Experiments Report

\section{Experiment Contents}

\begin{enumerate}

Draw a pie chart to show the *percentage* of the employees in different provinces. \\

Draw a scatter plot to show the association relationship between age and salary, with different colors representing different groups.

Generate three samples of 100,000 observations from *t* distribution with degrees of freedom 5, 10 and 30, respectively. Compare the (estimated) density plots of these samples with the standard normal density function in one plot.

Use the “mtcars” data set to conduct the hypothesis testing that the mean of mpg (miles per gallon) is larger than 15.

Use the “mtcars” data set to test whether the means of wt (weight) of the cars are different in the automatic and manual (am, 0 = automatic, 1 = manual) cases.

Use hypothesis testing to show whether these two drugs have significant difference.

\end{enumerate}

\section{Experiment Instruments}

\begin{enumerate}

RStudio of version 1.1.463

R X64 3.5.2

\end{enumerate}

\section{Experiment Design}

\textbf{Problem 1} \\ Constructing vectors of vectors of slices and labels respectively; Using “Pie” function to construct pie chart for “Employees Distribution”

\textbf{Problem 2} \\ Generating random values $s.t.$ $uniform distribution$ of ages for the three sets of people; \\Generating random values $s.t.$ $normal distribution$ of wages for the three sets of people; \\ Marking the three sets of people by “22~30 years old”,”21~45 years old”,”46~60 years old” respectively; \\ constructing data frame consisted of “Groups”,”Ages”, “Wages” respectively; \\ Factorizing “Groups” of the data frame;\\ Importing $ggplot$ function and drawing scatter plot of the three sets of people.

\textbf{Problem 3} \\ Generating random values $s.t.$ $t distribution$ of 10000 each for sample1,2,3 respectively by using $rt$ function;\\ Generating random value $s.t.$ $normal distribution$ of 10000 for sample 4 by using $rnorm$ function;\\ Marking the three samples by using $rep$ function;\\ Constructing data frame consisted of vector of $Samples$ and $Markers$;\\ Importing $ggplot2$ and use the function to draw density graphs in a plot, in which samples are marked by four different colours.

\textbf{Problem4} \\ Making null hypothesis $H\_{0}$ as “The mean of mpg is less or equal to 15” and making alternative hypothesis $H\_{1}$ as “The mean of mpg is larger than 15”; \\ Using $t.test$ function to perform $t test$ with $mu = 15$ and $alternative == “greater”$.

\textbf{Problem 5} \\ Making null hypothesis $H\_{0}$ as “means of wt of automatic and manual are equal” and making alternative hypothesis $H\_{1}$ as “means of wt of automatic and manual are unequal”; \\ Using $subset$ function to select data required and then subtracting data of $wt$ from selected data;\\ Using $t.test$ function to perform $t test$ with $alternative == “two-sided”$.

\textbf{Problem 6} \\ Making null hypothesis $H\_{0}$ as “the two drugs have similar effects” and making alternative hypothesis $H\_{1}$ as “the two drugs have significant different effects”; \\ Using $subset$ function to select data required and then subtracting data of $wt$ from selected data;\\ Using $t.test$ function to perform $t test$ with $alternative == “two-sided”$.

\section{Experiment Results and Conclusions}

\textbf{Problem 1} \\

\includegraphics{piechart.png}

\textbf{Problem 2}

\textbf{Problem 3}

\textbf{Problem 4}

\textbf{Problem 5}

\textbf{Problem 6}