

# Accurate Detection and Recognition of Dirty Vehicle Plate Numbers for High-Speed Applications

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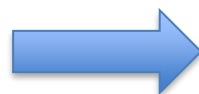
M. Tech PES University

# Introduction & Problem Statement

- - Importance of License Plate Recognition (LPR)
- - Challenges:
  - • Dirt/Mud/Obstructions
  - • Motion blur at high speeds
  - • Reduced recognition accuracy → fraud & enforcement gaps
- - Goal: Robust recognition of dirty/obscured plates at high speeds.

# Literature Review

- Existing ANPR Systems: Fail under dirt/motion blur
- OCR Optical Char Recognition (Tesseract, CNN): Reduced accuracy on noisy images
- GAN Generative Adversarial Networks -based Augmentation: Limited real-world use
- Conclusion: Need for robust dirty plate recognition.



YOLOv11



Gets Number  
Plat from Car



PaddleOCR



GY59KLL

Try to detect  
Actual Number



# Data Sets

- <https://github.com/detectRecog/CCPD>
- <https://www.kaggle.com/datasets/saisirishan/indian-vehicle-dataset>
- We have added MP4 Vdos as inputs
- Git link  
<https://github.com/j33tu/mtechpes25.git>

# Python app

MTECHPRJVM01 - 4.213.118.73:3389 - Remote Desktop Connection

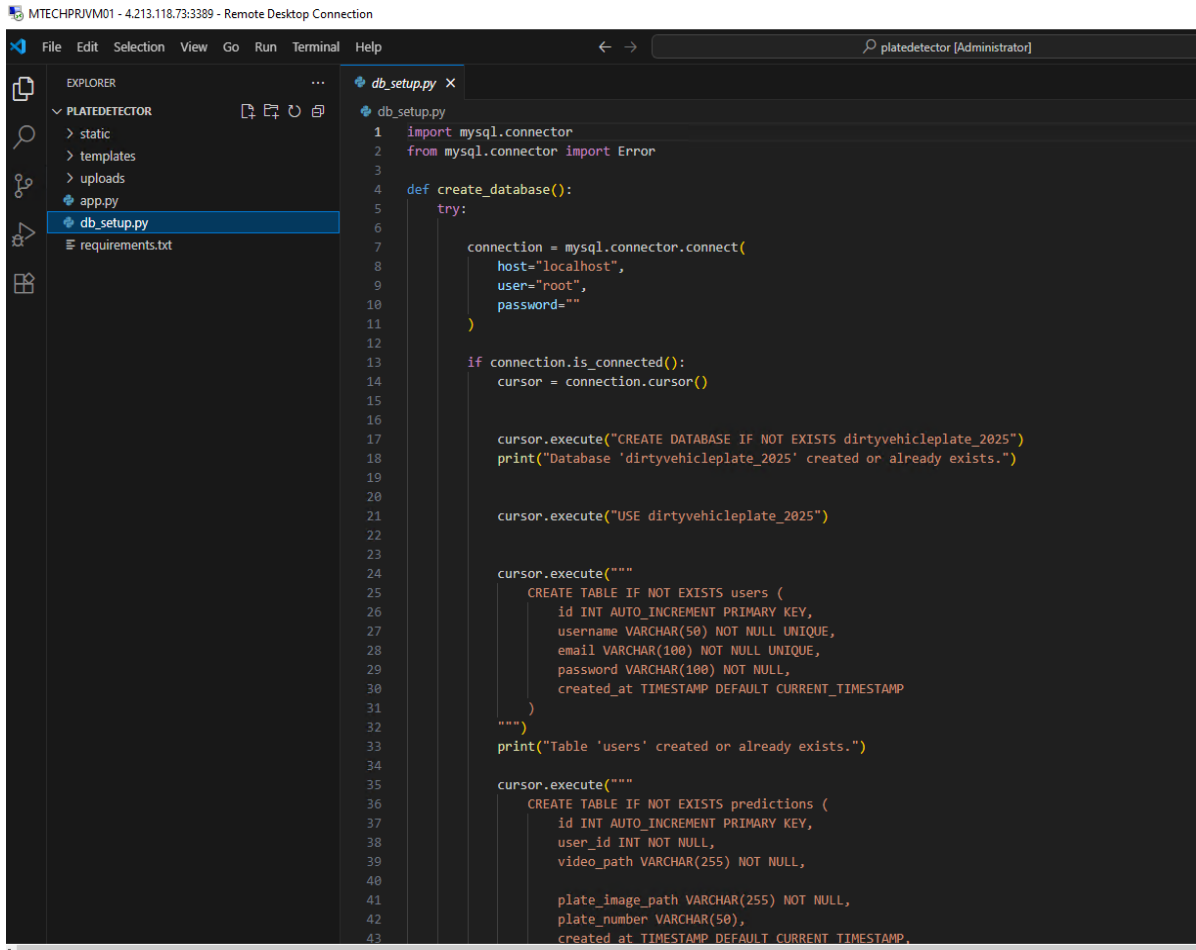
platedetector [Administrator]

EXPLORER

- PLATEDETECTOR
  - static
  - templates
  - uploads
  - app.py
  - db\_setup.py
  - requirements.txt

```
14
15 app = Flask(__name__)
16 app.secret_key = 'Qazwsx@123'
17
18 print("Downloading YOLOv11 model...")
19
20 repo_id = "morsetechlab/yolov11-license-plate-detection"
21 filename = "license-plate-finetune-v1n.pt"
22
23 try:
24     downloaded_model_path = hf_hub_download(repo_id=repo_id, filename=filename)
25     print(f"Model downloaded to: {downloaded_model_path}")
26 except Exception as e:
27     print(f"FATAL: Could not download model. Error: {e}")
28     exit()
29
30 print("Loading YOLOv11 model...")
31 YOLO_MODEL = YOLO(downloaded_model_path)
32 print("Plate detector loaded.")
33
34 print("Loading PaddleOCR...")
35 OCR_READER = PaddleOCR(use_textline_orientation=True, lang='en', enable_mkldnn=True)
36 print("PaddleOCR loaded.")
37
38 def get_db_connection():
39     connection = mysql.connector.connect(
40         host="localhost",
41         user="root",
42         password="",
43         database="dirtyvehicleplate_2025"
44     )
45     return connection
46
47 def preprocess_full_frame(frame):
48     """
49     Enhance the full frame before plate detection to improve both detection and OCR accuracy.
50     """
51
52     gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
53
54     denoised = cv2.bilateralFilter(gray, 9, 75, 75)
55
56
```

# DB configuration



The screenshot shows a remote desktop connection to a machine named 'MTECHPRJVM01' with IP '4.213.118.73:3389'. The application is 'platedetector [Administrator]'. The file explorer on the left shows a project named 'PLATEDETECTOR' with subfolders 'static', 'templates', 'uploads', and files 'app.py', 'db\_setup.py', and 'requirements.txt'. The 'db\_setup.py' file is open in the editor, showing the following Python code:

```
1 import mysql.connector
2 from mysql.connector import Error
3
4 def create_database():
5     try:
6
7         connection = mysql.connector.connect(
8             host="localhost",
9             user="root",
10            password=""
11        )
12
13        if connection.is_connected():
14            cursor = connection.cursor()
15
16
17            cursor.execute("CREATE DATABASE IF NOT EXISTS dirtyvehicleplate_2025")
18            print("Database 'dirtyvehicleplate_2025' created or already exists.")
19
20
21            cursor.execute("USE dirtyvehicleplate_2025")
22
23
24            cursor.execute("""
25                CREATE TABLE IF NOT EXISTS users (
26                    id INT AUTO_INCREMENT PRIMARY KEY,
27                    username VARCHAR(50) NOT NULL UNIQUE,
28                    email VARCHAR(100) NOT NULL UNIQUE,
29                    password VARCHAR(100) NOT NULL,
30                    created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
31                )
32            """)
33            print("Table 'users' created or already exists.")
34
35            cursor.execute("""
36                CREATE TABLE IF NOT EXISTS predictions (
37                    id INT AUTO_INCREMENT PRIMARY KEY,
38                    user_id INT NOT NULL,
39                    video_path VARCHAR(255) NOT NULL,
40
41                    plate_image_path VARCHAR(255) NOT NULL,
42                    plate_number VARCHAR(50),
43                    created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
```

Single Database  
Has 2 tables

Users: where  
registered users  
information to be  
saved

Predictions :  
where out put  
number plates are  
saved

# Predictions

MTECHPRJVM01 - 4.213.118.73:3389 - Remote Desktop Connection

localhost / 127.0.0.1 / dirtyvehic x dirty number plate muddy - Go x Prediction History x Documentation for Visual Studi x +

localhost/phpmyadmin/index.php?route=/sql&pos=0&db=dirtyvehicleplate\_2025&table=predictions

https://ciq.corp.link... ops review board On-Prem-Admin-St... WVD Automation Cloud legiaon Automation Bookmarks bar Documentation Azsk Oncall Learnings course Hsec-Approvals.xlsx [AZURE-4221] Event...

phpMyAdmin

Recent Favourites

- New
- dirtyvehicleplate\_2025
- New
- predictions
- users
- information\_schema
- mysql
- performance\_schema
- phpmyadmin
- test

Server: 127.0.0.1 » Database: dirtyvehicleplate\_2025 » Table: predictions

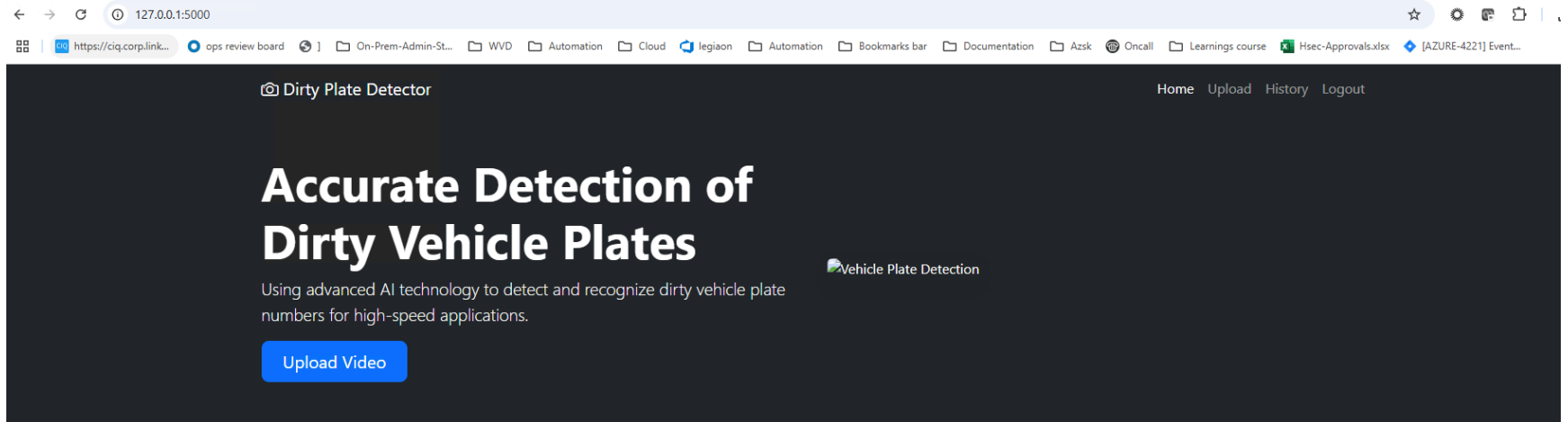
Browse Structure SQL Search Insert Export Import Privileges Operations Tracking Triggers

Extra options

			id	user_id	video_path	plate_image_path	plate_number	created_at	run_id	
<input type="checkbox"/>	Edit	Copy	Delete	1	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	C98191P	2025-07-18 07:52:32	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	2	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	191P	2025-07-18 07:52:43	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	3	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	9	2025-07-18 07:52:50	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	4	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	1073	2025-07-18 07:54:03	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	5	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	1078	2025-07-18 07:54:34	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	6	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	C64457T	2025-07-18 07:55:02	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	7	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	C6445	2025-07-18 07:55:09	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	8	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	RIVJROC64457T	2025-07-18 07:55:22	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	9	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	FKH9211	2025-07-18 07:56:02	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	10	1	static/uploads/user_117c3f95fa-aa03-48fd-9341-c1b2...	uploads/user_117c3f95fa-aa03-48fd-9341-c1b2a8a942e...	BFE3975	2025-07-18 07:56:48	7c3f95fa-aa03-48fd-9341-c1b2a8a942ec
<input type="checkbox"/>	Edit	Copy	Delete	11	1	static/uploads/user_115670b8f4-07d0-4f7a-b478-2c18...	uploads/user_115670b8f4-07d0-4f7a-b478-2c187fecf18...	LH56LHC	2025-07-18 08:44:03	5670b8f4-07d0-4f7a-b478-2c187fecf18a
<input type="checkbox"/>	Edit	Copy	Delete	12	1	static/uploads/user_115670b8f4-07d0-4f7a-b478-2c18...	uploads/user_115670b8f4-07d0-4f7a-b478-2c187fecf18...	MA08BZM	2025-07-18 08:44:08	5670b8f4-07d0-4f7a-b478-2c187fecf18a
<input type="checkbox"/>	Edit	Copy	Delete	13	1	static/uploads/user_115670b8f4-07d0-4f7a-b478-2c18...	uploads/user_115670b8f4-07d0-4f7a-b478-2c187fecf18...	MA08BZM	2025-07-18 08:44:19	5670b8f4-07d0-4f7a-b478-2c187fecf18a
<input type="checkbox"/>	Edit	Copy	Delete	14	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	LH56LHC	2025-07-18 08:45:26	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	15	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	MA08BZM	2025-07-18 08:45:32	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	16	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	MA08BZM	2025-07-18 08:45:43	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	17	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	LHS6LHC	2025-07-18 08:46:48	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	18	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	JH19SKT	2025-07-18 08:46:59	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	19	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	MA08BZ	2025-07-18 08:47:16	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	20	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	95H7	2025-07-18 08:47:25	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	21	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	HA08F	2025-07-18 08:47:30	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	22	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	HA0B	2025-07-18 08:47:38	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	23	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	办	2025-07-18 08:48:31	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	24	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	LF	2025-07-18 08:48:54	9d56bb26-2d63-49a6-b819-0f9205fa0188
<input type="checkbox"/>	Edit	Copy	Delete	25	1	static/uploads/user_119d56bb26-2d63-49a6-b819-0f92...	uploads/user_119d56bb26-2d63-49a6-b819-0f9205fa018...	5	2025-07-18 08:49:00	9d56bb26-2d63-49a6-b819-0f9205fa0188



# Portal User / registration



## Key Features



### High Accuracy

Advanced AI models (Paddle OCR and YOLO 11) ensure accurate detection even with dirty or partially obscured plates.



### High-Speed Processing

Optimized for real-time applications with fast processing capabilities for traffic monitoring systems.



### Detailed History

Keep track of all processed videos with comprehensive detection history and results.

## Upload Video for Plate Detection

Select Video File

Choose file

No file chosen

Upload and Process

# Confidence scores are mentioned

```
[DEBUG] - Running OCR on cropped plate...
[DEBUG] - No OCR text passed the confidence threshold.
[FAILED] - OCR failed for plate. Image saved to: uploads/user_1/2db34510-7c1a-4851-a3e6-612c40dbab6a/plate_1405

--- [FRAME 1410] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] No bounding boxes found in this result object.

--- [FRAME 1415] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 1 potential bounding box(es).
[DEBUG] - Box 0 has detection confidence: 0.3337
[DEBUG] - Confidence <= 0.6. REJECTED.

--- [FRAME 1420] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 1 potential bounding box(es).
[DEBUG] - Box 0 has detection confidence: 0.2956
[DEBUG] - Confidence <= 0.6. REJECTED.

--- [FRAME 1425] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 1 potential bounding box(es).
[DEBUG] - Box 0 has detection confidence: 0.4990
[DEBUG] - Confidence <= 0.6. REJECTED.

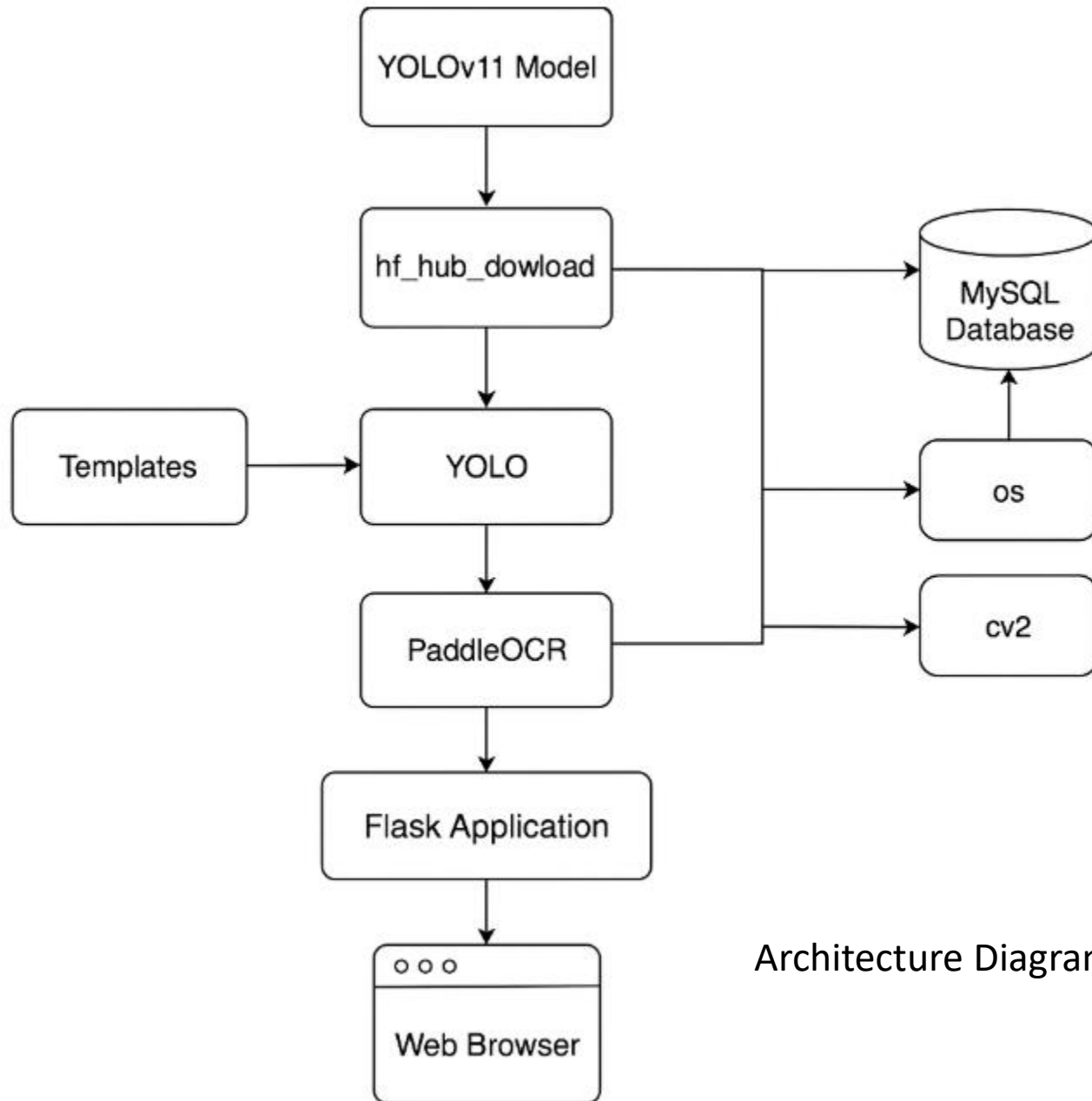
--- [FRAME 1430] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 1 potential bounding box(es).
[DEBUG] - Box 0 has detection confidence: 0.4351
[DEBUG] - Confidence <= 0.6. REJECTED.

--- [FRAME 1435] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 1 potential bounding box(es).
[DEBUG] - Box 0 has detection confidence: 0.4876
[DEBUG] - Confidence <= 0.6. REJECTED.

--- [FRAME 1440] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 1 potential bounding box(es).
[DEBUG] - Box 0 has detection confidence: 0.5485
[DEBUG] - Confidence <= 0.6. REJECTED.

--- [FRAME 1445] ---
[DEBUG] Preprocessing full frame...
[DEBUG] Running YOLOv11 plate detection on enhanced frame...
[DEBUG] Found 2 potential bounding box(es)
```





Architecture Diagram