

The background features a dark blue gradient with technical diagrams on the left side, including circular gauges with numerical scales (40, 150, 160, 170, 180, 190, 200, 220, 230, 240, 250, 260) and arrows. The bottom of the image shows a silhouette of a mountain range under a starry night sky.

SOFTWARE ENGINEERING PROJECT

FPAY AS YOU GO

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AIM

- We aim to develop a facial recognition-based payment system for the shuttle services on our campus and beyond.
- Our concept presents a simple and efficient approach to ensure that all shuttle boarders pay the travel fare and that the shuttle services do not suffer any losses.
- It makes the commute convenient for the shuttle boarders, as they don't have to wait in queues to make the payment.

LITERATURE SURVEY

S. No.	Title	Authors	Techniques discussed	Advantages	Drawbacks
1.	High Performance Facial Expression Recognition System Using Facial Region Segmentation, Fusion of HOG & LBP Features and Multiclass SVM	B. Islam, F. Mahmud and A. Hossain, 2018 10th International Conference on Electrical and Computer Engineering (ICECE).	Facial Region Segmentation. Histogram of Oriented Gradients (HOG) Features. Local Binary Patterns (LBP) Features. Feature Fusion. Support Vector Machine (SVM) Classifier.	Improved Accuracy. Robustness. Efficient Feature Extraction. Easy to implement. Applicability.	Limited Dataset. Sensibility to Noise. Insufficient data pre-processing Lack of Comparison.
2.	An Efficient Convolutional Neural Network Approach for Facial Recognition	A. Mangal, H. Malik and G. Aggarwal, 2020.	Data Preprocessing. Convolutional Neural Network Architecture. Transfer Learning. Data Augmentation. Softmax Classifier.	High Accuracy. Robustness. Efficiency. Transfer Learning. Scalability.	Training Data Bias. Overfitting. Computational Resources. Limited Interpretability. Privacy Concerns

LITERATURE SURVEY

S. No.	Title	Authors	Techniques discussed	Advantages	Drawbacks
3.	A Facial Expression Recognition Method Based on a Multibranch Cross-Connection Convolutional Neural Network	C. Shi, C. Tan and L. Wang, in IEEE Access, vol. 9, pp. 39255-39274, 2021	Data Preprocessing. Multibranch Cross-Connection Convolutional Neural Network Architecture. Transfer Learning. Data Augmentation. Softmax Classifier.	High Accuracy. Robustness. Multibranch cross-connection approach. Scalability. Flexibility. Generalizability.	Limited Scope. Computational Resources. Privacy Concerns. Lack of interpretability. Dataset Bias.
4.	Facial Recognition using the OpenCV Libraries of Python for the Pictures of Human Faces Wearing Face Masks during the COVID-19 Pandemic	J. Vadlapati, S. Senthil Velan and E. Varghese, 2021	Image Preprocessing. Feature Extraction. Face Mask Detection. Face Recognition. Evaluation.	Practical Solution. Easy Implementation. Accurate Mask Detection. Effective Feature Extraction. Evaluation Metrics.	Limited Accuracy. Limited Robustness. Limited Scalability. Privacy concerns. Biases and errors.

LITERATURE SURVEY

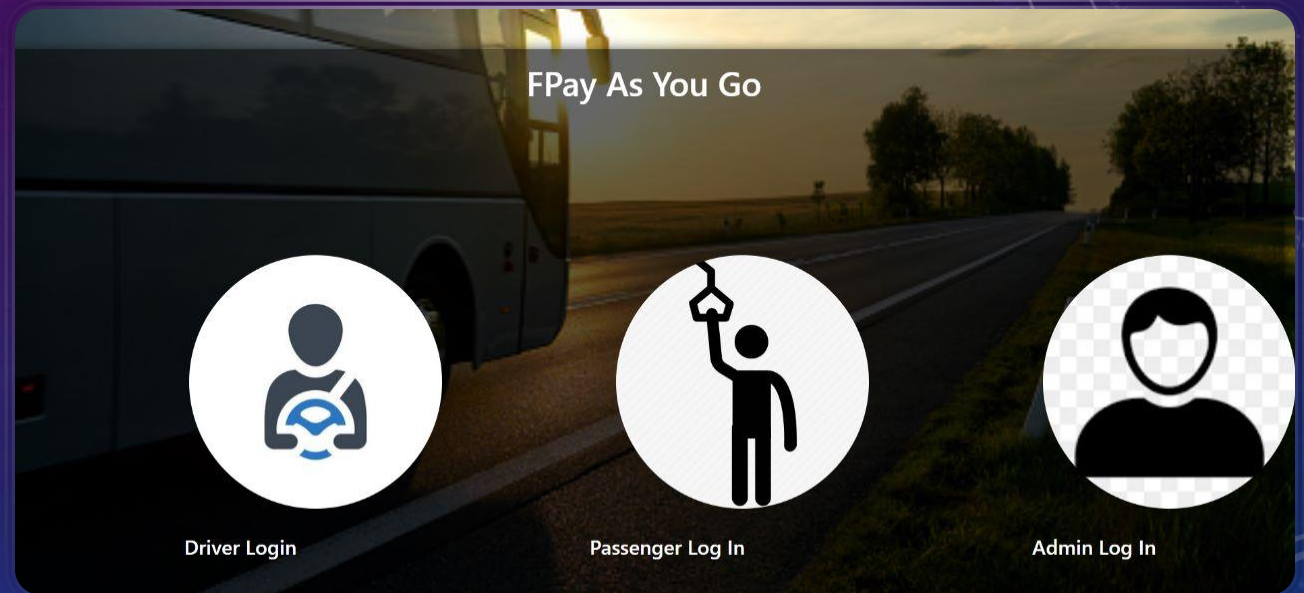
S. No.	Title	Authors	Techniques discussed	Advantages	Drawbacks
5.	Deep Learning based Facial Recognition System for Attendance Maintenance	K. G. Saravanan, J. Rani, D. C. Jullie Josephine, M. Parameswari, H. Venugopal and J. Ramal, 2022	Convolutional Neural Networks (CNNs). Transfer Learning. Face Detection. Face Alignment. Classification.	High Accuracy. Robustness. Efficiency. Scalability. Automation.	Privacy Concerns. Bias. Reliance on high-quality data. Cost. Vulnerability to attacks.
6.	A Novel Facial Expression Intelligent Recognition Method Using Improved Convolutional Neural Network	M. Shi, L. Xu and X. Chen, in IEEE Access, vol. 8, pp. 57606-57614, 2020	Data Preprocessing. Feature Extraction. Feature Selection. Classification. Evaluation.	High Accuracy. Efficiency. Robustness. Novelty. Generalizability.	Dataset Bias. Computational Complexity. Limited scope. Lack of comparison. Limited Evaluation.

JUSTIFICATION OF SCOPE

- The literature survey present primarily two methods of facial recognition – SVM +HOG (Support Vector Machine) and CNN (Convolutional Neural Network).
- We have chosen SVM+HOG as our method of facial recognition due to the following reasons:
 - Images of Passengers are trained faster with SVM+HOG method.
 - In our application, passengers have to be recognized quickly during the shuttle onboard so the computation time should be less. The computation time of SVM+HOG is lesser.
 - SVM+HOG can be more robust to variations in lighting and pose than CNN, as the HOG features are based on local gradients and are therefore less sensitive to global changes in illumination or viewpoint.
- Our dataset won't be limited or overfitting as equal number of photos of every passenger are used to train the model.
- Our project explores a new application of Facial Recognition to ease the payment process of shuttle services.

LOGIN/ REGISTER MODULE

- User Login process is decomposed into Register and Sign-In processes.
- Driver and Student input valid credentials, the login process matches those credentials against the one stored in Verified User datastore. If it matches, then the user is granted access
- The user module allows users to register, log in, and log out. Users benefit from being able to sign on because this associates content they create with their account and allows various permissions to be set for their roles.
- Our project has separate logins for 3 different kinds of users based on their roles:
 - Driver
 - Passenger
 - Admin



LOGIN/ REGISTER MODULE

- The shuttle Driver clicks on Driver's Login and enter his account's username and password
- The credentials are validated through the database and the Driver is logged into his account after which he can start the system
- If the credentials entered by the driver are incorrect an error message "Invalid Credentials" is displayed and the driver is asked to fill the credentials again.
- Passengers/students can access their accounts by clicking on Passenger's login and entering their authentic credentials.
- If it's a new passenger he/she can register by entering Username and password . Type the password again for confirmation. Password should follow the given criteria for it to be accepted. After registration the passengers have to use the "upload photos" feature on their first login.
- Admins can also login by entering their credentials and then view records on their account

Register

Username*

Required: 150 characters or fewer. Letters, digits and @/./+/-/_ only.

Password*

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Repeat Password*

Repeat your password as before, for verification.

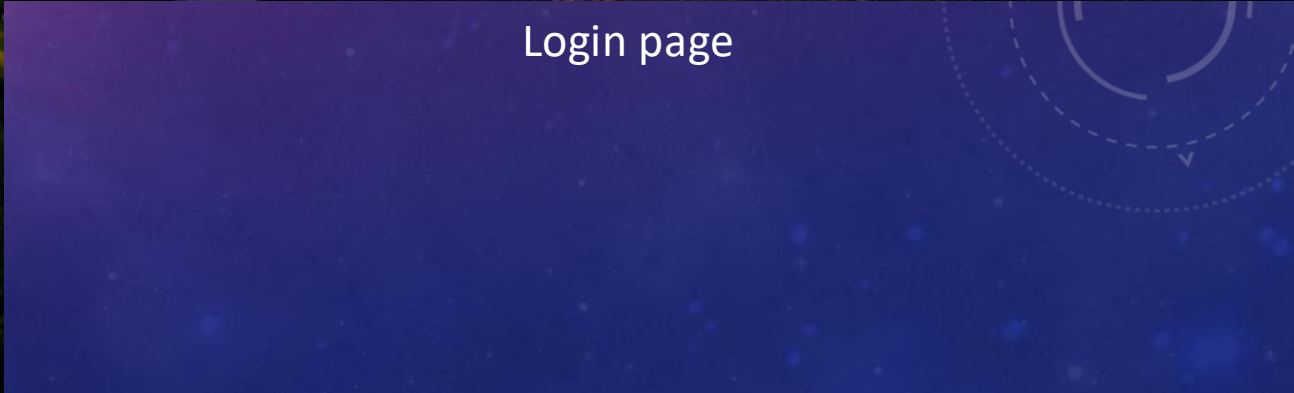
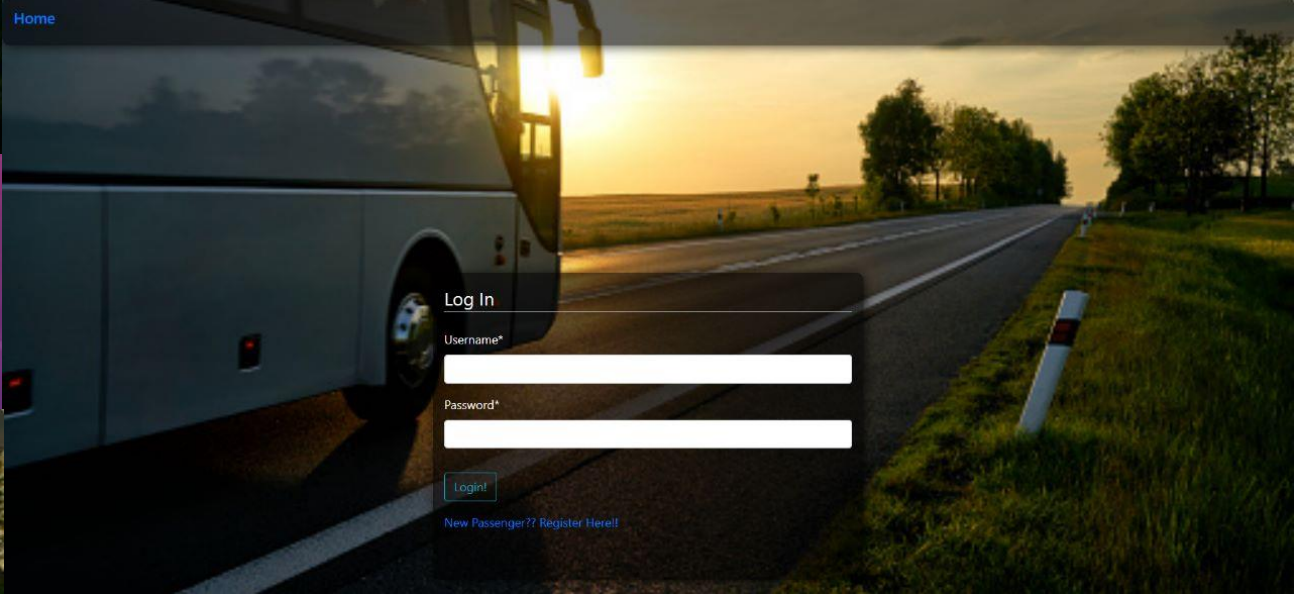
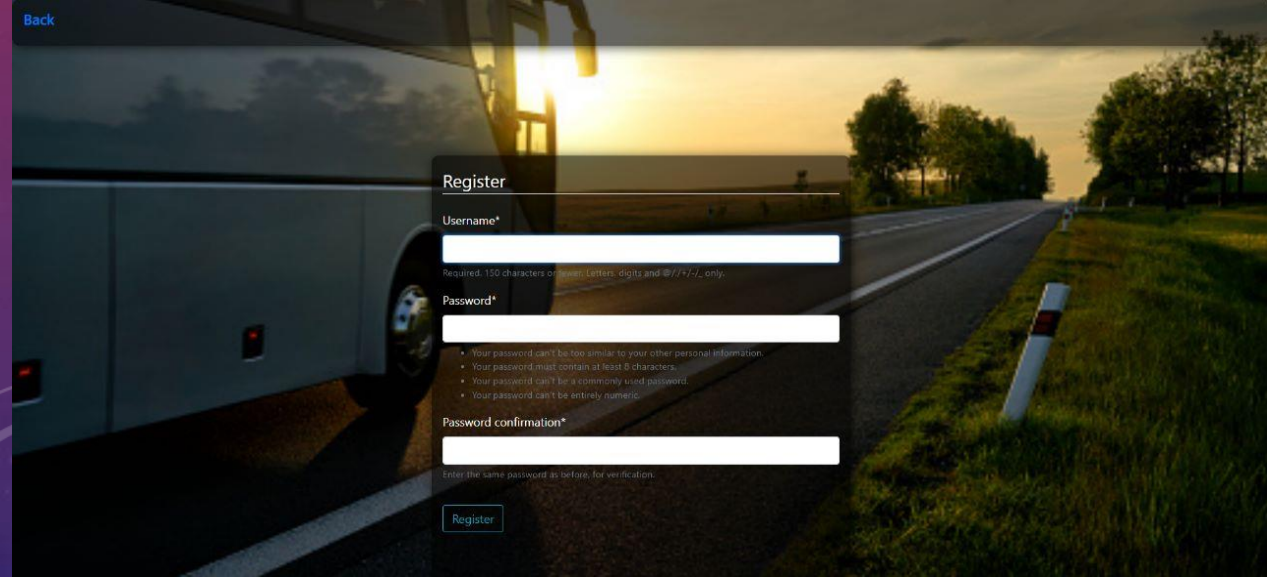
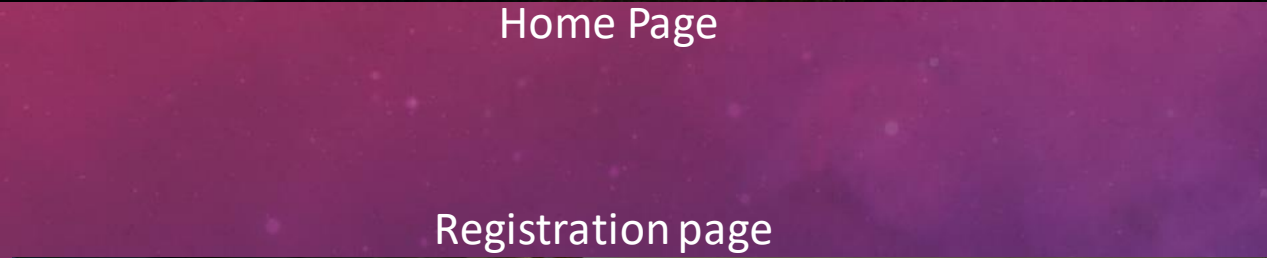
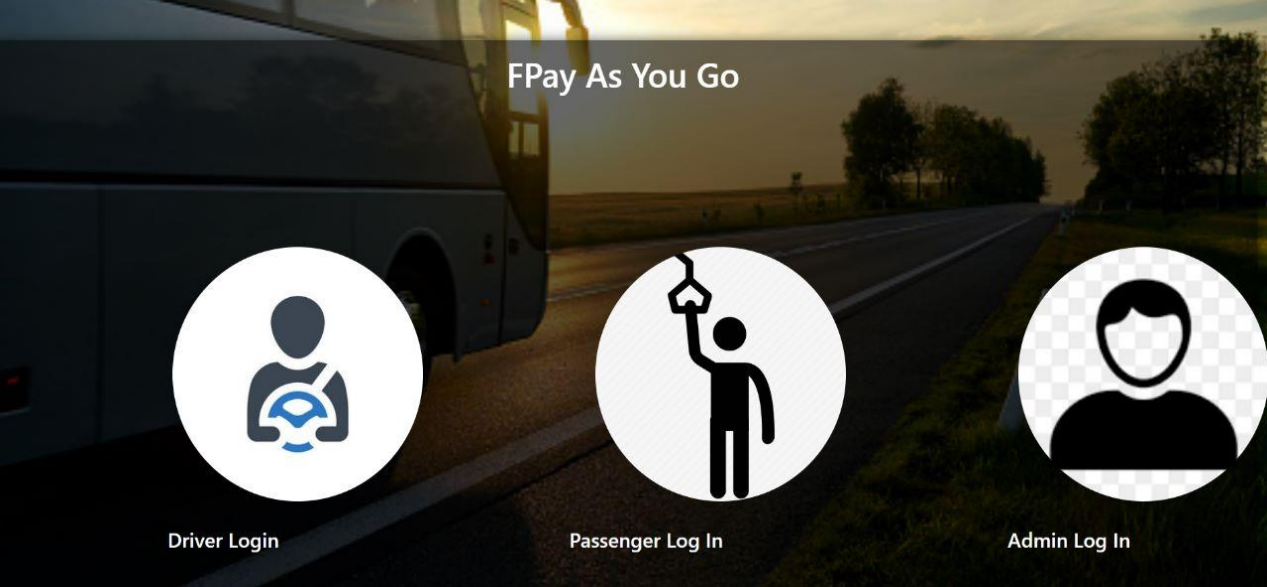
Log In

Username*

Password*

Login!

New Passenger?? Register Here!!



FACIAL RECOGNITION SYSTEM

- Passengers will have to use the "Upload Photos" feature on their first login. The system webcam will open and take photos of the passenger.
- Admin will have to use the "Train Images" feature to train the model using the images of the passenger.
- The model used is SVM + HOG (Support Vector Machine + Histogram Oriented Gradients).
- The driver will login to start the facial recognition during shuttle on-boarding.
- The passengers will be recognized and the ride fare will be reflected in their logins.

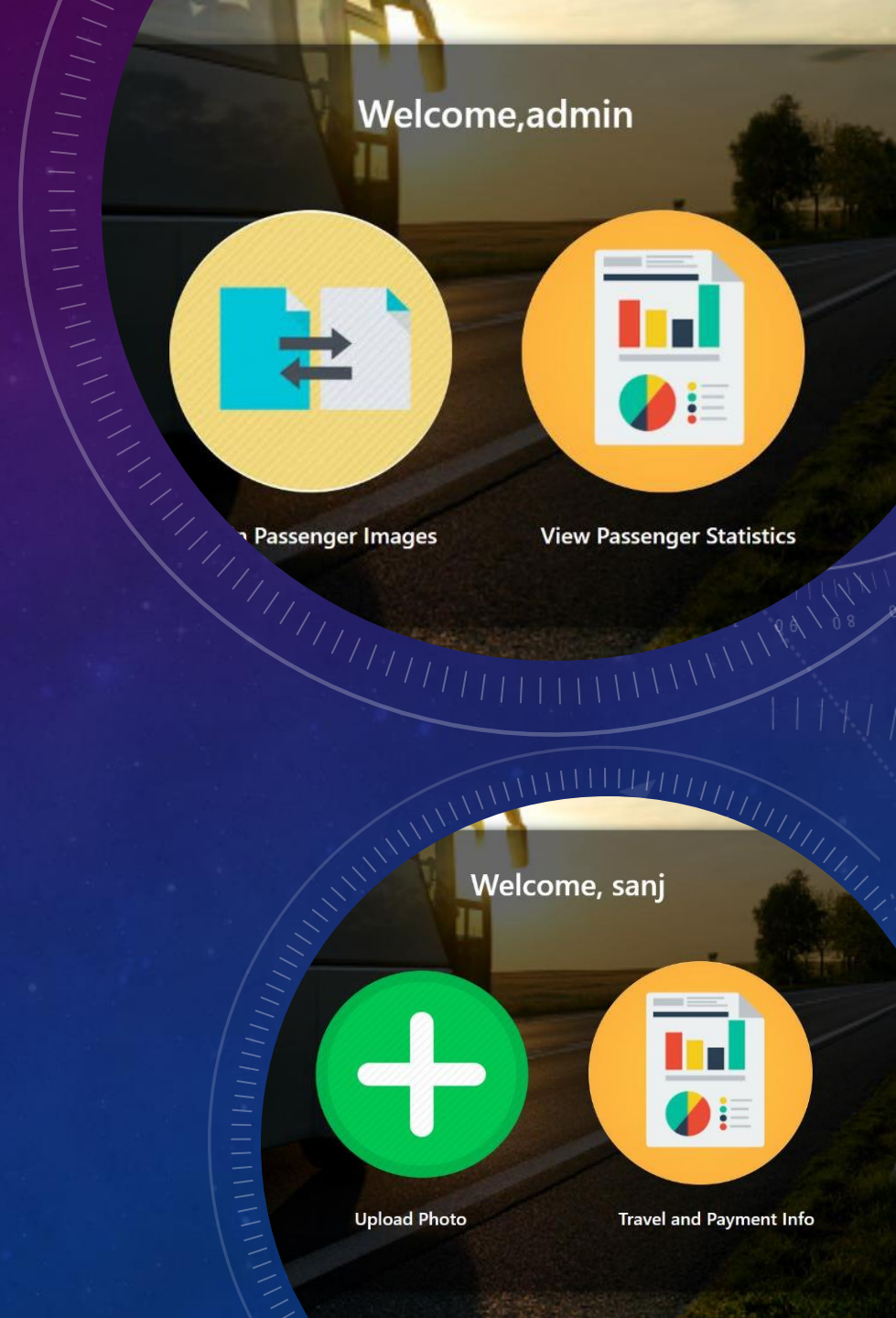
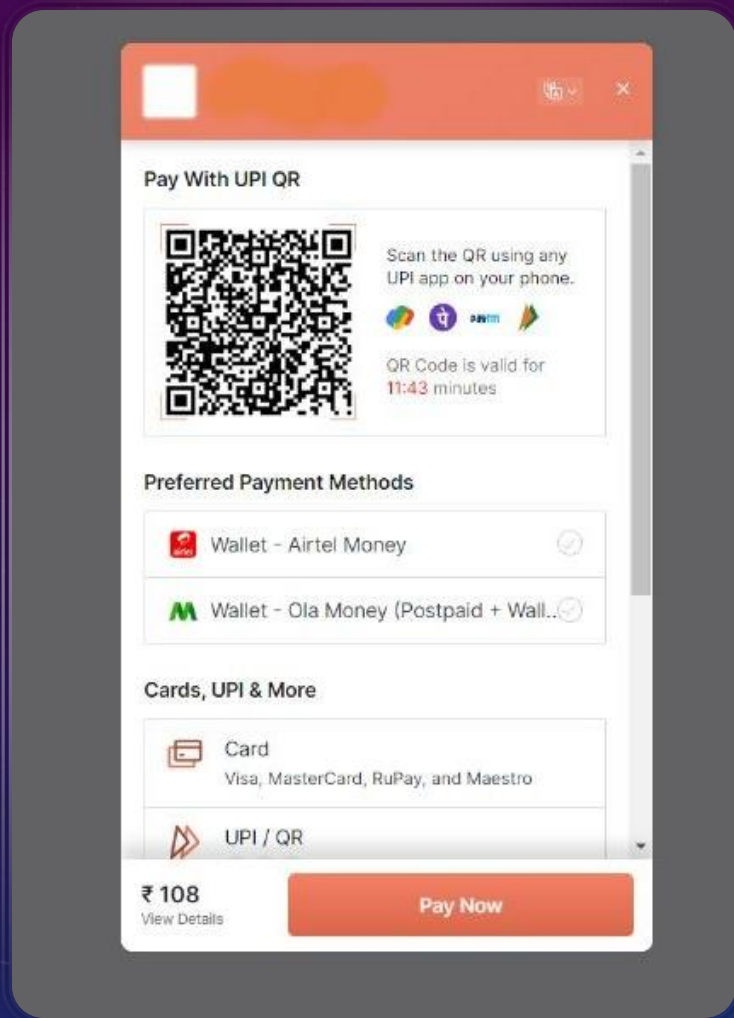


IMAGE PROCESSING & SVM + HOG

1. Initialize the video stream (for Upload Image)
2. Capture images from the video stream.
3. Load HOG face detector and the shape predictor for alignment.
4. Perform Image Processing using OpenCV and face detection using HOG
 - i. Re-size the images.
 - ii. Convert the images to grayscale (for better model efficiency)
 - iii. Find the coordinates of the image and return a frame around the detected face.
 - iv. Extract the HOG (Histogram of Oriented Gradients) features from the images. The HOG features are calculated by dividing each image into small cells and calculating the gradient directions and magnitudes of the pixels within each cell.
5. Store the images along with the passenger identity.
6. When admin clicks on train images, SVM (Support Vector Machine) classifier is trained on the HOG features extracted from the images. The SVM is a supervised learning classifier that learns to separate the positive and negative examples based on the HOG features. The radial basis function kernel (RBF kernel) SVM are used for training and tracking.
7. When the driver starts facial recognition, steps 1, 2, 3 and 4 are repeated again.
8. Passengers are identified using the trained SVM classifier and HOG features extracted from the uploaded images.

PAYMENT GATEWAY



- The passenger can make use of this integrated gateway to pay their dues.
- In our project, we have integrated the RazorPay payment gateway.
- The passenger is firstly supposed to enter their name, this is done so that the payment is recorded under the passengers full name, instead of the username (if they have used a different/short-form for their username).
- Then they would be directed to the payment interface.
- There they can select among multiple modes of payments like UPI, Credit/debit cards, wallets, etc

PAYMENT GATEWAY

- The amount to be paid will be pre-loaded from the database, as per their travel history and corresponding payment status.
- The required details of the payment recipient are pre-fed.
- After selecting the mode of payment (and providing required details if needed) the payment will be processed
- If the payment is successful, the user will be redirected to 'success' page, else will be notified of failure.

[By Passenger](#) [By Date](#) [Back to Admin Panel](#)

Select Username And Duration

Username*

Date from*

Date to*

PAYMENT/ TRAVEL RECORDS

Authenticate	Authenticate the admin user by verifying their credentials.
Retrieve	Retrieve the list of payment records from the database.
Display	Display the passenger trip records in a table format, showing relevant information such as boarding date, boarding time, amount due, payment date, passenger name, and other trip details.
Provide	Provide filters or sorting options to allow the admin user to narrow down the payment records based on specific criteria, such as boarding date range, passenger, or trip details.
Allow	Allow the admin user to search for a specific payment record by entering relevant keywords or information, such as payment ID, passenger name, or trip details.

Select Date

Date*

March
 ▼

26
 ▼

2023
 ▼

Submit

Today's Statistics

Total Number Of Registered
Passengers

11

Number of Riders today

0

Selenium IDE - FPay As You Go

Project: FPay As You Go

Tests +

Search tests...

http://127.0.0.1:8000

	Command	Target
7	type	id=id_password2
8	send keys	id=id_password2
9	type	id=id_username
10	type	id=id_password
11	send keys	id=id_password
12	click	css=.text-right

Command open

Target /

Value

Description

Log Reference

5. type on id=id_username with value danish OK

6. type on id=id_password1 with value shreya123 OK

7. type on id=id_password2 with value shreya123 OK

8. sendKeys on id=id_password2 with value \${KEY_ENTER} OK

9. type on id=id_username with value danish OK

10. type on id=id_password with value shreya123 OK

11. sendKeys on id=id_password with value \${KEY_ENTER} OK

12. click on css=.text-right OK

Registration/Login Module' completed successfully

TESTING REPORT

LOGIN AND REGISTRATION,
LOGIN WITH VALID CREDENTIALS

TESTING REPORT

UPLOAD PHOTOS FUNCTIONALITY

Selenium IDE - FPay As You Go

Project: FPay As You Go

Tests +

Search tests...

http://127.0.0.1:8000

	Command	Target
6	✓ send keys	id=id_password
7	✓ click	css=col-md-3:nth-child(2) .img-responsive
8	✓ click	id=id_username
9	✓ type	id=id_username
10	✓ click	css= .btn
11	✓ click	css= .text-left
12	✓ click	css= .text-right

Command: open

Target: /

Value:

Description:

Log Reference

4. type on id=id_username with value aditya OK

5. type on id=id_password with value kuchbhii OK

6. sendKeys on id=id_password with value \${KEY_ENTER} OK

7. click on css=col-md-3:nth-child(2) .img-responsive OK

8. click on id=id_username OK

9. type on id=id_username with value aditya OK

10. click on css= .btn OK

11. click on css= .text-left OK

12. click on css= .text-right OK

'Upload Photo' completed successfully

TESTING REPORT

- Login with invalid credentials

FPay As You Go

http://127.0.0.1:8000

	Command	Target
8	mouse move at	id=id_username
9	mouse up at	id=id_username
10	click	id=id_username
11	type	id=id_username
12	type	id=id_password
13	click	css= btn

Command: open

Target: /

Value:

Description:

Reference

on id=id_password with value \${KEY_ENTER} OK

At on id=id_username with value 92.5999755859375,23.5999755859375 OK

At on id=id_username with value 92.5999755859375,23.5999755859375 OK

At on id=id_username with value 92.5999755859375,23.5999755859375 OK

id_username OK

id_username with value arnav OK

id_password with value arnav OK

css= btn OK

Correct Password' completed successfully

TESTING REPORT

VIEWING ANOMALIES (UNKNOWN PASSENGER)

Selenium IDE - FPay As You Go

Project: FPay As You Go

Tests +

Search tests... http://127.0.0.1:8000

	Command	Target
11	send keys	id=id_password
12	click	css=col-md-3:nth-child(3).img-responsive
13	click	id=id_date_to_month
14	select	id=id_date_to_month
15	click	css=btn-outline-info
16	click	linkText=Back to Dashboard
17	click	css=.text-right

Command open

Target /

Value

Description

Log Reference

10. type on id=id_password with value motupatlu OK

11. sendKeys on id=id_password with value \${KEY_ENTER} OK

12. click on css= col-md-3:nth-child(3).img-responsive OK

13. click on id=id_date_to_month OK

14. select on id=id_date_to_month with value label=June OK

15. click on css= btn-outline-info OK





16. click on linkText=Back to Dashboard OK


17. click on css=.text-right OK

'Facial Recognition System' completed successfully



Selenium IDE - FPay As You Go



Project: FPay As You Go

Tests +    

Search tests...  http://127.0.0.1:8000

	Command	Target
✓ Admin: View Passenger R		
✓ Facial Recognition System	20 click	css= primary-cta
✓ Login with Incorrect Passv	21 click	css= new-method:nth-child(4) > .stack
✓ Payment Gateway	22 click	css= radio-option:nth-child(4)
✓ Registration/Login Module	23 click	css= .back path
✓ Upload Photo	24 click	css= #form-common .account-section
✓ Viewing Anomalies	25 click	css= .account-menu:nth-child(3)
	26 click	id= country-code

Command open  

Target /  

Value

Description

Log Reference

20. click on css= primary-cta OK

21. click on css= new-method:nth-child(4) > .stack > .svelte-1n0bvhf > .svelte-1n3jv1e OK

22. click on css= radio-option:nth-child(4) OK

23. click on css= .back path OK

24. click on css= #form-common .account-section OK

25. click on css= .account-menu:nth-child(3) OK

26. click on id= country-code OK

27. type on css= search-field > .svelte-15q0kle:nth-child(2) with value 91 OK


'Payment Gateway' completed successfully


TESTING REPORT

PAYMENT GATEWAY


Selenium IDE - FPay As You Go



Project: FPay As You Go

Tests + 

Search tests...  http://127.0.0.1:8000

	Command	Target
✓ Admin: View Passenger R		
✓ Facial Recognition System	18 select	id=id_date_day
✓ Login with Incorrect Passv	19 click	css=.btn
✓ Payment Gateway	20 click	id=id_date_day
✓ Registration/Login Module	21 select	id=id_date_day
✓ Upload Photo	22 click	css=.btn
✓ Viewing Anomalies	23 click	linkText=Back to Admin Panel
	24 click	css=.text-right

Command: open // 

Target: /  

Value:

Description:

Log Reference

18. select on id=id_date_day with value label=5 OK

19. click on css=.btn OK

20. click on id=id_date_day OK

21. select on id=id_date_day with value label=9 OK

22. click on css=.btn OK

23. click on linkText=Back to Admin Panel OK

24. click on css=.text-right OK

'Admin: View Passenger Ride Records' completed successfully

TESTING REPORT

ADMIN: VIEW PASSENGER
RECORDS

CONCLUSION

- Making use of the HOG SVM classifier, we developed an efficient Facial-recognition based payment system for the shuttle services.
- The application accurately identifies the passenger, adds the travel fare to their account, and maintains all passenger travel records which can be accessed by the admin.
- It has an integrated payment gateway(RazorPay) to provide an easy-to-use payment interface.
- An efficient solution was provided for the problem stated.

FUTURE ENHANCEMENT

- Make a mobile app, as they have better accessibility and thus would attract more customers.
- Improve the processing speed, the main aim is to reduce the time required for training the model while making sure to not affect its accuracy
- Multiple payment gateways can be integrated for user convenience.
- This project can utilize VIT database to ensure valid database entries.

The background is a dark blue to purple gradient. It features several overlapping circles of varying sizes and colors (purple, blue, teal). There are also faint, light-colored lines and dots scattered across the background, creating a bokeh or particle effect. A central rectangular box with a thin white border contains the text "THANK YOU!".

THANK YOU!