```
import numpy as NS
import pandas as pd
import matplotlib.pyplot as PDL
import seaborn as SNJ
```

```
path="/content/drive/MyDrive/Dataset/breast-cancer.csv"
df = pd.read_csv(path)
```

```
df.head(7)
```

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness
0	842302	M	17.99	10.38	122.80	1001.0	0
1	842517	M	20.57	17.77	132.90	1326.0	0.
2	84300903	M	19.69	21.25	130.00	1203.0	0.
3	84348301	M	11.42	20.38	77.58	386.1	0.
4	84358402	M	20.29	14.34	135.10	1297.0	0.
5	843786	M	12.45	15.70	82.57	477.1	0.
6	844359	M	18.25	19.98	119.60	1040.0	0.

7 rows × 32 columns

```
df.tail(12)
```

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness
557	925236	B	9.423	27.88	59.26	271.3	0.
558	925277	B	14.590	22.68	96.39	657.1	0.
559	925291	B	11.510	23.93	74.52	403.5	0.
560	925292	B	14.050	27.15	91.38	600.4	0.
561	925311	B	11.200	29.37	70.67	386.0	0.
562	925622	M	15.220	30.62	103.40	716.9	0.
563	926125	M	20.920	25.09	143.00	1347.0	0.
564	926424	M	21.560	22.39	142.00	1479.0	0
565	926682	M	20.130	28.25	131.20	1261.0	0.
566	926954	M	16.600	28.08	108.30	858.1	0.
567	927241	M	20.600	29.33	140.10	1265.0	0
568	92751	B	7.760	24.54	47.92	181.0	0.

12 rows × 32 columns

```
df.isnull().sum()
```

```
id                        0
diagnosis                 0
radius_mean               0
texture_mean              0
perimeter_mean            0
area_mean                 0
smoothness_mean           0
compactness_mean          0
concavity_mean            0
concave points_mean       0
symmetry_mean             0
fractal_dimension_mean    0
radius_se                 0
texture_se                0
perimeter_se              0
area_se                   0
smoothness_se             0
```

```
compactness_se             0
concavity_se               0
concave points_se          0
symmetry_se                0
fractal_dimension_se       0
radius_worst               0
texture_worst              0
perimeter_worst            0
area_worst                 0
smoothness_worst           0
compactness_worst          0
concavity_worst            0
concave points_worst       0
symmetry_worst             0
fractal_dimension_worst    0
dtype: int64
```

```
df.describe()
```

	id	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_r
count	5.690000e+02	569.000000	569.000000	569.000000	569.000000	569.000
mean	3.037183e+07	14.127292	19.289649	91.969033	654.889104	0.096
std	1.250206e+08	3.524049	4.301036	24.298981	351.914129	0.014
min	8.670000e+03	6.981000	9.710000	43.790000	143.500000	0.052
25%	8.692180e+05	11.700000	16.170000	75.170000	420.300000	0.086
50%	9.060240e+05	13.370000	18.840000	86.240000	551.100000	0.095
75%	8.813129e+06	15.780000	21.800000	104.100000	782.700000	0.105
max	9.113205e+08	28.110000	39.280000	188.500000	2501.000000	0.163

8 rows × 31 columns

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 569 entries, 0 to 568
Data columns (total 32 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   id                       569 non-null    int64
 1   diagnosis                569 non-null    object
 2   radius_mean              569 non-null    float64
 3   texture_mean             569 non-null    float64
 4   perimeter_mean           569 non-null    float64
 5   area_mean                569 non-null    float64
 6   smoothness_mean          569 non-null    float64
 7   compactness_mean         569 non-null    float64
 8   concavity_mean           569 non-null    float64
 9   concave points_mean      569 non-null    float64
 10  symmetry_mean            569 non-null    float64
 11  fractal_dimension_mean   569 non-null    float64
 12  radius_se                569 non-null    float64
 13  texture_se               569 non-null    float64
 14  perimeter_se             569 non-null    float64
 15  area_se                  569 non-null    float64
 16  smoothness_se            569 non-null    float64
 17  compactness_se           569 non-null    float64
 18  concavity_se             569 non-null    float64
 19  concave points_se        569 non-null    float64
 20  symmetry_se              569 non-null    float64
 21  fractal_dimension_se     569 non-null    float64
 22  radius_worst             569 non-null    float64
 23  texture_worst            569 non-null    float64
 24  perimeter_worst          569 non-null    float64
 25  area_worst               569 non-null    float64
 26  smoothness_worst         569 non-null    float64
 27  compactness_worst        569 non-null    float64
 28  concavity_worst          569 non-null    float64
 29  concave points_worst     569 non-null    float64
 30  symmetry_worst           569 non-null    float64
 31  fractal_dimension_worst  569 non-null    float64
dtypes: float64(30), int64(1), object(1)
memory usage: 142.4+ KB
```

```
df[df.index==91]
```

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_
91	861799	M	15.37	22.76	100.2	728.2	

1 rows × 32 columns

```
df[df.index.isin(range(21,48))]
```

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothnes
21	8510824	B	9.504	12.44	60.34	273.9	
22	8511133	M	15.340	14.26	102.50	704.4	
23	851509	M	21.160	23.04	137.20	1404.0	
24	852552	M	16.650	21.38	110.00	904.6	
25	852631	M	17.140	16.40	116.00	912.7	
26	852763	M	14.580	21.53	97.41	644.8	
27	852781	M	18.610	20.25	122.10	1094.0	
28	852973	M	15.300	25.27	102.40	732.4	
29	853201	M	17.570	15.05	115.00	955.1	
30	853401	M	18.630	25.11	124.80	1088.0	
31	853612	M	11.840	18.70	77.93	440.6	
32	85382601	M	17.020	23.98	112.80	899.3	
33	854002	M	19.270	26.47	127.90	1162.0	
34	854039	M	16.130	17.88	107.00	807.2	
35	854253	M	16.740	21.59	110.10	869.5	
36	854268	M	14.250	21.72	93.63	633.0	
37	854941	B	13.030	18.42	82.61	523.8	
38	855133	M	14.990	25.20	95.54	698.8	
39	855138	M	13.480	20.82	88.40	559.2	
40	855167	M	13.440	21.58	86.18	563.0	
41	855563	M	10.950	21.35	71.90	371.1	
42	855625	M	19.070	24.81	128.30	1104.0	
43	856106	M	13.280	20.28	87.32	545.2	
44	85638502	M	13.170	21.81	85.42	531.5	
45	857010	M	18.650	17.60	123.70	1076.0	
46	85713702	B	8.196	16.84	51.71	201.9	
47	85715	M	13.170	18.66	85.98	534.6	

27 rows × 32 columns

```
df.loc[8]
```

```
id                         844981
diagnosis                       M
radius_mean                  13.0
texture_mean                21.82
perimeter_mean               87.5
area_mean                   519.8
smoothness_mean            0.1273
compactness_mean           0.1932
concavity_mean             0.1859
concave points_mean       0.09353
symmetry_mean               0.235
fractal_dimension_mean    0.07389
```

```
radius_se                  0.3063
texture_se                  1.002
perimeter_se                2.406
area_se                     24.32
smoothness_se             0.005731
compactness_se             0.03502
concavity_se               0.03553
concave points_se          0.01226
symmetry_se                0.02143
fractal_dimension_se      0.003749
radius_worst                15.49
texture_worst               30.73
perimeter_worst             106.2
area_worst                  739.3
smoothness_worst           0.1703
compactness_worst          0.5401
concavity_worst             0.539
concave points_worst        0.206
symmetry_worst             0.4378
fractal_dimension_worst    0.1072
Name: 8, dtype: object
```

```
df.iloc[88:99]
```

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_
88	861597	B	12.360	21.80	79.78	466.1	0.0
89	861598	B	14.640	15.24	95.77	651.9	0.1
90	861648	B	14.620	24.02	94.57	662.7	0.0
91	861799	M	15.370	22.76	100.20	728.2	0.0
92	861853	B	13.270	14.76	84.74	551.7	0.0
93	862009	B	13.450	18.30	86.60	555.1	0.1
94	862028	M	15.060	19.83	100.30	705.6	0.1
95	86208	M	20.260	23.03	132.40	1264.0	0.0
96	86211	B	12.180	17.84	77.79	451.1	0.1
97	862261	B	9.787	19.94	62.11	294.5	0.1
98	862485	B	11.600	12.84	74.34	412.6	0.0

11 rows × 32 columns

```
df.columns
```

```
Index(['id', 'diagnosis', 'radius_mean', 'texture_mean', 'perimeter_mean',
       'area_mean', 'smoothness_mean', 'compactness_mean', 'concavity_mean',
       'concave points_mean', 'symmetry_mean', 'fractal_dimension_mean',
       'radius_se', 'texture_se', 'perimeter_se', 'area_se', 'smoothness_se',
       'compactness_se', 'concavity_se', 'concave points_se', 'symmetry_se',
       'fractal_dimension_se', 'radius_worst', 'texture_worst',
       'perimeter_worst', 'area_worst', 'smoothness_worst',
       'compactness_worst', 'concavity_worst', 'concave points_worst',
       'symmetry_worst', 'fractal_dimension_worst'],
      dtype='object')
```

```
df.nunique()
```

```
id                         569
diagnosis                    2
radius_mean                456
texture_mean               479
perimeter_mean             522
area_mean                  539
smoothness_mean            474
compactness_mean           537
concavity_mean             537
concave points_mean        542
symmetry_mean              432
fractal_dimension_mean     499
radius_se                  540
texture_se                 519
perimeter_se               533
area_se                    528
```

```
smoothness_se             547
compactness_se            541
concavity_se              533
concave points_se         507
symmetry_se               498
fractal_dimension_se      545
radius_worst              457
texture_worst             511
perimeter_worst           514
area_worst                544
smoothness_worst          411
compactness_worst         529
concavity_worst           539
concave points_worst      492
symmetry_worst            500
fractal_dimension_worst   535
dtype: int64
```

```
df.shape
```

```
(569, 32)
```

```
df.size
```

```
18208
```

```
df.count()
```

```
id                        569
diagnosis                 569
radius_mean               569
texture_mean              569
perimeter_mean            569
area_mean                 569
smoothness_mean           569
compactness_mean          569
concavity_mean            569
concave points_mean       569
symmetry_mean             569
fractal_dimension_mean    569
radius_se                 569
texture_se                569
perimeter_se              569
area_se                   569
smoothness_se             569
compactness_se            569
concavity_se              569
concave points_se         569
symmetry_se               569
fractal_dimension_se      569
radius_worst              569
texture_worst             569
perimeter_worst           569
area_worst                569
smoothness_worst          569
compactness_worst         569
concavity_worst           569
concave points_worst      569
symmetry_worst            569
fractal_dimension_worst   569
dtype: int64
```

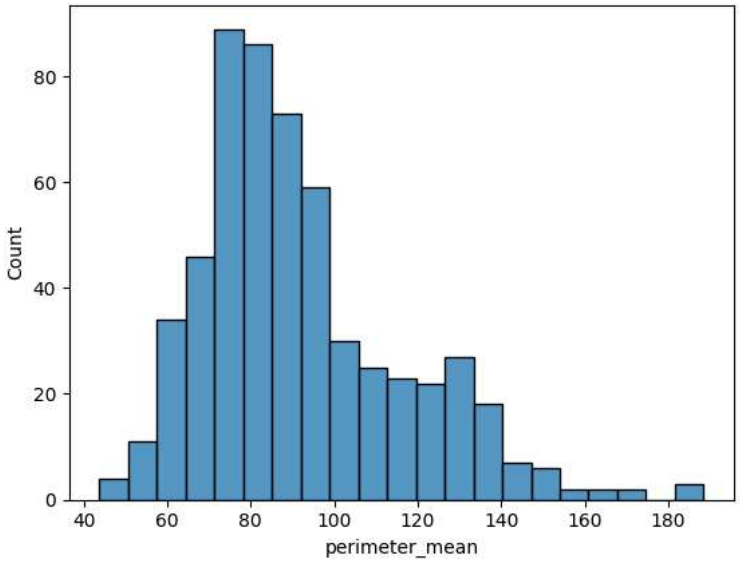
```
df["smoothness_worst"].value_counts()
```

```
smoothness_worst
0.13470    4
0.12750    4
0.12230    4
0.14010    4
0.12340    4
          ..
0.22260    1
0.13810    1
0.14290    1
0.13220    1
0.08996    1
Name: count, Length: 411, dtype: int64
```

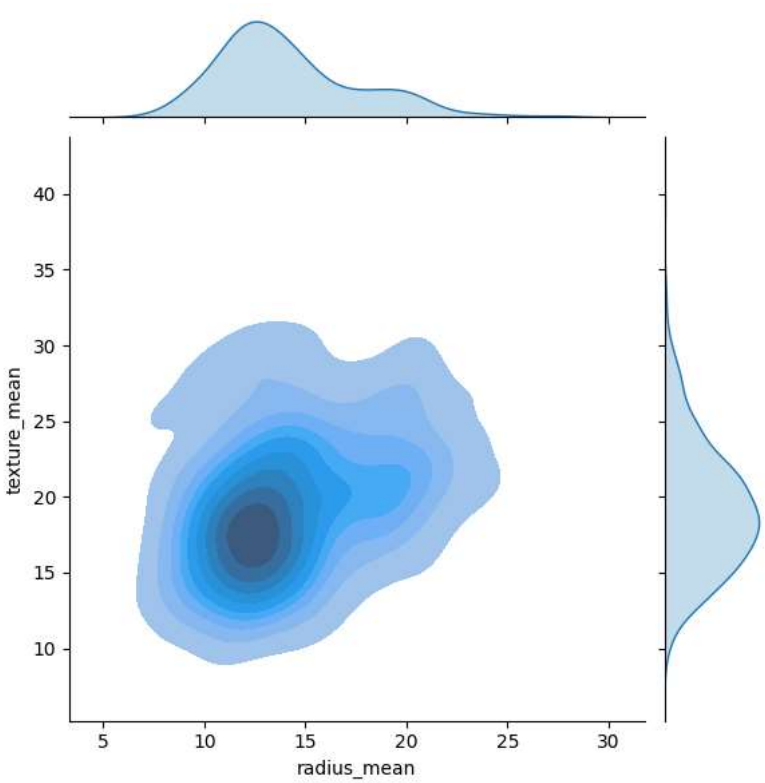
```
# Data Visualization using Matplotlib & Seaborn
```

```
SNJ.histplot(df["perimeter_mean"])
```

```
<Axes: xlabel='perimeter_mean', ylabel='Count'>
```

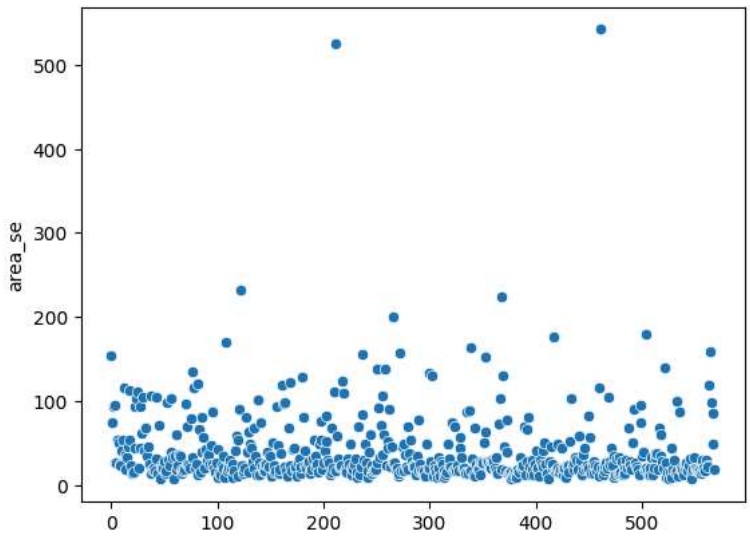



```
SNJ.jointplot(x="radius_mean",y="texture_mean",data=df,kind="kde",fill=True)
PDL.show()
```



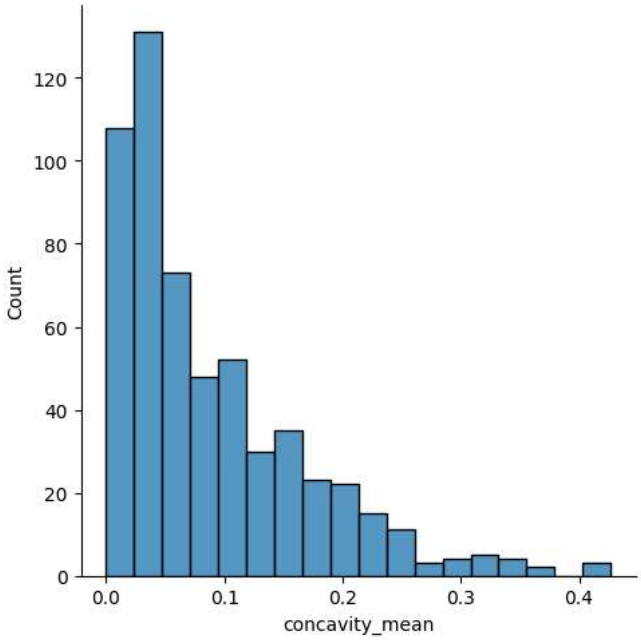

```
SNJ.scatterplot(df["area_se"])
```

```
<Axes: ylabel='area_se'>
```



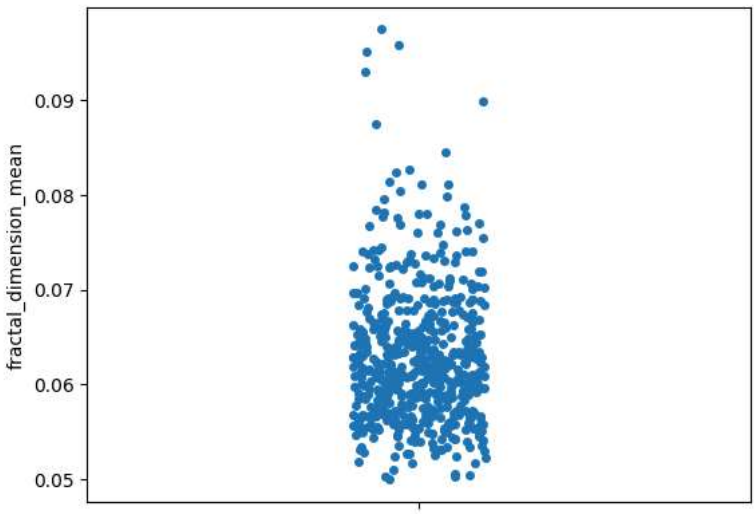

```
SNJ.displot(df["concavity_mean"])
```

```
<seaborn.axisgrid.FacetGrid at 0x7b784d93b3d0>
```




```
SNJ.stripplot(df["fractal_dimension_mean"])
```

```
<Axes: ylabel='fractal_dimension_mean'>
```




```
# Split the X & Y
```

```
X = NS.random.rand(364,10)
Y = NS.random.rand(364,1)
```

```
from sklearn.model_selection import train_test_split
X_train,Y_train,X_test,Y_test = train_test_split(X,Y,test_size=0.2,random_state=42)
```

```
X_train
```

```
array([[0.24817244, 0.47162519, 0.5934945 , ..., 0.59925333, 0.6438513 ,
        0.33896785],
       [0.47601185, 0.66848494, 0.73292579, ..., 0.20099749, 0.10796319,
        0.64376316],
       [0.6591658 , 0.3455543 , 0.28867733, ..., 0.60259914, 0.56981717,
        0.77414146],
       ...,
       [0.37856133, 0.60932311, 0.65868203, ..., 0.22668672, 0.78903503,
        0.88807605],
       [0.26176216, 0.52523248, 0.76180475, ..., 0.03820927, 0.00505998,
        0.73139905],
       [0.20012357, 0.60945011, 0.58744573, ..., 0.8790603 , 0.1520147 ,
        0.24138031]])
```

```
X_test
```

```
            [6.01705660e-01],
            [3.47113616e-01],
            [8.32012611e-01],
            [2.44406478e-01],
            [2.86589184e-02],
            [2.84226801e-01],
            [2.55406568e-02],
            [6.94089964e-01],
            [4.51176350e-01],
            [5.08075512e-01],
            [4.28483397e-02],
            [7.76437893e-01],
            [3.47768280e-01],
            [6.51410164e-01],
            [9.38524335e-01],
            [1.13608012e-02],
            [2.29000808e-01],
            [5.01563787e-01],
            [3.72021099e-01],
            [1.43662666e-01],
            [4.76661341e-01],
            [4.90644985e-01],
            [4.74855356e-01],
            [8.33538484e-01],
            [1.70708858e-01],
            [8.36676042e-02],
            [5.01443831e-01],
            [1.19319841e-01],
            [1.31602276e-01],
            [4.43152004e-01]])
```

```
print("X shape:", X.shape)
print("Y shape:", Y.shape)

# Define your model
model = Sequential([
    Dense(64, activation='relu', input_shape=(10,)),
    Dense(32, activation='relu'),
    Dense(1)
])

# Compile the model
model.compile(optimizer='adam', loss='mse')

# Fit the model
model.fit(X, Y, epochs=10, batch_size=32)
```

```
X shape: (364, 10)
Y shape: (364, 1)
Epoch 1/10
12/12 [==============================] - 1s 2ms/step - loss: 0.1667
Epoch 2/10
12/12 [==============================] - 0s 2ms/step - loss: 0.1113
Epoch 3/10
12/12 [==============================] - 0s 2ms/step - loss: 0.0942
Epoch 4/10
12/12 [==============================] - 0s 2ms/step - loss: 0.0903
Epoch 5/10
12/12 [==============================] - 0s 2ms/step - loss: 0.0874
Epoch 6/10
12/12 [==============================] - 0s 3ms/step - loss: 0.0848
Epoch 7/10
12/12 [==============================] - 0s 3ms/step - loss: 0.0830
Epoch 8/10
```