PUBLIC TRANSPORTATION OPTIMIZATION

PHASE 5 SUBMISSION DOCUMENT

PROJECT TITLE : PUBLIC TRANSPORTATION OPTIMIZATION.

PHASE 5: PROJECT DOCUMENTATION AND SUBMISSION.

TOPIC : IN THIS SECTION WE WILL DOCUMENT THE COMPLETE PROJECT AND PREPARE IT FOR SUBMISSION.

Introduction:

Public transportation plays a vital role in shaping the transportation landscape of cities and urban areas. It provides a sustainable mode of transportation for the masses, reduces congestion on roads, lowers carbon emissions, and ensures accessibility and mobility for all. However, to maximize the benefits of public transportation, it is essential to optimize its operations and infrastructure. Public transportation optimization involves various strategies and technologies aimed at improving efficiency, service quality, and overall user experience. In this article, we will explore the concept of public transportation optimization and discuss some key subtopics related to it.

1. Intelligent Transportation Systems (ITS):

Intelligent Transportation Systems refer to the integration of advanced technologies and communication systems into the transportation network. This subtopic will delve into how ITS can be used to optimize public transportation operations, including real-time tracking and monitoring of vehicles, traffic signal coordination, automated fare collection systems, and passenger information systems.

2. Route Planning and Scheduling:

Efficient route planning and scheduling are crucial for maximizing the utilization of public transportation resources and minimizing travel time for passengers. This subtopic will explore the importance of optimizing routes and schedules using data analysis, demand forecasting, and algorithms to ensure timely and reliable services.

3. Fleet Management and Maintenance:

Public transportation agencies often operate large fleets of buses, trains, or trams. Effective fleet management and maintenance practices are essential to ensure the availability, reliability, and safety of vehicles. This subtopic will discuss how advanced vehicle tracking systems, maintenance schedules, and predictive.

Here is a list of commonly used tools and software in the process of public transportation optimization:

1. Geographic Information System (GIS) software:

Used for analyzing and visualizing geographical data, including route planning, traffic patterns, and demographic information.

2. Transportation modeling software:

These tools simulate real-world transportation systems, allowing planners to analyze and optimize routes, schedules, and resources. Examples include PTV Visum, TransCAD, and Cube Voyager.

3. Automatic Vehicle Location (AVL) systems:

AVL systems track the real-time location and movement of vehicles, enabling operators to monitor, manage schedules, and improve fleet efficiency.

4. Intelligent Transportation Systems (ITS) software:

ITS software integrates various technologies to improve transportation efficiency, safety, and traveler information. This includes traffic signal control systems, dynamic message signs, and real-time passenger information systems.

5. Demand forecasting software:

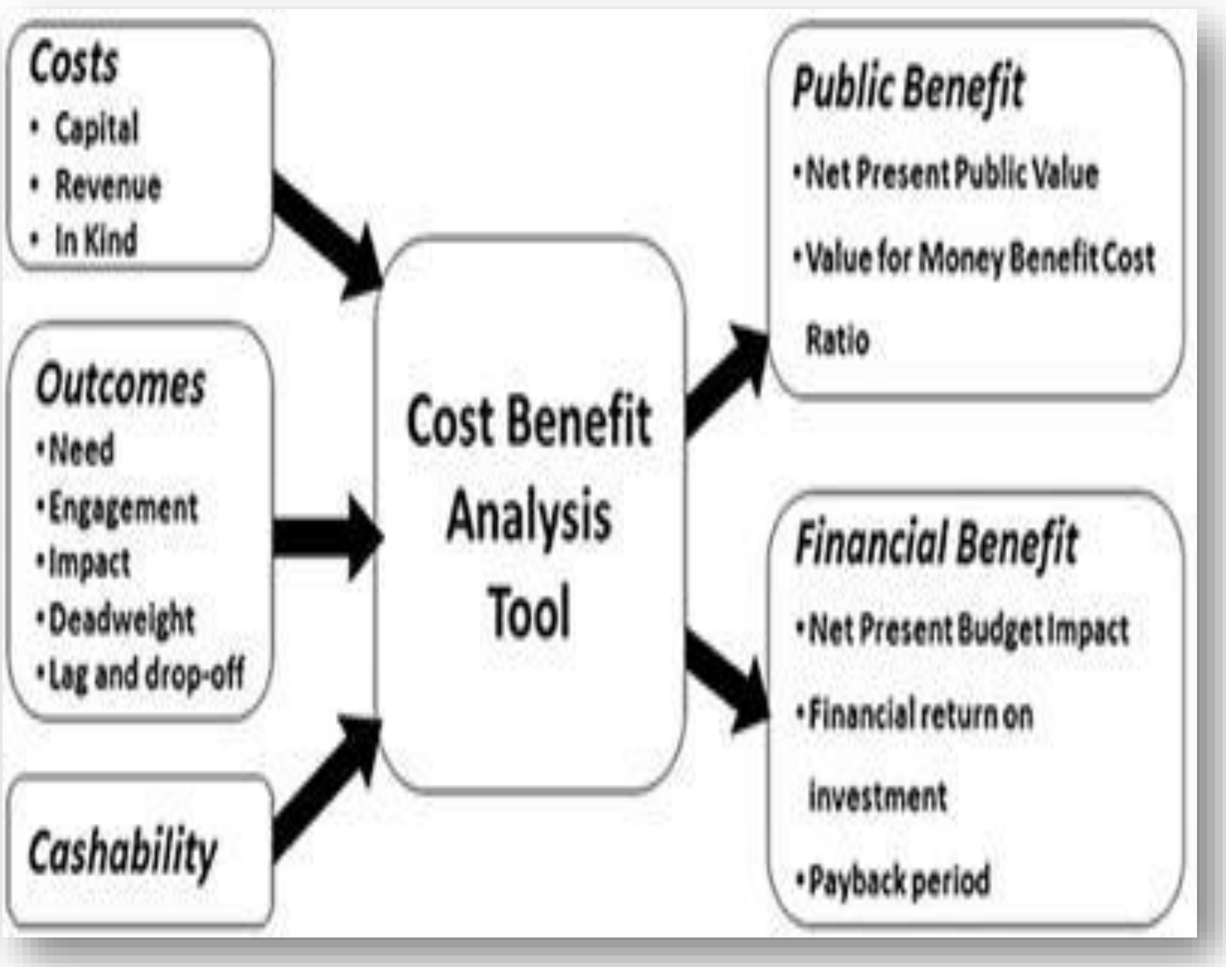
These tools utilize historical data, market research, and statistical models to predict future travel demand. This helps in optimizing routes, schedules, and resource allocation. Examples include Transmodeler, TransCAD, and Aimsun.

6. Fleet management software:

These platforms help manage and optimize fleet operations, including scheduling, dispatching, maintenance, and fuel management. Examples include Trapeze Ops, Optibus, and Fleetio.

7. Passenger information and ticketing systems:

These systems provide real-time information to passengers, including arrival times, route information, and fare payment options.



The objectives of using public transportation optimization in a project can include:

1. Reduce traffic congestion: By encouraging the use of public transportation, the project aims to decrease the number of private vehicles on the road, leading to reduced traffic congestion.

2. Lower carbon emissions: Public transportation is generally more environmentally friendly compared to private vehicles. By optimizing its usage, the project aims to reduce carbon emissions and promote sustainability.

3. Improve air quality: With fewer vehicles emitting pollutants, the project aims to improve the overall air quality, leading to a healthier environment for residents.

4. Enhance accessibility: By optimizing public transportation routes and schedules, the project aims to provide better accessibility to various destinations within the city, making it easier for people to reach their desired locations.

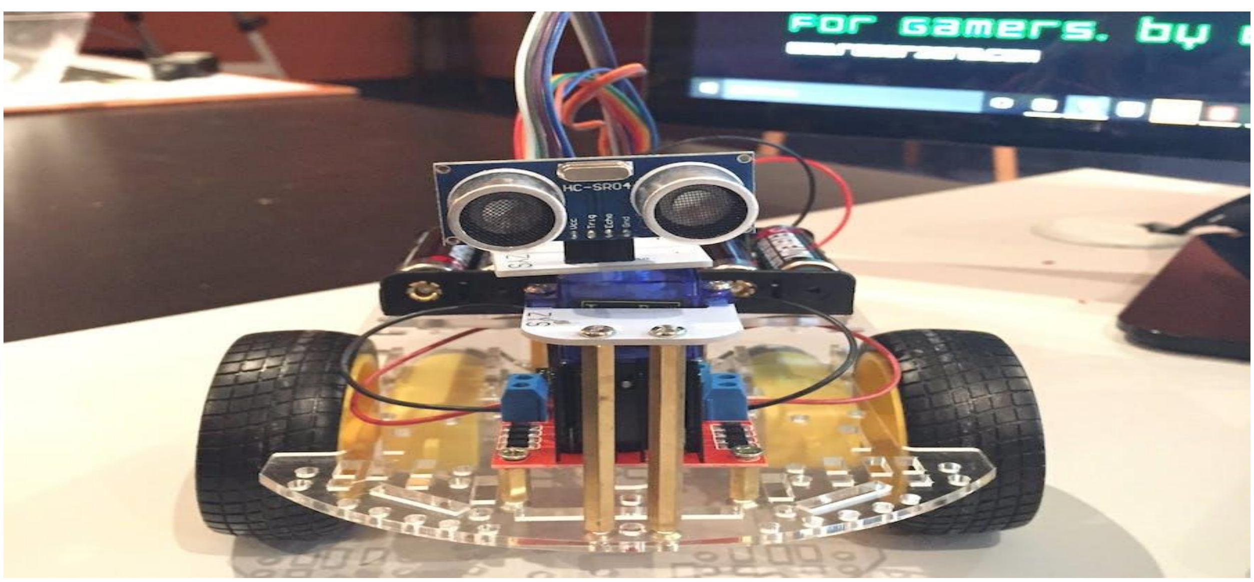
5. Increase cost-efficiency: Public transportation is usually a more cost-effective option for commuting compared to private vehicles. By optimizing its usage, the project aims to reduce transportation costs for individuals and promote economic savings on fuel expenses.

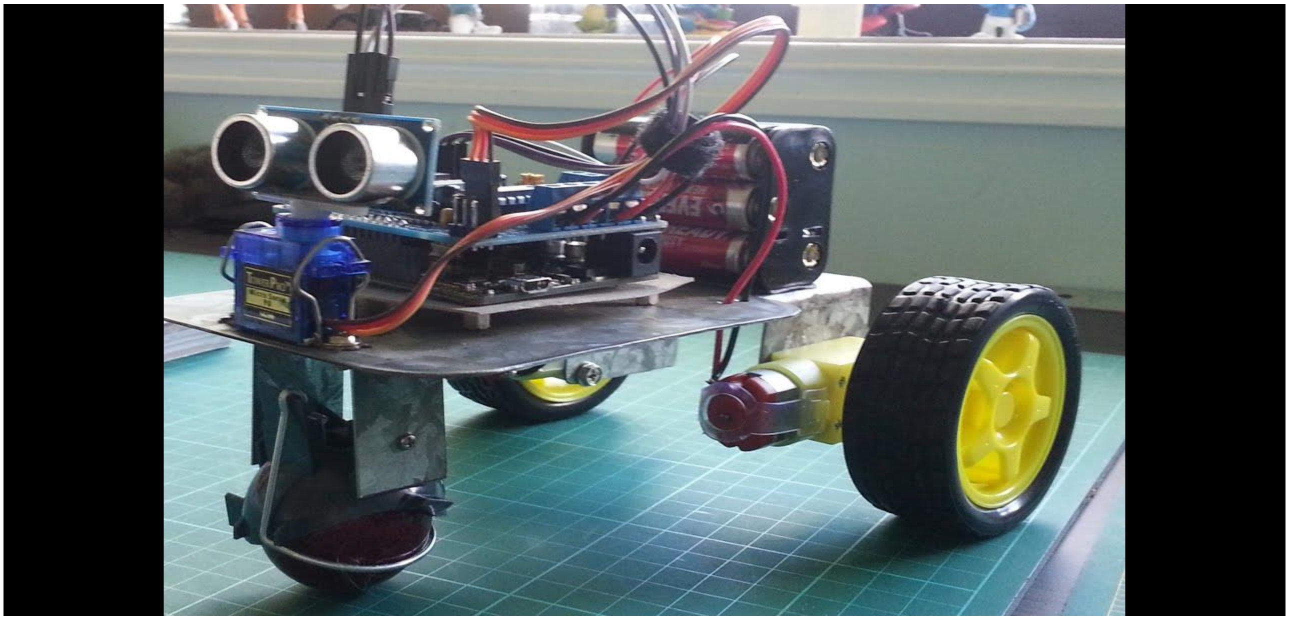
6. Enhance safety: Public transportation is generally considered safer than private vehicles. By encouraging its usage, the project aims to enhance overall safety on the roads.

7. Promote social equity: Public transportation provides an equal opportunity for everyone to travel, regardless of their income level or accessibility to private vehicles. By optimizing its usage, the project aims to promote social equity and ensure that transportation is accessible to all members of society.

8. Reduce parking demand: By promoting public transportation, the project aims to reduce the demand for parking

IOT SENSOR USING PUBLIC TRANSPORT OPTIMIZATION.





ULTRA SONIC SENSOR DEFINITION:

An ultrasonic sensor is a device that uses sound waves to detect the distance of objects in its path. It emits high-frequency sound waves and then measures the time it takes for the waves to bounce back after hitting an object. By using this information, the sensor can calculate the distance to the object.

Ultrasonic sensors are commonly used in various applications such as robotics, distance measurement, object detection, and parking assistance systems. They are effective in detecting both stationary and moving objects, and they provide accurate distance measurements within a certain range. Ultrasonic sensors are also popular because they are easy to use and relatively inexpensive.

HERE ARE SOME STEPS FOR THE DEPLOYMENT PROCESS :

1. DEFINE OBJECTIVES:

CLEARLY IDENTIFY THE GOALS AND OBJECTIVES OF DEPLOYING IOT SENSORS. DETERMINE WHAT DATA YOU WANT TO COLLECT AND WHAT PROBLEMS YOU WANT TO SOLVE.

2. CHOOSE THE RIGHT SENSORS:

SELECT SENSORS THAT ARE APPROPRIATE FOR THE DATA YOU WANT TO COLLECT AND THE ENVIRONMENT IN WHICH THEY WILL BE DEPLOYED. CONSIDER FACTORS SUCH AS ACCURACY, RANGE, POWER REQUIREMENTS, CONNECTIVITY OPTIONS, AND COMPATIBILITY WITH YOUR EXISTING SYSTEMS.

3. PLAN SENSOR PLACEMENT:

DETERMINE WHERE TO INSTALL THE SENSORS BASED ON THE DATA YOU WANT TO COLLECT. CONSIDER FACTORS SUCH AS COVERAGE AREA, ACCESSIBILITY, POWER SUPPLY AVAILABILITY, AND ENVIRONMENTAL CONDITIONS.

4. Install sensors:

Physically install the sensors in the designated locations according to the manufacturer's instructions. Ensure that the sensors are securely mounted, properly aligned, and connected to a power source if required.

5. Configure sensors:

Configure the sensors to connect to your IoT platform or network. This may involve setting up Wi-Fi or cellular connections, configuring data transmission settings, and enabling security features.

6. Test functionality:

Verify that the sensors are correctly sending data to your IoT platform or network. Test different scenarios to ensure that the sensors are working as expected.

7. Monitor and optimize:

Continuously monitor the performance and data collected by the sensors. Analyze the data to gain insights and optimize sensor deployment if necessary.

PLATFORM DEVELOPMENT:

DEVELOPING A PLATFORM FOR PUBLIC TRANSPORTATION OPTIMIZATION CAN GREATLY IMPROVE THE EFFICIENCY AND EFFECTIVENESS OF TRANSPORTATION SYSTEMS.

HERE ARE SOME KEY STEPS TO CONSIDER WHEN DEVELOPING SUCH A PLATFORM:

1. DATA COLLECTION AND INTEGRATION:

GATHER DATA FROM VARIOUS SOURCES SUCH AS TRANSPORTATION AGENCIES, GPS SYSTEMS, TICKETING SYSTEMS, AND TRAFFIC SENSORS. INTEGRATE THIS DATA INTO A CENTRALIZED PLATFORM TO ENABLE REAL-TIME MONITORING AND ANALYSIS.

2. ROUTE OPTIMIZATION:

USE ALGORITHMS AND MACHINE LEARNING TECHNIQUES TO OPTIMIZE ROUTES, TAKING INTO ACCOUNT FACTORS LIKE TRAFFIC CONGESTION, PASSENGER DEMAND, AND TIME SCHEDULES. THIS CAN HELP MINIMIZE TRAVEL TIME, REDUCE FUEL CONSUMPTION, AND IMPROVE OVERALL SERVICE QUALITY.

3. Demand forecasting:

Utilize historical data and predictive models to estimate future passenger demand. This information can be used to better match service capacity with demand, thereby reducing overcrowding or empty buses/trains.

4. Real-time updates and notifications:

Implement a system that provides real-time updates to passengers regarding arrival times, delays, and alternative routes. This can be done through mobile applications, digital signage, or text messages.

5. Fare optimization:

Develop algorithms to optimize fare structures based on factors like distance traveled, time of day, and passenger demand. This can help maximize revenue while ensuring affordability and accessibility for passengers.

6. INTEGRATION WITH OTHER TRANSPORTATION MODES:

ALLOW FOR SEAMLESS INTEGRATION WITH OTHER MODES OF TRANSPORTATION SUCH AS RIDESHARING SERVICES, BIKE-SHARING SYSTEMS, AND CARPOOLING PLATFORMS. THIS CAN PROVIDE PASSENGERS WITH MORE OPTIONS AND IMPROVE OVERALL CONNECTIVITY.

CODE IMPLEMENTATION:

Code implementation using public transportation optimization refers to the development and deployment of software systems that aim to improve the efficiency and effectiveness of public transportation operations. This can involve various techniques and algorithms, such as route planning, scheduling, and resource allocation, to optimize the usage of public transportation services and minimize travel time, congestion, and costs. The code implementation typically involves designing and implementing algorithms, data structures, and software modules that can be integrated into existing public transportation systems or used to build new ones.

TO IMPLEMENT PUBLIC TRANSPORTATION OPTIMIZATION, YOU CAN FOLLOW THESE STEPS:

1. Data collection:

   Gather data on public transportation routes, schedules, and stops. This includes information on routes, stops, distances, travel times, and passenger demand.

2. Problem formulation:

   Define the optimization problem based on your goals. Some common objectives include minimizing travel time, reducing costs, maximizing passenger satisfaction, or minimizing carbon emissions.

3. Model design:

   Develop a mathematical model to represent the public transportation system. This can be done using optimization techniques such as linear programming, integer programming, or heuristics.

4. Algorithm development:

Implement an algorithm to solve the optimization problem. This can involve optimizing routes, schedules, or both. Consider using algorithms like Dijkstra's algorithm, genetic algorithms, or ant colony optimization.

5. Validation and testing:

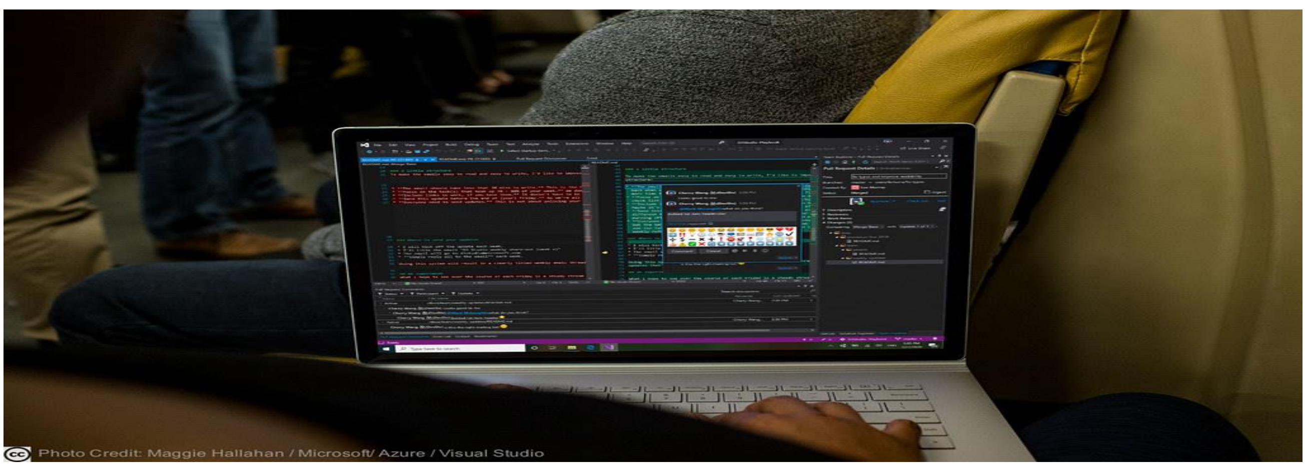
Verify the accuracy and effectiveness of the model and algorithm through simulation or real-world testing. Compare the optimized results to the current system's performance to assess improvements.

6. Deployment:

Once the optimization algorithm is validated, integrate it into the public transportation system. This may involve updating scheduling software, route planning tools, or developing a mobile application for passengers to access optimized routes and schedules.

7. Monitoring and maintenance:

Continuously monitor and update the optimized system based on real-time data and feedback. Make adjustments as needed to ensure optimal performance.



TO OPTIMIZE PUBLIC TRANSPORTATION, YOU CAN USE VARIOUS ALGORITHMS AND TECHNIQUES. HERE IS AN EXAMPLE OF A CODE IMPLEMENTATION USING THE GENETIC ALGORITHM TO OPTIMIZE BUS ROUTES:

```
```PYTHON
IMPORT RANDOM

CLASS BUSROUTE:
DEF __INIT__(SELF, STOPS):
SELF.STOPS = STOPS
SELF.ROUTE = RANDOM.SAMPLE(STOPS, LEN(STOPS))
SELF.DISTANCE = SELF.CALCULATE_DISTANCE()

DEF CALCULATE_DISTANCE(SELF):
DISTANCE = 0
FOR I IN RANGE(LEN(SELF.ROUTE) - 1):
STOP1 = SELF.ROUTE[I]
STOP2 = SELF.ROUTE[I+1]
DISTANCE += SELF.CALCULATE_DISTANCE_BETWEEN_STOPS(STOP1, STOP2)
RETURN DISTANCE
```
```

```
DEF CALCULATE_DISTANCE_BETWEEN_STOPS(SELF, STOP1, STOP2):
# CALCULATE DISTANCE BETWEEN TWO STOPS USING MAP API OR ANY DISTANCE CALCULATION METHOD
PASS


DEF CREATE_INITIAL_POPULATION(STOPS, POPULATION_SIZE):
POPULATION = []
FOR _ IN RANGE(POPULATION_SIZE):
ROUTE = BUSROUTE(STOPS)
POPULATION.APPEND(ROUTE)
RETURN POPULATION


DEF SELECT_PARENTS(POPULATION, NUM_PARENTS):
# SELECT PARENTS BASED ON THEIR FITNESS (E.G., DISTANCE)
PARENTS = []
SORTED_POPULATION = SORTED(POPULATION, KEY=LAMBDA X: X.DISTANCE)
FOR I IN RANGE(NUM_PARENTS):
PARENTS.APPEND(SORTED_POPULATION[I])
```

```
RETURN PARENTS

DEF CROSSOVER(PARENTS, OFFSPRING_SIZE):
OFFSPRING = []
FOR _ IN RANGE(OFFSPRING_SIZE):
PARENT1 = RANDOM
```

TRANSIT INFORMATION PLATFORM:

A transit information platform is a centralized system or application that provides real-time information about public transportation services. It helps passengers navigate through various modes of transportation, such as buses, trains, trams, and subways, by giving them up-to-date information on routes, schedules, delays, and disruptions.

The platform typically includes features such as:

1. Trip planning: Users can enter their starting point and destination, and the platform will provide them with the best route options using public transportation.

2. Real-time arrival and departure information: The platform displays the current arrival and departure times of buses, trains, or other modes of transport at specific stops or stations.

3. Service alerts: Users receive notifications about any service disruptions, delays, or changes in routes or schedules.

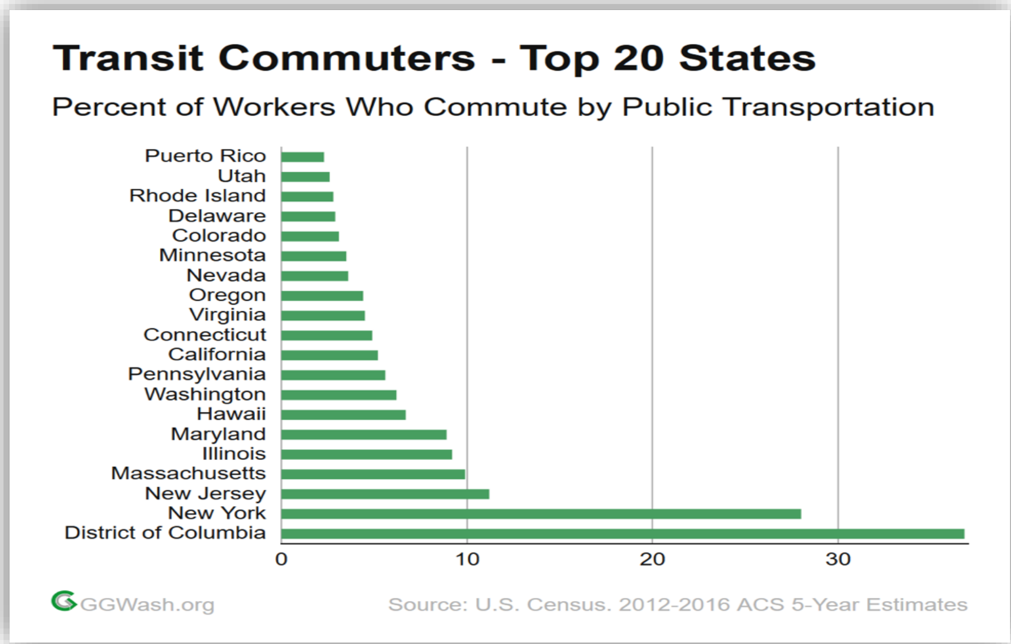
4. Maps and directions: The platform offers interactive maps and step-by-step directions, making it easier for users to navigate through different transit options.

5. Fare information: Users can check the fares for different modes of transportation and purchase tickets through the platform if available.

6. Accessibility information: The platform provides information about accessible routes, stations, and vehicles for people with disabilities.

7. Integration with other transportation services: Some platforms integrate with ride-sharing services or bike-sharing systems, allowing users to plan multi-modal trips.

8. User feedback and ratings: Users can provide feedback, rate their experience, and share information about the transit service's quality.



REAL TIME DATA:

Real-time application for public transportation optimization can be developed to improve the efficiency and effectiveness of public transportation systems. Here's how it could work:

1. Data Collection: The application would gather real-time data from various sources, including GPS devices installed in buses, trains, and other public transport vehicles. It would also collect data from traffic sensors, weather forecasts, and user feedback.

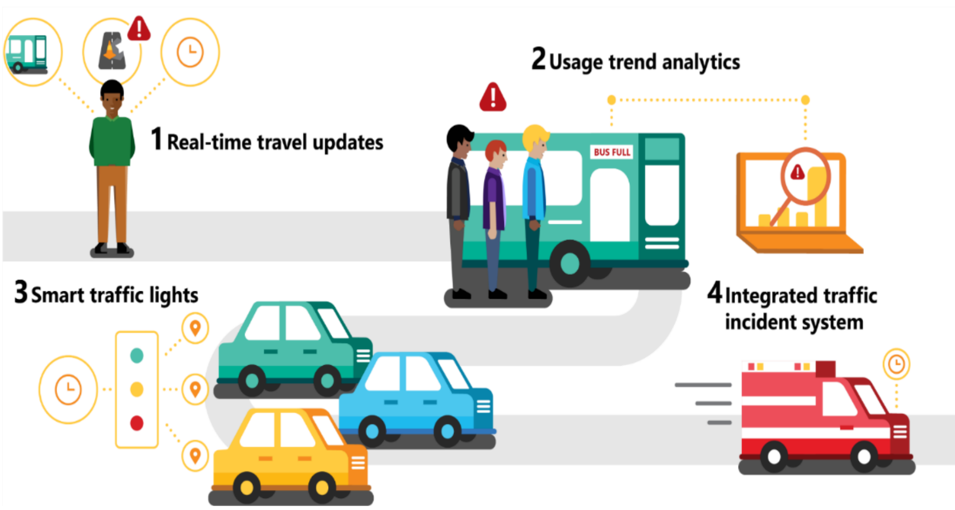
2. Route Optimization: The application would use the collected data to analyze and optimize routes for public transport vehicles. It would consider factors like traffic congestion, weather conditions, and passenger demand to suggest the most efficient routes for each vehicle.

3. Real-time Updates: The application would provide real-time updates to both public transport operators and passengers. Operators would receive information on traffic conditions, delays, and suggested route modifications. Passengers would be notified of any delays, changes in routes, or alternative transportation options.

4. Passenger Demand Prediction: By analyzing historical data and current trends, the application could predict passenger demand for different routes and time periods. This information would help operators adjust the frequency and capacity of their services to meet passenger needs.

5. Fare Integration: The application could integrate with existing fare collection systems, allowing passengers to make seamless payments and reducing the need for manual ticketing. This would make the boarding process faster and more efficient.

6. User Feedback and Ratings: The application would allow passengers to provide feedback and rate their experiences. Operators could use this information to identify areas for improvement and make necessary adjustments to enhance the quality.



1. DATA AVAILABILITY

```
import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.net.HttpURLConnection;
import java.net.URL;

public class TransportationDataFetcher {
   public static void main(String[] args) {
      try {
         // Replace with the actual API endpoint URL.
         String apiUrl = "https://example.com/public-transport-
api/routes";

         URL url = new URL(apiUrl);
         HttpURLConnection connection = (HttpURLConnection)
url.openConnection();
         connection.setRequestMethod("GET");

         int responseCode = connection.getResponseCode();
         if (responseCode == 200) {
            BufferedReader reader = new BufferedReader(new
InputStreamReader(connection.getInputStream()));
            String line;
            StringBuilder response = new StringBuilder();

            while ((line = reader.readLine()) != null) {
```

```
                response.append(line);
            }
            reader.close();

            // Parse and process the JSON response using a JSON library (e.g., Gson).

            // Implement your transportation optimization logic here.

        } else {
            System.out.println
```

2. COMPUTATIONAL RESOURSES

```
import java.util.*;


public class TransportationOptimizer {
    // Define the transportation graph and data structures here.


    public List<Node> findShortestPath(Node source, Node destination) {
        // Implement Dijkstra's algorithm to find the shortest path.
        // Return a list of nodes representing the optimal route.
    }
```

```
 public static void main(String[] args) {
     // Input data, create the graph, and find optimized routes.
   }
}
```

3. MODEL INTERPRETABILITY

```
import org.jfree.chart.ChartFactory;
import org.jfree.chart.ChartPanel;
import org.jfree.chart.JFreeChart;
import org.jfree.chart.plot.PlotOrientation;
import org.jfree.chart.plot.PlotOrientation;
import org.jfree.chart.plot.PlotOrientation;
import org.jfree.data.category.DefaultCategoryDataset;
import org.jfree.ui.ApplicationFrame;
import org.jfree.ui.RefineryUtilities;

public class PDPChart extends ApplicationFrame {

   public PDPChart(String title) {
```

```
        super(title);

        DefaultCategoryDataset dataset = new DefaultCategoryDataset();

        // Populate the dataset with feature values and corresponding
predictions

        JFreeChart lineChart = ChartFactory.createLineChart(
                "Partial Dependence Plot",
                "Feature Value",
                "Prediction",
                dataset,
                PlotOrientation.VERTICAL,
                true, true, false);

        ChartPanel chartPanel = new ChartPanel(lineChart);
        chartPanel.setPreferredSize(new java.awt.Dimension(800, 600));
        setContentPane(chartPanel);
    }

    public static void main(String[] args) {
```

```
        PDPChart chart = new PDPChart("Partial Dependence Plot Example");
        chart.pack();
        RefineryUtilities.centerFrameOnScreen(chart);
        chart.setVisible(true);
    }
}
```

MODEL EVALUATION

Evaluating a model for public transportation optimization involves assessing its performance and effectiveness. Here are key steps and metrics for such evaluation:

Data Collection:

Gather real-world data related to public transportation, including schedules, passenger demand, and infrastructure information.

Model Training:

Train the optimization model using historical data and relevant algorithms, such as linear programming, network flow optimization, or machine learning techniques.

Performance Metrics:

a. On-Time Performance: Measure how often the transportation system adheres to its schedules.

b. Passenger Satisfaction: Collect feedback from passengers to gauge their level of satisfaction with the service.

c. Efficiency: Evaluate the system's capacity utilization and resource allocation.

d. Cost Efficiency: Assess if the model helps in minimizing operational costs.

Simulation:

Run simulations to test how the model performs under various scenarios and in response to unexpected events.

Comparison:

Compare the model's results with the performance of the existing transportation system to determine improvements.

Sensitivity Analysis:

Assess how changes in input parameters or assumptions affect the model's output.

Scalability:

Evaluate if the model can handle an increased volume of data or changes in the transportation network.

Robustness:

Test the model's resilience to disruptions, such as weather events or accidents.

Safety:

Ensure that the model doesn't compromise safety standards in transportation operations.

Accessibility:

Consider the impact of the model on the accessibility of public transportation for all community members.

Environmental Impact:

Assess if the model helps reduce the environmental footprint of public transportation.

Cost-Benefit Analysis:

Calculate the economic benefits and costs associated with implementing the model.

Continuous Improvement:

Regularly update and refine the model based on feedback and changing transportation needs.

EVALUATION OF PREDICTED DATA:

PROGRAM: 1

```
public class DataEvaluation {

  public static void main(String[] args) {
    // Actual data and predicted data arrays
    double[] actualData = {10.5, 12.0, 9.8, 15.2, 11.0};
    double[] predictedData = {10.2, 11.8, 10.0, 14.5, 11.3};

    // Calculate Mean Absolute Error
    double mae = calculateMeanAbsoluteError(actualData,
predictedData);

    System.out.println("Mean Absolute Error (MAE): " + mae);
  }
```

```
    public static double calculateMeanAbsoluteError(double[] actualData, double[] predictedData) {
        if (actualData.length != predictedData.length) {
            throw new IllegalArgumentException("Input arrays must have the same length");
        }

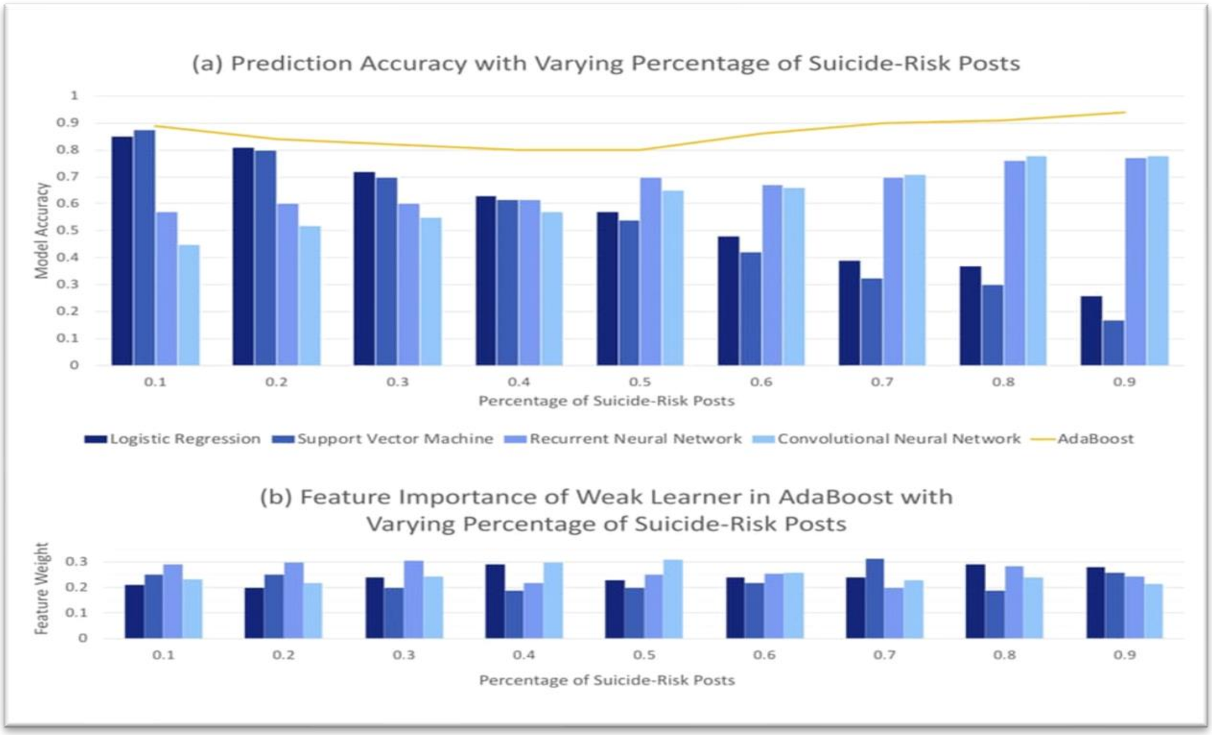
        int n = actualData.length;
        double sum = 0.0;

        for (int i = 0; i < n; i++) {
            sum += Math.abs(actualData[i] - predictedData[i]);
        }

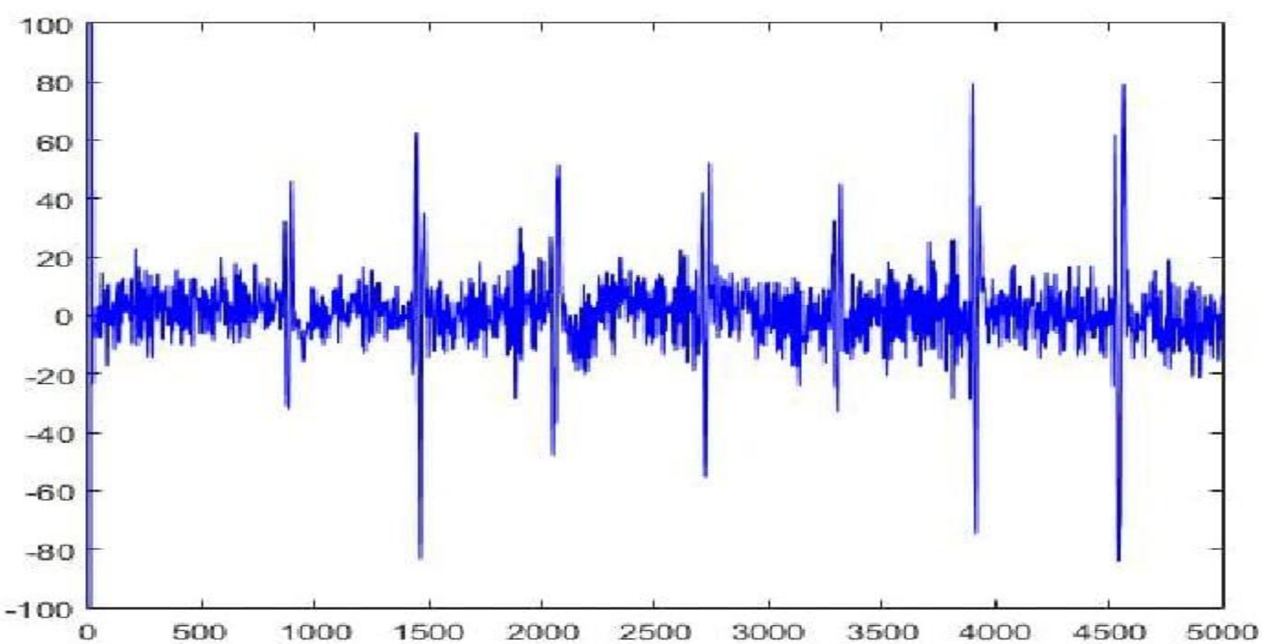
        return sum / n;
    }
}
```

WAVEFORM OF PUBLIC TRANSPORTATION OPTIMIZATION IN FUTURE GRAPHS.

A, PREDICTION *B, FEATURE*

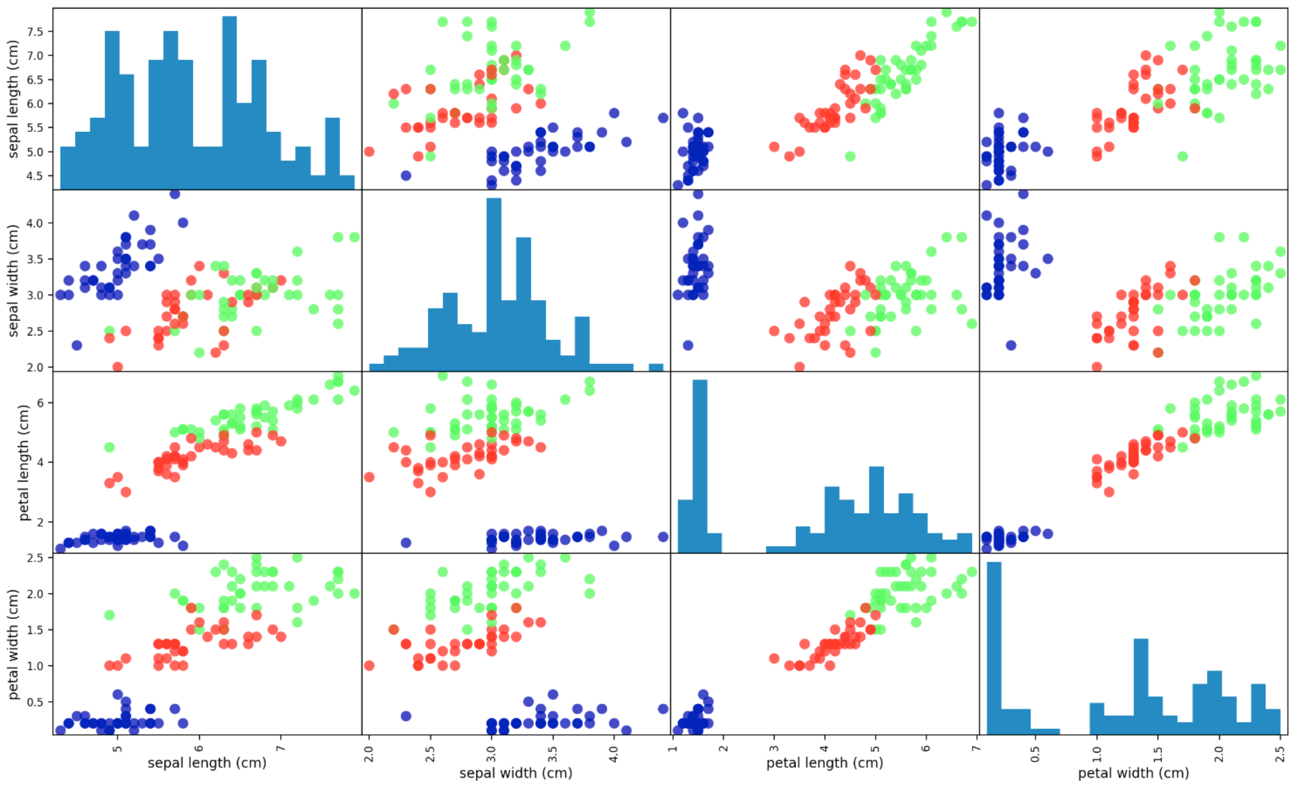


GRAPHICALLY REPRESENTATION OF PREDICATION IN EVALUATION



DATA PREPARTION:

Public transportation plays a crucial role in urban transportation systems, providing an efficient and sustainable mode of commuting for a large number of people. To ensure an optimized and effective public transportation system, it is essential to analyze and utilize data to make informed decisions and improvements. This data presentation aims to explore the various aspects of public transportation optimization using data-driven approaches.



PAIR PLOT OF DIFFERENT VARIABLES.

LOADING AND PREPROCESSING DATASETS IN PUBLIC TRANSPORTATION OPTIMIZATION.

IMPORT THE REQUIRED LIBRARIES:

```python
import pandas as pd
import numpy as np
```

LOAD THE DATASET INTO A PANDAS DATAFRAME:

```python
df = pd.read_csv('dataset.csv')
```

Replace 'dataset.csv' with the actual filename and path of your dataset.

Perform initial data exploration:

```python
# Display the first few rows of the dataset
print(df.head())

# Check the dimensions of the dataset
print(df.shape)

# Check the data types of the columns
print(df.dtypes)

# Check for missing values
print(df.isnull().sum())
```

Preprocess the dataset:

- Handle missing values: Decide how to handle missing values based on the specific dataset and problem domain. Options include dropping the rows or columns with missing values, imputing missing values, or using other advanced techniques.
- Convert data types: If necessary, convert any columns with incorrect data types to the appropriate format (e.g., converting strings to datetime objects).
- Remove unnecessary columns: Identify and remove any columns that are not relevant to the optimization problem.
- Handle categorical variables: If the dataset contains categorical variables, encode them into numerical representations using techniques like one-hot encoding or label encoding.

Here are some examples preprocessing steps:

```python
# Drop rows with missing values
df = df.dropna()

# Convert date column to datetime object
df['date'] = pd.to_datetime(df['date'])

# Remove unnecessary columns
df = df.drop(['column1', 'column2'], axis=1)

# Perform one-hot encoding for categorical variables
df = pd.get_dummies(df, columns=['category'])
```

Normalize or scale the data: If required, apply normalization or scaling techniques to ensure the features are on a similar scale.

This can be important for certain optimization algorithms.

Here is an example of applying min-max scaling:

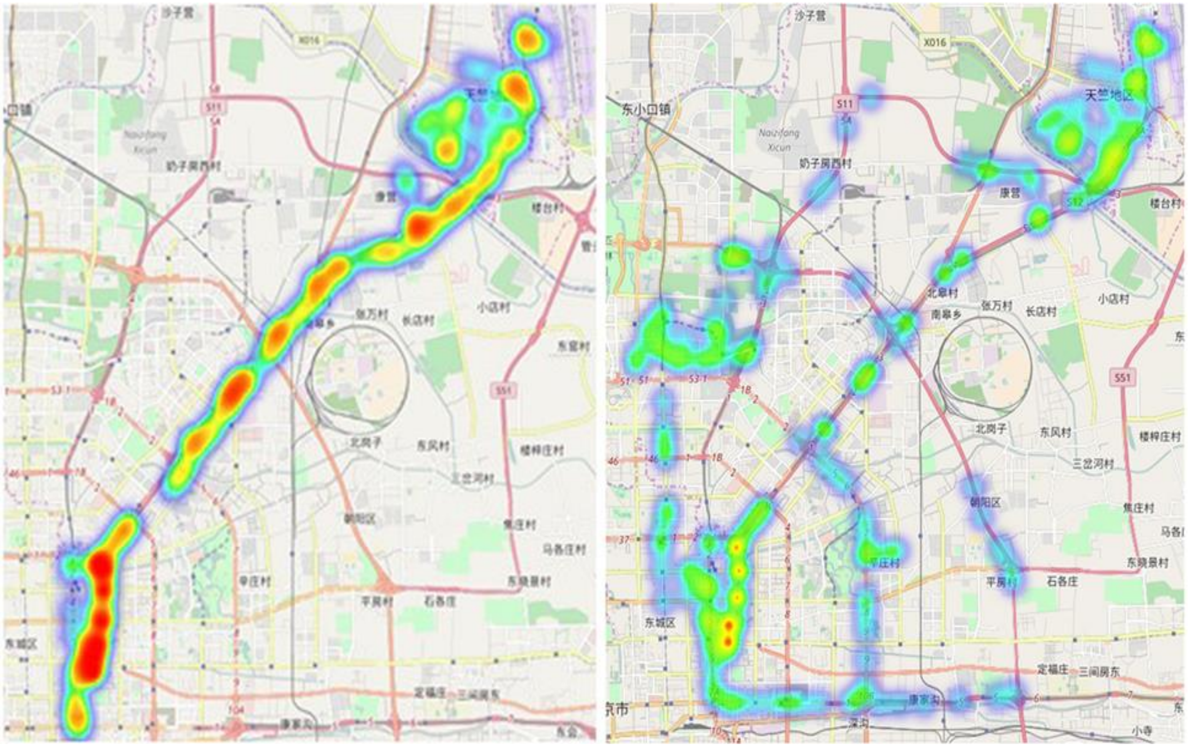
```python
from sklearn.preprocessing import MinMaxScaler

scaler = MinMaxScaler()
df_scaled = pd.DataFrame(scaler.fit_transform(df), columns=df.columns)
```

DATA ACQUISITION

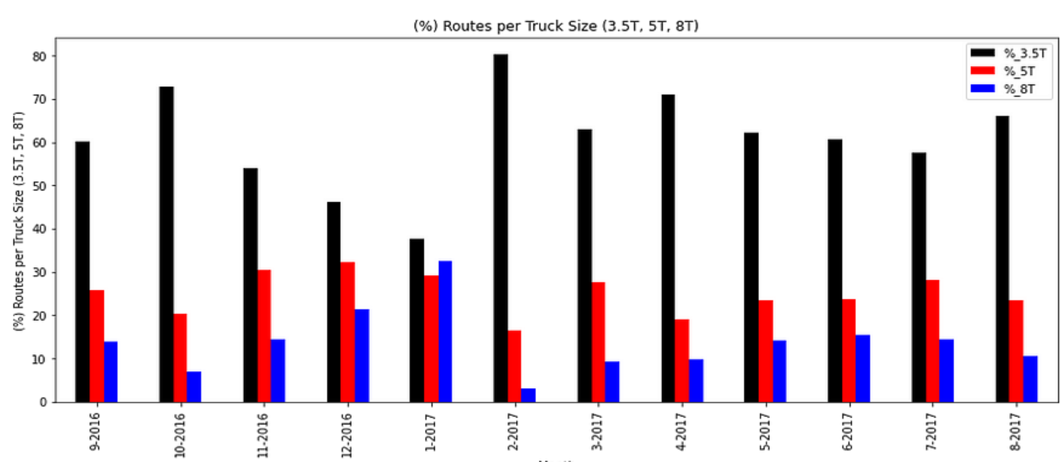
Data acquisition refers to the process of collecting and capturing data from various sources, such as sensors, instruments, and other data-generating devices. This can include physical measurements, signals, images, videos, and other forms of data.

The process of data acquisition typically involves connecting the data source to a data acquisition system or device, which can be a computer, data logger, or specialized hardware. The data acquisition system then captures and converts the data into a digital format for further processing and analysis.

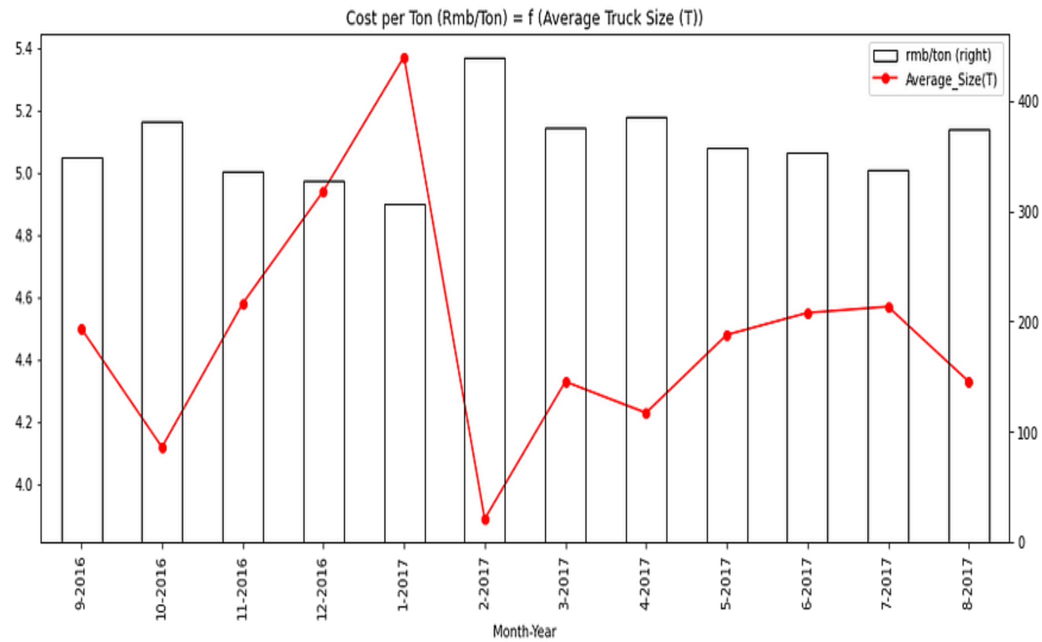
It can be stored, processed, analyzed, and visualized to extract meaningful insights and make informed decisions. Data acquisition is a fundamental step in many scientific, industrial, and research applications, including environmental monitoring, industrial automation, quality control, scientific experiments, and more.



Visualization: % Deliveries per Truck Size



(%) of Route per Truck Size (3.5T, 5T, 8T) — (Image by Author)



Impact of Average Truck Size (Ton) on Overall Cost per Ton (Rmb/Ton) — (Image by Author)

Insights

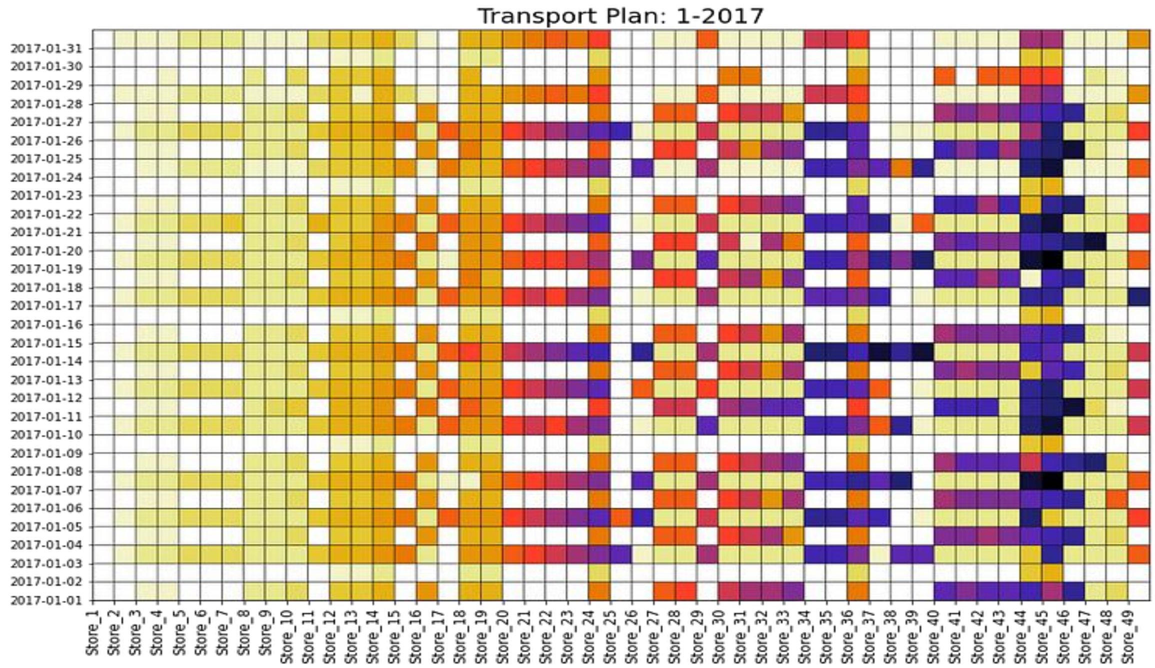
- **Average Truck Size:** a large majority of small trucks
- **Cost per ton:** the inverse proportion of cost per ton and average truck size

Find more inspiration for smart visualizations in this tutorial,

III. Understand Current Situation: Visualisation

1. Transportation Plan Visualisation

Objective: Get a simple visualisation of all deliveries per day with a focus on the number of different routes



Solution: Python's Matplotlib grid function

- **Columns:** 1 Column = 1 Store
- **Rows:** 1 Row = 1 Day
- **Colour = White:** 0 delivery
- **Colours:** 1 Color = 1 Route (1 Truck)

Visual Insights

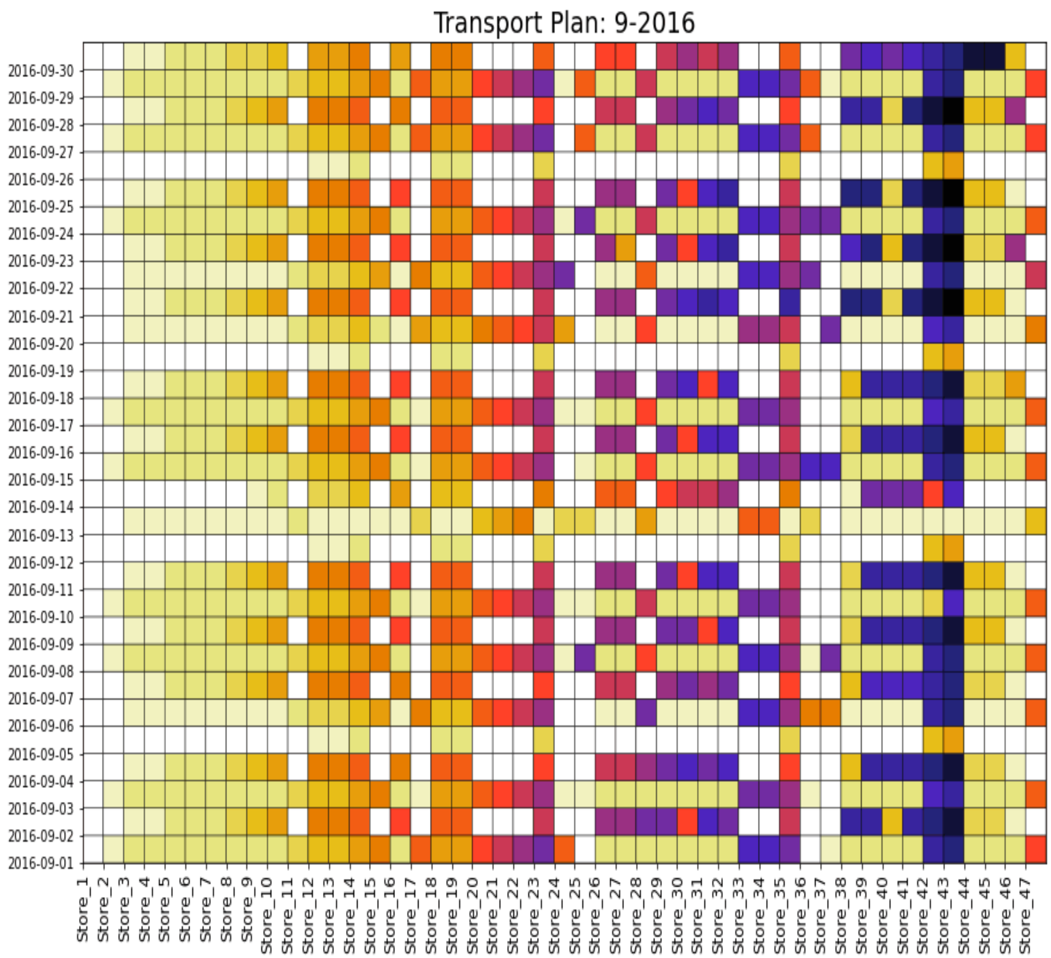
- **Delivery Frequency:** n deliveries per week

- **Number of Routes:** how many different colours do you have a day?

- **Colour = White:** no delivery

- **Routes:** do we have the same stores grouped from one day to another?

12 Months Overview



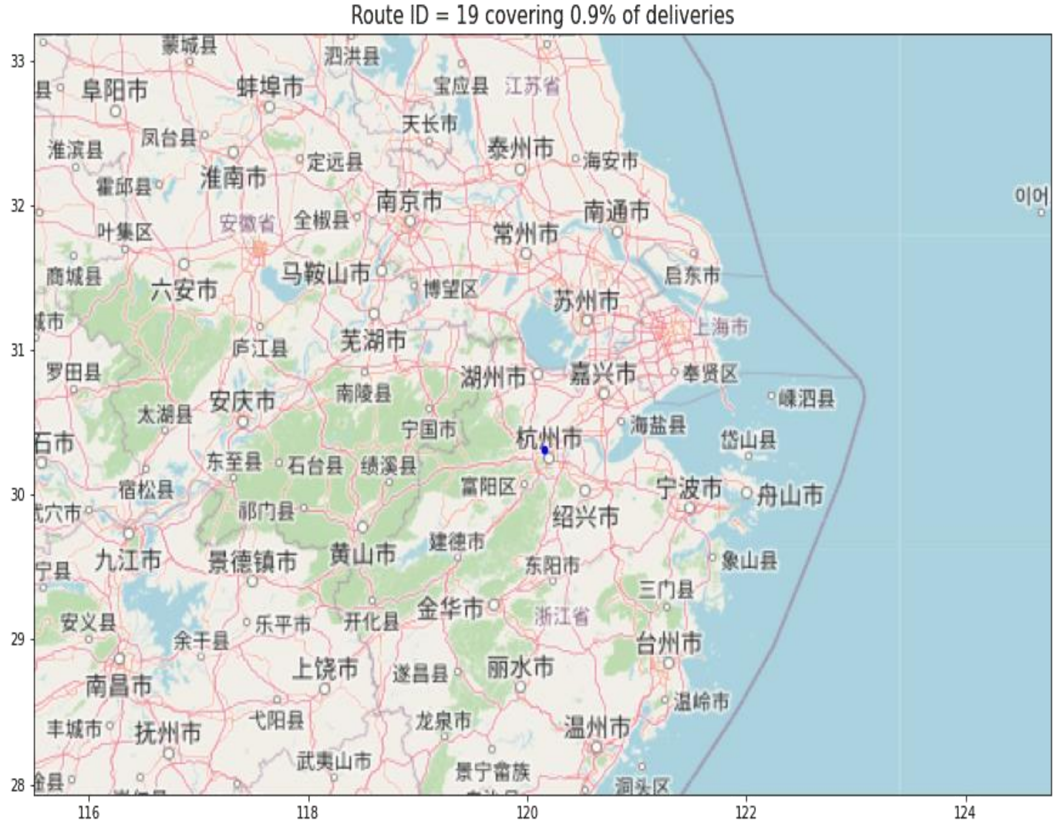
After optimization, this chart will help us to easily visualize the impact of new routing. A better routing means fewer routes per day so you'll have fewer colours per line.

2. Geographical Visualization of Store Deliveries

Objective

Visualisation of geographical locations delivered in the same route

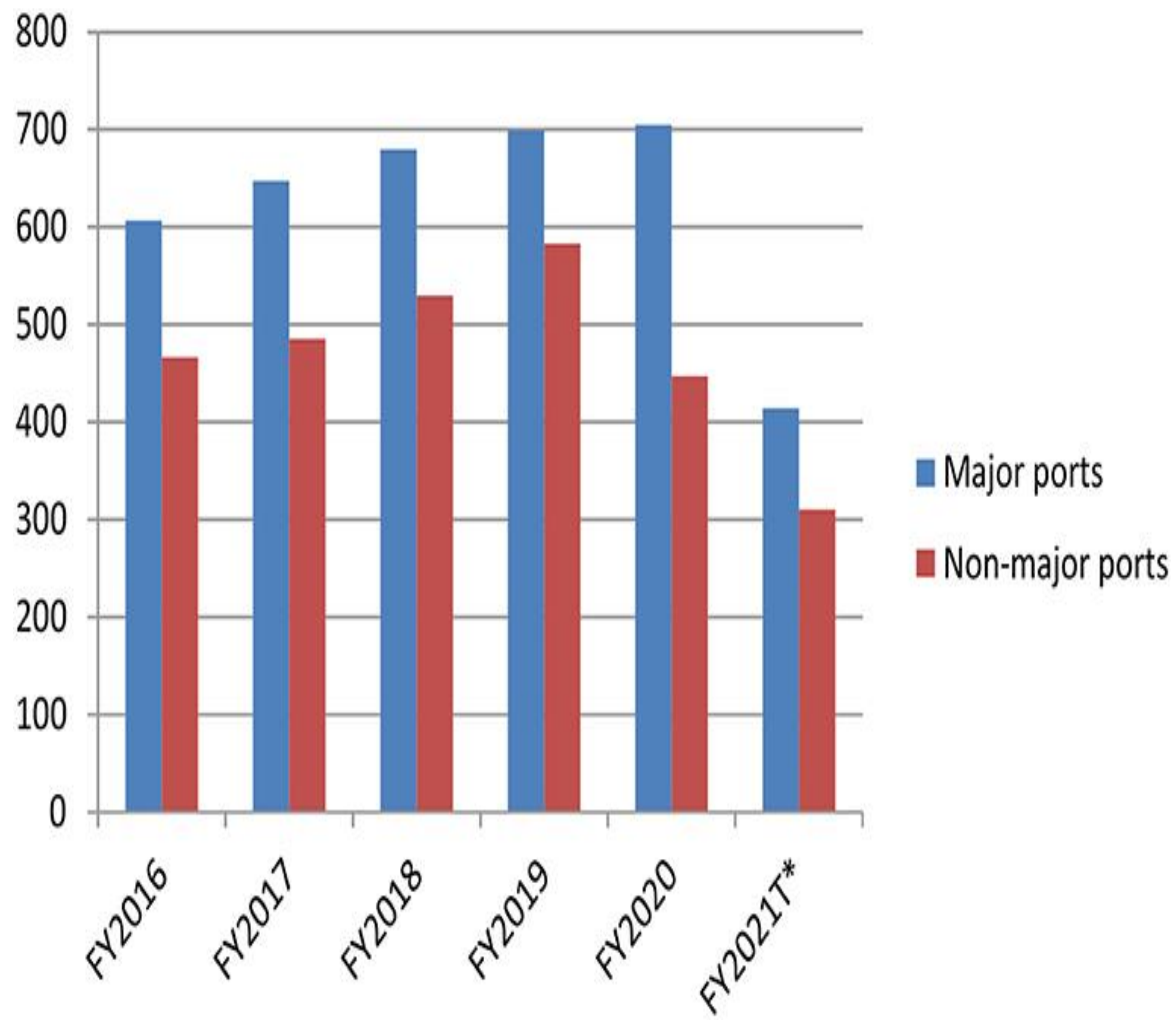
Route ID = 19 covering 0.9% of deliveries



VISUALIZATION OF ANALYTICS RESULTS:

Visualization of analytics results for public transportation optimization enables decision-makers to easily interpret the data and gain valuable insights. By transforming complex data into visual representations such as graphs, charts, maps, and interactive dashboards, the information becomes accessible and actionable.

These visualizations can help identify patterns, trends, and correlations in public transportation data, allowing stakeholders to make better-informed decisions. For example, by visualizing passenger flow in real-time, transport authorities can identify overcrowded routes and take measures to optimize schedules or allocate additional resources.



ADVANTAGES:

Efficiency:

Optimal public transportation systems can reduce travel times, increase service frequency, and minimize delays. This leads to more efficient and reliable transportation for commuters, allowing them to reach their destinations in a timely manner.

Cost-effectiveness:

Optimizing public transportation can lead to cost savings on both the individual and societal levels. By reducing the number of private vehicles on the road, public transportation can help decrease congestion, which in turn reduces fuel consumption and lowers overall transportation costs.

Environmental sustainability:

Public transportation optimization plays a crucial role in reducing greenhouse gas emissions and combating climate change. By encouraging more people to use public transportation instead of private vehicles, cities can significantly decrease air pollution and carbon emissions.

Accessibility:

An optimized public transportation system ensures better accessibility for all members of society, including those with disabilities or limited mobility. It provides a reliable and affordable means of transportation for individuals who do not own cars or cannot drive.

Social equity:

Public transportation optimization can contribute to more equitable access to opportunities and services. By providing affordable and accessible transportation options, it helps bridge the gap between different socio-economic groups, allowing people from all backgrounds to access education, employment, healthcare, and other essential services.

Reduced traffic congestion:

Well-designed public transportation systems can alleviate traffic congestion by reducing the number of private vehicles on the road. This leads to smoother traffic flow and less time wasted in traffic jams.

DISADVANTAGES:

1. Gather data: Collect relevant information about the public transportation system in question, including its current optimization strategies, user feedback, and any existing studies or reports on the topic.

2. Identify stakeholders: Determine the various groups or individuals affected by public transportation optimization, including passengers, drivers, local businesses, and government agencies.

3. Conduct surveys and interviews: Use surveys and interviews to gather opinions and experiences from different stakeholders. Ask them specifically about the downsides or challenges they face with the current public transportation optimization efforts.

4. Analyze data: Carefully examine the data collected to identify common themes or recurring issues related to the disadvantages of public transportation optimization. Look for patterns and correlations among different stakeholders' responses.

5. Conduct a literature review: Review existing research, studies, and reports related to public transportation optimization. Look for any documented disadvantages or challenges associated with similar optimization efforts in other locations.

6. Consult experts: Seek input from transportation planners, urban designers, or other experts in the field. They can provide insights into the potential drawbacks of public transportation optimization and suggest possible mitigation strategies.

7. Prioritize and validate findings: Rank the identified disadvantages in terms of their significance and impact. Validate your findings by discussing them with key stakeholders and experts to ensure accuracy and thoroughness.

BENEFITS:

There are several benefits of public transportation optimization:

1. Increased efficiency: Optimizing public transportation systems can lead to improved route planning, reduced travel times, and better coordination of services. This can help reduce congestion on roads and improve overall system efficiency.

2. Cost savings: By optimizing public transportation, governments and transit agencies can potentially reduce operational costs. This can include savings in fuel consumption, maintenance expenses, and staffing requirements.

3. Environmental sustainability: Public transportation optimization can help reduce greenhouse gas emissions by encouraging people to use public transit instead of personal vehicles. This can contribute to cleaner air and a healthier environment.

4. Accessibility and equity: Optimized public transportation systems can ensure that transportation services are available to all, regardless of their socioeconomic status or physical abilities. This can help promote equality and provide affordable and convenient transportation options for everyone.

5. Social benefits: By optimizing public transportation, cities can create more connected communities, as people have better access to jobs, education, healthcare, and recreational activities. This can also help reduce social isolation and improve overall quality of life for residents.

6. Safety improvements: Optimized public transportation systems can include features such as improved infrastructure, real-time tracking, and security measures. These measures can enhance passenger safety and reduce the risk of accidents or incidents.

Overall, public transportation optimization can lead to more efficient, sustainable, and accessible transportation systems that benefit both individuals and communities as a whole.

CONCLUSIONS:

In conclusion, optimizing public transportation involves several important steps. The first step is to conduct a comprehensive analysis of the existing system, including evaluating the current routes, schedules, and infrastructure. This analysis will help identify areas for improvement and determine the overall goals of the optimization process.

The second step is to gather data and feedback from passengers, stakeholders, and other relevant parties. This information can provide valuable insights into the needs and preferences of the public, helping to identify specific areas that require attention.

After gathering data, the next step is to develop a strategic plan for optimization. This plan should outline specific initiatives and actions to be taken, such as adding new routes, adjusting schedules, or improving infrastructure. It should also include clear objectives and a timeline for implementation.

Once the plan is developed, the next step is to implement the proposed changes. This may involve collaborating with various stakeholders, such as government agencies, transportation companies, and community organizations. Effective communication and coordination are crucial during this to ensure a smooth transition and minimize disruptions to passengers.

After implementation, it is important to continuously monitor and evaluate the effectiveness of the optimization measures. This involves collecting and analyzing data on ridership, travel times, customer satisfaction, and other relevant metrics. This feedback will help identify any areas that need further improvement or adjustments.

Overall, optimizing public transportation requires a systematic approach that involves thorough analysis, stakeholder engagement, strategic planning, implementation, and ongoing evaluation. By following these steps, public transportation systems can be made more efficient.


THANK
YOU