M.Sc C.S - II
SEM III
Journal

Roll No.	056
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Subject	Business Intelligence and Big Data Analytics - II

Thakur Educational Trust's (Regd.)
THAKUR COLLEGE OF SCIENCE & COMMERCE
AUTONOMOUS COLLEGE, PERMANENTLY AFFILIATED TO UNIVERSITY OF MUMBAI
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CERTIFICATE

This is here to certify that Mr. **OJHA ABHISHEK DEVMANI**, Seat Number **056** of M.Sc. II Computer Science, has satisfactorily completed the required number of experiments prescribed by the **THAKUR COLLEGE OF SCIENCE & COMMERCE AUTONOMOUS COLLEGE, PERMANENTLY AFFILIATED TO UNIVERSITY OF MUMBAI** during the academic year 2021 – 2022.

Date: 23-09-2022
Place: Mumbai

Teacher In-Charge Head of Department

External Examiner

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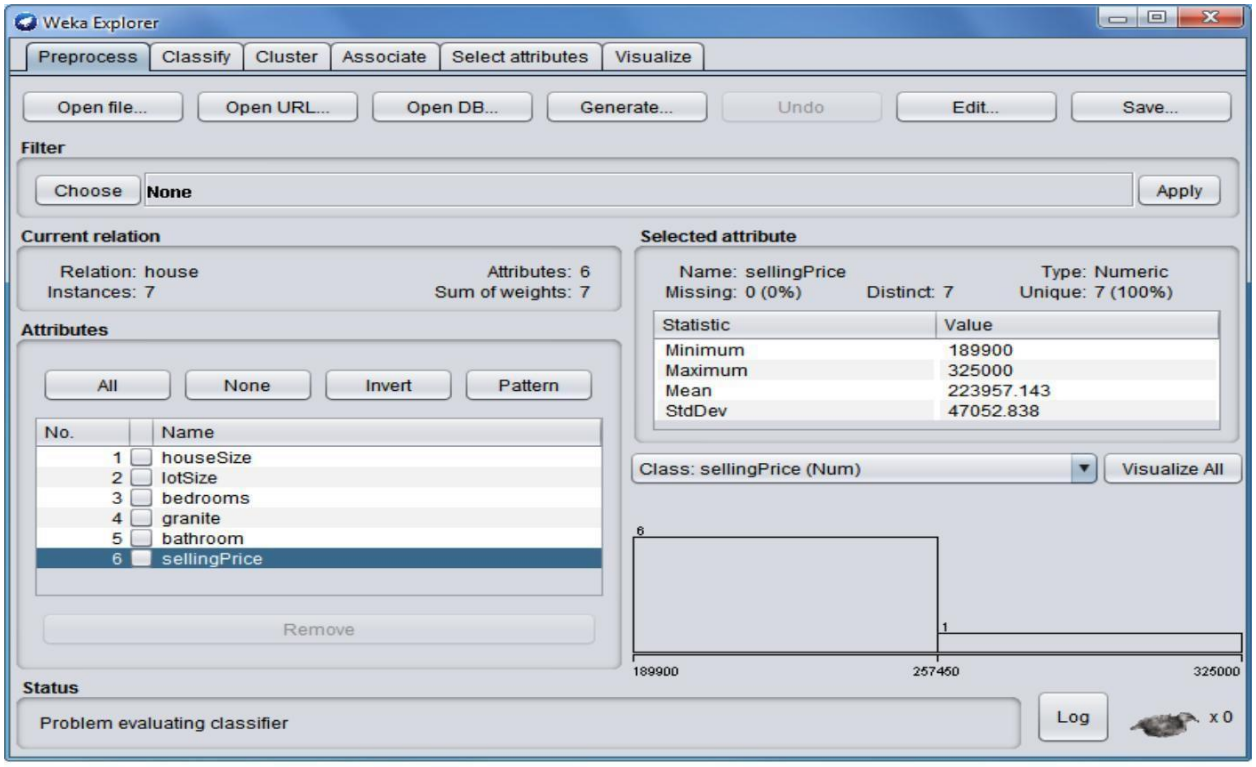
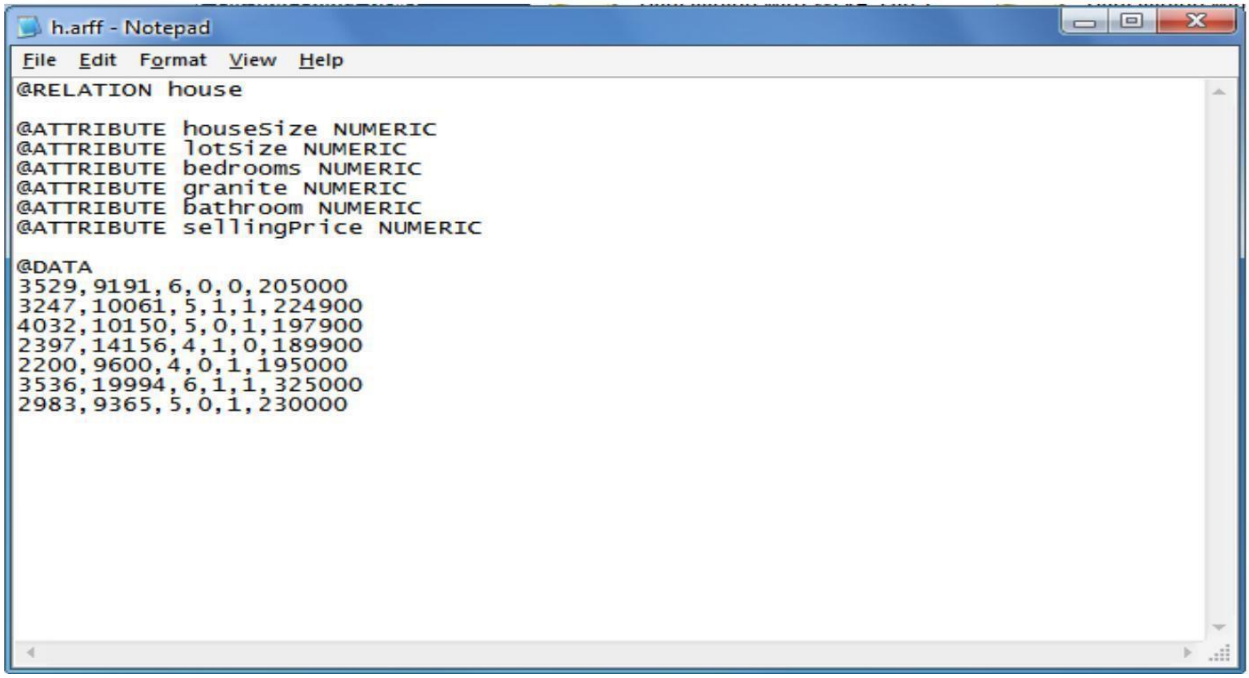
Practical No. 1

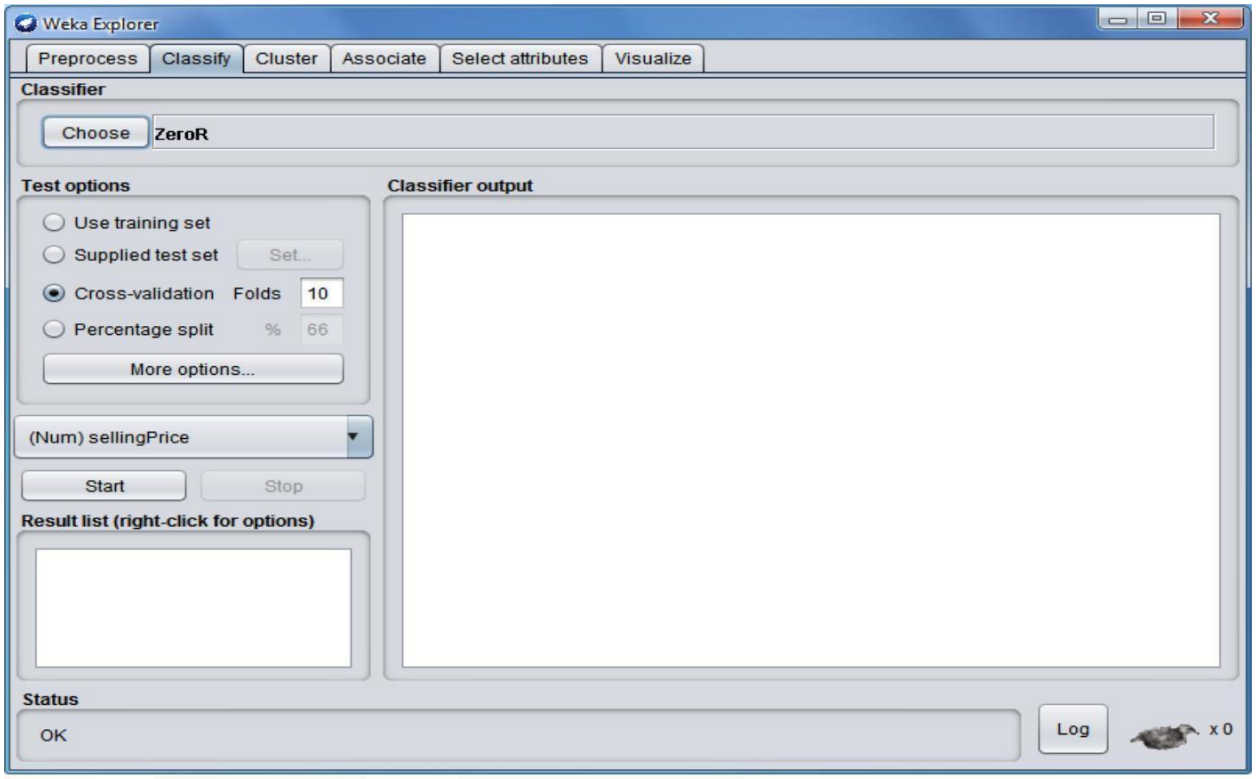
Aim : **Generate Regression model and interpret the result for a given data set.**

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.


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
ZeroR
Test options
Use training set
Supplied test set
Set...
Cross-validation
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Percentage split
%
66
More options...
Classifier output
(Num) sellingPrice
Start
Stop
Result list (right-click for options)
Status
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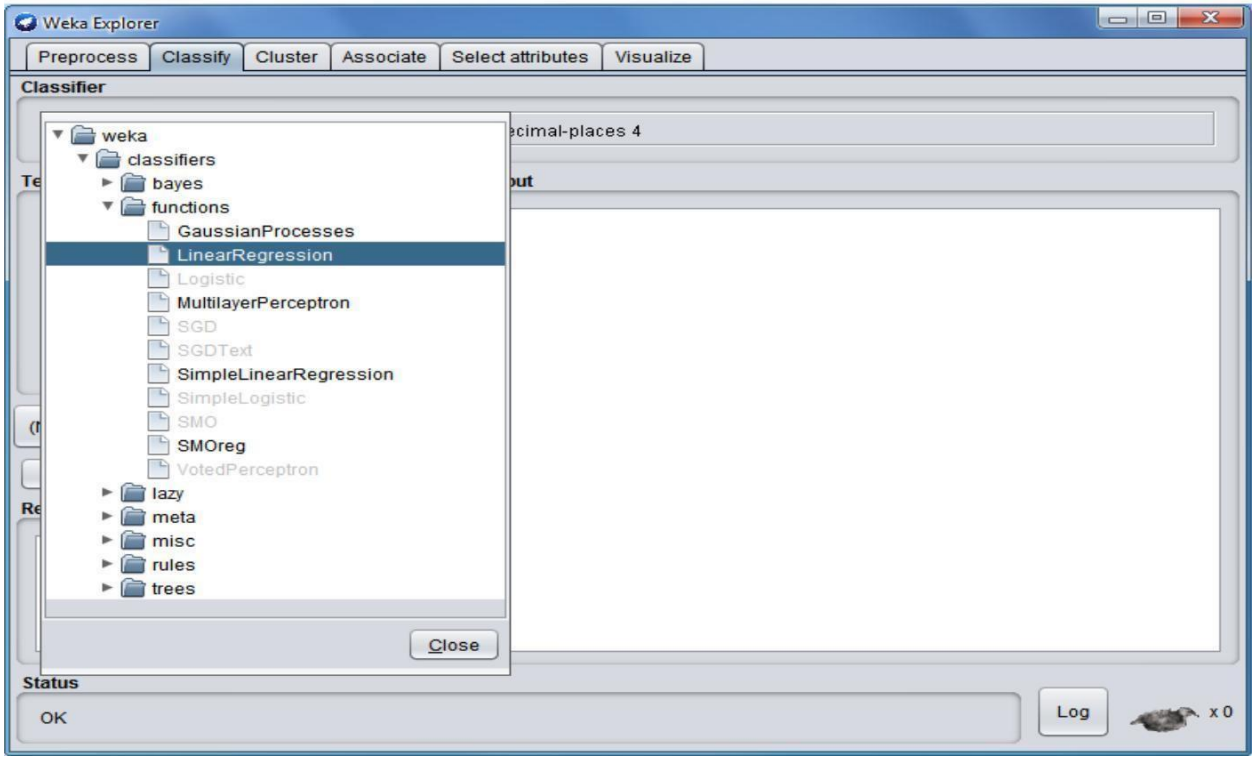
x 0


Weka Explorer
Preprocess
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Associate
Select attributes
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functions
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Logistic
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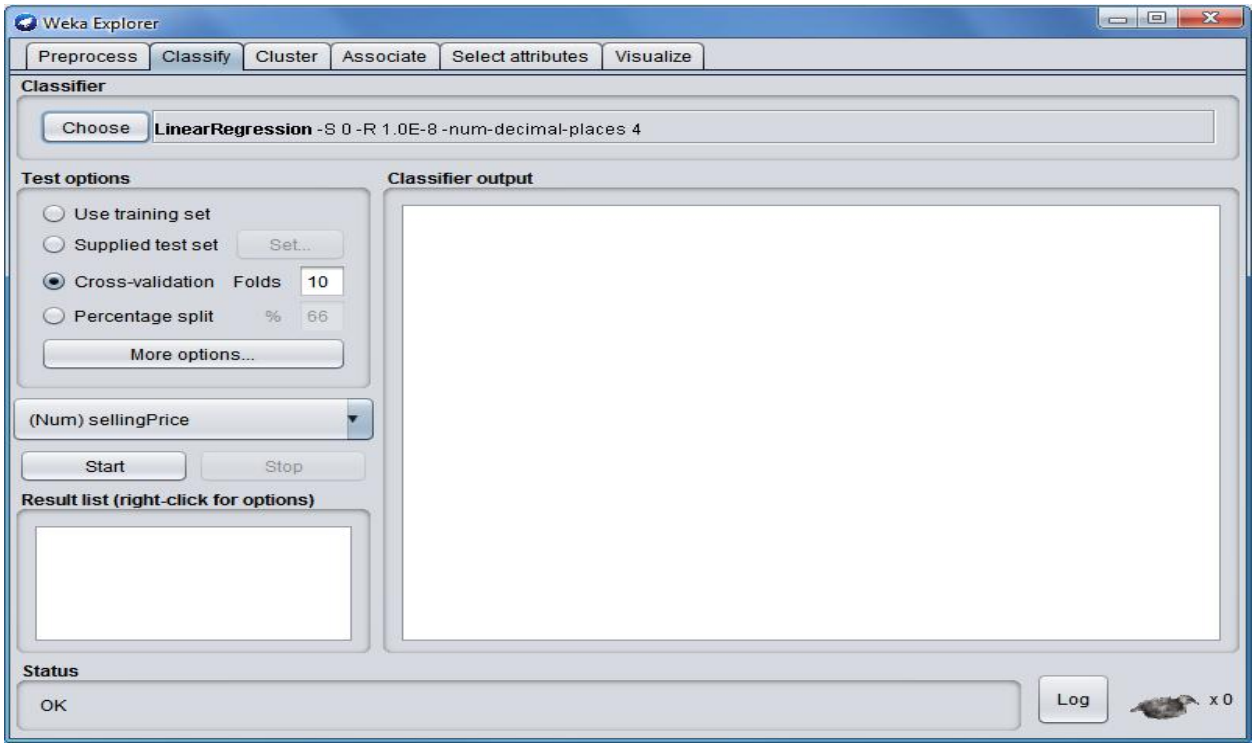
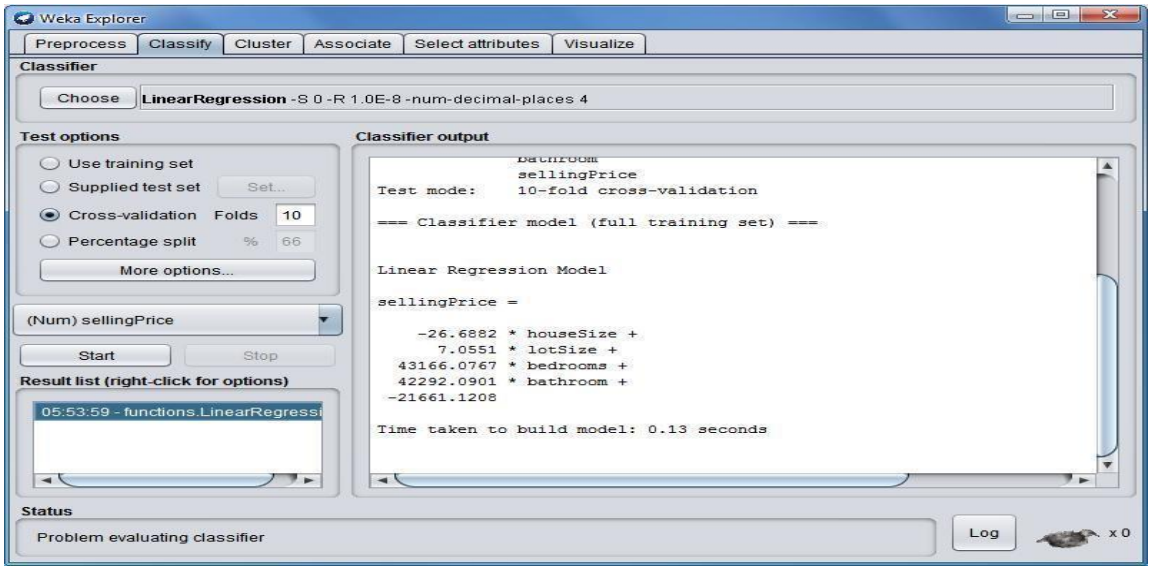
SimpleLinearRegression
SimpleLogistic
SMO
SMOreg
VotedPerceptron
lazy
meta
misc
rules
trees
Close
Status
OK
Log
x 0



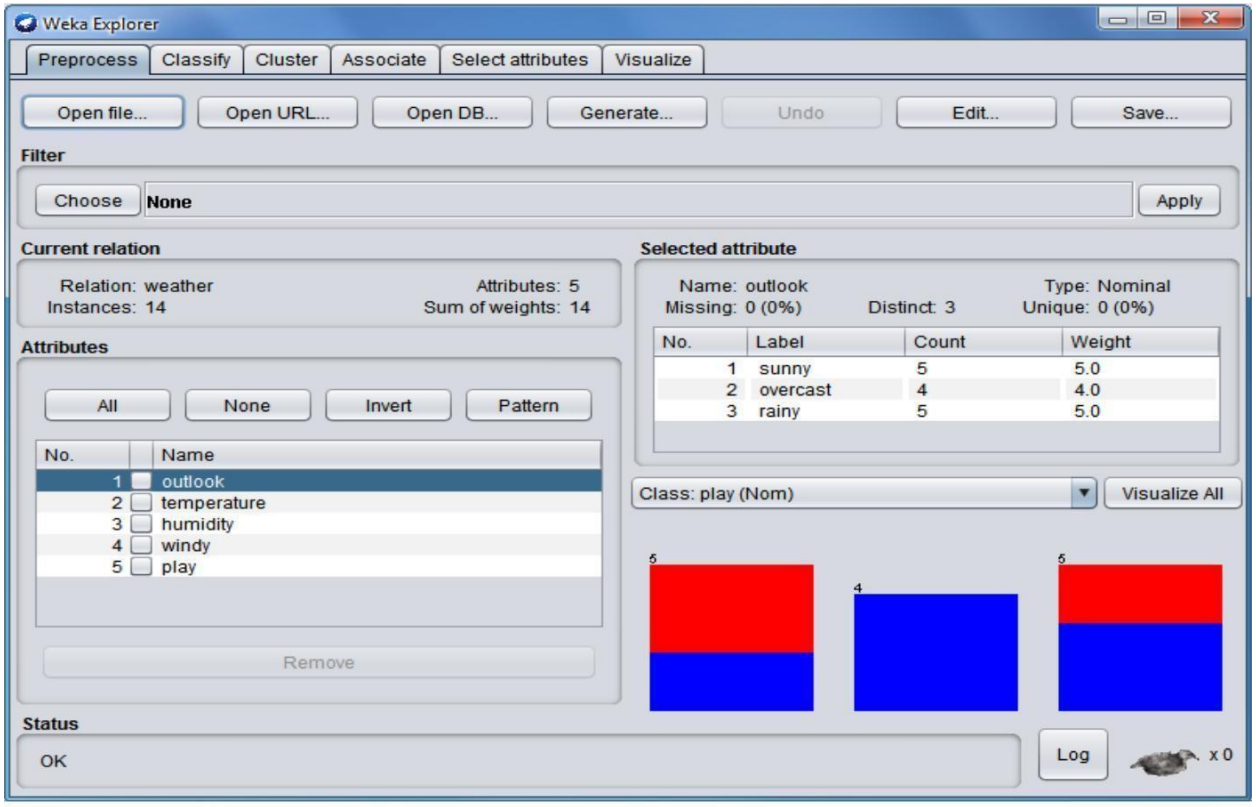
Step 3: Click on Start. You can see the linear regression on the input file.

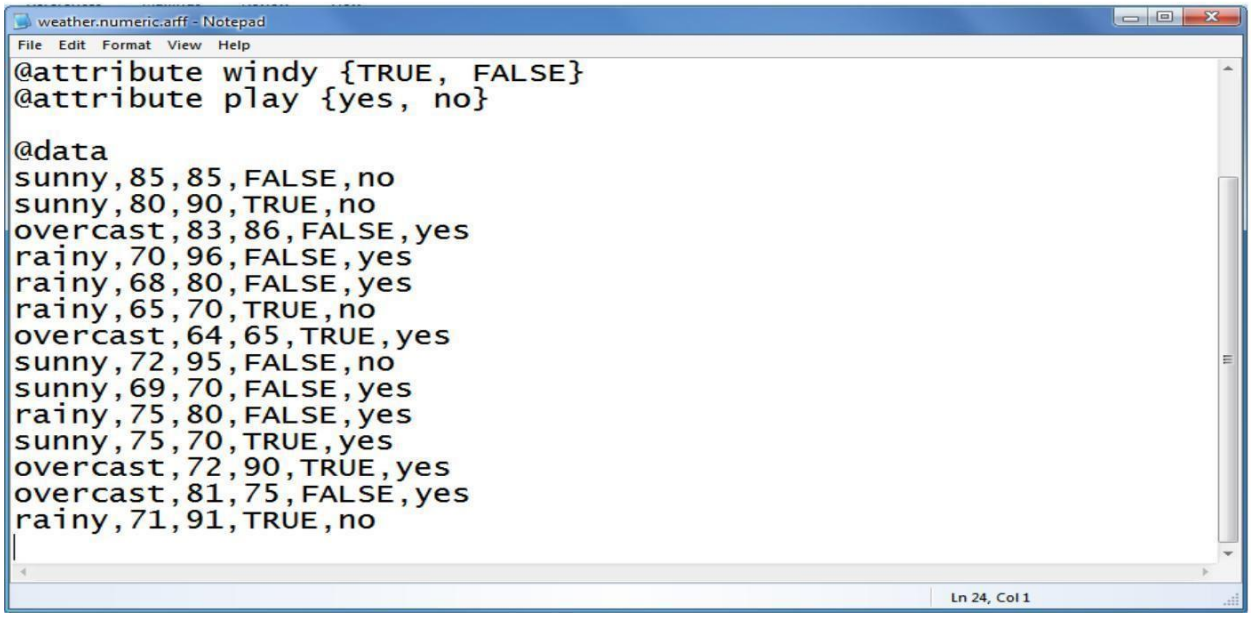


Practical No. 2

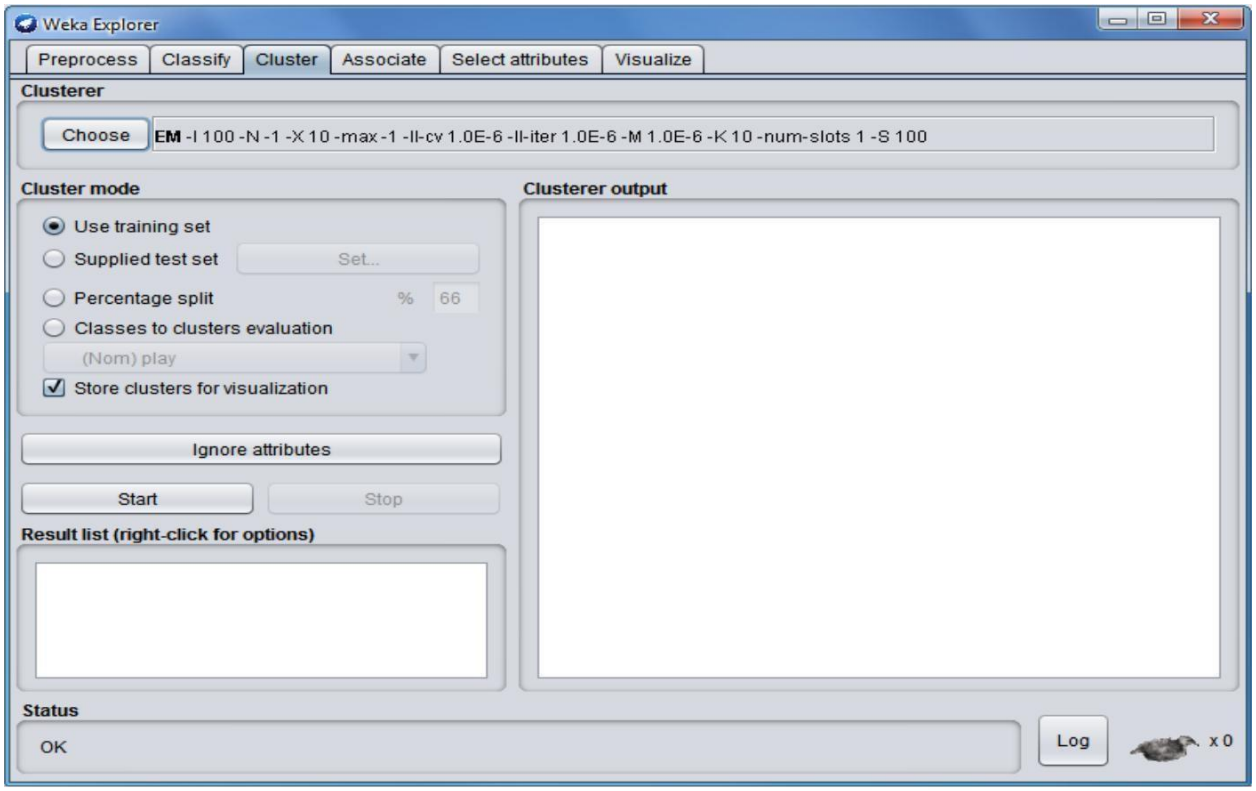
Aim : **Generate forecasting model and interpret the result for a given data set.**

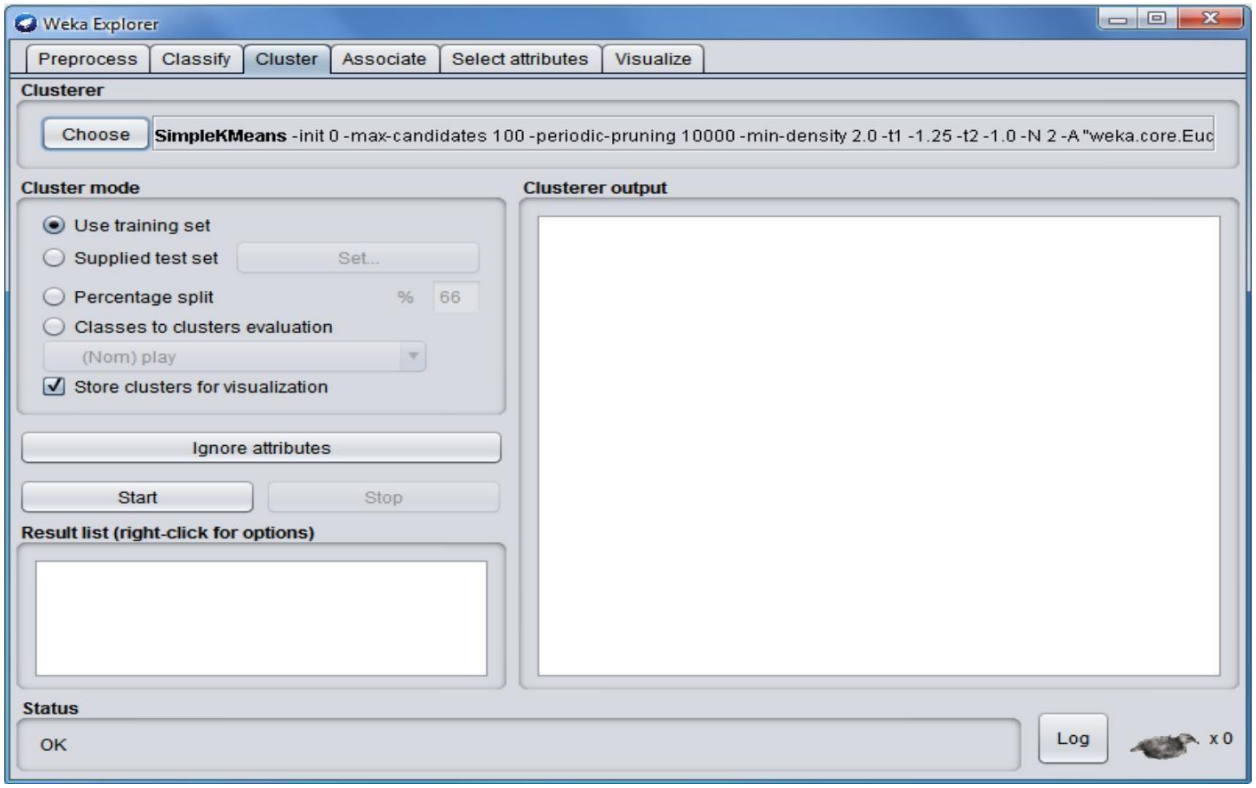
Step 1: Open Weka then open file Weather.arff in Weka Explorer.



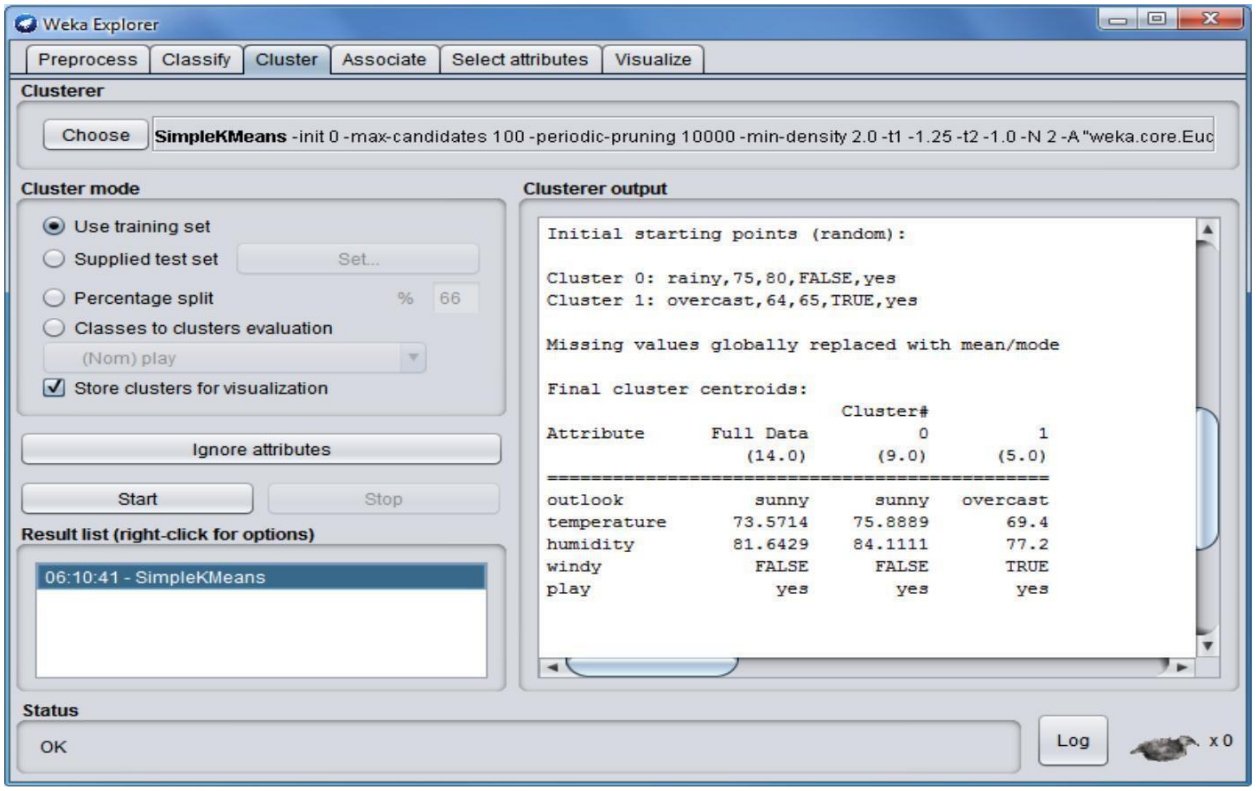


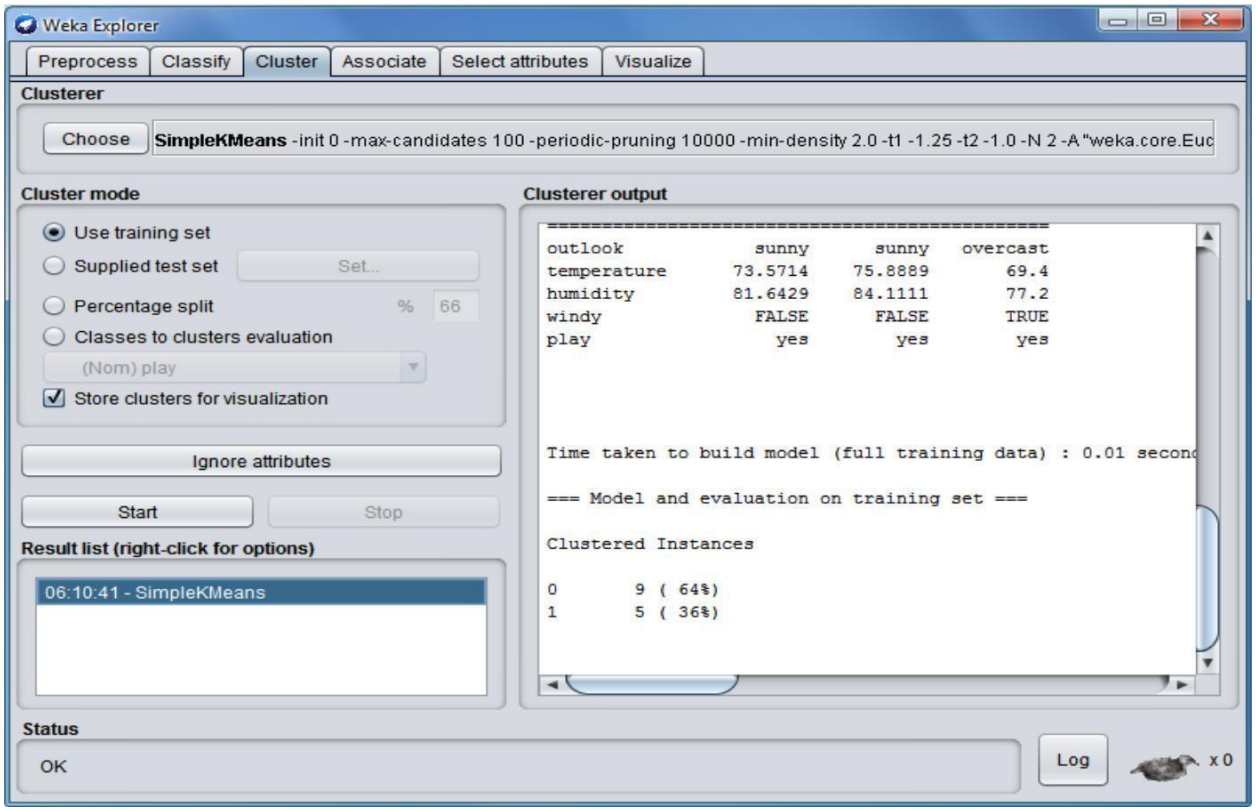
Step 2: click on Cluster, choose weka forcasting function SimpleKMean.





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


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Clusterer
Choose
SimpleKMeans -init 0 -max-candidates 100 -periodic-pruning 10000 -min-density 2.0 -t1 -1.25 -t2 -1.0 -N 2 -A "weka.core.Euc
Cluster mode
Use training set
Supplied test set
Set...
Percentage split
%
66
Classes to clusters evaluation
(Nom) play
Store clusters for visualization
Ignore attributes
Start
Stop
Result list (right-click for options)
06:10:41 - SimpleKMeans
Clusterer output
Initial starting points (random):
Cluster 0: rainy,75,80,FALSE,yes
Cluster 1: overcast,64,65,TRUE,yes
Missing values globally replaced with mean/mode
Final cluster centroids:
Cluster#
Attribute Full Data 0 1
(14.0) (9.0) (5.0)
outlook sunny sunny overcast
temperature 73.5714 75.8889 69.4
humidity 81.6429 84.1111 77.2
windy FALSE FALSE TRUE
play yes yes yes
Status
OK
Log
x 0


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Clusterer
Choose
SimpleKMeans -init 0 -max-candidates 100 -periodic-pruning 10000 -min-density 2.0 -t1 -1.25 -t2 -1.0 -N 2 -A "weka.core.Euc
Cluster mode
Use training set
Supplied test set
Set...
Percentage split
%
66
Classes to clusters evaluation
(Nom) play
Store clusters for visualization
Ignore attributes
Start
Stop
Result list (right-click for options)
06:10:41 - SimpleKMeans
Clusterer output
outlook sunny sunny overcast
temperature 73.5714 75.8889 69.4
humidity 81.6429 84.1111 77.2
windy FALSE FALSE TRUE
play yes yes yes
Time taken to build model (full training data) : 0.01 second
=== Model and evaluation on training set ===
Clustered Instances
0 9 (64%)
1 5 (36%)
Status
OK
Log
x 0

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.FileInputFormat;
import 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"))
{
            context.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:-

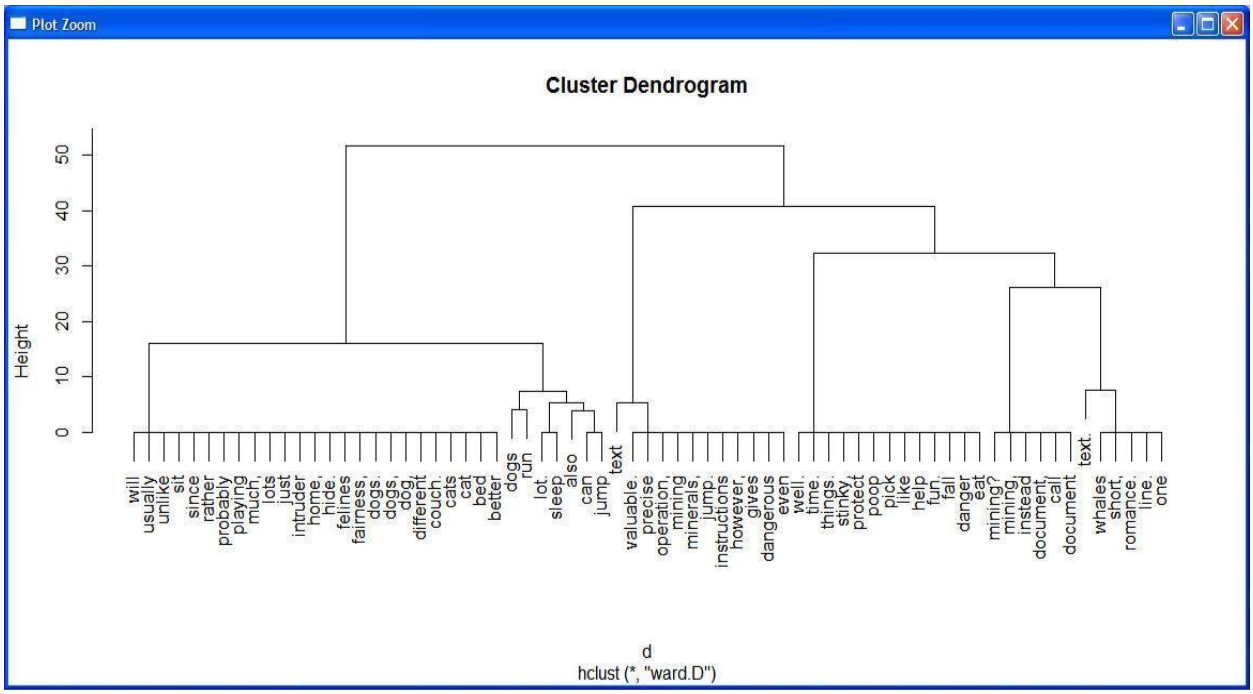
```
<<TermDocumentMatrix (terms: 69, documents: 6)>>
Non-/sparse entries: 97/317
Sparsity : 77%
Maximal term length: 12
Weighting : term frequency (tf)
Docs
Terms                    File1.txt File2.txt File3.txt File4.txt File5.txt File6.txt

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)
```

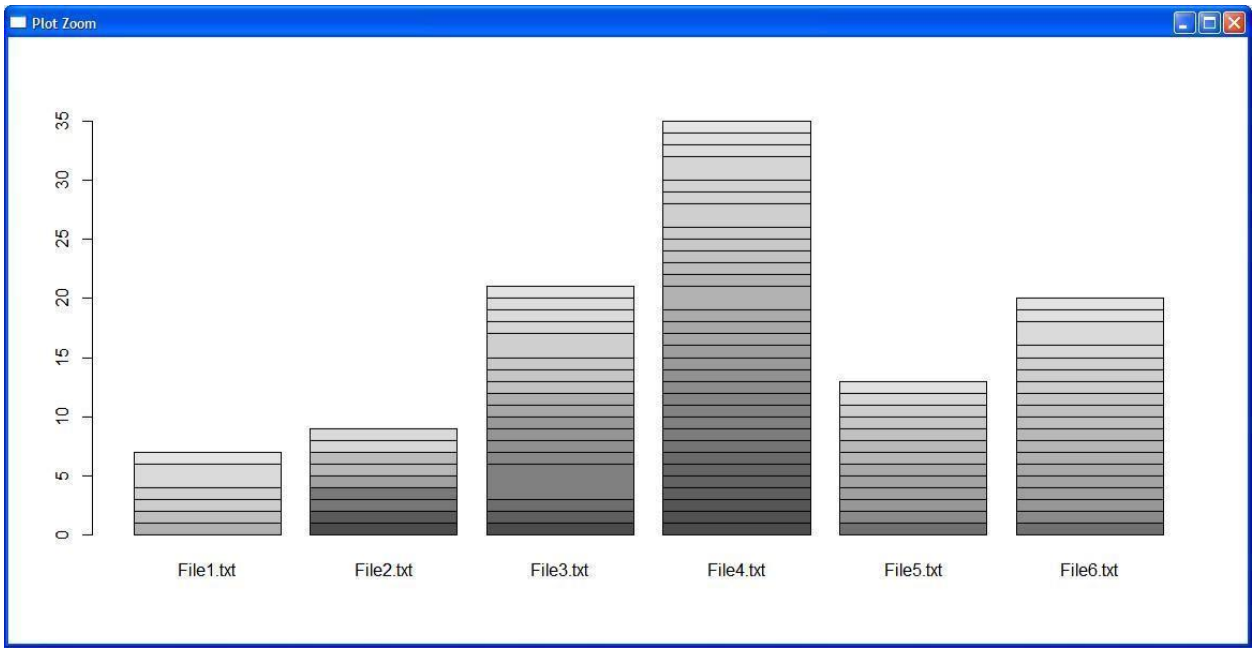


Sourec code 2 (using bar plot with and without color):my.corpus

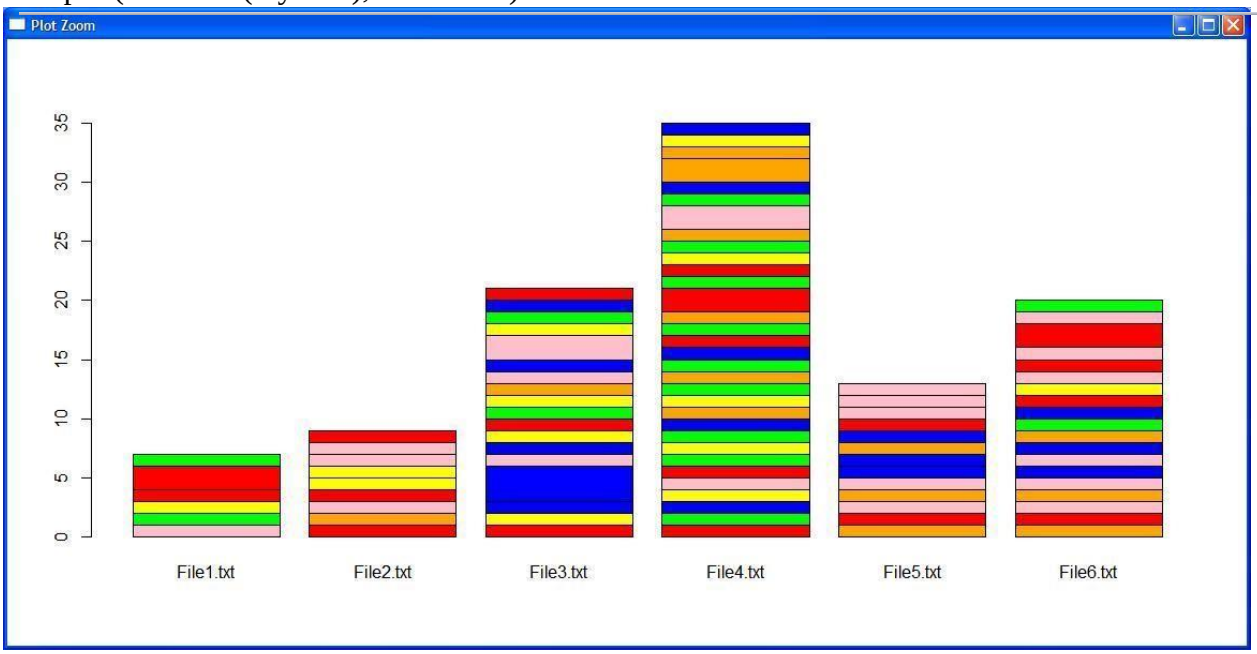
<- Corpus(DirSource("c:/msc/r-corpus"))

```
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 coefficient 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}

Sourec 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)

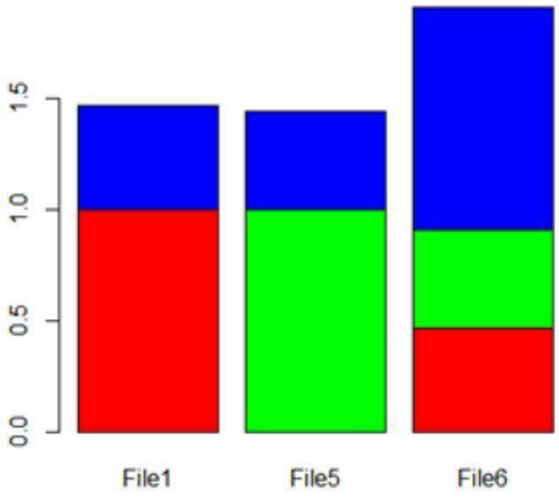
buckets <- lsh(ats, bands = 50, progress = interactive())
candidates <- lsh_candidates(buckets)
scores <- lsh_compare(candidates, ats, jaccard_similarity, progress =

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

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

Output:

	a	b	score
	<chr>	<chr>	<dbl>
1	File1	File6	0.4651163
2	File5	File6	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_moment=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);

  }
}
```

Output :

```
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+ExpValuXE2+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