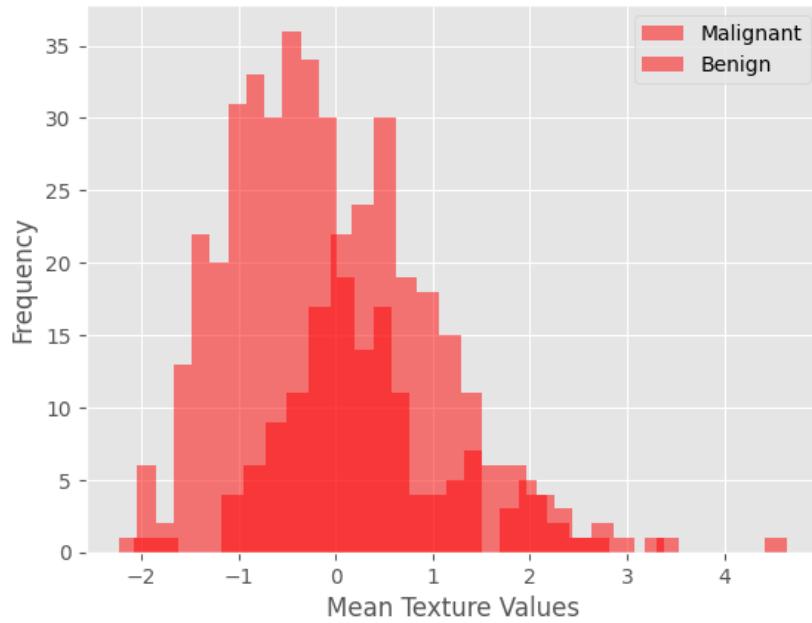
```
[ ]: <Axes: xlabel='mean_smoothness', ylabel='diagnosis'>
```



```
[301]: data_n_mean=pd.concat([y,data_n.iloc[:,0:10]],axis=1)
M=plt.hist(data_n_mean[data_n_mean['diagnosis']=='M'].
           ↪mean_texture,bins=30,fc=(1,0,0,0.5),label='Malignant')
B=plt.hist(data_n_mean[data_n_mean['diagnosis']=='B'].
           ↪mean_texture,bins=30,fc=(1,0,0,0.5),label='Benign')
plt.legend()
plt.xlabel('Mean Texture Values')
plt.ylabel('Frequency')
plt.title('Histogram of Mean Texture of Cell Nuclei in Benign and Malignant
           ↪Tumors')
```

```
[301]: Text(0.5, 1.0, 'Histogram of Mean Texture of Cell Nuclei in Benign and Malignant
Tumors')
```

Histogram of Mean Texture of Cell Nuclei in Benign and Malignant Tumors



```
[302]: data_n.cov()
```

```
[302]:
```

	mean_radius	mean_texture	mean_perimeter	mean_area
mean_radius	1.000000	0.323782	0.997855	0.987357 \
mean_texture	0.323782	1.000000	0.329533	0.321086
mean_perimeter	0.997855	0.329533	1.000000	0.986507
mean_area	0.987357	0.321086	0.986507	1.000000
mean_smoothness	0.170581	-0.023389	0.207278	0.177028
mean_compactness	0.506124	0.236702	0.556936	0.498502
mean_concavity	0.676764	0.302418	0.716136	0.685983
mean_concave_points	0.822529	0.293464	0.850977	0.823269
mean_symmetry	0.147741	0.071401	0.183027	0.151293
mean_fractal_dimension	-0.311631	-0.076437	-0.261477	-0.283110
SE_radius	0.679090	0.275869	0.691765	0.732562
SE_texture	-0.097317	0.386358	-0.086761	-0.066280
SE_perimeter	0.674172	0.281673	0.693135	0.726628
SE_area	0.735864	0.259845	0.744983	0.800086
SE_smoothness	-0.222600	0.006614	-0.202694	-0.166777
SE_compactness	0.206000	0.191975	0.250744	0.212583
SE_concavity	0.194204	0.143293	0.228082	0.207660
SE_concave_points	0.376169	0.163851	0.407217	0.372320
SE_symmetry	-0.104321	0.009127	-0.081629	-0.072497
SE_fractal_dimension	-0.042641	0.054458	-0.005523	-0.019887
worst_radius	0.969539	0.352573	0.969476	0.962746
worst_texture	0.297008	0.912045	0.303038	0.287489

worst_perimeter	0.965137	0.358040	0.970387	0.959120
worst_area	0.941082	0.343546	0.941550	0.959213
worst_smoothness	0.119616	0.077503	0.150549	0.123523
worst_compactness	0.413463	0.277830	0.455774	0.390410
worst_concavity	0.526911	0.301025	0.563879	0.512606
worst_concave points	0.744214	0.295316	0.771241	0.722017
worst_symmetry	0.163953	0.105008	0.189115	0.143570
worst_fractal dimension	0.007066	0.119205	0.051019	0.003738

	mean_smoothness	mean(compactness)	mean(concavity)	\
mean_radius	0.170581	0.506124	0.676764	\
mean_texture	-0.023389	0.236702	0.302418	
mean_perimeter	0.207278	0.556936	0.716136	
mean_area	0.177028	0.498502	0.685983	
mean_smoothness	1.000000	0.659123	0.521984	
mean_compactness	0.659123	1.000000	0.883121	
mean_concavity	0.521984	0.883121	1.000000	
mean_concave points	0.553695	0.831135	0.921391	
mean_symmetry	0.557775	0.602641	0.500667	
mean_fractal dimension	0.584792	0.565369	0.336783	
SE_radius	0.301467	0.497473	0.631925	
SE_texture	0.068406	0.046205	0.076218	
SE_perimeter	0.296092	0.548905	0.660391	
SE_area	0.246552	0.455653	0.617427	
SE_smoothness	0.332375	0.135299	0.098564	
SE_compactness	0.318943	0.738722	0.670279	
SE_concavity	0.248396	0.570517	0.691270	
SE_concave points	0.380676	0.642262	0.683260	
SE_symmetry	0.200774	0.229977	0.178009	
SE_fractal dimension	0.283607	0.507318	0.449301	
worst_radius	0.213120	0.535315	0.688236	
worst_texture	0.036072	0.248133	0.299879	
worst_perimeter	0.238853	0.590210	0.729565	
worst_area	0.206718	0.509604	0.675987	
worst_smoothness	0.805324	0.565541	0.448822	
worst_compactness	0.472468	0.865809	0.754968	
worst_concavity	0.434926	0.816275	0.884103	
worst_concave points	0.503053	0.815573	0.861323	
worst_symmetry	0.394309	0.510223	0.409464	
worst_fractal dimension	0.499316	0.687382	0.514930	

	mean_concave points	mean_symmetry	\
mean_radius	0.822529	0.147741	\
mean_texture	0.293464	0.071401	
mean_perimeter	0.850977	0.183027	
mean_area	0.823269	0.151293	
mean_smoothness	0.553695	0.557775	

mean_compactness	0.831135	0.602641
mean_concavity	0.921391	0.500667
mean_concave_points	1.000000	0.462497
mean_symmetry	0.462497	1.000000
mean_fractal_dimension	0.166917	0.479921
SE_radius	0.698050	0.303379
SE_texture	0.021480	0.128053
SE_perimeter	0.710650	0.313893
SE_area	0.690299	0.223970
SE_smoothness	0.027653	0.187321
SE(compactness)	0.490424	0.421659
SE_concavity	0.439167	0.342627
SE_concave_points	0.615634	0.393298
SE_symmetry	0.095351	0.449137
SE_fractal_dimension	0.257584	0.331786
worst_radius	0.830318	0.185728
worst_texture	0.292752	0.090651
worst_perimeter	0.855923	0.219169
worst_area	0.809630	0.177193
worst_smoothness	0.452753	0.426675
worst_compactness	0.667454	0.473200
worst_concavity	0.752399	0.433721
worst_concave_points	0.910155	0.430297
worst_symmetry	0.375744	0.699826
worst_fractal_dimension	0.368661	0.438413

	mean_fractal_dimension	...	worst_radius	\
mean_radius	-0.311631	...	0.969539	\
mean_texture	-0.076437	...	0.352573	
mean_perimeter	-0.261477	...	0.969476	
mean_area	-0.283110	...	0.962746	
mean_smoothness	0.584792	...	0.213120	
mean_compactness	0.565369	...	0.535315	
mean_concavity	0.336783	...	0.688236	
mean_concave_points	0.166917	...	0.830318	
mean_symmetry	0.479921	...	0.185728	
mean_fractal_dimension	1.000000	...	-0.253691	
SE_radius	0.000111	...	0.715065	
SE_texture	0.164174	...	-0.111690	
SE_perimeter	0.039830	...	0.697201	
SE_area	-0.090170	...	0.757373	
SE_smoothness	0.401964	...	-0.230691	
SE(compactness)	0.559837	...	0.204607	
SE_concavity	0.446630	...	0.186904	
SE_concave_points	0.341198	...	0.358127	
SE_symmetry	0.345007	...	-0.128121	
SE_fractal_dimension	0.688132	...	-0.037488	

	worst_radius	worst_texture	worst_perimeter	worst_area	worst_smoothness	worst_compactness	worst_concavity	worst_symmetry	worst_fractal dimension	worst_texture	worst_perimeter	worst_area	worst_smoothness	worst_compactness	worst_concavity	
mean_radius	-0.253691	1.000000												
mean_texture	-0.051269	0.359921												
mean_perimeter	-0.205151	0.993708												
mean_area	-0.231854	0.984015												
mean_smoothness	0.504942	0.216574												
mean(compactness)	0.458798	0.475820												
mean(concavity)	0.346234	0.573975												
mean(concave points)	0.175325	0.787424												
mean(symmetry)	0.334019	0.243529												
mean(fractal dimension)	0.767297	0.093492												
SE_radius	0.297008	0.965137	0.941082	\												
SE_texture	0.912045	0.358040	0.343546													
SE_perimeter	0.303038	0.970387	0.941550													
SE_area	0.287489	0.959120	0.959213													
SE_smoothness	0.036072	0.238853	0.206718													
SE(compactness)	0.248133	0.590210	0.509604													
SE(concavity)	0.299879	0.729565	0.675987													
SE(concave points)	0.292752	0.855923	0.809630													
SE(symmetry)	0.090651	0.219169	0.177193													
SE(fractal dimension)	-0.051269	-0.205151	-0.231854													
worst_radius	0.359921	0.993708	0.984015													
worst_texture	1.000000	0.365098	0.345842													
worst_perimeter	0.365098	1.000000	0.977578													
worst_area	0.345842	0.977578	1.000000													
worst_smoothness	0.225429	0.236775	0.209145													
worst(compactness)	0.360832	0.529408	0.438296													
worst(concavity)	0.368366	0.618344	0.543331													
worst(concave points)	0.359755	0.816322	0.747419													
worst(symmetry)	0.233027	0.269493	0.209146													
worst(fractal dimension)	0.219122	0.138957	0.079647													
mean_radius	0.119616	0.413463	0.526911	\												
mean_texture	0.077503	0.277830	0.301025													
mean_perimeter	0.150549	0.455774	0.563879													

mean_area	0.123523	0.390410	0.512606
mean_smoothness	0.805324	0.472468	0.434926
mean_compactness	0.565541	0.865809	0.816275
mean_concavity	0.448822	0.754968	0.884103
mean_concave_points	0.452753	0.667454	0.752399
mean_symmetry	0.426675	0.473200	0.433721
mean_fractal_dimension	0.504942	0.458798	0.346234
SE_radius	0.141919	0.287103	0.380585
SE_texture	-0.073658	-0.092439	-0.068956
SE_perimeter	0.130054	0.341919	0.418899
SE_area	0.125389	0.283257	0.385100
SE_smoothness	0.314457	-0.055558	-0.058298
SE_compactness	0.227394	0.678780	0.639147
SE_concavity	0.168481	0.484858	0.662564
SE_concave_points	0.215351	0.452888	0.549592
SE_symmetry	-0.012662	0.060255	0.037119
SE_fractal_dimension	0.170568	0.390159	0.379975
worst_radius	0.216574	0.475820	0.573975
worst_texture	0.225429	0.360832	0.368366
worst_perimeter	0.236775	0.529408	0.618344
worst_area	0.209145	0.438296	0.543331
worst_smoothness	1.000000	0.568187	0.518523
worst_compactness	0.568187	1.000000	0.892261
worst_concavity	0.518523	0.892261	1.000000
worst_concave_points	0.547691	0.801080	0.855434
worst_symmetry	0.493838	0.614441	0.532520
worst_fractal_dimension	0.617624	0.810455	0.686511

	worst_concave_points	worst_symmetry	\
mean_radius	0.744214	0.163953	\
mean_texture	0.295316	0.105008	
mean_perimeter	0.771241	0.189115	
mean_area	0.722017	0.143570	
mean_smoothness	0.503053	0.394309	
mean_compactness	0.815573	0.510223	
mean_concavity	0.861323	0.409464	
mean_concave_points	0.910155	0.375744	
mean_symmetry	0.430297	0.699826	
mean_fractal_dimension	0.175325	0.334019	
SE_radius	0.531062	0.094543	
SE_texture	-0.119638	-0.128215	
SE_perimeter	0.554897	0.109930	
SE_area	0.538166	0.074126	
SE_smoothness	-0.102007	-0.107342	
SE_compactness	0.483208	0.277878	
SE_concavity	0.440472	0.197788	
SE_concave_points	0.602450	0.143116	

SE_symmetry	-0.030413	0.389402
SE_fractal dimension	0.215204	0.111094
worst_radius	0.787424	0.243529
worst_texture	0.359755	0.233027
worst_perimeter	0.816322	0.269493
worst_area	0.747419	0.209146
worst_smoothness	0.547691	0.493838
worst_compactness	0.801080	0.614441
worst_concavity	0.855434	0.532520
worst_concave_points	1.000000	0.502528
worst_symmetry	0.502528	1.000000
worst_fractal_dimension	0.511114	0.537848

	worst_fractal_dimension
mean_radius	0.007066
mean_texture	0.119205
mean_perimeter	0.051019
mean_area	0.003738
mean_smoothness	0.499316
mean_compactness	0.687382
mean_concavity	0.514930
mean_concave_points	0.368661
mean_symmetry	0.438413
mean_fractal_dimension	0.767297
SE_radius	0.049559
SE_texture	-0.045655
SE_perimeter	0.085433
SE_area	0.017539
SE_smoothness	0.101480
SE_compactness	0.590973
SE_concavity	0.439329
SE_concave_points	0.310655
SE_symmetry	0.078079
SE_fractal_dimension	0.591328
worst_radius	0.093492
worst_texture	0.219122
worst_perimeter	0.138957
worst_area	0.079647
worst_smoothness	0.617624
worst_compactness	0.810455
worst_concavity	0.686511
worst_concave_points	0.511114
worst_symmetry	0.537848
worst_fractal_dimension	1.000000

[30 rows x 30 columns]