Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College (Autonomous) Ahmednagar

Department of Statistics

ST-369: Project

(TYBsc)

CERTIFICATE

This is to certify that **Miss. Kawale Snehal Kondiba**, a student of class TYBSc has successfully completed the project "**Effect of MSRTC Bus strike on society**" during the year 2021-2022.

Date: 01/06/2022
Place: Ahmednagar

Prof. K. B. Mane

Teacher-In-Charge

Dr. A. A. Kulkarni

Head

Department of Statistics

1

ACKNOWLEDGEMENT

In the present world of competition there is a race of existence in which those are having will to come forward succeed. Project is like a bridge between theoretical and practical working. With this willing we joined this particular project. First of all, we would like to thank the supreme power the Almighty God is obviously the one has always guided us to work on the right path of life. Without his grace this project could not become a reality. Next to him are our parents, whom we are greatly indebted for us brought up with love and encouragement to this stage.

We are feeling obligue in taking the opportunity to sincerely thanks to **Dr. B. H. Zaware** (Principal of New Arts Commerce and Science college, Ahmednagar (Autonomous) and special thanks to our worthy Head of Department **Dr. A. A. Kulkarni.** We are highly obliged in taking the opportunity to sincerely thanks to **Prof. K. B. Mane** for their generous attitude and friendly behaviour.

Also, I would like to thank all the non-teaching staff of the department for their help and co-operation. I thank all my friends and the teaching staff for their co-operation and help which I received from them during the work throughout.

I am indebted to my parents for their encouragement and patience throughout my study and for the trust they have on me.

Table of Content

Abstract

The Maharashtra State Road Transport Corporation is established by State Government of Maharashtra as per the provision in Section 3 of RTC Act 1950. The M.S.R.T. Corporation is operating its services by the approved scheme of Road Transport Published vide Notification MVA 3173/ 30303-XIIA dated 29 of the official gazette of the State Government. The area covered by the scheme is entire area of the State of Maharashtra. The undertaking is operating stage and contract carriage services in the entire area of Maharashtra except S.T. undertaking defined under Section 68A (b) of M.V. Act and other exception published in the scheme.

The setup of M.S.R.T.C Corporation is as under :

The Chairman, Vice Chairman &Managing Director and Directors of M.S.R.T. Corporation.

The **Maharashtra State Road Transport Corporation** abbreviated as (MSRTC, or simply ST), is the state run bus service of Maharashtra, India which serves routes to towns and cities within Maharashtra as well as to its adjoining states. It has a fleet strength of 18,449 buses. It also offers a facility for online booking of tickets for all buses. Recently From 21 May 2020, the Corporation Started Goods Transportation, Private Bus Body Building, Private Vehicle Tyre Remoulding. In future, Corporation plans to start petrol pump for private vehicles all over the Maharashtra.

What triggered the strike? The issue started with a delay in salaries of over 90,000 staffers for three to four months after the first nationwide lockdown during the pandemic. As MSRTC struggled to pay salaries, several staffers allegedly committed suicide.

A section of the Maharashtra State Road Transport Corporation (MSRTC) employees have been on strike since October last year, demanding that the undertaking be merged with the state government, which would give them better salaries and greater job security.

ST employees have a total of three demands. According to the new wage agreement, inflation allowance, housing allowance should be increased (inflation allowance, housing allowance should be increased) were his two main demands. However, the issue of the merger of the MSRTC with the state government remained unresolved.

Key Words

- MSRTC Bus strike
- Employees
- Passengers
- Chi-square test and Classification

<u>Introduction</u>

MSRTC is a state-owned transport corporation which runs inter-city and inter-state buses. It has a fleet of 16,000 buses and 96,000 employees across the state. MSRTC, which used to cater almost 68 lakh passengers daily and earn around Rs 22-24 crore daily before the pandemic, has been suffering huge losses due to the lockdowns with the ridership going down to 24-28 lakh with an earning of Rs 12 crore approximately.

Officials claim that the cumulative losses of MSRTC, which was Rs 3,500 crore before the pandemic, has gone up to over Rs 9,000 crore making it difficult for the Corporation to meet its operational costs and pay salaries of its 96,000 employees on time.
The state government provided financial assistance to MSRTC thrice in the past one and half year to pay salaries.

There are total 250 depots of MSRTC and it has a fleet strength of 18,449 buses with approximately 92,266 employees. The employees of MSRTC have been on a strike since October 27, 2021. They have been demanding that the transport corporation be merged with the state government so that they are entitled to salaries and benefits as state government employees. Also inflation allowance , housing allowance should be increased.

After the salaries were delayed due to the losses and over 30 employees died by suicide in the past one and year, several unions called for a hunger strike to be held on October 27. The action committee of Unions had four major demands, including hike in the dearness allowance, house rent allowance and salary increment along with the merger of MSRTC in the state government.

While state transport minister Anil Parab on October 25 had increased the dearness allowance by five per cent, taking it to 17 per cent from existing 12 per cent, the agitation was held on October 27 demanding the dearness allowance to be 28 per cent which is at par with state government employees along with the existing demands.

After the October 27 strike, on October 28, the action committee of union leaders held a meeting with Parab and all the three demands were accepted except for the merger issue and during the meeting, the union leaders agreed to withdraw the strike.

Although the union leaders agreed to withdraw the strike after the demands were accepted, a section of employees did not resume work and the strike continued with the merger demand — which according to the employees is the main demand — still in place. If fulfilled, the merger demand will apparently resolve all the remaining issues.

Although the government accepted the other demands, the major demand was to merge the corporation which would ultimately resolve most of the issues and demands of the employees. However, the demand remained unsolved in the meeting and even after the major unions agreed to withdraw the agitation, it continued as the employees were angry and frustrated.

<u>Objectives</u>

➢ To study the people's opinions about the MSRTC bus strike.

➢ To study the problems faced by employees during the strike.

➢ To study the effect of MSRTC bus strike on social, mental health and the various fields of the society.

➢ To check interrelation between various attributes related to bus strike.

➢ To predict the opinions of passengers.

<u>Data Description</u>

We collect the primary data by using Questionnaire. (by Telephone as well as One-one communication)

■ For Employees:

Number of Variables:- 19

Number of Observations:- 144

■ For Passengers:

Number of Variables:- 35

Number of Observations:- 157

Questionnaire

For Employees:

1) Name:-
2) Age group :-
   a) 18-25   b) 25-35   c) 35-45   d) 45-60   e) Greater than 60
3) Gender:-
   a) Male   b) Female   c) Other
4) Occupation
   a) Conductor   b) Driver   c) Mechanic   d) Other
5) Annual Income
   a) 20000-50000   b) 50000-250000   c) 250000-500000   d) >500000
6) तुम्हाला पुरेसे वेतन आहे का ? Do you have enough salary?

   a) Yes हो   b) No नाही

7) तुमच्या कुटुंबातील दुसरी व्यक्ती काम करते का? करत असेल तर कोणते? Does another person in your family work? Which ?

   a) सरकारी नोकरी (Government Job)

   b) खाजगी नोकरी (Private Job)

   c) व्यवसाय (Business)

8) संपाच्या काळात घर चालवण्यासाठी तुम्ही काय केले ? What did you do to run the house during the strike?

   a)बचत (Saving)   b) व्यवसाय (Business)   c) मजुरी (Labour)

   d)शेती (Farming)   e) इतर (Other)

9) कामगार संघटनांची मान्यता रद्द झाली हे चांगले झाले की वाईट? Is it good or bad that trade unions have been de-recognized?

   a) चांगले (Good)   b) वाईट (Bad)

10) भविष्य काळात कामगारांच्या हितासाठी संघटनांची गरज आहे का? Is there a need for unions for the benefit of the workers in the future?

    a) Yes हो   b) No नाही

11) सरकारने केलेल्या 41% पगारवाढी बाबत तुम्ही समाधानी आहात का? Are you satisfied with the 41% salary increase made by the government?

    a) 80-100%   b) 60-80%   c) 40-60%   d) <40

12) संपाच्या काळात तुम्हाला आरोग्याच्या कोणत्या समस्या जाणवल्या? What health problems did you experience during the strike?

a) मानसिक व्याधी (Mental Problems)   c) हृदय रोग (Heart Problems)

b) शारीरिक व्याधी (Physical Problems)   d) इतर (Other)

13) संपाच्या काळात तुमच्या प्रति घरच्यांची वागणूक कशी होती? How did your family members treat you during the strike?

a) चांगली (Good)   b) वाईट (Bad)   c) काहीच बदल नाही (No change)   d) इतर (Other)

14) संपाच्या काळात वकील सदावर्तेंची भूमिका तुमच्या हिताची वाटली का? Did you find the role of lawyer Sadavarte in your interest during the strike?

a) Yes हो   b) No नाही

15) संपाचा कालावधी वाढल्यानंतर वकील सदावर्ते नी सरकारसोबत चर्चा करायला हवी होती का? Should Advocate Sadavarte have held discussions with the government after the strike period was extended?

a) Yes हो   b) No नाही

16) संपानंतर तुम्ही किती कालावधीने कामावर रुजू झालात? How long have you been working after the strike?(Month)

a) 0-1   b) 1-2   c) 2-3   d) 3-4   e) 4-5   f) अजूनही नाही (Not yet)

17) सरकार ने संसदेच्या अधिवेशनात विलीनीकरण शक्य नाही असे जाहीर केल्यानंतर तुम्ही कामाला जायला हवे होते असे वाटते का? Do you think you should have gone to work after the government declared in Parliament that merger is not possible?

a) Yes हो   b) No नाही

18) वकील सदावर्ते नी तुमच्याकडून पैसे घेतले हे योग्य होते का? Was it right that lawyer Sadavarte took money from you?

a) Yes हो   b) No नाही

19) संपानंतर तुम्हाला मिळालेल्या गोष्टींमध्ये तुम्ही खुश आहात का? Are you happy with what you got after the end?

a) नाही, खुश नाही (No, Not happy)

b) हो, थोडे खुश आहोत (Yes, little bit happy)

c) हो, खूप खुश आहे (Yes, very happy)

For Passengers:-

1) Name (नाव):-

2) Age Group(वय)
   a) 0-18   b) 18-30   c) 30-45   d) >45

3) Gender:-
   a) Male   b) Female   c) Other

4) Area (प्रदेश)
   a) Rural (ग्रामीण)   b) Urban (शहर)

5) Occupation (व्यवसाय)

a) Student (विद्यार्थी) b) Working (कामगार) c) Non-Working (बेरोजगार) d) Other (इतर)

6) तुम्ही बस ने प्रवास करता का? Do you travel by bus?
   a) Yes हो   b) No नाही

7) तुम्ही प्रति महिना सरासरी किती किमी प्रवास करता? How many km do you travel on average per month?
   a) 0-10   b) 10-35   c) 35-70   d) >70

8) बस वेळेवर येते का? Does the bus arrive on time?
   a) Yes हो   b) No नाही

9) बस चा प्रवास सुखकर आणि सुरक्षित आहे असे वाटते का? Do you find the bus journey safe and enjoyable?
   a) Yes हो   b) No नाही

10) बस स्टॉप वर किती वेळ वाट पहावी लागते? How long do I have to wait at the bus stop?(in minutes)
   a) 0   b) 10-30   c) 30-60   d) >60

11) तुम्हाला बसमध्ये रिकामी सीट मिळते का? Do you get empty seat In the bus?
   a) हो, पूर्णवेळ भेटते (Yes Get full time)
   b) हो, थोडा वेळ (Yes, for a while)
   c) नाही, मी खुश आहे उभा राहून (No, I'm happy standing up)
   d) नाही, मला सीट भेटले तर आवडेल (No, I'd love to get a seat)

12) बस कामगारांचा व्यवहार तुमच्या प्रति कसा वाटला? How did the bus workers treat you?
   a) चांगला (Good)   b) मध्यम (Medium)   c) खराब (Bad)

13) बस चे भाडे तुम्हाला परवडते का? Can you afford bus fares?
   a) Yes हो   b) No नाही

14) तुम्ही बस ने सरासरी किती मिनिटे प्रवास करता? How many minutes do you travel by bus on average?

    a) 10-30   b) 30-60   c) 60-120   d) >120

15) MSRTC मध्ये काम करणाऱ्या व्यक्तींशी तुमचा संबंध आहे का? Are you related to people working in MSRTC?

    a) स्वतः (Me)   b) मित्र (Friend)   c) जवळचा नातेवाईक (Closed Relative)

    d) दूरचा नातेवाईक (Distant relative)   e) नाही (No)

16) बस च्या संपाविषयी तुम्हाला काय वाटते विलीनीकरण व्हावे की नको? What do you think about the bus strike Merger occur or not?

    a) Yes हो   b) No नाही

17) बस ची दुरावस्था सरकार मुळे झाली असे वाटते का? Do you think the poor condition of the bus is due to the government?

    a) Yes हो   b) No नाही

18) बस कामगार चुकीच्या मागण्यांसाठी लढत आहेत अस वाटत का? Do you think bus workers are fighting for wrong demands?

    a) Yes हो   b) No नाही

19) बस कामगार आणि सरकार यांचा वाद यामध्ये वकील गुणरत्न सदावर्ते यांची भूमिका योग्य वाटते का? Does Gunaratna Sadavarte's role in the dispute between the bus workers and the government seem appropriate?

    a) Yes हो   b) No नाही

20) बस कामगार आणि गुणरत्न सदावर्ते यांचे सरकार विरुद्ध भूमिका मांडणे योग्य आहे का? Is it right for bus workers and Gunaratna Sadavarte to take a stand against the government?

    a) Yes हो   b) No नाही

21) खालील मागण्या मान्य व्हाव्यात असे वाटते का? Do you think the following demands should be met?

    I.   विलीनीकरण (Merger)   a) Yes हो   b) No नाही

    II.   राज्य सरकारी कर्मचाऱ्या प्रमाणे वेतन व भत्ते आणि वेतनाची हमी (Guarantee of salaries and allowances and pay as state government employees)

                                  a) Yes हो   b) No नाही

    III.   शिस्त व आयोजन कार्य पद्धती कायदा रद्द (Repeal the Discipline and Organizing Procedures Act)   a) Yes हो   b) No नाही

22) इतर महामंडळाप्रमाणे एस टी महामंडळाला सातवा वेतन आयोग द्यावा की नाही? Should 7th pay commission be given to ST Corporation like other corporations?

    a) Yes हो   b) No नाही

23) MSRTC खाजगीमध्ये असावे की सरकारमध्ये? Should MSRTC be in private or in government?
   a) खाजगी (Private)
   b) सरकारी (Government)
   c) निम शासकीय (Semi-government)
   d) Other (इतर)

24) संपाच्या काळात प्रवाशांना कोणत्या समस्यांना तोंड द्यावे लागले? What problems did the passengers face during the strike?
   a) अपघाताचे प्रमाण वाढले. Accident rate increased.
   b) खाजगी वाहन चालकांकडून प्रवाशांची आर्थिक लूट. Financial robbery of passengers by private motorists
   c) मानसिक त्रास. Mental distress.
   d) प्रवाशांना वेळेला पोहोचता येत नव्हते. Passengers could not be reached on time.

25) दुसरी कोणतीही वाहतूक व्यवस्था एस टी महामंडळाची जागा घेऊ शकते का?
   a) Yes हो
   b) No नाही

26) कोण उत्तम सेवा देईल? Who will provide the best service?
   a) एस टी महामंडळ (ST Corporation) b) खाजगी बस (Private Bus) c) इतर (Other)

27) एस टी महामंडळ किंवा खाजगी बस कोणते परवडते? Which is more affordable, ST Corporation or Private Bus?
   a) एस टी महामंडळ (ST Corporation)
   b) खाजगी बस (Private Bus)

28) तुम्ही कोणाला सपोर्ट कराल? Who will you support?
   a) सरकार (Government)
   b) एस टी महामंडळ (ST Corporation)

29) एस टी कामगार संपावर असताना विद्यार्थ्यांना कोणत्या समस्यांना सामोरे जावे लागले? What problems did the students have to face while the ST workers were on strike?
   a) आर्थिक लूट Economic plunder
   b) दूर अंतर चालत जावे लागले Had to walk long distances.
   c) पैसा व वेळ जाणे Money and time go by
   d) लांब प्रवासासाठी मर्यादा Limits for long journeys

30) एसटी खाजगी क्षेत्रात काम करत असेल तर काय होईल? What if ST operates in the private sector?
   a) वाहन चालकांची मनमानी चालणार Drivers will run arbitrarily
   b) सवलती मिळणार नाहीत There will be no concessions
   c) प्रवास भाड्याला नियंत्रण राहणार नाही Travel fares will not be controlled
   d) खाजगी मालक फक्त फायद्याच्या रस्त्यावरच बस चालवणार Private owners will only run buses on profitable roads

31) एस टी संपाच्या काळात तुम्ही कोणत्या वाहतूक व्यवस्थेला प्राधान्य दिले? Which mode of transport did you prefer during the ST strike?

a) खाजगी गाडी / मोटर सायकल (Private car / motorcycle)

b) खाजगी बस (Private bus)

c) टॅक्सी /रिक्शा (Taxi /Auto)

d) इतर (Other)

32) बस मधील सुविधाना rating द्या. Rate the facilities in the bus.

i.	Wi-Fi	(0)	(1)	(2)	(3)	(4)	(5)
ii.	Driving	(0)	(1)	(2)	(3)	(4)	(5)
iii.	Behaviour	(0)	(1)	(2)	(3)	(4)	(5)
iv.	Cleanliness	(0)	(1)	(2)	(3)	(4)	(5)
v.	Overall	(0)	(1)	(2)	(3)	(4)	(5)

Procedure

Step 1)

We collected the primary data by meeting the MSRTC Employees and passengers on Bus station.

Step 2)

We observe the effects of MSRTC bus strike on employees as well as passengers in the data collected.

Step 3)

We used data visualization techniques on the collected data.

Step 4)

We used Chi-square test for independent attributes and prove our hypothesis. Also, apply proportion tests on the data.

Step 5)

We used various classification techniques in machine learning and sort our data.

Step 6)

Now, give the conclusions using the statistical analysis on our data.

Statistical analysis

❖ Data Visualization:-
For Passengers

Gender (लिंग)

157 responses

- Male (पुरुष)
- Female (महिला)
- Other (इतर)

55.4%

44.6%
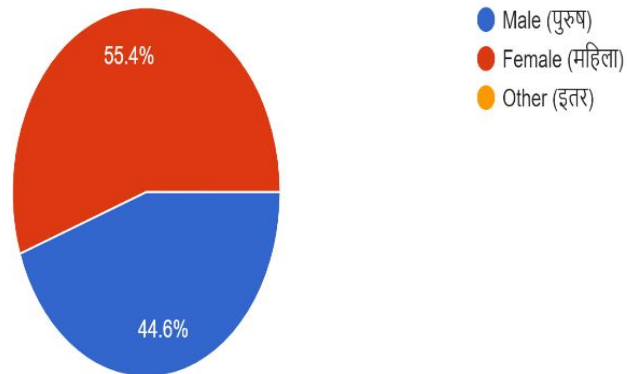
Conclusion:-

From the above pie chart, we conclude that the data consist of 55.4% female passenger and 44.6% male passengers.

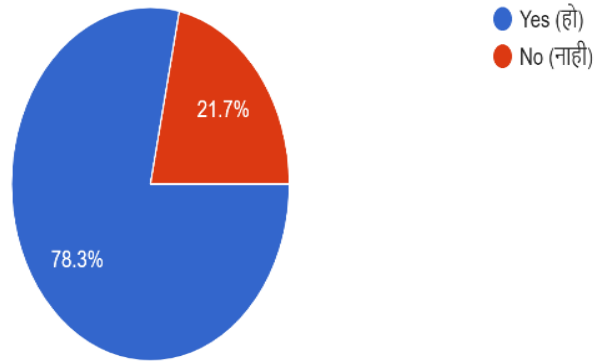तुम्ही कोणाला सपोर्ट कराल? Who will you support?

157 responses

- सरकार (Government)
- एस टी महामंडळ (ST Corporation)

79.6%

20.4%
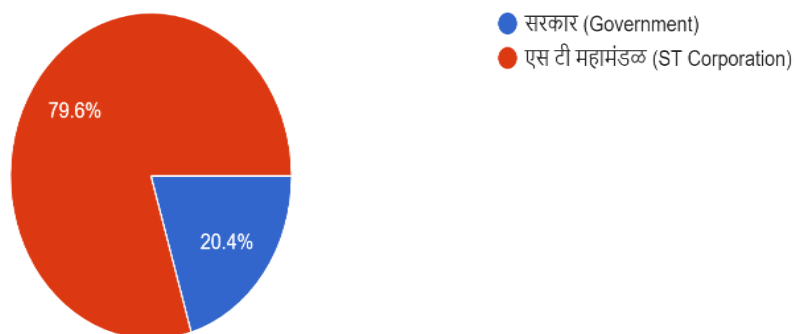
Conclusion:-

From the above graph, we conclude that about 79.6% people supports ST corporation and 20.4% supports government.

बस च्या संपाविषयी तुम्हाला काय वाटते विलीनीकरण व्हावे की नको? What do you think about the bus strike Merger occur or not?

157 responses

- Yes (हो)
- No (नाही)

21.7%

78.3%

Conclusion:-

About 78.3% passenger thinks that merger of the ST corporation with government will be more beneficial for the society.

एस टी संपाच्या काळात तुम्ही कोणत्या वाहतूक व्यवस्थेला प्राधान्य दिले? Which mode of transport did you prefer during the ST strike?
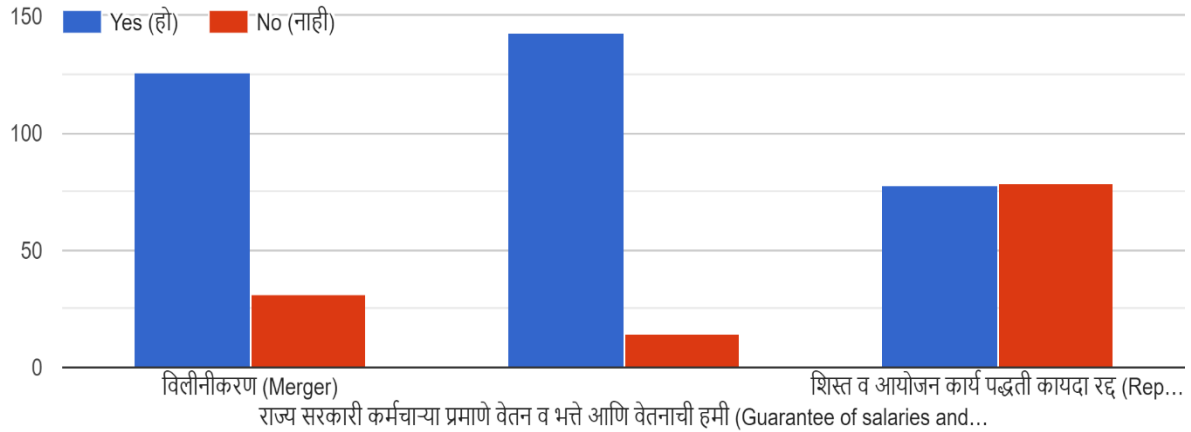
157 responses

- खाजगी गाडी / मोटर सायकल (Private car / motorcycle)
- खाजगी बस (Private bus)
- टॅक्सी /रिक्शा (Taxi /Auto)
- इतर (Other)

14.6% 15.3%

10.8%

59.2%
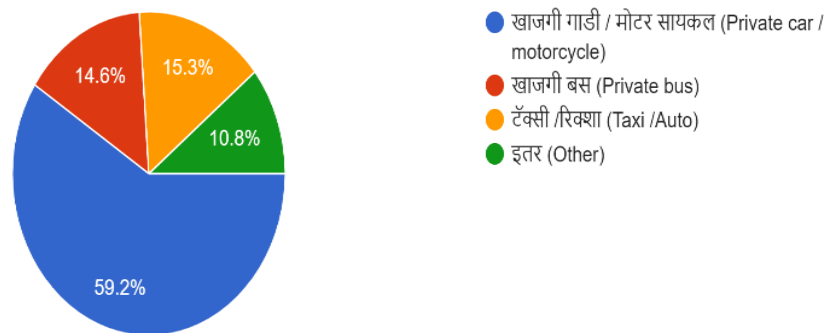
Conclusion:-

Mostly passengers used private cars or motorcycle for transportation purpose during ST bus strike.

खालील मागण्या मान्य व्हाव्यात असे वाटते का? Do you think the following demands should be met?

Conclusion:-

i) 80.25% passenger wants Merger demand should be met.

ii) 91.08% passenger wants demand of Guarantee of salaries and allowances and pay as state government employees should be met.

iii) 49.68% passenger wants demand of Repeal the Discipline and Organizing Procedures Act should be met.

संपाच्या काळात प्रवाशांना कोणत्या समस्यांना तोंड द्यावे लागले? What problems did the passengers face during the strike?
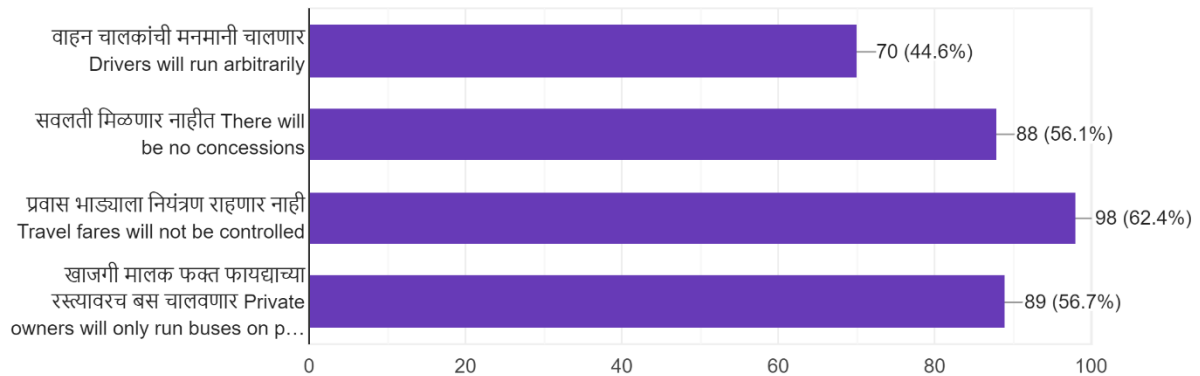
157 responses
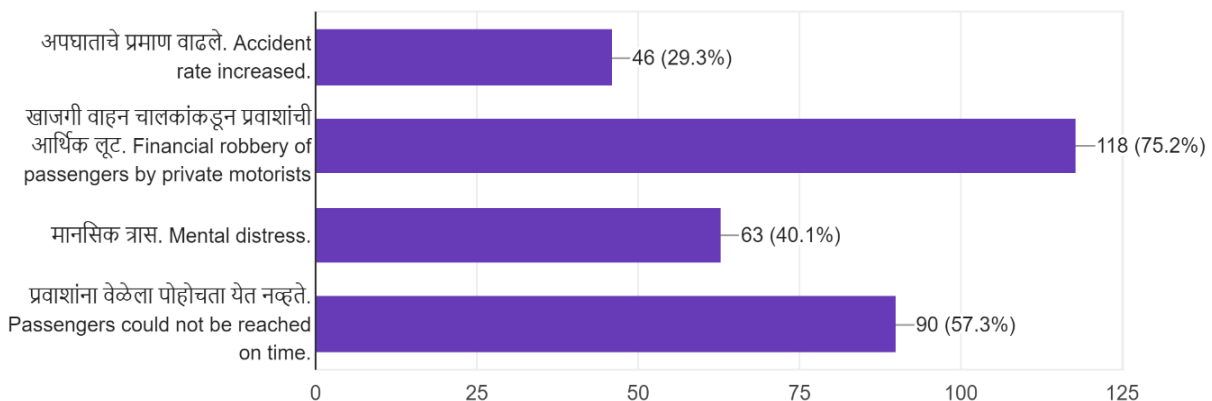
Conclusion:-

Most of the passengers faced Financial plunder by private motorists during the strike.

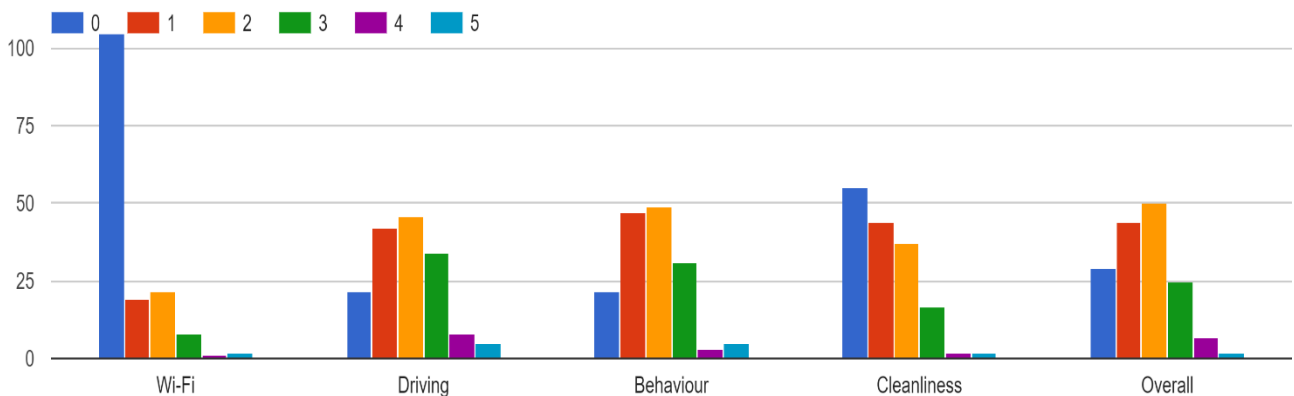एसटी खाजगी क्षेत्रात काम करत असेल तर काय होईल? What if ST operates in the private sector?
157 responses

Conclusion:-

Most of the passengers thinks that if ST operates in the private sector travel fares will not be controlled.

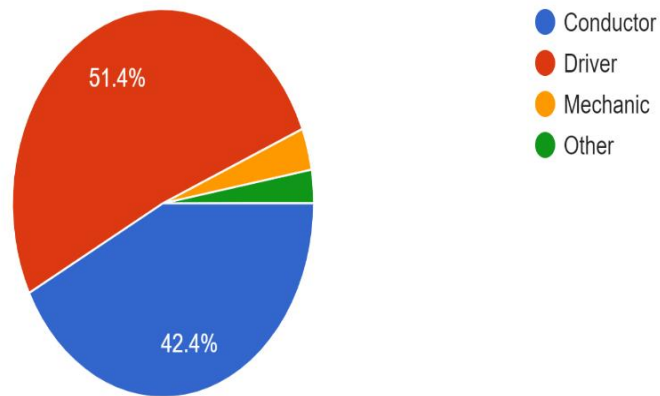बस मधील सुविधाना rating द्या. Rate the facilities in the bus.

Conclusion:-

i)   Passenger were somewhat satisfied from the driving and Behaviour of the employees.

ii)   Passengers were not satisfied from the Wi-Fi and cleanliness facilities of the ST corporation.

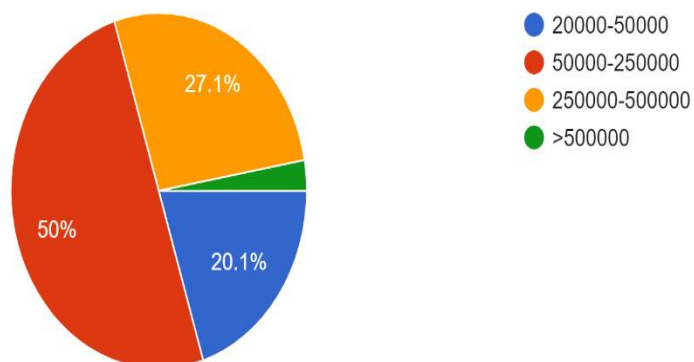iii) Overall passengers were moderately satisfied by the facilities.

For Employees

Occupation

144 responses

Conclusion:-

From the above pie diagram, we conclude that the data consist of 51.4% responses from driver and 42.4% from conductor.
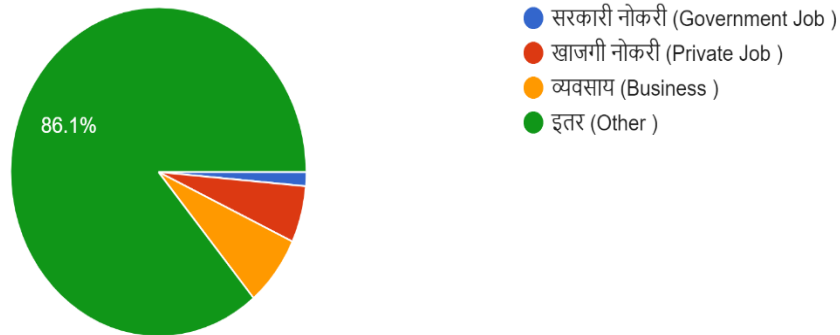
Annual Income

144 responses

Conclusion:-

From above chart, 50% employees have annual income ranges from 50000 to 250000.

तुमच्या कुटुंबातील दुसरी व्यक्ती काम करते का? करत असेल तर कोणते? Does another person in your family work?Which ?

144 responses

- सरकारी नोकरी (Government Job)
- खाजगी नोकरी (Private Job)
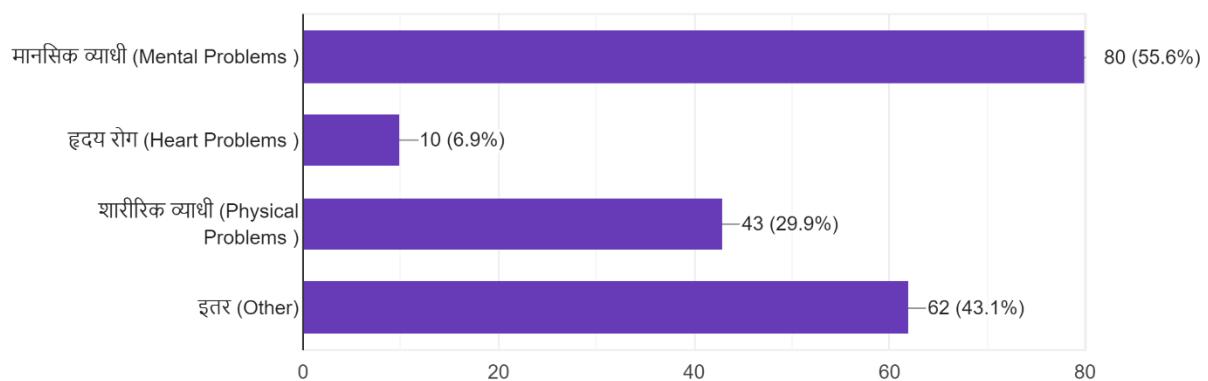- व्यवसाय (Business)
- इतर (Other)

86.1%

Conclusion:-

In most of the employee's family, only one person works for fulfilment of his/her family and their needs.

संपाच्या काळात तुम्हाला आरोग्याच्या कोणत्या समस्या जाणवल्या? What health problems did you experience during the strike?

144 responses

Category	Value
मानसिक व्याधी (Mental Problems)	80 (55.6%)
हृदय रोग (Heart Problems)	10 (6.9%)
शारीरिक व्याधी (Physical Problems)	43 (29.9%)
इतर (Other)	62 (43.1%)

Conclusion:-

Most of the employees faced mental problem during the strike. Employees faced government threats and repeated rulings by the courts that the strike is illegal. During the bus strike workers did not have enough money to run the house, so they had to face mental distress.

संपानंतर तुम्ही किती कालावधीने कामावर रुजू झालात? How long have you been working after the strike?(Month)
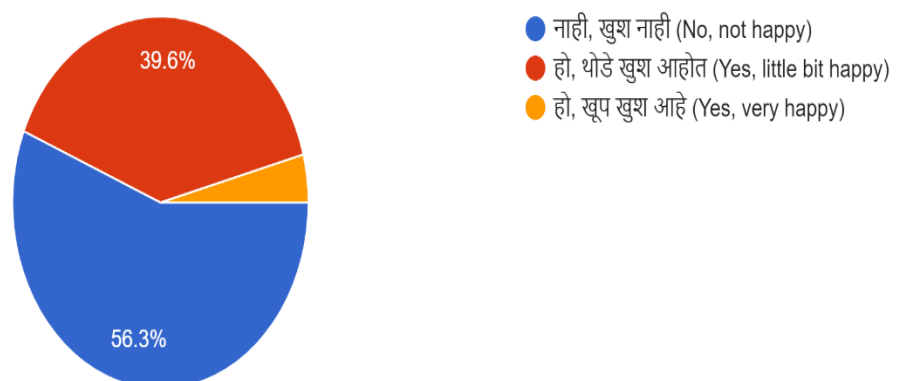
144 responses

- 0-1
- 1-2
- 2-3
- 3-4
- 4-5
- अजूनही नाही (Not yet)
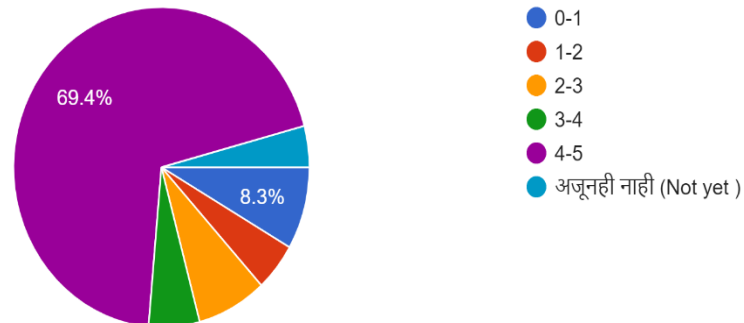
Conclusion:-

69.4% workers joined their duty after 4-5 months of the strike. Although the demands of the worker's were not met, the worker's had to go back to work as per the court order.

संपानंतर तुम्हाला मिळालेल्या गोष्टींमध्ये तुम्ही खुश आहात का? Are you happy with what you got after the end?

144 responses

- नाही, खुश नाही (No, not happy)
- हो, थोडे खुश आहोत (Yes, little bit happy)
- हो, खूप खुश आहे (Yes, very happy)

Conclusion:-

Most of the employees were not satisfied from courts judgement. After waiting so many days, their demands were not met, so the workers are not happy.

Hypothesis testing

> data=read.csv("C:\\Users\\DELL\\Desktop\\SNEHAL SYBSC

EXAM\\TY snehal\\Passangers (Responses).csv",header=T)

> View(data)

❖ Chi-square tests:-

For Passengers

I.

H_0: Area of living and Travel by bus are independent of each other.

H_1: Area of living and Travel by bus are dependent of each other.

> y=matrix(nrow=2,ncol=2,data=c(10,6,110,31),byrow=T);y

    [,1] [,2]

[1,]　10　6

[2,]　110　31

> x0=chisq.test(y,correct=F);x0

      Pearson's Chi-squared test

data:　y

X-squared = 1.9201, df = 1, p-value = 0.1659

p-value:- 0.1659

Decision:-

Here, p-value is greater than 0.05. Hence, accept H_0 at 5% level of significance.

Conclusion:-

Thus, we conclude that passengers travel by bus and living area does not related with each other.

II.

H$_0$: Bus worker's behaviour and Merger are independent of each other.

H$_1$: Bus worker's behaviour and Merger are dependent of each other.

> y=matrix(nrow=3,ncol=2,data=c(0,4,15,73,19,46),byrow=T);y

   [,1] [,2]

[1,] 0 4

[2,] 15 73

[3,] 19 46

> x1=chisq.test(y,correct=F);x1

     Pearson's Chi-squared test

data: y

X-squared = 4.4064, df = 2, p-value = 0.1104

p-value:- 0.1104

Decision:-

Here, p-value is greater than 0.05. Hence, accept H$_0$ at 5% level of significance.

Conclusion:-

Thus, passengers want merger of ST corporation and bus worker's behaviour towards them are not related to each other.

III.

H0: Relation of passengers with Bus employee and wants Merger are independent of each other.

H1: Relation of passengers with Bus employee and wants Merger are dependent of each other.

> y=matrix(nrow=5,ncol=2,data=c(4,26,3,4,26,70,1,22,0,1),byrow=T);y

```
     [,1] [,2]
[1,]   4   26
[2,]   3    4
[3,]  26   70
[4,]   1   22
[5,]   0    1
```

> x2=chisq.test(y,correct=F);x2

　　Pearson's Chi-squared test

data: y

X-squared = 9.0836, df = 4, p-value = 0.05904

p-value:- 0.05904

Decision:-

i.　　　　Here, p-value is greater than 0.05. Hence, accept H_0 at 5% level of significance.

ii.　　　　Here, p-value is less than 0.10. Hence, reject H_0 at 10% level of significance.

Conclusion:-

i)　　　Thus, Relation of passengers with Bus employee and wants Merger are independent of each other at 5% level of significance.

ii)　　　Thus, Relation of passengers with Bus employee and wants Merger are dependent of each other at 10% level of significance.

❖ Proportion test:-

H0: Proportions of male and female about the thought that the bus journey safe and enjoyable are same.

H1: Proportions of male and female about the thought that the bus journey safe and enjoyable are different.

> n=c(86,70);n

[1] 86 70

> x=c(80,61);x

[1] 80 61

> prop.test(x,n)

2-sample test for equality of proportions with continuity correction

data: x out of n

X-squared = 0.93333, df = 1, p-value = 0.334

alternative hypothesis: two.sided

95 percent confidence interval:

 -0.04927134 0.16687932

sample estimates:

  prop 1   prop 2

0.9302326 0.8714286

p-value:- 0.334

Decision:-

Here, p-value is greater than 0.05. Hence, accept H_0 at 5% level of significance.

Conclusion:-

Thus, proportions of male and female about the thought that the bus journey safe and enjoyable are same.

❖ Chi-square tests:-

For employees

i.

H₀: Opinions of the employees about the need of unions for the benefit of the workers in the future and good or bad that trade unions have been de-recognized are independent of each other.

H₁: Opinions of the employees about the need of unions for the benefit of the workers in the future and good or bad that trade unions have been de-recognized are dependent of each other.

> y=matrix(nrow=2,ncol=2,data=c(42,63,2,37),byrow=T);y

   [,1] [,2]

[1,] 42 63

[2,]   2 37

> x3=chisq.test(y,correct=F);x3

    Pearson's Chi-squared test

data: y

X-squared = 16.297, df = 1, p-value = 5.414e-05

p-value:- 5.414e-05

Decision:-

Here, p-value is less than 0.05. Hence, reject H₀ at 5% level of significance.

Conclusion:-

Thus, opinions of the employees about the need of unions for the benefit of the workers in the future and good or bad that trade unions have been de-recognized are associated with each other.

ii.

H₀: Opinions of the employees about the another person in their family work and run the house during the strike are independent of each other.

H₁: Opinions of the employees about the another person in your family work and run the house during the strike are dependent of each other.

>y=matrix(nrow=5,ncol=4,data=c(11,2,1,2,4,0,1,0,51,2,3,0,4,1,2,0,54,3,3,0),byrow=T);y

```
     [,1] [,2] [,3] [,4]
[1,]  11   2    1    2
[2,]   4   0    1    0
[3,]  51   2    3    0
[4,]   4   1    2    0
[5,]  54   3    3    0
```

> x4=chisq.test(y,correct=F);x4

    Pearson's Chi-squared test

data: y

X-squared = 27.069, df = 12, p-value = 0.007552

p-value:- 0.007552

Decision:-

Here, p-value is less than 0.05. Hence, reject H_0 at 5% level of significance.

Conclusion:-

Thus, opinions of the employees about the another person in your family work and run the house during the strike are associated with each other.

26

iii.

H0: Opinions of the employees about the family members treat you during the strike and join the work after the strike are independent of each other.

H1: Opinions of the employees about the family members treat you during the strike and join the work after the strike are dependent of each other.

>y=matrix(nrow=4,ncol=6,data=c(0,0,0,1,0,6,4,3,4,18,2,5,1,7,2,52,4,1,2,1,1,29,0,0),byrow=T);

y

```
     [,1] [,2] [,3] [,4] [,5] [,6]
[1,]  0    0    0    1    0    6
[2,]  4    3    4   18    2    5
[3,]  1    7    2   52    4    1
[4,]  2    1    1   29    0    0
```

> x5=chisq.test(y,correct=F);x5

	Pearson's Chi-squared test

data: y

X-squared = 78.238, df = 15, p-value = 1.464e-10

p-value:- 1.464e-10

Decision:-

Here, p-value is less than 0.05. Hence, reject H_0 at 5% level of significance.

Conclusion:-

Thus, opinions of the employees about the family members treat you during the strike and join the work after the strike are dependent of each other.

iv.

H$_0$: Opinions of the employees about the annual income and happy with what you got after the end are independent of each other.

H$_1$: Opinions of the employees about the annual income and happy with what you got after the end are dependent of each other.

\> y=matrix(nrow=4,ncol=3,data=c(1,0,3,22,0,7,18,4,17,40,2,30),byrow=T);y

```
    [,1] [,2] [,3]
[1,]   1    0    3
[2,]  22    0    7
[3,]  18    4   17
[4,]  40    2   30
```

\> x6=chisq.test(y,correct=F);x6

Warning message:

In chisq.test(y, correct = F) : Chi-squared approximation may be incorrect

    Pearson's Chi-squared test

data: y

X-squared = 11.822, df = 6, p-value = 0.06605

p-value:- 0.06605

Decision:-

i.   Here, p-value is greater than 0.05. Hence, accept H$_0$ at 5% level of significance.

ii.   Here, p-value is less than 0.10. Hence, reject H$_0$ at 10% level of significance.

Conclusion:-

i.   Thus, Opinions of the employees about the annual income and happy with what you got after the end are independent of each other at 5% level of significance.

ii.   Thus, Opinions of the employees about the annual income and happy with what you got after the end are dependent of each other at 10% level of significance.

Classification Techniques

K-Nearest Neighbour

```
>#Data entry
> data=read.csv("C:\\Users\\DELL\\Desktop\\data knn Employeescsv.csv",header=T)


> # Normalize the dataset between values 0 and 1
> normalize= function(x){
+   return ((x-min(x))/(max(x)-min(x)))}
> data.new=as.data.frame(lapply(data[,c(1,15)],normalize))


> # subset the dataset
> data.train=data.new[1:108,]
> data.train.target<- data[1:108,1]
> data.test<- data.new[108:144,]
> data.test.target<- data[108:144,1]


> summary(data.new)
   Age.group      Are.you.happy.with.what.you.got.after.the.end.
 Min.   :0.0000   Min.   :0.0000
 1st Qu.:0.3333   1st Qu.:0.0000
 Median :0.3333   Median :0.0000
 Mean   :0.4769   Mean   :0.2569
 3rd Qu.:0.6667   3rd Qu.:0.5000
 Max.   :1.0000   Max.   :1.0000


> #Apply k-NN classification algorithm
> model1<- knn(train=data.train, test=data.test, cl=data.train.target, k=2)
> model1
 [1] 2 2 2 1 2 2 1 2 1 2 1 2 2 2 2 1 1 2 1 2 1 2 1 2 1 2 2 2 2 1 1 2 1 1 2 1 2
Levels: 0 1 2 3
```

```
> #Confusion matrix
> tab=table(data.test.target, model1);tab
          model1
data.test.target  0  1  2  3
            0  0  1  0  0
            1  0 14  0  0
            2  0  0 22  0
> #accuracy
> acc=100 * sum( data.test.target== model1)/NROW(model1);acc
[1] 97.2973
```

Conclusion:-

By using K- Nearest Neighbour Classification Technique, our model is 97.2973% accurate.

Decision Tree Algorithm

```
> set.seed(678)
> df=read.csv("C:\\Users\\DELL\\Desktop\\data knn Employeescsv.csv",header=T)
> View(df)
> install.packages("rpart.plot")
> rnum=sample(rep(1:144))
> df=df[rnum,]
> df1=sort(sample(nrow(df),nrow(df)*0.7))
> train=df[df1,]
> test=df[-df1,]
> library(rpart)
> library(rpart.plot)
> fit=rpart(Happy_with_court_order~.,data=train,method='class')
> rpart.plot(fit)
> predict_unseen=predict(fit,test,type='class')
> t=table(test$Happy_with_court_order,predict_unseen);t
  predict_unseen
```
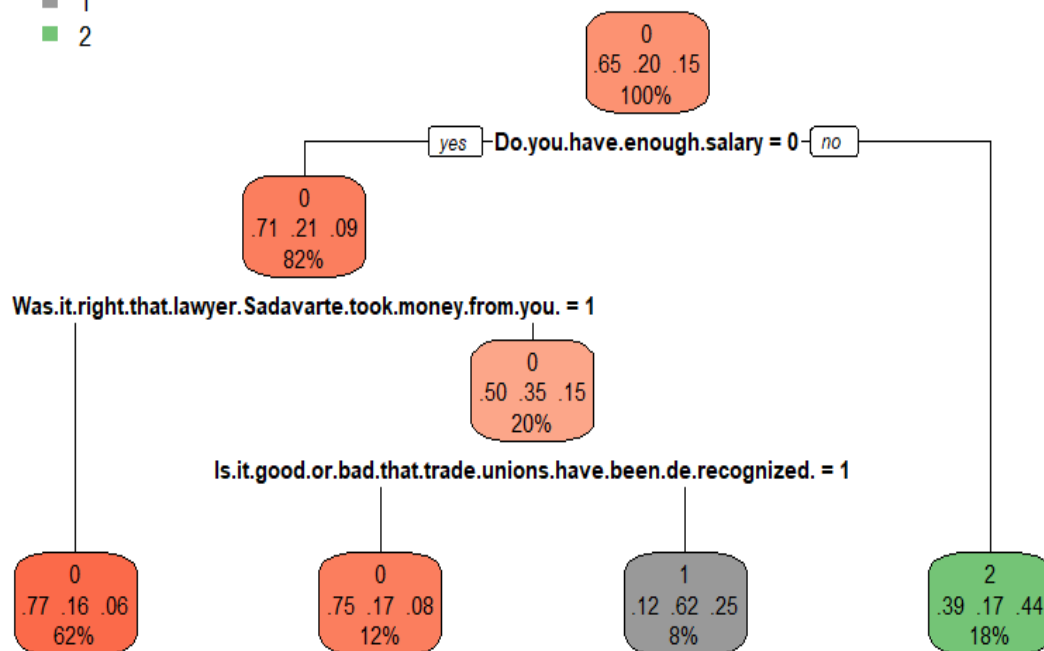
```
   0  1  2
0 26  0  1
1  5  4  1
2  3  0  4
```

> accuracy=sum(diag(t))/sum(t);accuracy

[1] 0.7727273

Conclusion:-

By using Decision tree Classification Technique, our model is 77.27273% accurate.

<u>Conclusions</u>

➢ From our data, about 79.6% people supports ST corporation and 20.4% supports government. It reveals that, in democratic Maharashtra majority of people wants merger of ST bus. From our project, we want to give suggestion to government that they should have to think on merger of ST corporation.

➢ 59.2% passengers used private cars or motorcycle for transportation purpose during ST bus strike. It concludes that most of the people uses private modes of transportation. This increases pollution. Therefore public transport is only way to reduce such circumstances.

➢ Nearly 86.1% employees are the only one person who works for fulfilment of his/her family.

➢ From the study it reveals that employees faced government threats and repeated rulings by the courts that the strike is illegal. During the bus strike workers did not have enough money to run the house, so they had to face mental distress.

➢ Both male and female thought that the bus journey is safe and enjoyable.

Limitations

❖ We collected data from Ahmednagar district but if observations are from another districts then results will be somewhat changed.

❖ Some employees thought that there is any fraud while answering such questions and they have fear about there job security during answering strike related questions.

❖ Due to time constraint, we were unable to collect appropriate sample.

Future Scope

In the future, to better generalize our findings it is necessary to further expand the set of data and attributes considered. With more data the training process is likely to produce more effective classifiers also allowing a more reliable estimate of the exhibited performance. Researcher can also collect the sample from all 250 depots. This will give better and unbiased results. Our project helps government to take action towards the bus employee's issue.

Softwares Used

- R 4.1.2
- Microsoft Excel
- Python

References

- https://indianexpress.com/article/cities/mumbai/msrtc-employees-strike-maharashtra-bus-transport-7680857/
- Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor, tenth edition.
- Programmed Statistics by B. L. Agarwal, second edition
- https://en.wikipedia.org/wiki/Maharashtra_State_Road_Transport_Corporation