



## **Unlocking insights into the Global Air Transportable Network with Tableau**

**Project Based Experiential Learning Program**

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## **1. INTRODUCTION**

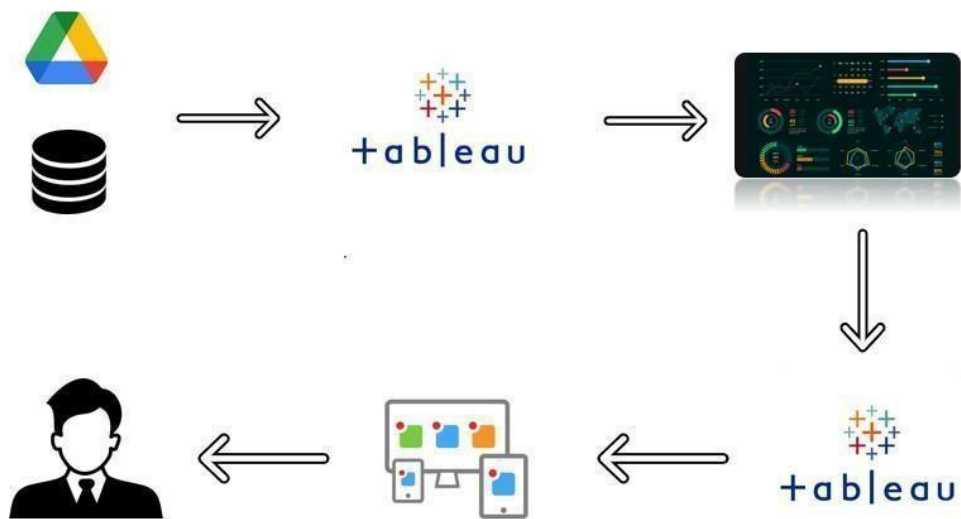
### **1.1 Overview**

The air transport system generally includes airports, ATC (air traffic control) system, and airlines. The airports represent the ground part of the system's infrastructure handling the aircraft operated by different airlines transporting passengers and freight/cargo shipments.

### **1.2 Purpose**

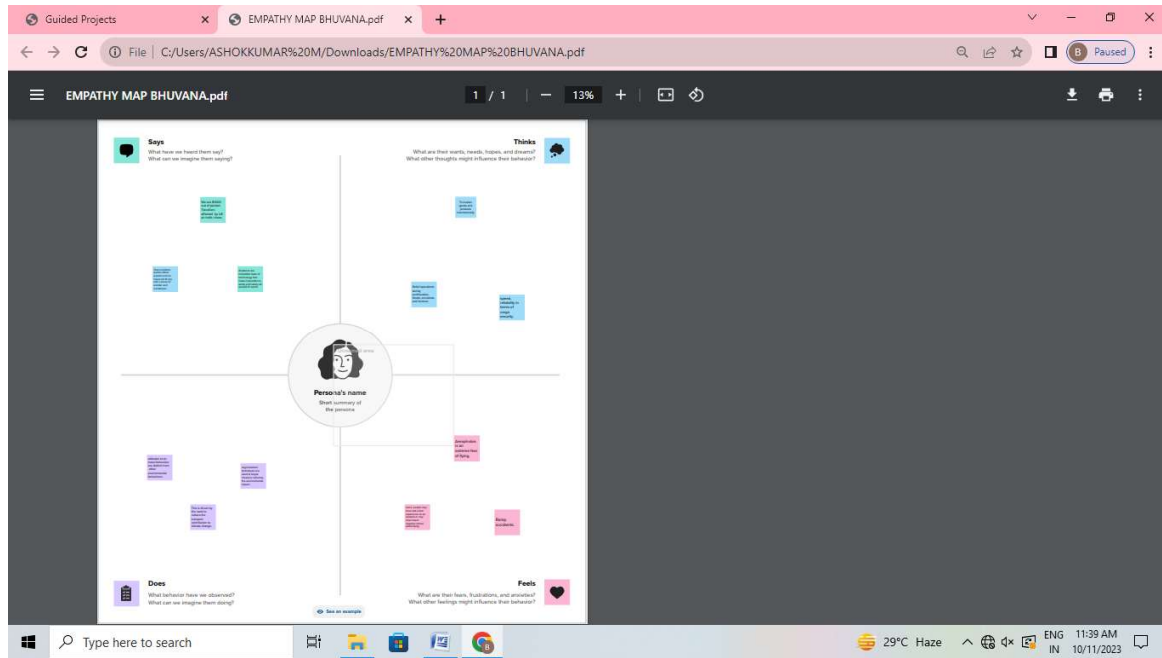
Air transport allows people from different countries to cross international boundaries and travel other countries for personal, business, medical, and tourism purposes.

## Technical Architecture:

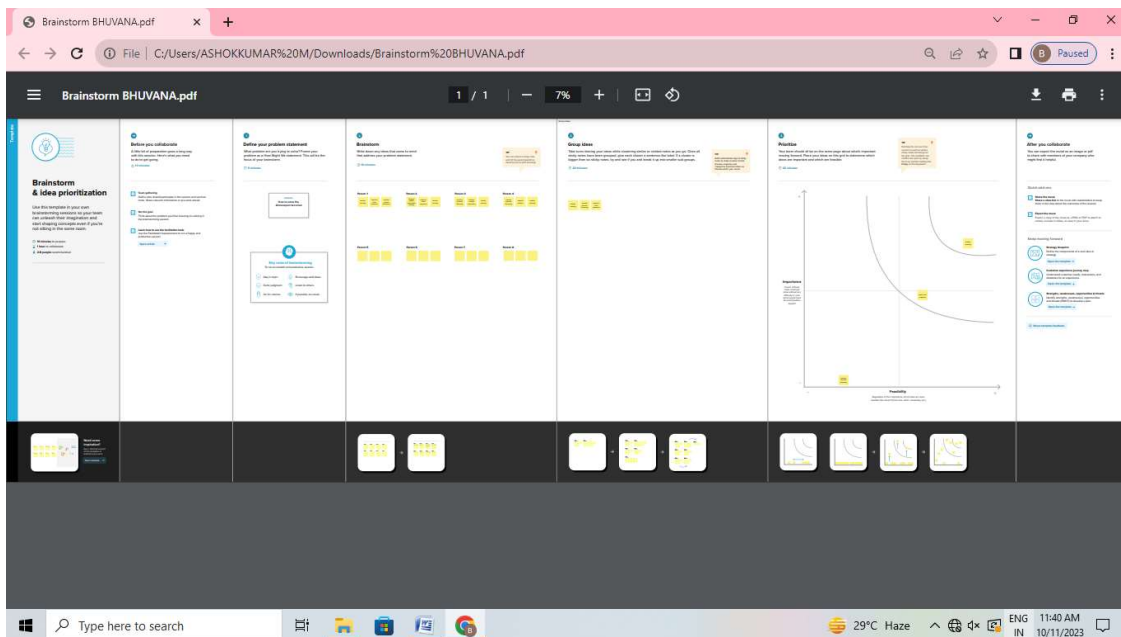


## 2. Problem Definition & Define Thinking

### 2.1 Empathy Map



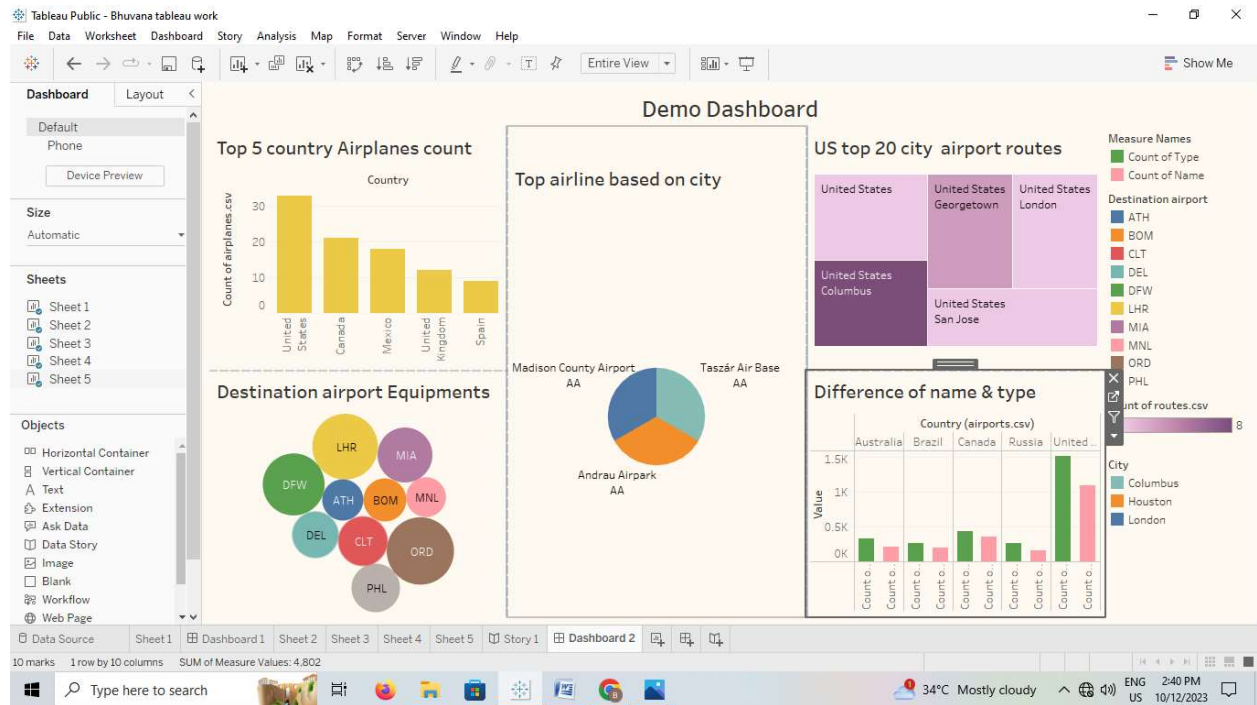
### 2.2 Brain Storming Map



### 3. Results

#### 3.1 Tableau public Dashboard

Screenshot:

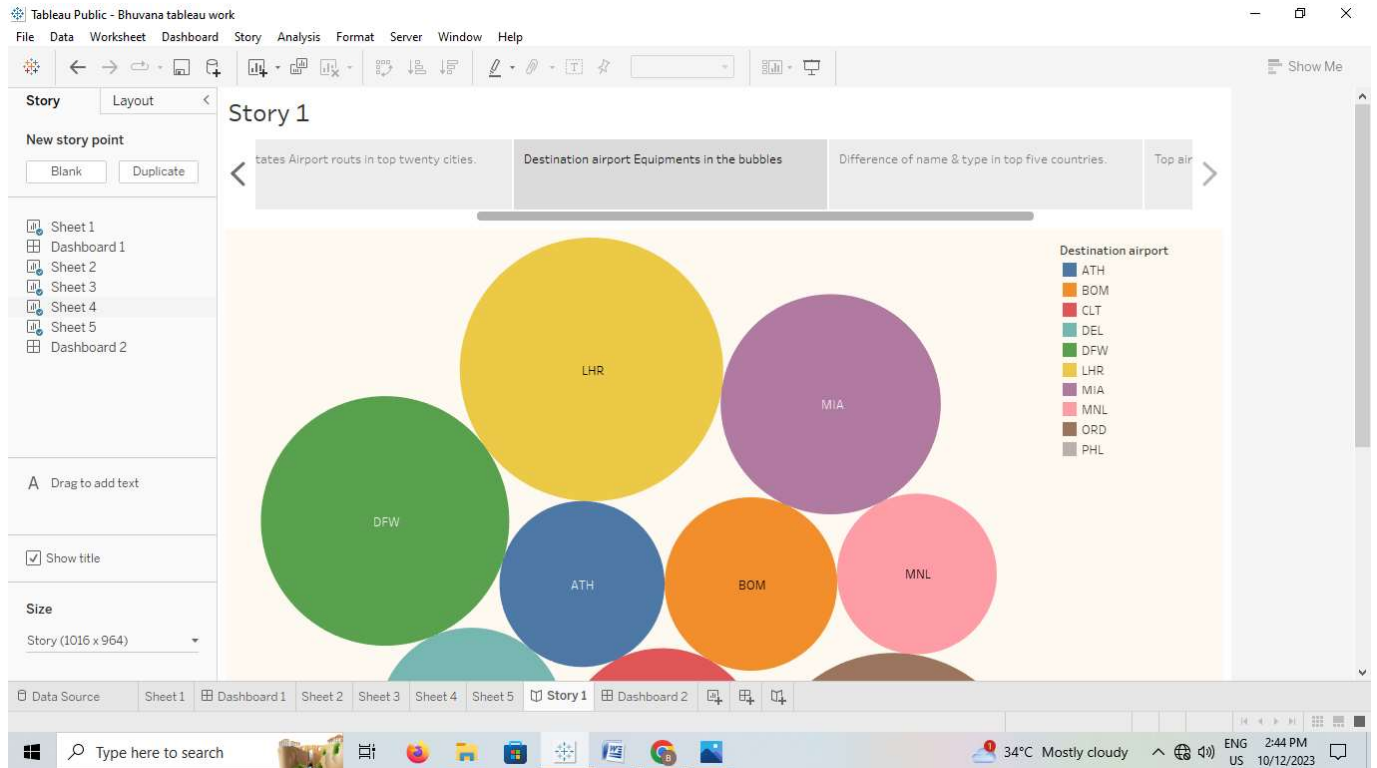


Link:

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## 3.2 Tableau public story

Screenshot:

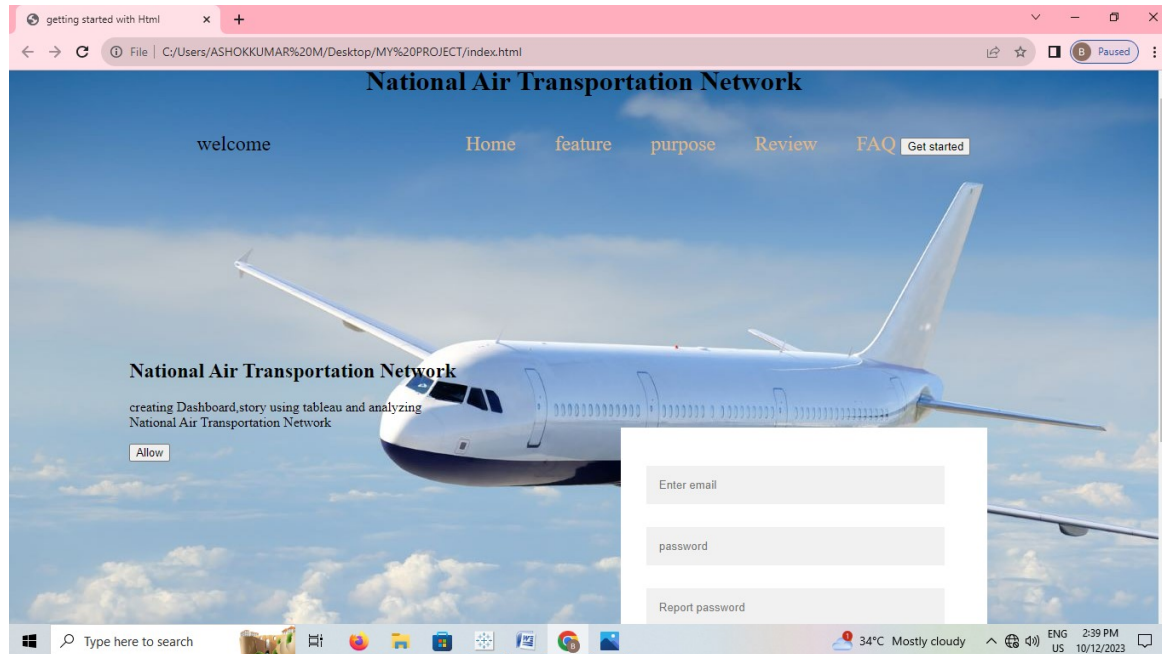


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### 3.3 Web applications

#### HTML Template Screenshot:



## **4. ADVANTAGES & DISADVANTAGES**

### **4.1 Advantages**

#### **Global Reach:**

Air transport provides extensive global coverage, connecting businesses to various destinations around the world. It allows companies to expand their customer base and reach new markets, irrespective of geographical barriers. This enables businesses to tap into international opportunities and access a broader range of customers.

#### **Reliable Timeline:**

. This reliability is crucial for businesses that require precise order preparation and fulfillment to meet customer Air transport operates on fixed schedules, ensuring reliable timelines for delivery. Airlines maintain strict adherence to departure and arrival times, minimizing delays and enhancing supply chain efficiency expectations.

#### **Reduced Inventory Holding Costs:**

The fast transit times offered by air transport help reduce inventory holding costs. With shorter lead times, businesses can maintain lower inventory levels while still meeting customer demands. This frees up working capital and minimizes storage expenses, contributing to overall cost savings.

#### **Enhanced Security:**

Air transport offers enhanced security measures compared to other modes of transportation. Airports have stringent security protocols in place to ensure the safety of cargo, including thorough screening processes and restricted access. This helps protect valuable and sensitive products during transit, reducing the risk of theft or damage.



## **4.2 Disadvantages**

### **Higher Cost:**

One of the significant drawbacks of air transport is its higher cost compared to other modes, such as sea or land transport. Air freight charges are generally higher due to factors like fuel costs, infrastructure investments, and handling fees. Businesses must carefully evaluate the cost-benefit analysis of air transport based on their specific needs and budget.

### **Limited Capacity:**

Airplanes have limited cargo space compared to ships or trains. This limited capacity can pose challenges for businesses dealing with bulky or oversized shipments. Air transport is best suited for high-value, time-sensitive goods that require swift delivery, rather than large-volume shipments.

### **Restrictions on Hazardous Goods:**

Air transport has strict regulations regarding the transportation of hazardous goods. Certain hazardous materials or substances may be prohibited from being transported by air due to safety concerns. Businesses dealing with such goods need to comply with stringent regulations and find alternative transportation methods if necessary.

Understanding the advantages and disadvantages of air transport is crucial for businesses seeking efficient order preparation and global shipping solutions. The speed, global reach, reliable timelines, reduced inventory holding costs, and enhanced security make air transport an attractive option for many companies. However, it is essential to consider the higher cost and limited capacity associated with air transport.

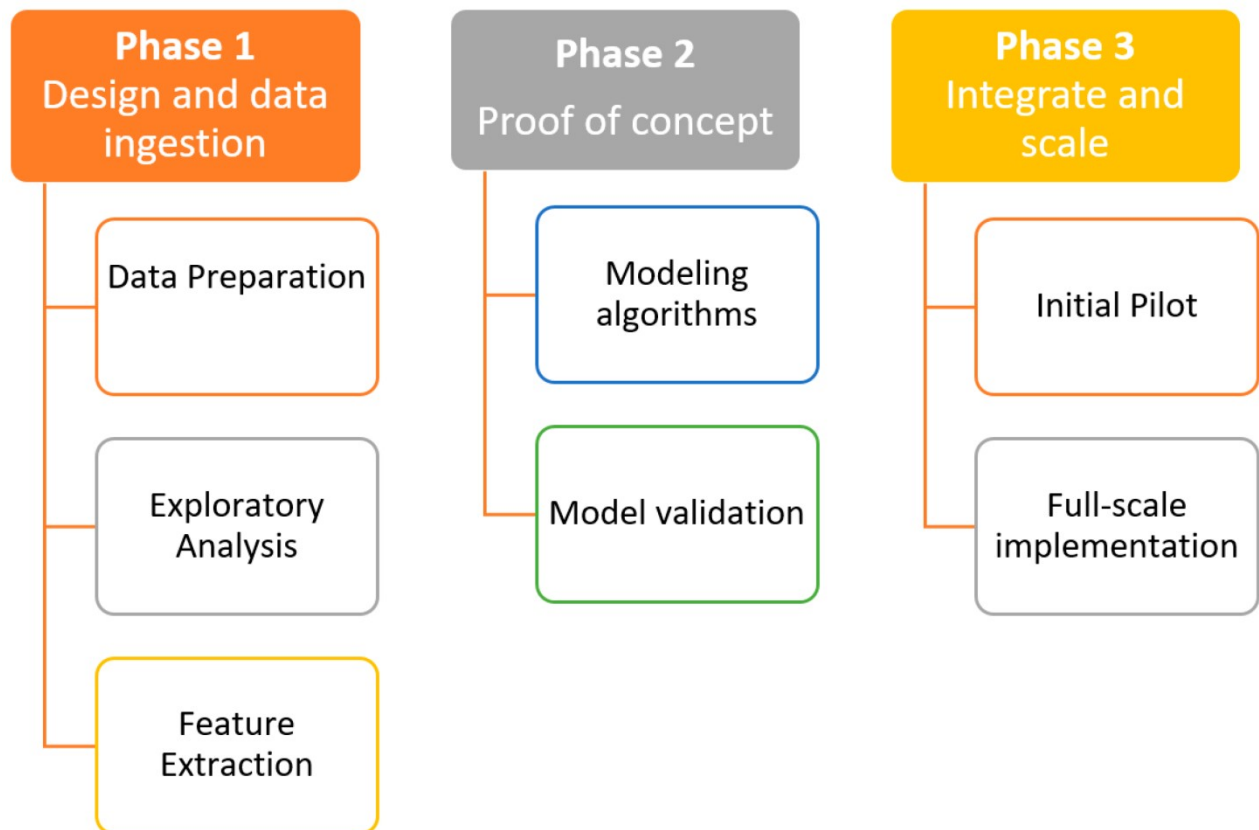
## 5. APPLICATIONS

In many cases, it is hard to fully understand the relationships between the characteristics of the transportation system; therefore, AI methods can be presented as a smart solution for such complex systems that can't be managed using traditional methods. Many researchers have demonstrated the advantages of AI in transport. An example of that includes transforming the traffic sensors on the road into a smart agent that detects accidents automatically and predicts future traffic conditions . Also, there are many AI methods used in transport such as ANNs. ANNs can be used for road planning public transport Traffic Incident Detection and predicting traffic conditions It is classified into supervised and unsupervised learning methods. Supervised methods include Support Vector Machine (SVM), Probabilistic Neural Network (PNN), Radial Basis Network (RBN), K-Nearest Neighbors and Decision Tree, etc. while unsupervised NNs include greedy layer-wise and cluster analysis.

Many transportation problems lead to an optimization problem that needs bespoke algorithms to make computational analytics easy to solve. They are highly advanced computational algorithms referred to as raster algorithms. The Genetic Algorithm (GA) is an example of those algorithms. It is based on the evolutionary biological concept. It solves complex optimizations problems based on “survival of the fitness” concept and it is a good tool to use in the urban design networks . Another algorithm is Simulated Annealing (SA) which is obtained from by simulating the process of annealing of metal. Ant Colony Optimiser (ACO) is also an AI algorithm developed based on the behaviour of a group of real ants following their path from the nest to food source .An artificial Immune system (AIS) which is modelled based on the human immune system . Bee Colony Optimization (BCO) which solves a hybrid complex optimization problem . ACO and BCO are part of swarm intelligence systems .

Swarm intelligence is an AI system which is inspired by ants and bees working together as a group to reach to an optimised solution. The intelligent computational analytics of these system are able to represent uncertainty, imprecision and vague concepts, hence these techniques are used for route optimization problems in transport . Another optimisation technique is Fuzzy Logic Model (FLM). It is applied to solve shortest path optimization. The performance of FLM is

compared with Logistic Regression Model (LRM) by when developing a route choice model, and FLM outperformed. Therefore, intelligent techniques such as FLM, GA, ANN, ACO are suitable for prediction, reasoning, and adaptability. Therefore, these are used to solve optimization problems which involve dynamic traffic situations and events. Another novel software paradigm has introduced based on AI theories, called Agent-Based Software Engineering (ABSE). ABSE is capable of allowing the dynamic approach to identifying shortest path through the formation of multi-criteria and multi scenarios .



## 6. CONCLUSION

The air transport industry is not only a vital engine of global socio-economic growth but is also of vital importance as a catalyst for economic development in most countries and for many regions within each country. Its importance arises not only from its ability to facilitate the movement of people but also its ability to expedite the movement goods.

Currently, rising operating costs, stocked by the high price of aviation fuel combined with slowing or even negative demand growth, will lead to dramatic restructuring of the airline industry and the collapse of many airlines especially smaller ones. Reduces access to air services for both passengers and freight may put many communities at a disadvantage.

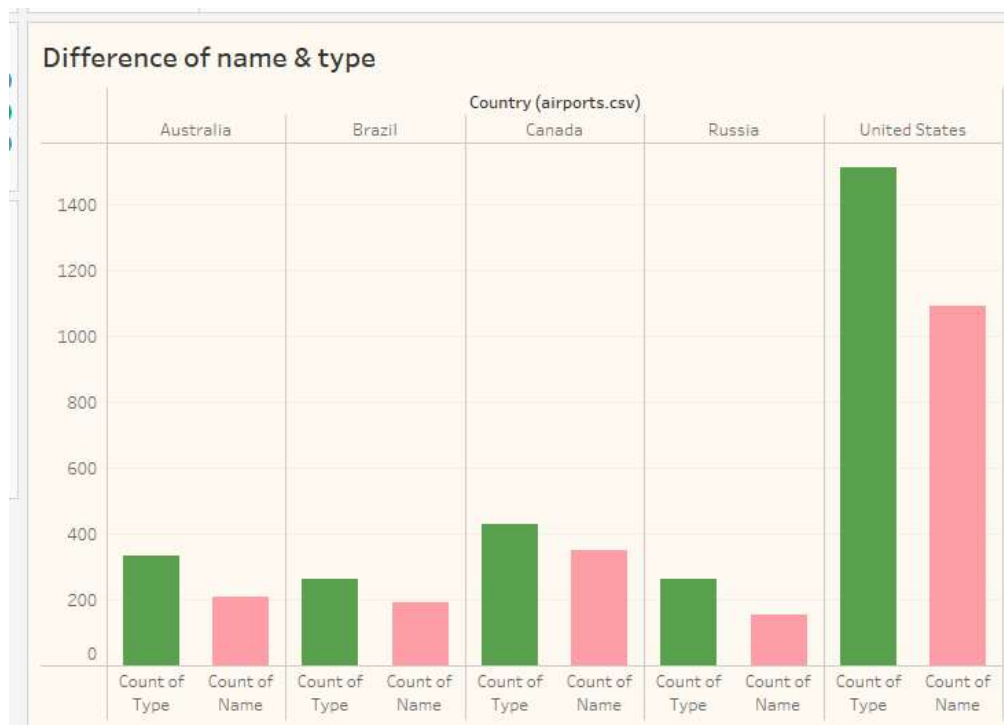
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Air transport allows people from different countries to cross international boundaries and travel other countries for personal, business, medical, and tourism purposes.

## 7. FEATURE SCOPE

It has been noted that ANN is a robust model because it can cover multiple AI tasks and it doesn't need a deep understanding of the process for a certain targeted task. Its advantages also include relating inputs to outputs using pattern recognition. It also can manage a huge amount of data with well adjustment and performance when surrounded by noisy data. It saves time since it is a fast computation tool with good performance. It is successfully implemented when tested around different structures and different tasks. However, very few research has been conducted for a long-term traffic state prediction using deep learning architecture. Also, previous research focuses on only one or two traffic parameters to develop the model. Therefore, a future research will be directed towards enhancing predictive operations using more than two features and more than one hidden layer for the structure of the model.

The aim is to estimate future traffic based on historical and real-time information collected from detector stations located upstream and downstream and cameras attached on the freeway. A freeway in Melbourne/Australia will be selected as a Test Bed to demonstrate the feasibility of the research and the specific location and data gathering will be agreed on with the freeway authority at the early stage of the research. As seen in the previous research, the successful implementation of ANN is to choose the right architecture for the network i.e., the number of neurons in the hidden layers and the number of hidden layers. A deep learning system is chosen because it can detect increasingly subtle features of the input data (e.g., combinations of the on-ramp and mainline traffic flows, geometric bottlenecks and weather conditions) which together might produce unique traffic situations on the freeway.



## **8. APPENDIX**

### **Discrimination is Prohibited:**

Management of carriers are required to ensure that the carrier (either directly or indirectly through its contractual, licensing, or other arrangements for provision of air transportation) does not discriminate against qualified individuals with a disability by reason of such disability. In addition, management of carriers should be aware that they are responsible for compliance with the ACAA and not only by their *own* employees, but also by employees of any company or entity performing functions on behalf of the carrier.

More specifically, carriers cannot require a passenger with a disability to accept special services, *e.g.*, pre-boarding, not requested by the passenger. Carriers cannot exclude a qualified individual with a disability from or deny that individual the benefit of air transportation or related services that are available to other individuals, even if there are separate or different services available for passengers with a disability, except as provided by the ACAA . Carriers cannot take actions adverse to passengers with a disability if they assert their rights under the ACAA .

Carriers cannot limit the number of passengers with a disability on a given flight. Carriers must modify policies, practices, and facilities as necessary to ensure nondiscrimination consistent with the standards of the Rehabilitation Act, as amended. Carriers are not required to make modifications that would constitute an undue burden or would fundamentally alter their program.

### **Refusal of Transportation:**

Carriers cannot refuse transportation to a qualified individual with a disability solely because the person's disability results in appearance or involuntary behavior that may offend, annoy, or inconvenience others. Carriers must not refuse to provide transportation to a passenger with a disability on the basis of his or her disability unless it is expressly permitted by the ACAA and part .

## **Safety Considerations :**

The ACAA does not require air carriers to disregard applicable FAA safety regulations. Carriers may refuse to provide transportation to *any* passenger on the basis of safety and if carriage would violate FAA regulations. However, when carriers exercise this authority, they must not discriminate against a passenger with a disability on the basis of disability.

## **Indirect Air Carriers:**

If an indirect air carrier provides facilities or services for passengers that are covered for other carriers through the indirect air carrier must do so in a manner consistent with those regulations.

## **Contractors and Travel Agents:**

Carriers must receive assurances from their contractors who provide services, including travel agents (except non-U.S. citizens providing services outside the U.S.), that they will not discriminate on the basis of disability when providing such services and include a clause with that assurance in their contracts. Similarly, their contracts must contain a clause stating that contractor employees will comply with directives issued by CRO's.

## **Accessibility of Airport Facilities:**

All terminal facilities and services owned, leased, or operated by a carrier at a commercial service airport, including parking and ground transportation, must comply with the Standards for Accessible Design under the Americans with Disabilities Act.. Carriers must ensure that these terminal facilities and services are accessible to and usable by individuals with disabilities, including individuals who use wheelchairs. For example, carriers must ensure that there is an accessible path between the gate and the boarding area.

Contracts or leases between carriers and airport operators concerning the use of airport facilities must set forth the respective responsibilities of the parties for the provision of accessible facilities and services to individuals with disabilities as required by law.

Carriers must not (i) restrict the movements of individuals with disabilities in terminals; (ii) require them to remain in a holding area or other location in order to receive assistance; or (iii) mandate separate treatment for individuals with disabilities except as required or permitted .

Compliance with the requirements applying to places of public accommodation under Department of Justice (DOJ) regulations implementing of the Americans with Disabilities Act (ADA) is sufficient for compliance under the ACAA and with respect to airport terminal facilities and services.

**Advance Notice and Reservation System:**

Carriers' reservation and other administrative systems must ensure that when advance notice is provided by a passenger with a disability as provided by the ACAA and its implementing regulations the notice is recorded and properly transmitted to operating employees responsible for providing the accommodation about which notice was provided.