SYNOPSIS:

- The way public transport ticketing works currently, is either the
  - passenger buys the ticket before getting onboard in exchange of money or
  - the ticket is issued by a human after boarding. That is, it works on manual basis with very less automation.
- This makes it very inconvenient as there is a long waiting time at the counters, problems related to cash or there is a need to remember to carry a card always. This project aims to cut on that waiting time and to get more citizens to use the public transport- and with a unique approach.
- Along with that this system has many other drawbacks, like the safety concerns it presents, because of physical contact and also because social distancing in public transport is a virtue. Passengers have an aversion, and rightfully so, towards public transport and it is time to change that.
- Metro rail is fast becoming the most popular means of mass rapid transit in India with an operational network of over 660 km across 12 cities.
- The scenario in case of metros is that a Metro Card or Pass is used for traveling using public transport we plan to replace that system using face detection through machine learning.
- The basic idea is to store the images in a database or in a cloud and can be accessed by the transport system using AI, to make the process smooth and fast, by narrowing down possibilities, while scanning is taking place.
- The person will enter the public transport, where his face is detected and then proceeds into the metro train/bus after verification.
- After the travel is completed, his face is scanned again. After verifying his identity, the fare is calculated and is deducted from his linked account.

- To make it faster to access the database, we plan to implement AI. We have observed that a person generally starts from a particular station and gets down at the same destination every day and not getting down on any other station coming in between, so the AI will narrow down the possibilities prioritizing the user details at the predicted time of arrival in the station where the user is most likely to get down.

- In the future, we plan to implement this idea in all modes of public transport like Airlines, Railways, Buses, etc., as its implementation will reduce the travel time considerably, by automating the process of user verification, issuing of tickets. Human effort is reduced substantially while increasing the efficiency of the system considerably.

- Most importantly, this system will encourage citizens to use public transport. This will help in reducing air pollution and make for more mainstream use of public transport. This is a very important advantage of the implementation of this product.

- Scalability is one of the most important factors for this product, while considering to take the implementation to the highest level.

- The product will have initial costs of only the hardware and the database and/or cloud services, as we are plan on implementing the code themselves. The running costs will include only the costs for the database management, or cloud services and the maintenance for the hardware.

IMPLEMENTATION:

- The passenger has to first register at one of the centers, wherein a few of his photos are captured and details like name, mobile, email are fed to the system.
- The passenger is allowed to choose between wallet or bank account which is then going to be linked with a unique key generated for the passenger.
- When the passenger enters the premises, at the security check, his face is scanned and is then identified by facial recognition model.
- The model returns the unique ID to the server which adds the starting point to the passengers record in the database.
- After the travel is complete, the passenger's face is scanned again and the ID is fed to the server.
- The Server then adds the terminal point in the passengers record after which the fare is calculated and is deducted from the passengers linked account.
- The travel is then updated in the database for the sake of record keeping.
- We've opted for the three-tier architecture:

Front-End:

For adding and accessing the passenger details, also issuing tokens to have a re-scan in rare cases.

Back-End:

The Server adds travel records, calculates fare, issues warnings and is used to access the database.

Database:

The Database is used to store all passenger details like images which are required for faceNet model to ID passengers

TECHNOLOGY USED:

- Google's faceNet model is used to generate the embeddings to train the Artificial Neural Networks in order to recognize the commuter's face.
- MySQL, a relational database is being used for all the storage needs.
- The Front end is designed using ReactJS.
- MaterialIO is used for styling the front end.
- ExpressJs is used for backend.
- React, Express and Node are used for creating the website.
- Express,MySQL,body-parser and other node modules are used for the webpage.
- We have used python for facial recognition and fare calculation.
- OpenCV, mtcnn ,numpy etc.has also been used.