M.Sc C.S. – II SEM - II
Journal

Roll No.	
Name	
Subject	**Business Intelligence and Big Data Analytics - II**

Thakur Educational Trust's (Regd.)

Thakur College of Science & Commerce

UGC Recognised • Affiliated to University Of Mumbai

(NAAC Accredited with Grade "A" [3rd Cycle] & ISO 9001:2015 Certified)

CERTIFICATE

This is here to certify that Mr/Ms , Seat Number ___ of M.Sc. II Computer Science, has satisfactorily completed the required number of experiments prescribed by the UNIVERSITY OF MUMBAI during the academic year 2022 – 2023.

Date:22-09-2022

Place: Mumbai

Teacher In-Charge

Head of Department

External Examiner

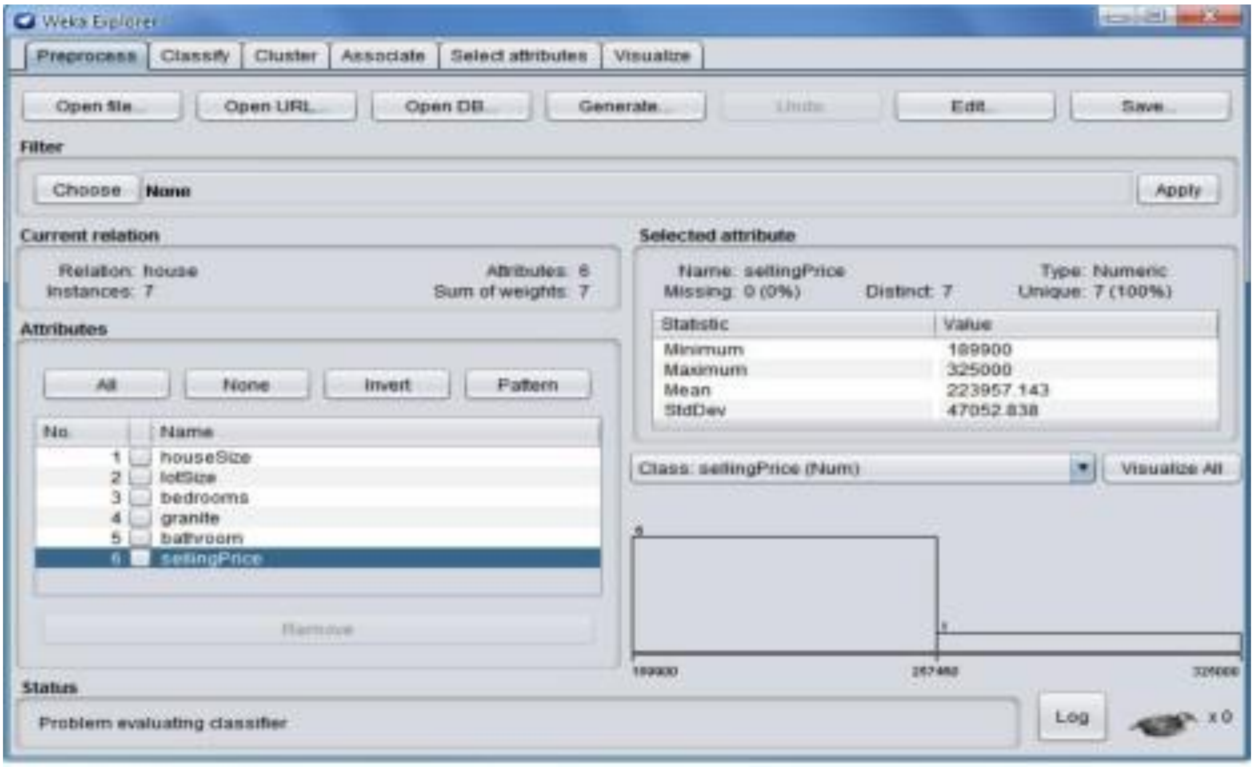
INDEX

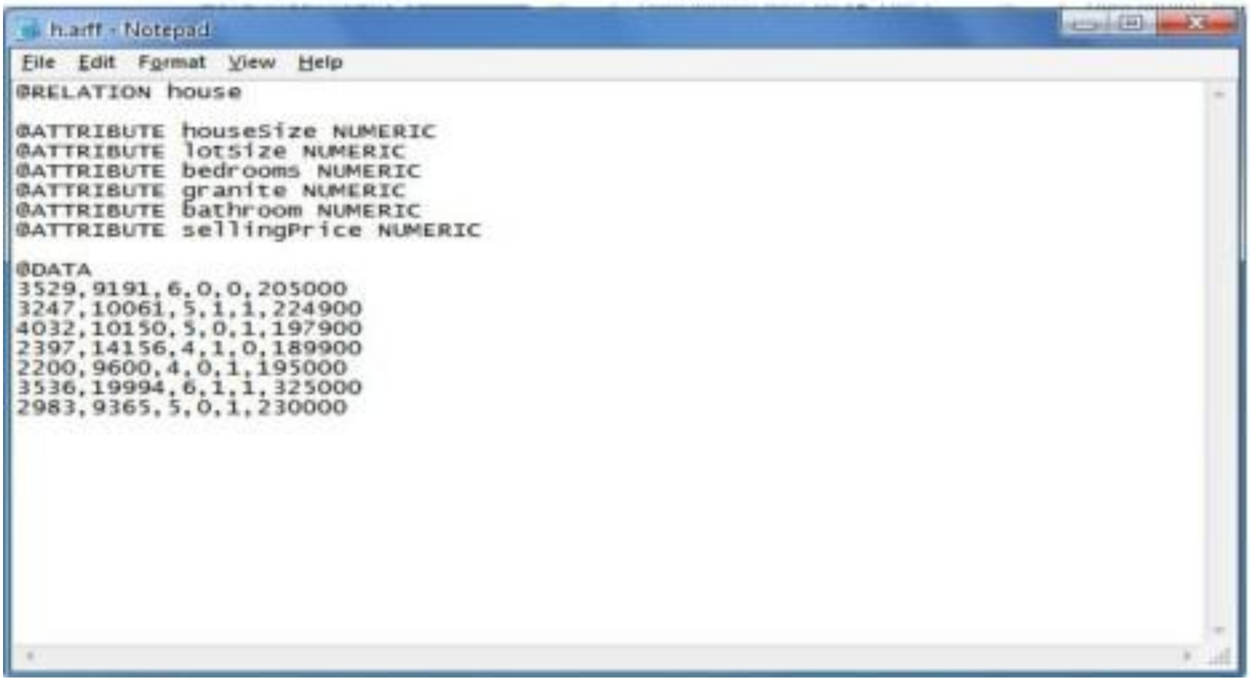
Sr no	Experiment	Date	Remarks
1	Generate Regression model and interpret the result for a given data set.		
2	Generate Regression model and interpret the result for a given data set.		
3	Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each should be case-insensitive(i.e include both upper-case and lower-case versions of the letter, ignore non-alphabetic characters)		
4	Write a map-reduce program to count the number of occurrences of each word in the given dataset.(A word is defined as any string of alphabetic characters appearing between non-alphabetic characters like nature's is two words. The count should be case-insensitive. If a word occurs multiple times in a line, all should be counted).		
5	Write a program to construct different types of k-shingles for a given document. Installation of required packages before executing program		
6	Write a program for measuring similarity among documents and detecting passages which have been reused.		
7	Write a program to compute the n-moment for a given stream where n is given.		
8	Write a program to demonstrate the Alon-Matias-Szegedy Algorithm for second moments.		

Practical No: 1

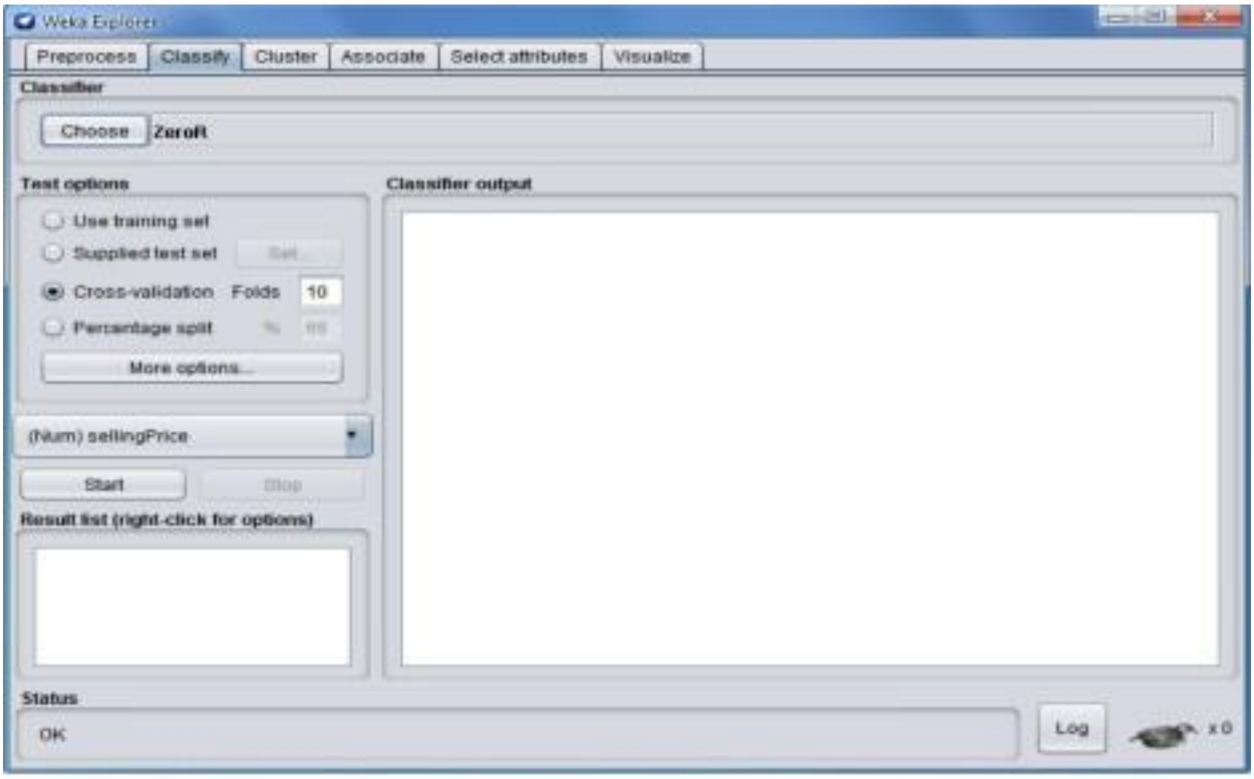
Aim : Generate Regression model and interpret the result for a given data set.

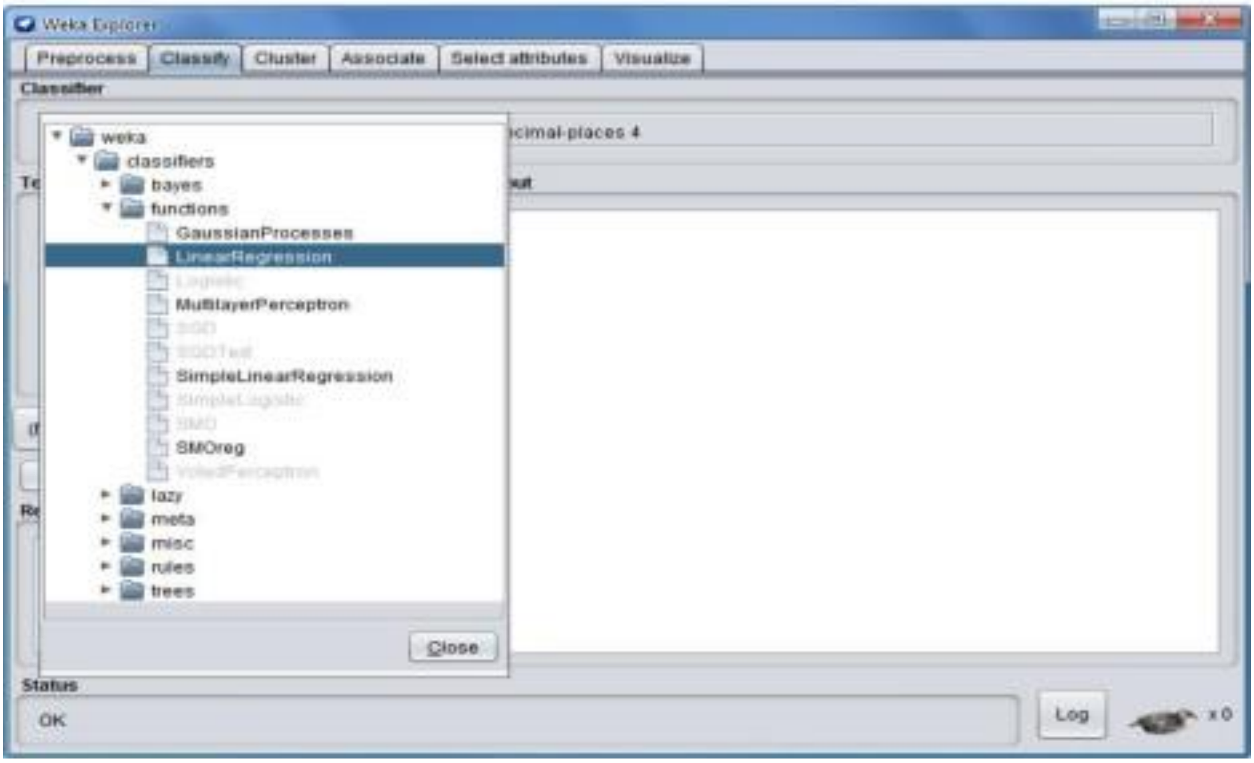
Step 1: Open Weka then open file h.arff in Weka Explorer.

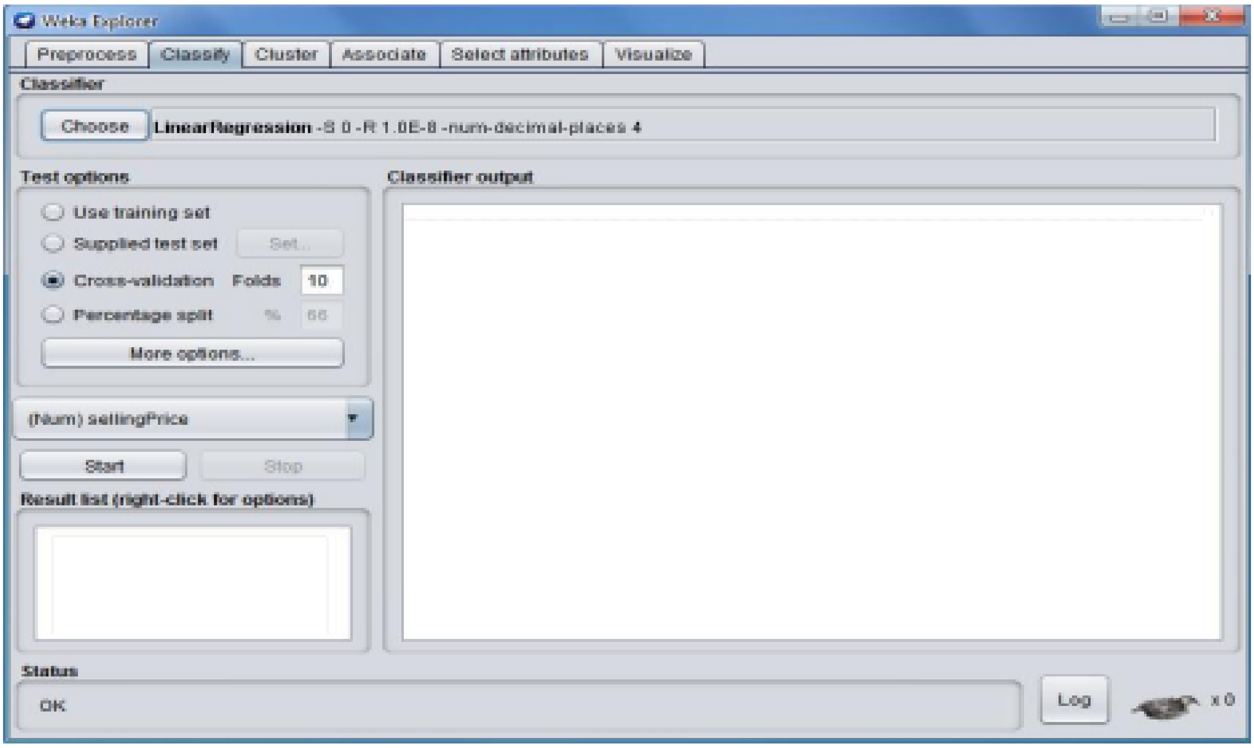




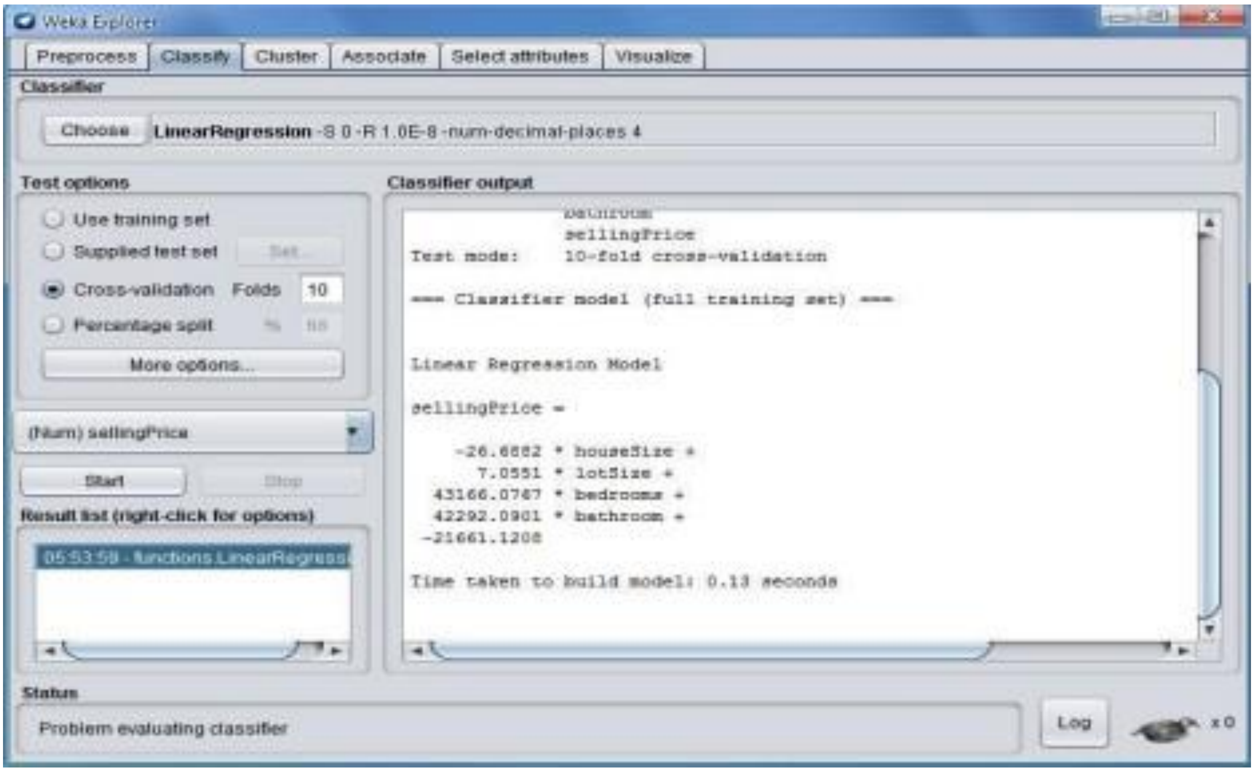
Step 2: Click on Classify, choose weka classifier function LinearRegression -S 0 -R 1.0E-8 -num-decimal-places 4.







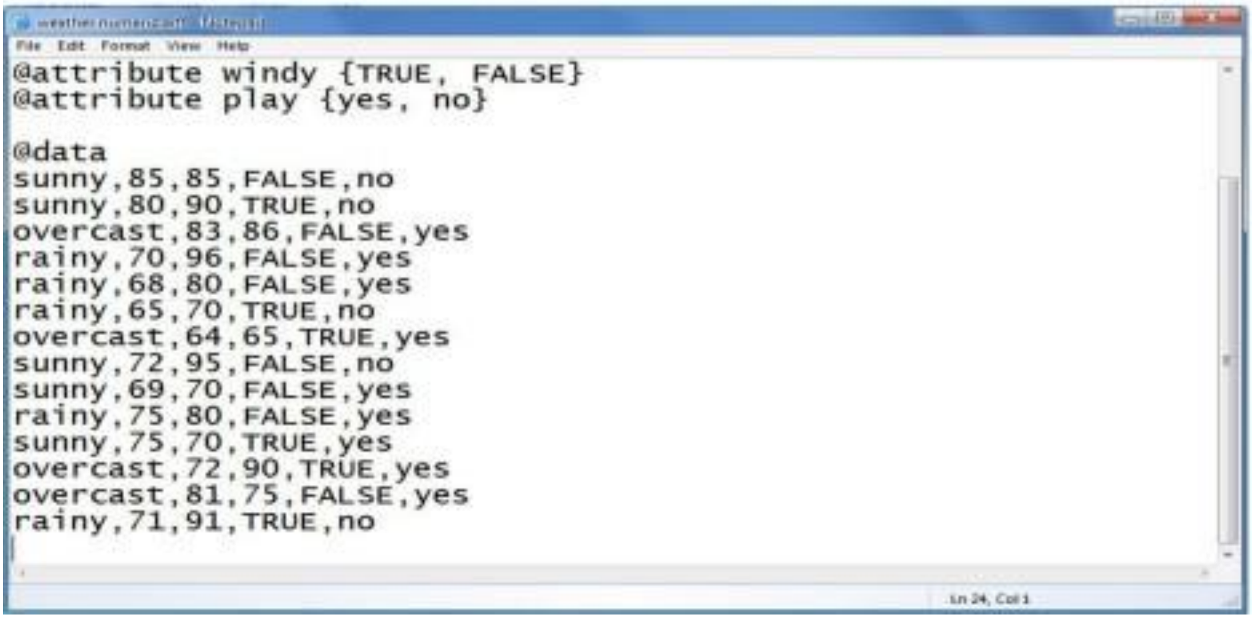
Step 3: Click on Start. You can see the linear regression on the input file.



Practical No: 2

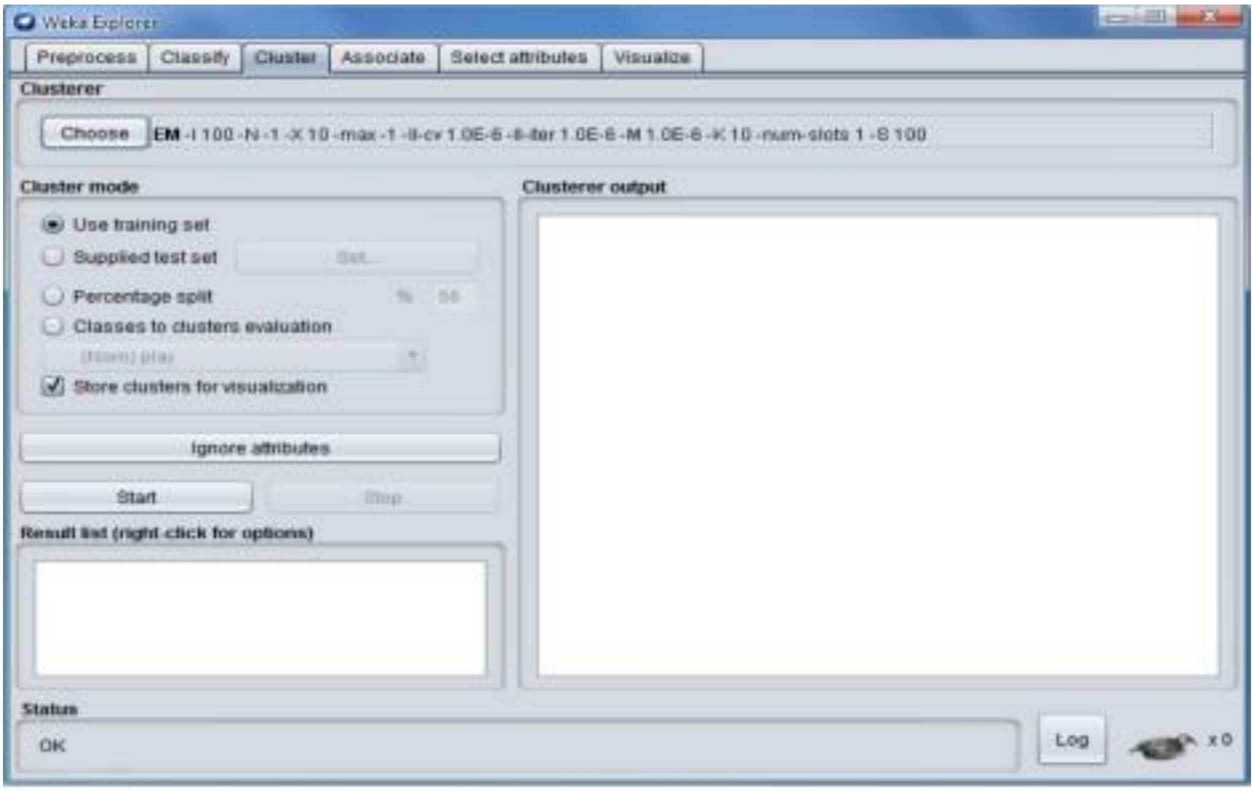
Aim : Generate forecasting model and interpret the result for a given data set.

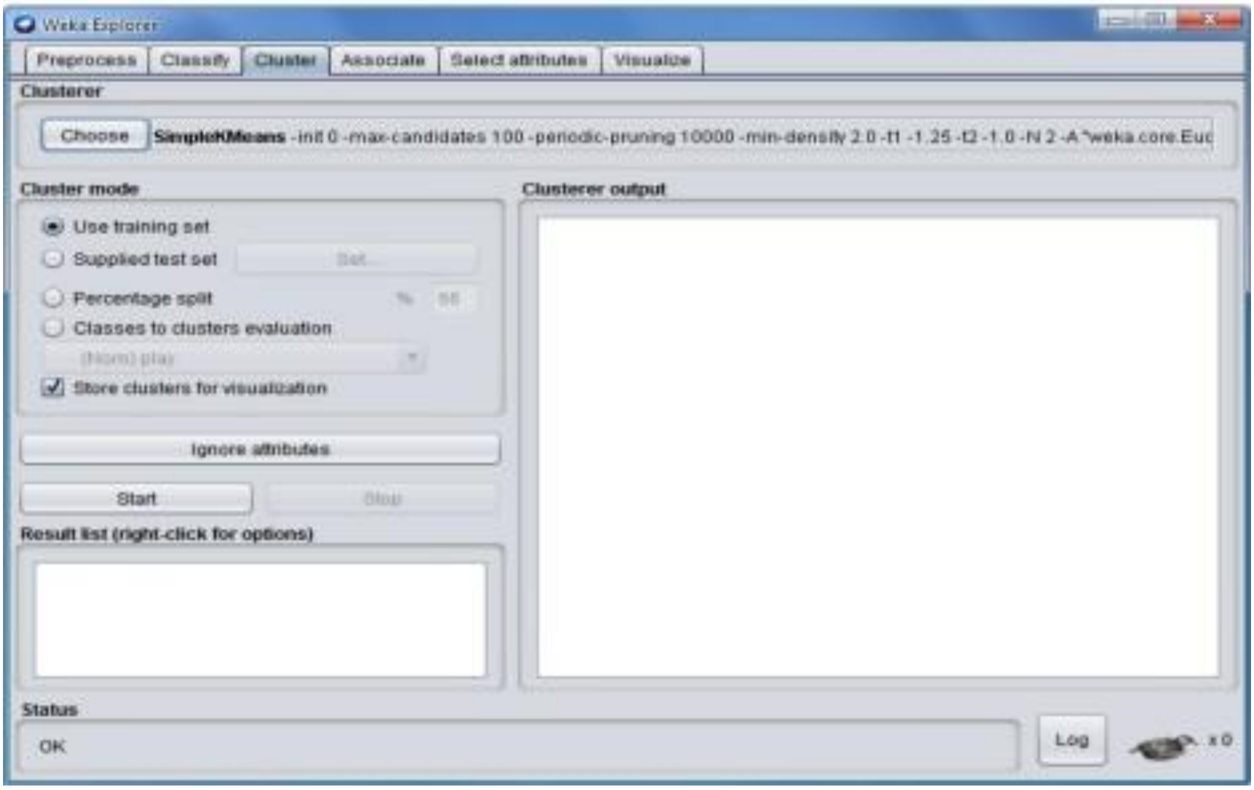
Step 1: Open Weka then open file Weather.arff in Weka Explorer.



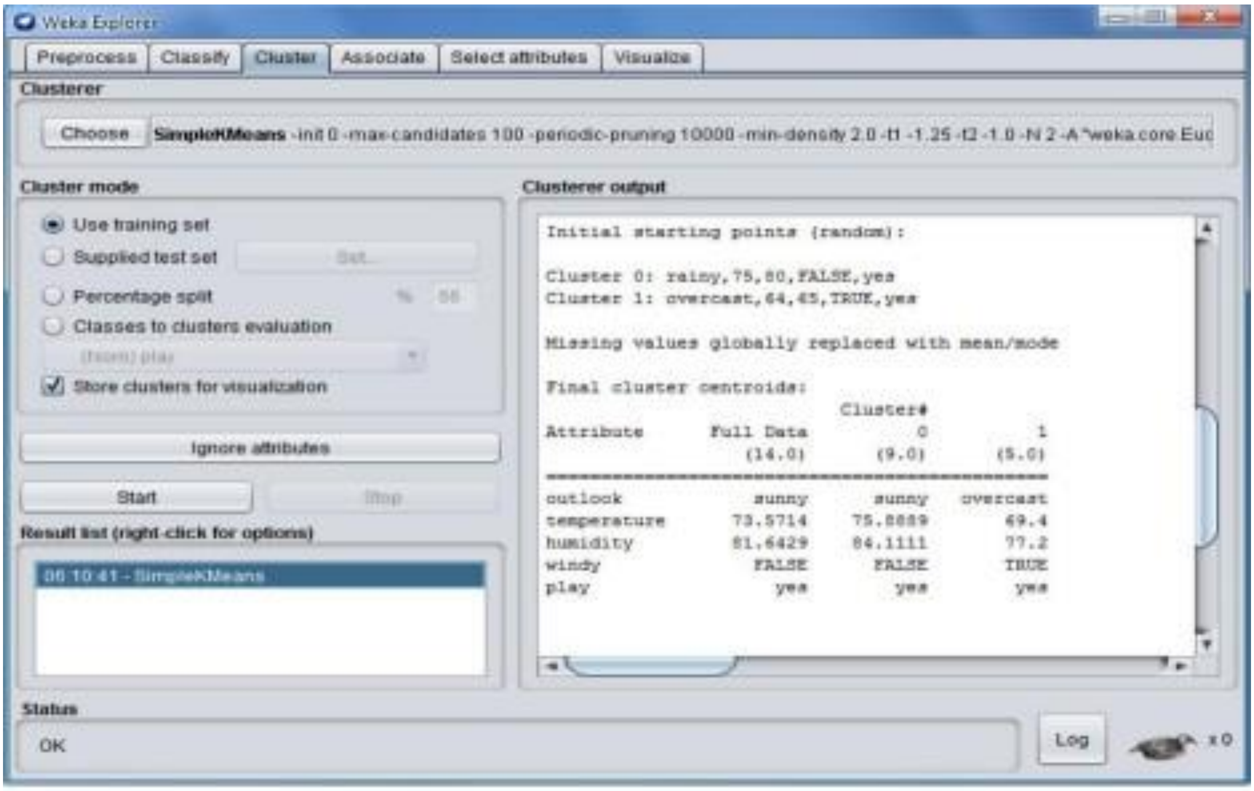
```
@attribute windy {TRUE, FALSE}
@attribute play {yes, no}

@data
sunny,85,85,FALSE,no
sunny,80,90,TRUE,no
overcast,83,86,FALSE,yes
rainy,70,96,FALSE,yes
rainy,68,80,FALSE,yes
rainy,65,70,TRUE,no
overcast,64,65,TRUE,yes
sunny,72,95,FALSE,no
sunny,69,70,FALSE,yes
rainy,75,80,FALSE,yes
sunny,75,70,TRUE,yes
overcast,72,90,TRUE,yes
overcast,81,75,FALSE,yes
rainy,71,91,TRUE,no
```

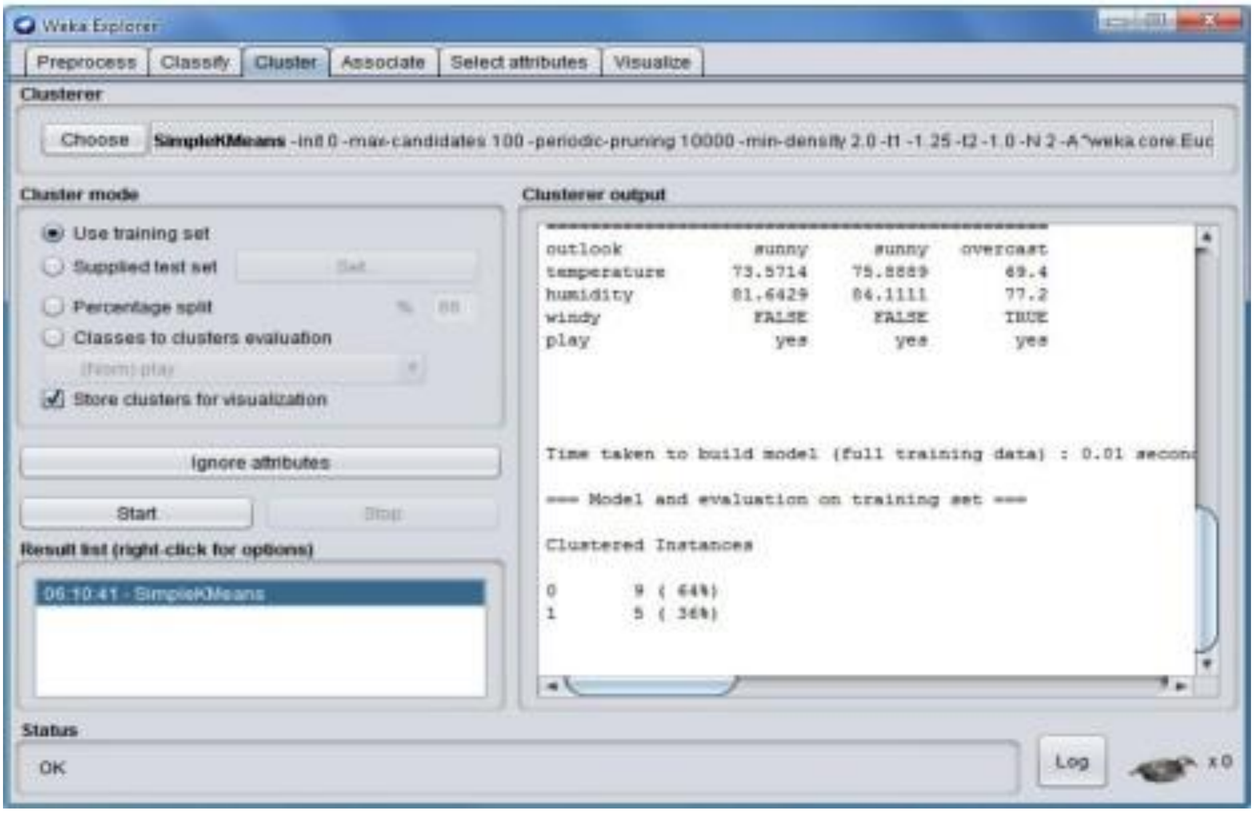
<u>Step 2</u>: Click on Cluster, choose weka forecasting function SimpleKMean.





Step 3: **Click on Start. You can see the SimpleKMean on the input file.**





Practical No: 3

Aim : Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each should be case-insensitive(i.e include both upper-case and lower-case versions of the letter, ignore non-alphabetic characters).

Source Code:

Charcount.java(Driver Class)

```
import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
Import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.io.Text;
import  org.apache.hadoop.mapreduce.Job;

import org.apache.hadoop.mapreduce.lib.input.FileInputFormatimport
org.apache.hadoop.mapreduce.lib.input.TextInputFormat; import
org.apache.hadoop.mapreduce.lib.output.FileOutputFormat; import
org.apache.hadoop.mapreduce.lib.output.TextOutputFormat;

public class Charcount {

public static void main(String[] args) throws Exception {

// TODO Auto-generated method stub Configuration
conf = new Configuration(); Job job = new Job(conf,
"Charcount"); job.setJarByClass(Charcount.class);
job.setMapperClass(Charmap.class);
job.setReducerClass(Charreduce.class);
job.setInputFormatClass(TextInputFormat.class);
job.setOutputFormatClass(TextOutputFormat.class);
job.setMapOutputKeyClass(Text.class);
job.setMapOutputValueClass(IntWritable.class);
job.setOutputKeyClass(Text.class);
job.setOutputValueClass(IntWritable.class);
FileInputFormat.addInputPath(job, new Path(args[0]));
FileOutputFormat.setOutputPath(job, new Path(args[1]));
System.exit(job.waitForCompletion(true) ? 0 : 1);

        }

}
```

Charmap.java(Mapper Class)

```
import java.io.IOException;
import java.util.StringTokenizer;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import  org.apache.hadoop.mapreduce.Mapper;

public class Charmap extends Mapper<LongWritable, Text, Text,
IntWritable> { public void map(LongWritable key, Text value, Context
context)

throws IOException, InterruptedException {

String line = value.toString();
char[] carr = line.toCharArray();

for (char c : carr) {
     System.out.println(c);
      context.write(new Text(String.valueOf(c)), new IntWritable(1));
             }

         }

   }
```

Charreduce.java(Reducer Class)

```
import java.io.IOException;

import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import   org.apache.hadoop.mapreduce.Reducer;

public class Charreduce extends Reducer<Text, IntWritable, Text,
IntWritable> { public void reduce(Text key,Iterable<IntWritable>
values,Context context)throws IOException,InterruptedException{
int count = 0;

IntWritable result = new IntWritable();
for (IntWritable val : values) {
count +=val.get();
result.set(count);

}
String found = key.toString();
if  (found.equals("a")  ||  found.equals("t")  ||  found.equals("c")  ||
```

```
found.equals("g")) {
conttext.write(key, result); }

                  }
               }
```

Practical No: 4

Aim : Write a map-reduce program to count the number of occurrences of each word in the given dataset.(A word is defined as any string of alphabetic characters appearing between non-alphabetic characters like nature's is two words. The count should be case-insensitive. If a word occurs multiple times in a line, all should be counted).

WordCount.java(Driver Class)

```
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.conf.*;
import org.apache.hadoop.io.*;
import org.apache.hadoop.mapred.*;
import org.apache.hadoop.util.*;



public class WordCount extends Configured implements Tool{ public
    int run(String[] args) throws Exception

    {

//creating a JobConf object and assigning a job name for identification
purposes

        JobConf conf = new JobConf(getConf(), WordCount.class);
        conf.setJobName("WordCount");

        //Setting configuration object with the Data Type
        of output Key and Value
        conf.setOutputKeyClass(Text.class);
        conf.setOutputValueClass(IntWritable.class);

        //Providing the mapper and reducer class names
        conf.setMapperClass(WordCountMapper.class);
        conf.setReducerClass(WordCountReducer.class);

//We wil give 2 arguments at the run time, one in input path and other is
output path
        Path inp = new Path(args[0]);
        Path out = new Path(args[1]);

        //the hdfs input and output directory to be fetched from the
        command line FileInputFormat.addInputPath(conf, inp);
        FileOutputFormat.setOutputPath(conf, out);
        JobClient.runJob(conf);
        return 0;
```

```
        }

        public static void main(String[] args) throws Exception
        {
            // this main function will call run method defined above.

         int res = ToolRunner.run(new Configuration(), new WordCount(),args);
            System.exit(res);

        }
    }
```

WordCountMapper.java(Mapper Class)

```
    import java.io.IOException;
    import java.util.StringTokenizer;

    import org.apache.hadoop.io.*;
    import org.apache.hadoop.mapred.*;

    public class WordCountMapper extends MapReduceBase
    implements Mapper<LongWritable, Text, Text, IntWritable> {

        //hadoop supported data types

        private final static IntWritable one = new IntWritable(1); private
        Text word = new Text();

//map method that performs the tokenizer job and framing the initial key

value pairs


 // after all lines are converted into key-value pairs, reducer is called.

        public void map(LongWritable key, Text value,
    OutputCollector<Text, IntWritable> output, Reporter reporter) throws
    IOException

        {

            //taking one line at a time from input file and
            tokenizing the same String line = value.toString();

            StringTokenizer tokenizer = new StringTokenizer(line);
//iterating through all the words available in that line and forming the key
value pair
```

```
                    while (tokenizer.hasMoreTokens())
                    {
                      word.set(tokenizer.nextToken());

        //sending to output collector which inturn passes the same to
                                                            reducer
                       output.collect(word, one);

                    }
                  }
               }
```

WordCountReducer.java(Reducer Class)

```
               import java.io.IOException;
               import java.util.Iterator;

               import org.apache.hadoop.io.*;
               import org.apache.hadoop.mapred.*;

  public class WordCountReducer extends MapReduceBase implements Reducer<Text,

               IntWritable, Text, IntWritable>
               {

                 //reduce method accepts the Key Value pairs from mappers, do
               the aggregation based on keys and produce the final out put

                 public void reduce(Text key, Iterator<IntWritable> values,
               OutputCollector<Text, IntWritable> output, Reporter
               reporter) throws IOException

                 {
                   int sum = 0;

  /*iterates through all the values available with a key and add them together and
                                                                        give the

                    final result as the key and sum of its values*/ while
                   (values.hasNext()) {

                     sum += values.next().get();

                   }
                   output.collect(key, new IntWritable(sum));
                 }
               }
```

Practical No: 5

Aim :Write a program to construct different types of k-shingles for given document. Installation of required packages before executing program:-

```
install.packages("tm")
require("tm")
install.packages("devtools")
```

```
readinteger <- function()

{

    n <- readline(prompt="Enter value of k-1:
    ") k<-as.integer(n)

    u1  <-  readLines(E:/BA/Hadoop.txt")
    Shingle<-0

    i <-0
    while(i<nchar(u1)-k+1)
    {

        Shingle[i] <- substr(u1, start=i, stop=i+k)
        print(Shingle[i])

        i=i+1
    }

}
if(interactive()) readinteger()
```

Output:

```
> if(interactive()) readinteger()
Enter value of k-1: 2 character(0)
[1] "thi"
[1] "his"
[1] "is "
[1] "s i"
[1] " is"
[1] "is "
[1] "s a"
[1] " a "
[1] "a t"
[1] " te"
[1] "tex"
[1] "ext"
[1] "xt."
```

Output:

```
> if(interactive()) readinteger()
Enter value of k-1: 3 character(0)
[1] "this"
[1] "his "
[1] "is i"
[1] "s is"
[1] " is "
[1] "is a"
[1] "s a "
[1] " a t"
[1] "a te"
```

Output:

```
> if(interactive()) readinteger()
Enter value of k-1: 4 character(0)
[1] "this "
[1] "his i"
[1] "is is"
[1] "s is "
[1] " is a"
[1] "is a "
[1] "s a t"
[1] " a te"
[1] "a tex"
[1] " text"
[1] "text."
[1] "ext. "
```

Practical No: 6

Aim: Write a program for measuring similarity among documents and detecting passages which have been reused.

Installation of required packages before executing program:

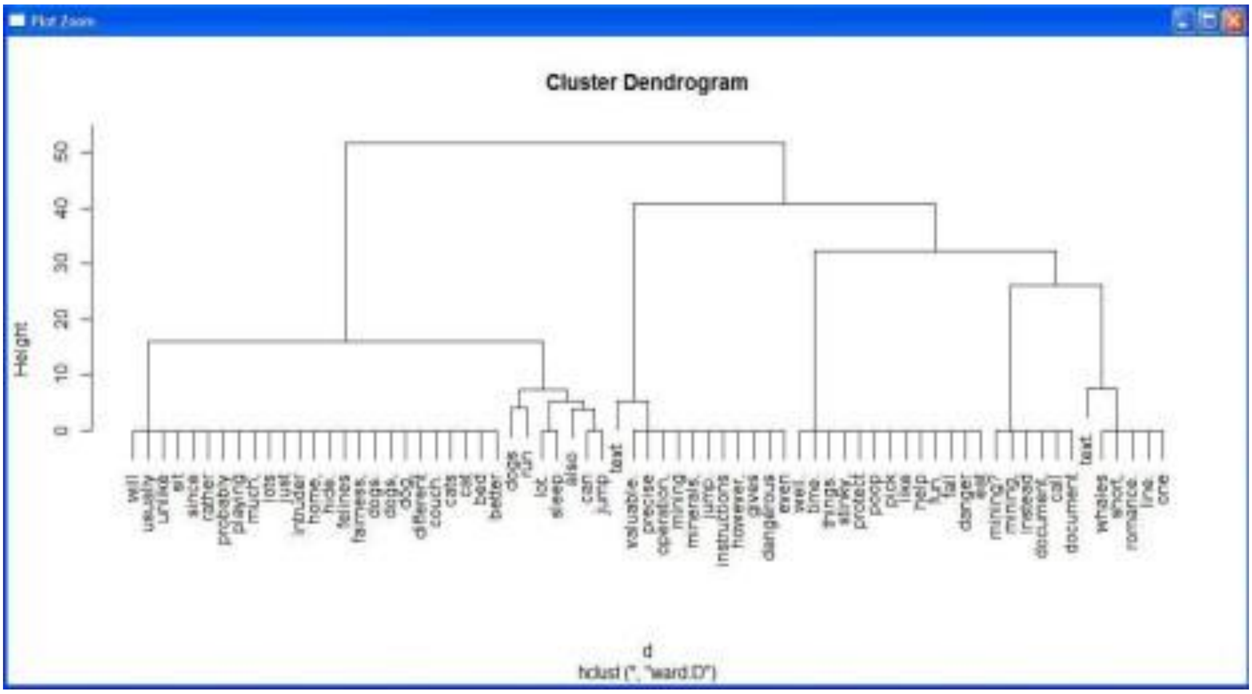
```
install.packages("tm")
require("tm")
install.packages("ggplot2")
install.packages("textreuse")
install.packages("devtools")
```

Source Code 1:

```
my.corpus <- Corpus(DirSource("c:/msc/r-corpus"))

my.corpus <- tm_map(my.corpus, removeWords, stopwords("english"))
my.tdm <- TermDocumentMatrix(my.corpus)
#inspect(my.tdm)
my.dtm <- DocumentTermMatrix(my.corpus, control = list(weighting =

weightTfIdf, stopwords = TRUE))
#inspect(my.dtm)
my.df <- as.data.frame(inspect(my.tdm))
my.df.scale <- scale(my.df)

d <-
dist(my.df.scale,method="euclidean") fit <-
hclust(d, method="ward") plot(fit)
```

Output:

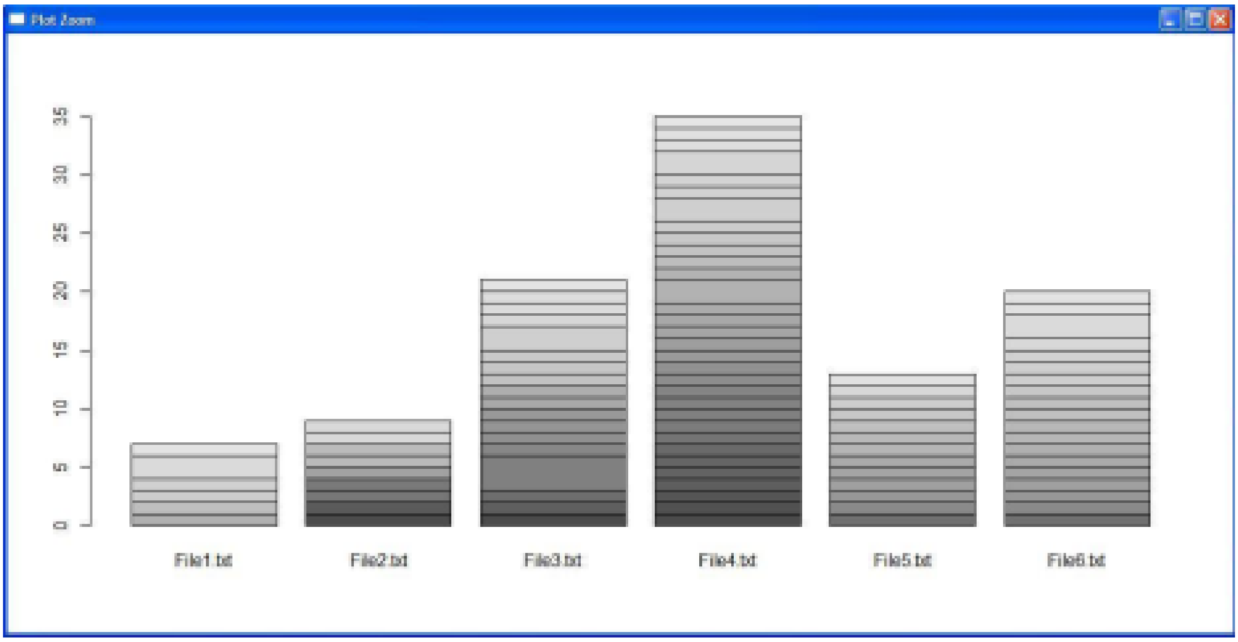
```
<<TermDocumentMatrix (terms: 69, documents: 6)>>
Non-/sparse entries: 97/317
Sparsity  :  77%
Maximal term length: 12
Weighting : term frequency (tf)
Docs
Terms File1.txt File2.txt File3.txt File4.txt File5.txt File6.txt also 0 1 1 1 0 0 bed 0 0 0 1
0 0 better 0 0 0 1 0 0 call 0 1 0 0 0 0 can 0 0 1 1 0 0 cat 0 0 0 1 0 0 cats 0 0 0 1 0 0
couch. 0 0 0 1 0 0
> barplot(as.matrix(my.tdm))
> my.df.scale <- scale(my.df)
> d <- dist(my.df.scale,method="euclidean")
> fit <- hclust(d, method="ward")

The "ward" method has been renamed to "ward.D"; note new
"ward.D2" > plot(fit)
```



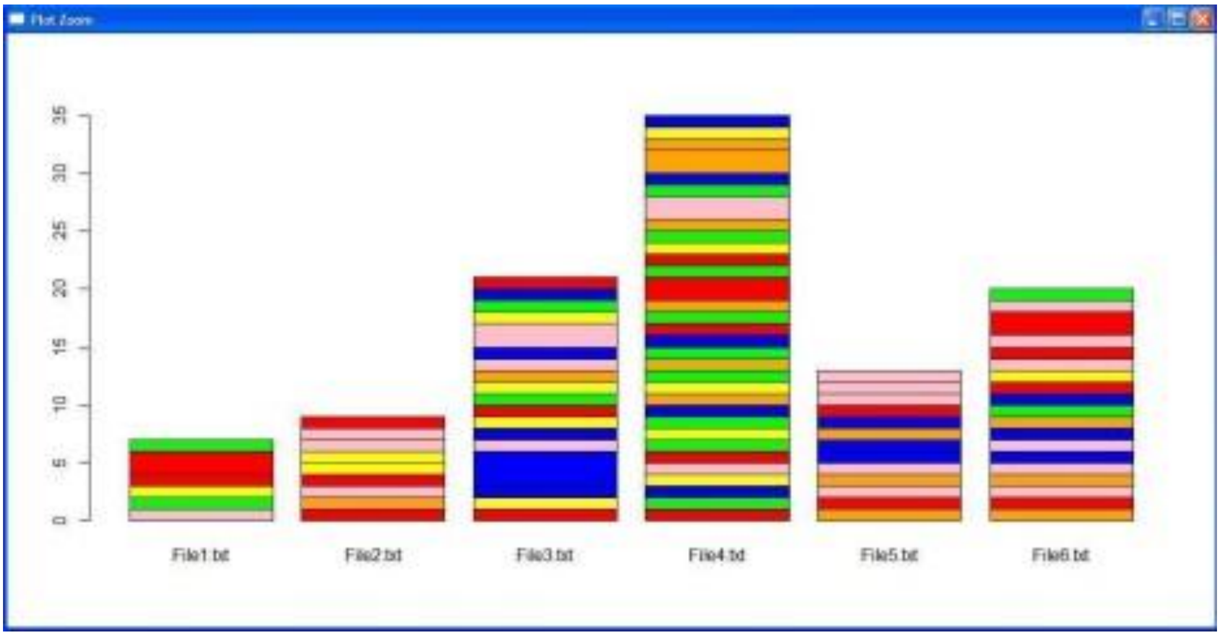
Source code 2 (using bar plot with and without color):

```
my.corpus <- Corpus(DirSource("c:/msc/r-corpus"))

my.corpus <- tm_map(my.corpus, removeWords, stopwords("english"))
my.tdm <- TermDocumentMatrix(my.corpus)

inspect(my.tdm)
my.df <- as.data.frame(inspect(my.tdm))
barplot(as.matrix(my.tdm))
#barplot(as.matrix(my.tdm),col = color)
```

OutPut:



barplot(as.matrix(my.tdm),col = color)



Jaccard similarity

Similarity of asymmetric binary attributes[edit]

Given two objects, *A* and *B*, each with *n* binary attributes, the Jaccard coeficient is a useful measure of the overlap that *A* and *B* *Share* with their attributes. Each attribute of *A* and *B* can either be 0 or 1. The total number of each combination of attributes for both *A* and *B* are specified as follows:

- **represents the total number of attributes where *A* and *B* both have a value of 1.**
- **represents the total number of attributes where the attribute of *A* is 0 and the attribute of *B* is 1.**
- **represents the total number of attributes where the attribute of *A* is 1 and the attribute of *B* is 0.**
- **represents the total number of attributes where *A* and *B* both have a value of 0.**

Each attribute must fall into one of these four categories, meaning that

$$M_{11}+M_{01}+M_{10}+M_{00}=n.$$

The Jaccard similarity coefficient, J, is given as

$$J=\frac{M_{11}}{M_{01}+M_{10}+M_{11}}.$$

The Jaccard distance, d_J, is given as

$$d_J=\frac{M_{01}+M_{10}}{M_{01}+M_{10}+M_{11}}=1-J.$$

		A	
		0	1
B	0	M_{00}	M_{10}
	1	M_{01}	M_{11}

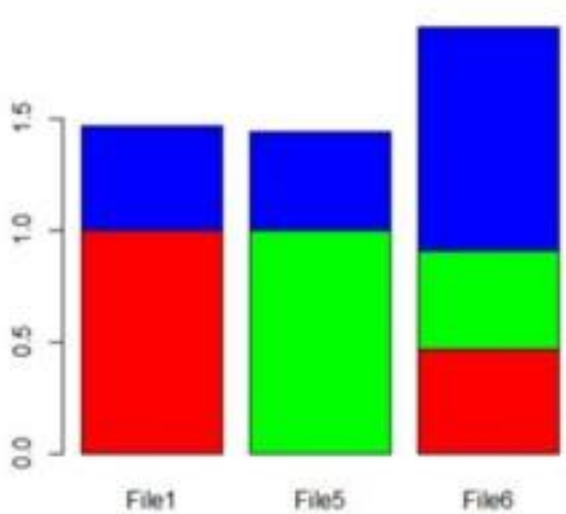
Source code 3 (using minhash and jaccard similarity): library(textreuse)

Source Code:

```
minhash <- minhash_generator(200, seed = 235)

ats <- TextReuseCorpus(dir = "c:/msc/r-corpus", tokenizer =
tokenize_ngrams, n = 5, minhash_func = minhash)

buckets <- lsh(ats, bands = 50, progress = interactive())
candidates <- lsh_candidates(buckets)
scores <- lsh_compare(candidates, ats, jaccard_similarity,
progress = FALSE) scores

color <- c("red","green","blue","orange","yellow","pink")

barplot(as.matrix(scores),col = color)
```

Output:

```
       a      b          score
  <chr>  <chr>          <dbl>
1 File 1 File 6 0.4651163
2 File 5 File 6 0.4418605
```



Practical No: 7

Aim : Write a program to compute the n-moment for a given stream where n is given.

Source Code:

```
import java.io.*;
import java.util.*;

class n_moment2
{
 public static void main(String args[])
 {

    int n=15;
String stream[]={"a","b","c","b","d","a","c","d","a","b","d","c","a","a","b"};

    int
    zero_moment=0,first_moment=0,second_momen
    t=0,count=1,flag=0; ArrayList<Integer> arrlist=new
    ArrayList();;

    System.out.println("Arraylist elements are :: ");
    for(int i=0;i<15;i++)
    {
        System.out.print(stream[i]+"  ");
    }

    Arrays.sort(stream);

    //Calculate Zeroth moment(calculates unique
    elements-raised to zero) for(int i=1;i<n;i++)
    {

        if(stream[i]==stream[i-1])
        {
            count++;
        }

        else
        {
            arrlist.add(count);
            count=1;

        }
    }
```

```
            arrlist.add(count);

        zero_moment=arrlist.size();
         System.out.println("\n\n\nValue of Zeroth moment for given

         stream ::"+zero_moment); //Calculate First moment(Calculate

                     length of the stream-raised to one)

            for(int i=0;i<arrlist.size();i++)
            {
                first_moment+=arrlist.get(i);
            }
        System.out.println("\n\nValue of First moment for given stream
                                                  ::"+first_moment);

            //Calculate Second moment(raised to two)
            for(int i=0;i<arrlist.size();i++)
            {

                int j=arrlist.get(i);
                second_moment+=(j*j);
            }
      System.out.println("\n\nValue of Second moment for given stream
                                                 ::"+second_moment);

       }
     }
```

<u>Output</u>:

Arraylist elements are ::
a b c b d a c d a b d c a a b

Value of Zeroth moment for given stream ::4

Value of First moment for given stream ::15

Value of Second moment for given stream ::59

Practical No: 8

Aim : Write a program to demonstrate the Alon-Matias-Szegedy Algorithm for second moments.

Source Code:

```
import java.io.*;
import java.util.*;
class AMSA
{

    public static int findCharCount(String stream,char

    XE,int random,int n) {

        int countOccurance=0;

        for(int i=random;i<n;i++)

        {

            if(stream.charAt(i)==XE)

            {

    countOccurance++;//System.out.println(countOccurance+"    "+i);

            }

        }

        return countOccurance;

    }

    public static int estimateValue(int XV1,int n)

    {

        int ExpValue;

        ExpValue=n*(2*XV1-1);

        return ExpValue;

    }
```

```
public static void main(String args[])
{
        int n=15;
        String stream="abcbdacdabdcaab";
        int random1=3,random2=8,random3=13;
        char XE1,XE2,XE3;
        int XV1,XV2,XV3;
        int ExpValuXE1, ExpValuXE2, ExpValuXE3;
        int apprSecondMomentValue;
        XE1=stream.charAt(random1-1);
        XE2=stream.charAt(random2-1);
        XE3=stream.charAt(random3-1);
        //System.out.println(XE1+" "+XE2+" "+XE3);
        XV1=findCharCount(stream,XE1,random1-1,n);
        XV2=findCharCount(stream,XE2,random2-1,n);
        XV3=findCharCount(stream,XE3,random3-1,n);
        System.out.println(XE1+"="+XV1+" "+XE2+"="+XV2+"
        "+XE3+"="+XV3); ExpValuXE1=estimateValue(XV1,n);
        ExpValuXE2=estimateValue(XV2,n);
        ExpValuXE3=estimateValue(XV3,n);
        System.out.println("Expected value for "+XE1+" is ::
        "+ExpValuXE1); System.out.println("Expected value
        for "+XE2+" is :: "+ExpValuXE2);
        System.out.println("Expected value for "+XE3+" is ::
```

```
                            "+ExpValuXE3);

                            apprSecondMomentValue=(ExpValuXE1+ExpValuXE

                            2+ExpValuXE3)/3;


        System.out.println("Approximate Second moment value using
          Alon-Matias-Szegedy is :: "+apprSecondMomentValue);

                    }
            }
```

Output:

```
c=3 d=2 a=2

Expected value for c is :: 75

Expected value for d is :: 45

Expected value for a is :: 45

Approximate Second moment value using Alon-Matias-Szegedy is :: 55
```