lab2_pandas

September 9, 2024

[11]:
```
import pandas as pd
print(pd.__version__)
```

```
2.2.2
```

[12]:
```
# create a numeric series
list_location1 = [-121.87, 37.23, 19, 7357, 963, 3018, 981, 6.9473]
pd_location1 = pd.Series(list_location1)

print(pd_location1)

print("type(pd_location1): ", type(pd_location1))
```

```
0    -121.8700
1      37.2300
2      19.0000
3    7357.0000
4     963.0000
5    3018.0000
6     981.0000
7       6.9473
dtype: float64
type(pd_location1):  <class 'pandas.core.series.Series'>
```

[13]:
```
#To create an object series (for column names)
table_column = ['Longitude', 'Latitude', 'Housing_median_age (Year)',␣
 ↪'Total_rooms', 'Total_bedrooms', 'Population', 'Households', 'Median_income']
pd_table_column = pd.Series(table_column)
print(pd_table_column)
```

```
0                    Longitude
1                     Latitude
2    Housing_median_age (Year)
3                  Total_rooms
4               Total_bedrooms
5                   Population
6                   Households
7                Median_income
dtype: object
```

[14]:
```
#To create a series  by giving both numeric and string values
table_values = ['Longitude', 'Latitude', 25, 'Total_rooms', 'Total_bedrooms',␣
 ↪10.3, 'Households', 'Median_income']
pd_table_values = pd.Series(table_values)
print(pd_table_values)
```

```
0         Longitude
1          Latitude
2                25
3       Total_rooms
4    Total_bedrooms
5              10.3
6        Households
7     Median_income
dtype: object
```

[15]:
```
# To create a series from a dictionary
longitude_column = {'location1': -113, 'location2': -111.2, 'location3': -112,␣
 ↪'location4': -110}
pd.Series(longitude_column)
```

[15]:
```
location1   -113.0
location2   -111.2
location3   -112.0
location4   -110.0
dtype: float64
```

[16]:
```
# Creating a 2d data frame a dictionary
data = {'Sample': ['location1', 'location2', 'location3', 'location4',␣
 ↪'location5', 'location6'],
'Longitude': [-121.87, -121.12, -119.31, -118.03, -120.97, -118.18],
'Latitude': [37.23, 39.03, 36.06, 33.78, 37.61, 34.02]
}

df_data = pd.DataFrame(data)

print(df_data)
```

```
      Sample  Longitude  Latitude
0  location1    -121.87     37.23
1  location2    -121.12     39.03
2  location3    -119.31     36.06
3  location4    -118.03     33.78
4  location5    -120.97     37.61
5  location6    -118.18     34.02
```

0.1 Problem 1

Task 1

[17]:
```
# Load the ' housing.csv Download housing.csv' data into python using Pandas␣
↪library.
housing = pd.read_csv('housing-4-1.csv')
```

Task 2

[18]:
```
print(housing.describe())
```

```
          longitude      latitude  housing_median_age   total_rooms  \
count  20640.000000  20640.000000        20640.000000  20640.000000
mean    -119.569704     35.631861           28.639486   2635.763081
std        2.003532      2.135952           12.585558   2181.615252
min     -124.350000     32.540000            1.000000      2.000000
25%     -121.800000     33.930000           18.000000   1447.750000
50%     -118.490000     34.260000           29.000000   2127.000000
75%     -118.010000     37.710000           37.000000   3148.000000
max     -114.310000     41.950000           52.000000  39320.000000

       total_bedrooms    population    households  median_income  \
count    20433.000000  20640.000000  20640.000000   20640.000000
mean       537.870553   1425.476744    499.539680       3.870671
std        421.385070   1132.462122    382.329753       1.899822
min          1.000000      3.000000      1.000000       0.499900
25%        296.000000    787.000000    280.000000       2.563400
50%        435.000000   1166.000000    409.000000       3.534800
75%        647.000000   1725.000000    605.000000       4.743250
max       6445.000000  35682.000000   6082.000000      15.000100

       median_house_value
count        20640.000000
mean        206855.816909
std         115395.615874
min          14999.000000
25%         119600.000000
50%         179700.000000
75%         264725.000000
max         500001.000000
```

Task 3

[19]:
```
###Check the Data types of values in each column of dataset using Pandas␣
↪function (i.e., info()). Write code for the activity and print out the␣
↪dataframe information.
print(housing.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20640 entries, 0 to 20639
Data columns (total 9 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
```

```
 0   longitude           20640 non-null  float64
 1   latitude            20640 non-null  float64
 2   housing_median_age  20640 non-null  float64
 3   total_rooms         20640 non-null  float64
 4   total_bedrooms      20433 non-null  float64
 5   population          20640 non-null  float64
 6   households          20640 non-null  float64
 7   median_income       20640 non-null  float64
 8   median_house_value  20640 non-null  float64
dtypes: float64(9)
memory usage: 1.4 MB
None
```

Task 4

[21]:
```
%pip install matplotlib
```

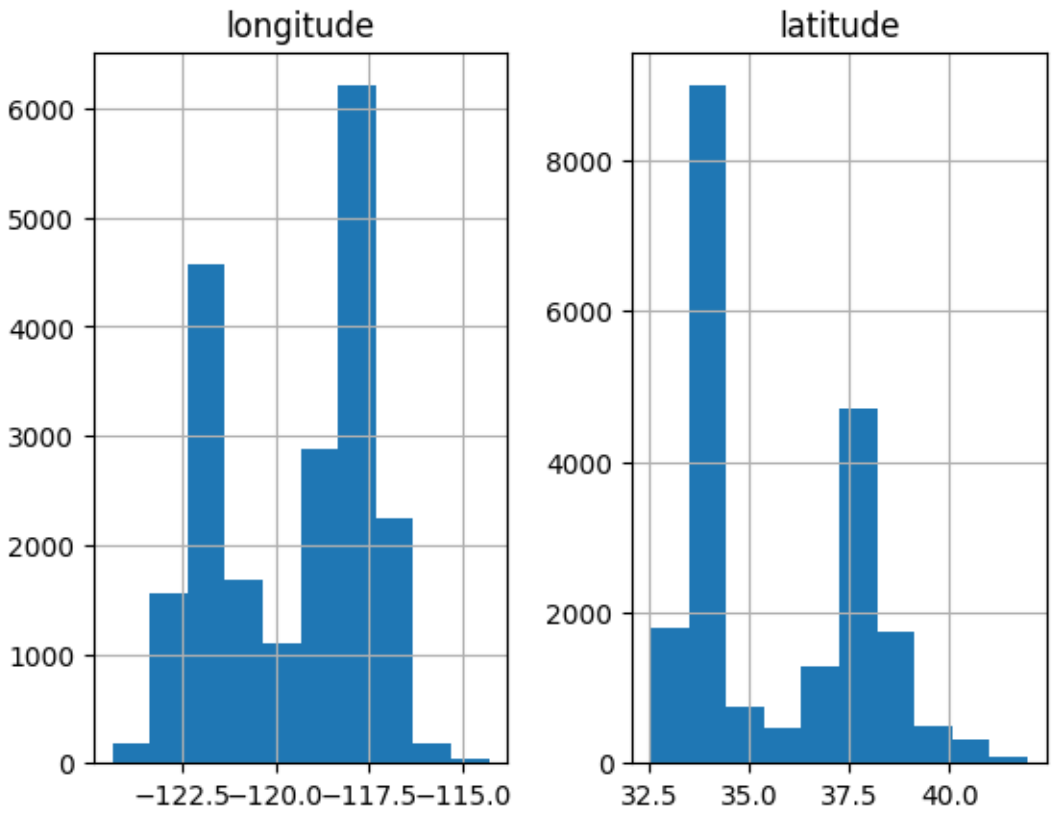
```
Collecting matplotlib
  Downloading matplotlib-3.9.2-cp311-cp311-win_amd64.whl.metadata (11 kB)
Collecting contourpy>=1.0.1 (from matplotlib)
  Downloading contourpy-1.3.0-cp311-cp311-win_amd64.whl.metadata (5.4 kB)
Collecting cycler>=0.10 (from matplotlib)
  Downloading cycler-0.12.1-py3-none-any.whl.metadata (3.8 kB)
Collecting fonttools>=4.22.0 (from matplotlib)
  Downloading fonttools-4.53.1-cp311-cp311-win_amd64.whl.metadata (165 kB)
     ---------------------------------------- 0.0/165.9 kB ? eta -:--:--
     -------------------------------- ----- 143.4/165.9 kB 2.8 MB/s eta 0:00:01
     ---------------------------------------- 165.9/165.9 kB 3.3 MB/s eta 0:00:00
Collecting kiwisolver>=1.3.1 (from matplotlib)
  Downloading kiwisolver-1.4.7-cp311-cp311-win_amd64.whl.metadata (6.4 kB)
Requirement already satisfied: numpy>=1.23 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
matplotlib) (1.25.0)
Requirement already satisfied: packaging>=20.0 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
matplotlib) (23.2)
Requirement already satisfied: pillow>=8 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
matplotlib) (10.0.0)
Requirement already satisfied: pyparsing>=2.3.1 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
matplotlib) (3.1.0)
Requirement already satisfied: python-dateutil>=2.7 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
matplotlib) (2.8.2)
Requirement already satisfied: six>=1.5 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
python-dateutil>=2.7->matplotlib) (1.16.0)
Downloading matplotlib-3.9.2-cp311-cp311-win_amd64.whl (7.8 MB)
```

```
   ---------------------------------------- 0.0/7.8 MB ? eta -:--:--
   -- ------------------------------------- 0.6/7.8 MB 12.2 MB/s eta 0:00:01
   -------- ------------------------------- 2.0/7.8 MB 20.9 MB/s eta 0:00:01
   ---------- ----------------------------- 4.3/7.8 MB 34.3 MB/s eta 0:00:01
   ---------------------------------------  7.8/7.8 MB 45.7 MB/s eta 0:00:01
   ---------------------------------------- 7.8/7.8 MB 41.8 MB/s eta 0:00:00
Downloading contourpy-1.3.0-cp311-cp311-win_amd64.whl (217 kB)
   ---------------------------------------- 0.0/217.2 kB ? eta -:--:--
   ---------------------------------------- 217.2/217.2 kB 12.9 MB/s eta 0:00:00
Downloading cycler-0.12.1-py3-none-any.whl (8.3 kB)
Downloading fonttools-4.53.1-cp311-cp311-win_amd64.whl (2.2 MB)
   ---------------------------------------- 0.0/2.2 MB ? eta -:--:--
   ---------------------------------------- 2.2/2.2 MB 46.7 MB/s eta 0:00:00
Downloading kiwisolver-1.4.7-cp311-cp311-win_amd64.whl (56 kB)
   ---------------------------------------- 0.0/56.0 kB ? eta -:--:--
   ---------------------------------------- 56.0/56.0 kB 2.9 MB/s eta 0:00:00
Installing collected packages: kiwisolver, fonttools, cycler, contourpy,
matplotlib
Successfully installed contourpy-1.3.0 cycler-0.12.1 fonttools-4.53.1
kiwisolver-1.4.7 matplotlib-3.9.2
Note: you may need to restart the kernel to use updated packages.


[notice] A new release of pip is available: 24.1.2 -> 24.2
[notice] To update, run: python.exe -m pip install --upgrade pip
```

[22]:
```
#Pick at least two numeric columns, and draw graph using pandas function (i.e.,␣
↪histogram, scatter plot, etc.) Note: if no numeric columns are found in␣
↪dataset, provide justification that none of columns in data are numeric␣
↪columns
pd.plotting.hist_frame(housing[['longitude', 'latitude']])
```

[22]:
```
array([[<Axes: title={'center': 'longitude'}>,
        <Axes: title={'center': 'latitude'}>]], dtype=object)
```




```
The Kernel crashed while executing code in the current cell or a previous cell.

Please review the code in the cell(s) to identify a possible cause of the␣
↪failure.

Click <a href='https://aka.ms/vscodeJupyterKernelCrash'>here</a> for more info.

View Jupyter <a href='command:jupyter.viewOutput'>log</a> for further details.
```

Task 5 There are no categorical columns because there is no qualtitative data here, just quantative data.

0.2 Problem 2

Task 1 This dataset, related to health and medicine, contains 32 instances and 56 integer-based features, with missing values. It is used for a classification task to distinguish between three types of pathological lung cancers. Models such as RDA, KNN, and the optimal discriminant plane have been applied, with varying accuracy rates (62.5%, 53.1%, and 59.4%, respectively). The data was used to illustrate the power of the optimal discriminant plane, despite being ill-posed, with some

features containing missing or altered values.

Task 2 i have no idea how to import the zip into python fso im doing it the other way listed on this website

[1]:
```
%pip install ucimlrepo
```

```
Collecting ucimlrepo
  Downloading ucimlrepo-0.0.7-py3-none-any.whl.metadata (5.5 kB)
Requirement already satisfied: pandas>=1.0.0 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
ucimlrepo) (2.2.2)
Requirement already satisfied: certifi>=2020.12.5 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
ucimlrepo) (2024.7.4)
Requirement already satisfied: numpy>=1.23.2 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
pandas>=1.0.0->ucimlrepo) (1.25.0)
Requirement already satisfied: python-dateutil>=2.8.2 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
pandas>=1.0.0->ucimlrepo) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
pandas>=1.0.0->ucimlrepo) (2024.1)
Requirement already satisfied: tzdata>=2022.7 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
pandas>=1.0.0->ucimlrepo) (2023.3)
Requirement already satisfied: six>=1.5 in
c:\users\julian\appdata\local\programs\python\python311\lib\site-packages (from
python-dateutil>=2.8.2->pandas>=1.0.0->ucimlrepo) (1.16.0)
Downloading ucimlrepo-0.0.7-py3-none-any.whl (8.0 kB)
Installing collected packages: ucimlrepo
Successfully installed ucimlrepo-0.0.7
Note: you may need to restart the kernel to use updated packages.


[notice] A new release of pip is available: 24.1.2 -> 24.2
[notice] To update, run: python.exe -m pip install --upgrade pip
```

[4]:
```
from ucimlrepo import fetch_ucirepo
lung_cancer = fetch_ucirepo(id=62)

print(lung_cancer)
```

```
{'data': {'ids': None, 'features':     Attribute1  Attribute2  Attribute3
Attribute4  Attribute5  Attribute6  \
0            0           3           0         NaN           0           2
1            0           3           3         1.0           0           3
2            0           3           3         2.0           0           3
```

3	0	2	3	2.0	1	3
4	0	3	2	1.0	1	3
5	0	3	3	2.0	0	3
6	0	3	2	1.0	0	3
7	0	2	2	1.0	0	3
8	0	3	1	1.0	0	3
9	0	2	3	2.0	0	2
10	0	2	2	0.0	0	3
11	0	2	3	2.0	0	1
12	0	2	1	1.0	0	1
13	0	2	2	1.0	1	2
14	1	3	0	NaN	1	1
15	0	3	2	2.0	1	2
16	0	3	2	2.0	0	1
17	0	2	1	1.0	0	2
18	0	2	0	NaN	0	2
19	0	1	2	1.0	0	3
20	0	2	0	NaN	1	3
21	0	3	3	2.0	0	2
22	0	2	3	1.0	1	2
23	0	2	3	1.0	1	1
24	0	3	3	1.0	0	3
25	0	2	3	2.0	0	1
26	0	2	2	2.0	0	2
27	0	2	2	1.0	0	2
28	0	3	2	2.0	0	2
29	0	2	1	1.0	0	2
30	0	2	3	2.0	1	2
31	0	2	3	1.0	0	2

	Attribute7	Attribute8	Attribute9	Attribute10	…	Attribute47	\
0	2	2	1	1	…	2	
1	1	3	1	1	…	2	
2	3	3	1	1	…	2	
3	3	3	1	2	…	2	
4	3	3	2	2	…	2	
5	3	3	1	2	…	2	
6	3	3	1	2	…	2	
7	1	3	3	3	…	2	
8	1	3	1	1	…	2	
9	2	2	1	2	…	2	
10	2	3	1	1	…	2	
11	2	1	1	2	…	2	
12	2	2	1	2	…	2	
13	3	3	1	1	…	2	
14	2	2	1	1	…	2	
15	2	2	1	1	…	2	
16	1	3	1	1	…	2	

17	1	3	1	1	…	2
18	3	3	3	2	…	2
19	3	3	1	2	…	2
20	3	3	1	2	…	2
21	1	3	1	1	…	2
22	2	1	1	1	…	3
23	2	1	1	1	…	2
24	3	1	1	1	…	2
25	2	2	1	2	…	2
26	1	2	1	1	…	2
27	2	2	1	1	…	3
28	2	2	1	1	…	2
29	2	1	1	1	…	2
30	2	3	1	1	…	2
31	3	3	1	1	…	2

	Attribute48	Attribute49	Attribute50	Attribute51	Attribute52	\
0	2	2	2	2	1	
1	2	2	2	2	2	
2	2	2	2	2	2	
3	2	2	2	2	2	
4	2	2	2	2	2	
5	2	2	2	2	2	
6	2	2	2	1	2	
7	2	1	2	2	2	
8	2	2	2	2	2	
9	2	2	1	3	2	
10	2	2	2	2	2	
11	2	2	2	2	1	
12	2	2	2	2	2	
13	2	2	2	2	1	
14	2	2	2	2	2	
15	2	2	2	2	2	
16	2	2	2	2	2	
17	2	2	2	2	1	
18	2	2	2	2	2	
19	2	2	2	2	1	
20	2	2	2	1	2	
21	2	1	2	2	2	
22	3	3	3	1	3	
23	2	2	2	2	2	
24	2	2	2	3	2	
25	2	2	1	3	1	
26	2	2	2	2	2	
27	3	2	2	3	2	
28	2	2	3	1	2	
29	2	3	2	2	2	
30	2	2	2	2	2	

```
31            2            2            2            2            2

    Attribute53  Attribute54  Attribute55  Attribute56
0             1            1            2            2
1             2            1            2            2
2             2            2            1            2
3             2            2            2            2
4             2            1            2            2
5             2            2            1            2
6             2            2            1            2
7             2            1            2            2
8             2            1            2            2
9             1            1            2            2
10            2            2            2            2
11            1            2            2            1
12            2            1            2            2
13            1            1            2            2
14            2            1            2            1
15            2            2            2            2
16            2            1            2            2
17            1            1            2            2
18            2            2            1            2
19            1            2            2            1
20            2            1            2            2
21            2            2            1            2
22            3            2            2            1
23            2            2            2            1
24            2            2            2            1
25            2            2            1            2
26            2            1            2            1
27            2            2            2            1
28            2            2            2            2
29            2            2            2            1
30            2            1            2            2
31            2            2            2            2

[32 rows x 56 columns], 'targets':     class
0       1
1       1
2       1
3       1
4       1
5       1
6       1
7       1
8       1
9       2
10      2
```

```
11      2
12      2
13      2
14      2
15      2
16      2
17      2
18      2
19      2
20      2
21      2
22      3
23      3
24      3
25      3
26      3
27      3
28      3
29      3
30      3
31      3, 'original':     class  Attribute1  Attribute2  Attribute3  Attribute4
Attribute5  \
0       1           0           3           0         NaN           0
1       1           0           3           3         1.0           0
2       1           0           3           3         2.0           0
3       1           0           2           3         2.0           1
4       1           0           3           2         1.0           1
5       1           0           3           3         2.0           0
6       1           0           3           2         1.0           0
7       1           0           2           2         1.0           0
8       1           0           3           1         1.0           0
9       2           0           2           3         2.0           0
10      2           0           2           2         0.0           0
11      2           0           2           3         2.0           0
12      2           0           2           1         1.0           0
13      2           0           2           2         1.0           1
14      2           1           3           0         NaN           1
15      2           0           3           2         2.0           1
16      2           0           3           2         2.0           0
17      2           0           2           1         1.0           0
18      2           0           2           0         NaN           0
19      2           0           1           2         1.0           0
20      2           0           2           0         NaN           1
21      2           0           3           3         2.0           0
22      3           0           2           3         1.0           1
23      3           0           2           3         1.0           1
24      3           0           3           3         1.0           0
25      3           0           2           3         2.0           0
```

26	3	0	2	2	2.0	0
27	3	0	2	2	1.0	0
28	3	0	3	2	2.0	0
29	3	0	2	1	1.0	0
30	3	0	2	3	2.0	1
31	3	0	2	3	1.0	0

	Attribute6	Attribute7	Attribute8	Attribute9	…	Attribute47	\
0	2	2	2	1	…	2	
1	3	1	3	1	…	2	
2	3	3	3	1	…	2	
3	3	3	3	1	…	2	
4	3	3	3	2	…	2	
5	3	3	3	1	…	2	
6	3	3	3	1	…	2	
7	3	1	3	3	…	2	
8	3	1	3	1	…	2	
9	2	2	2	1	…	2	
10	3	2	3	1	…	2	
11	1	2	1	1	…	2	
12	1	2	2	1	…	2	
13	2	3	3	1	…	2	
14	1	2	2	1	…	2	
15	2	2	2	1	…	2	
16	1	1	3	1	…	2	
17	2	1	3	1	…	2	
18	2	3	3	3	…	2	
19	3	3	3	1	…	2	
20	3	3	3	1	…	2	
21	2	1	3	1	…	2	
22	2	2	1	1	…	3	
23	1	2	1	1	…	2	
24	3	3	1	1	…	2	
25	1	2	2	1	…	2	
26	2	1	2	1	…	2	
27	2	2	2	1	…	3	
28	2	2	2	1	…	2	
29	2	2	1	1	…	2	
30	2	2	3	1	…	2	
31	2	3	3	1	…	2	

	Attribute48	Attribute49	Attribute50	Attribute51	Attribute52	\
0	2	2	2	2	1	
1	2	2	2	2	2	
2	2	2	2	2	2	
3	2	2	2	2	2	
4	2	2	2	2	2	
5	2	2	2	2	2	

6	2	2	2	1	2
7	2	1	2	2	2
8	2	2	2	2	2
9	2	2	1	3	2
10	2	2	2	2	2
11	2	2	2	2	1
12	2	2	2	2	2
13	2	2	2	2	1
14	2	2	2	2	2
15	2	2	2	2	2
16	2	2	2	2	2
17	2	2	2	2	1
18	2	2	2	2	2
19	2	2	2	2	1
20	2	2	2	1	2
21	2	1	2	2	2
22	3	3	3	1	3
23	2	2	2	2	2
24	2	2	2	3	2
25	2	2	1	3	1
26	2	2	2	2	2
27	3	2	2	3	2
28	2	2	3	1	2
29	2	3	2	2	2
30	2	2	2	2	2
31	2	2	2	2	2

	Attribute53	Attribute54	Attribute55	Attribute56
0	1	1	2	2
1	2	1	2	2
2	2	2	1	2
3	2	2	2	2
4	2	1	2	2
5	2	2	1	2
6	2	2	1	2
7	2	1	2	2
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12	2	1	2	2
13	1	1	2	2
14	2	1	2	1
15	2	2	2	2
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17	1	1	2	2
18	2	2	1	2
19	1	2	2	1

```
20          2          1          2          2
21          2          2          1          2
22          3          2          2          1
23          2          2          2          1
24          2          2          2          1
25          2          2          1          2
26          2          1          2          1
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       'Attribute42', 'Attribute43', 'Attribute44', 'Attribute45',
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and Young to illustrate the power of the optimal discriminant plane even in ill-
posed settings. Applying the KNN method in the resulting plane gave 77%
accuracy. However, these results are strongly biased (See Aeberhard's second
ref. above, or email to stefan@coral.cs.jcu.edu.au). Results obtained by
Aeberhard et al. are :\r\n \r\nRDA : 62.5%, KNN 53.1%, Opt. Disc. Plane
59.4%\r\n\r\nThe data described 3 types of pathological lung cancers. The
Authors give no information on the individual variables nor on where the data
was originally used.\r\n\r\nNotes:\r\n-  In the original data 4 values for the
fifth attribute were -1. These values have been changed to ? (unknown). (*)\r\n-
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In the original data 1 value for the 39 attribute was 4. This value has been changed to ? (unknown). (*)", 'purpose': None, 'funded_by': None, 'instances_represent': None, 'recommended_data_splits': None, 'sensitive_data': None, 'preprocessing_description': None, 'variable_info': 'Attribute 1 is the class label.\r\n\r\nAll predictive attributes are nominal, taking on integer values 0-3', 'citation': None}}, 'variables':

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3	Attribute3	Feature	Categorical		None	None	None
4	Attribute4	Feature	Categorical		None	None	None
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6	Attribute6	Feature	Categorical		None	None	None
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10	Attribute10	Feature	Categorical		None	None	None
11	Attribute11	Feature	Categorical		None	None	None
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15	Attribute15	Feature	Categorical		None	None	None
16	Attribute16	Feature	Categorical		None	None	None
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19	Attribute19	Feature	Categorical		None	None	None
20	Attribute20	Feature	Categorical		None	None	None
21	Attribute21	Feature	Categorical		None	None	None
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23	Attribute23	Feature	Categorical		None	None	None
24	Attribute24	Feature	Categorical		None	None	None
25	Attribute25	Feature	Categorical		None	None	None
26	Attribute26	Feature	Categorical		None	None	None
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41  Attribute41  Feature  Categorical        None        None  None
42  Attribute42  Feature  Categorical        None        None  None
43  Attribute43  Feature  Categorical        None        None  None
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45  Attribute45  Feature  Categorical        None        None  None
46  Attribute46  Feature  Categorical        None        None  None
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27             no
28             no
29             no
```

```
30              no
31              no
32              no
33              no
34              no
35              no
36              no
37              no
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39              no
40              no
41              no
42              no
43              no
44              no
45              no
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