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PHYS 243 Midterm- Acute Inflammations

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# 1.0 Data Set Description

The data set prepares the algorithm of the expert system, which will perform the presumptive diagnosis of two diseases of urinary system. The two diseases are diagnosing of the acute inflammations of urinary bladder and acute nephritises. Acute inflammation of urinary bladder is characterized by sudden occurrence of pains in the abdomen region and the urination in form of constant urine pushing, micturition pains and sometimes lack of urine keeping. Temperatures in patients rise but usually not above 38 degrees Celsius. Urine is sometimes bloody and turbid. Proper treatment allows symptoms to decease within several days. With patients with inflammation of urinary bladder, illness is expected to return to protracted form.

Acute nephritis of renal pelvis usually occurs more often in women than in men. Fever comes first and reaches, and sometimes exceeds 40 degrees Celsius. One- or both-side lumbar pains and shivers usually come with this fever. These symptoms occur very often and sometimes include nausea and vomiting with pains through the whole abdomen. The data set includes attributes of various patients with them shown in Table 1.1. The data set itself contains 120 instances and 6 attributes as columns. It is a multivariate data set with categorical and integer attributes that Assistant Professor Jacek Czerniak, Ph.D. put together. Source information can be found in (See Appendix A).

|  |  |
| --- | --- |
| Attribute | Description |
| a1 | Temperature of patient (35C-42C) |
| a2 | Occurrence of nausea (yes, no) |
| a3 | Lumbar pain (yes, no) |
| a4 | Urine pushing (continuous need for urination) (yes, no) |
| a5 | Micturition pains (yes, no) |
| a6 | Burning of urethra, itch, swelling of urethra outlet (yes, no) |
| d1 | Decision: Inflammation of urinary bladder (yes, no) |
| d2 | Decision: Nephritis of renal pelvis origin (yes, no) |

**Table 1.1** Attribute Descriptions

# 2.0 Supervised learning

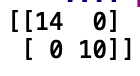
Supervised learning involves a labeled dataset and predicting a label for future instances. It is used to find the conditional probability for our variables given a set of known examples.

## 2.1 Classification-Nearest Neighbor

K-Nearest Neighbor uses all of the data for training while classifying a new data point or instance. In this case, our classes would represent the two diseases; acute inflammations of urinary bladder and acute nephritises. A benefit of using this method is it does not assume anything about the underlying data, which is often what is needed in real world data.

One was used for nearest neighbors however five is the most often used. Higher k’s can be used to cover more patients as demonstrated.

### 2.1.1 Inflamed bladder analysis



**Figure 2.1 K=1 Inflamed Bladder Confusion Matrix**

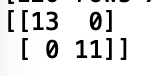
Confusion matrix shows that the algorithm was able to successfully diagnose 24 patients correctly with k=1.

## Macintosh HD:Users:dominiquecacuna:Desktop:Screen Shot 2019-07-29 at 12.06.33 AM.png

**Figure 2.2 K=1 Inflamed Bladder Classification Report**

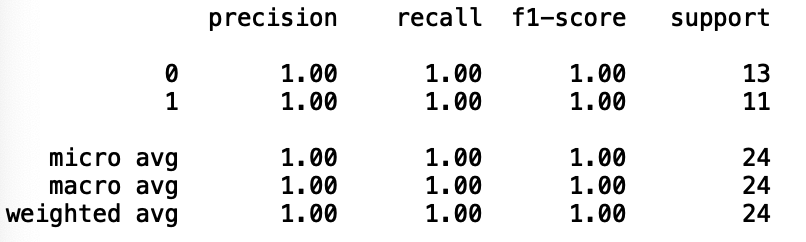
Results show that the algorithm was able to successfully classify 10 of the patients as having inflammatory bladder and 14 as not. This is a total of 24 patients being successfully diagnosed with k=1

### 2.1.2 Acute Nephritis Analysis



**Figure 2.5 K=1 Acute Nephritis Confusion Matrix**

Confusion matrix shows that the algorithm was able to successfully diagnose 24 patients correctly with k=1.



**Figure 2.6 K=1 Acute Nephritis Classification Report**

Results show that the algorithm was able to successfully classify 11 of the patients as having inflammatory bladder and 13 as not. This is a total of 24 patients being successfully diagnosed with k=1.

# 3.0 Recommendations/Comments

Overall, this is a dataset with many instances. After conducting K nearest neighbor method, that characterizes or separates two or more classes of objects or events, it was determined that 24 patients could be diagnosed for both diseases from the dataset.

# Appendix A- Source Information

Source:

J.Czerniak, H.Zarzycki, Application of rough sets in the presumptive

diagnosis of urinary system diseases, Artifical Inteligence and Security

in Computing Systems, ACS'2002 9th International Conference Proceedings,

Kluwer Academic Publishers,2003, pp. 41-51

# Appendix B- Python Code for Inflamed Bladder

See Github for better format

import numpy as np
import pandas as pd
import random
import matplotlib.pyplot as plt
data={'nausea':[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,0,1,1,0,1,0,1,1,1,0,1,1,1,0,1,1,1,0,1,0,0,1,1,0,1,0,1,0,1,1,0,1,0,1,0,1,0,1,0,0,1,0,0],
'lumbar\_pai':[1,0,1,0,1,1,0,1,0,0,0,1,1,0,1,1,0,0,0,1,0,0,1,0,0,0,0,0,1,0,0,0,1,0,1,0,0,1,0,0,1,1,0,0,0,0,0,0,0,0,1,0,1,0,0,0,0,1,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,0,0,1,1,1,1,1,0,1,1,1,1,1,0,1,1,1,0,1,1,1,0,1,1,1,1,1,1,1,0,1,1,1,1,0,1,1,1,0,1,1,1,1,0,1,1,1],
'frequent\_urination':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,1,1,0,1,1,1,1,1,0,1,1,1,0,1,0,1,1,0,1,1,0,0,1,1,1,1,1,1,1,1,0,1,0,1,1,1,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,1,1,1,0,0,1,1,1,1,0,0,1,1,0,0,1,1,0,0,1,1,1,1,1,1,0,0,1,1,1,0,0,1,1,0,0,1,1,1,0,0,1,1],
'painful\_urination':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,1,1,0,1,1,1,1,0,0,1,0,1,0,0,0,1,0,0,0,1,0,0,1,0,0,1,1,1,1,1,0,0,0,1,0,1,1,0,1,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,0,1,1,0,1,0,1,1,1,0,1,1,1,0,1,1,1,0,1,0,0,1,1,0,1,0,1,0,1,1,0,1,0,1,0,1,0,1,0,0,1,0,0],
'burning\_urethra':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,0,0,0,1,1,1,1,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,1,0,1,0,0,1,1,0,0,0,0,0,1,0,0,1,0,0,0,1,1,0,0,1,1,0,0,1,1,0,0,0,1,1,0,0,1,0,1,0,0,1,1],
'inflamed\_bladder':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,1,1,0,1,1,1,1,1,0,1,1,1,0,1,0,1,1,0,1,1,0,0,1,1,1,1,1,1,1,1,0,1,0,1,1,1,1,0,1,1,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,0,0,0,1,1,0,0,0,1,1,1,0,0,1,1,0,0,1,1,0,0,0,0,1,1,0,1,0,0,0,1,1,0,0,0,1,0,0,0,1,0,0,0,0,0]}

training\_data=pd.DataFrame(data)

#print(training\_data)

#test data matrix

test\_data = [ [0, 0, 1, 1, 0], [0, 0, 0, 1, 1], [1, 1, 0, 0, 0], [0, 1, 0, 0, 1], [0, 1, 0, 0, 0], [0, 0, 0, 0, 1]]
#Now train classifier on training\_data and inflamed\_bladder. Then test the created classifier on the test\_data you just created to predict whether each test subject has an inflamed\_bladder.

X = training\_data.iloc[:, :-1].values
y = training\_data.iloc[:, 4].values
from sklearn.model\_selection import train\_test\_split
X\_train, X\_test, y\_train, y\_test = train\_test\_split(X, y, test\_size=0.20)
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
scaler.fit(X\_train)
X\_train = scaler.transform(X\_train)
X\_test = scaler.transform(X\_test)
from sklearn.neighbors import KNeighborsClassifier
classifier = KNeighborsClassifier(n\_neighbors=1)
classifier.fit(X\_train, y\_train)
y\_pred = classifier.predict(X\_test)
from sklearn.metrics import classification\_report, confusion\_matrix
print(confusion\_matrix(y\_test, y\_pred))
print(classification\_report(y\_test, y\_pred))

# Appendix C- Python Code for Acute Nephritis

See Github for better format

import numpy as np
import pandas as pd
import random
import matplotlib.pyplot as plt
#Now train classifier on training\_data and Nephritise
data2={'nausea':[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,0,1,1,0,1,0,1,1,1,0,1,1,1,0,1,1,1,0,1,0,0,1,1,0,1,0,1,0,1,1,0,1,0,1,0,1,0,1,0,0,1,0,0],
'lumbar\_pai':[1,0,1,0,1,1,0,1,0,0,0,1,1,0,1,1,0,0,0,1,0,0,1,0,0,0,0,0,1,0,0,0,1,0,1,0,0,1,0,0,1,1,0,0,0,0,0,0,0,0,1,0,1,0,0,0,0,1,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,0,0,1,1,1,1,1,0,1,1,1,1,1,0,1,1,1,0,1,1,1,0,1,1,1,1,1,1,1,0,1,1,1,1,0,1,1,1,0,1,1,1,1,0,1,1,1],
'frequent\_urination':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,1,1,0,1,1,1,1,1,0,1,1,1,0,1,0,1,1,0,1,1,0,0,1,1,1,1,1,1,1,1,0,1,0,1,1,1,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,1,1,1,0,0,1,1,1,1,0,0,1,1,0,0,1,1,0,0,1,1,1,1,1,1,0,0,1,1,1,0,0,1,1,0,0,1,1,1,0,0,1,1],
'painful\_urination':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,1,1,0,1,1,1,1,0,0,1,0,1,0,0,0,1,0,0,0,1,0,0,1,0,0,1,1,1,1,1,0,0,0,1,0,1,1,0,1,0,0,0,0,0,0,0,0,0,0,0,1,1,1,0,0,1,1,0,1,1,0,1,0,1,1,1,0,1,1,1,0,1,1,1,0,1,0,0,1,1,0,1,0,1,0,1,1,0,1,0,1,0,1,0,1,0,0,1,0,0],
'burning\_urethra':[0,1,0,1,0,0,1,0,1,1,1,0,0,1,0,0,1,1,1,0,0,0,0,1,1,1,1,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,1,0,1,0,0,1,1,0,0,0,0,0,1,0,0,1,0,0,0,1,1,0,0,1,1,0,0,1,1,0,0,0,1,1,0,0,1,0,1,0,0,1,1],
'acute\_nephritis':[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,0,0,1,1,1,1,1,0,1,1,1,1,1,0,1,1,1,0,1,1,1,0,1,1,1,1,1,1,1,0,1,1,1,1,0,1,1,1,0,1,1,1,1,0,1,1,1]}
training\_data2=pd.DataFrame(data2)
print(training\_data2)
X2 = training\_data2.iloc[:, :-1].values
y2 = training\_data2.iloc[:, 4].values
from sklearn.model\_selection import train\_test\_split
X\_train2, X\_test2, y\_train2, y\_test2 = train\_test\_split(X2, y2, test\_size=0.20)
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
scaler.fit(X\_train2)
X\_train2 = scaler.transform(X\_train2)
X\_test2 = scaler.transform(X\_test2)
from sklearn.neighbors import KNeighborsClassifier
classifier = KNeighborsClassifier(n\_neighbors=5)
classifier.fit(X\_train2, y\_train2)
y\_pred2 = classifier.predict(X\_test2)
from sklearn.metrics import classification\_report, confusion\_matrix
print(confusion\_matrix(y\_test2, y\_pred2))
print(classification\_report(y\_test2, y\_pred2))