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

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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

Try to detect Actual Number

GY59KLL

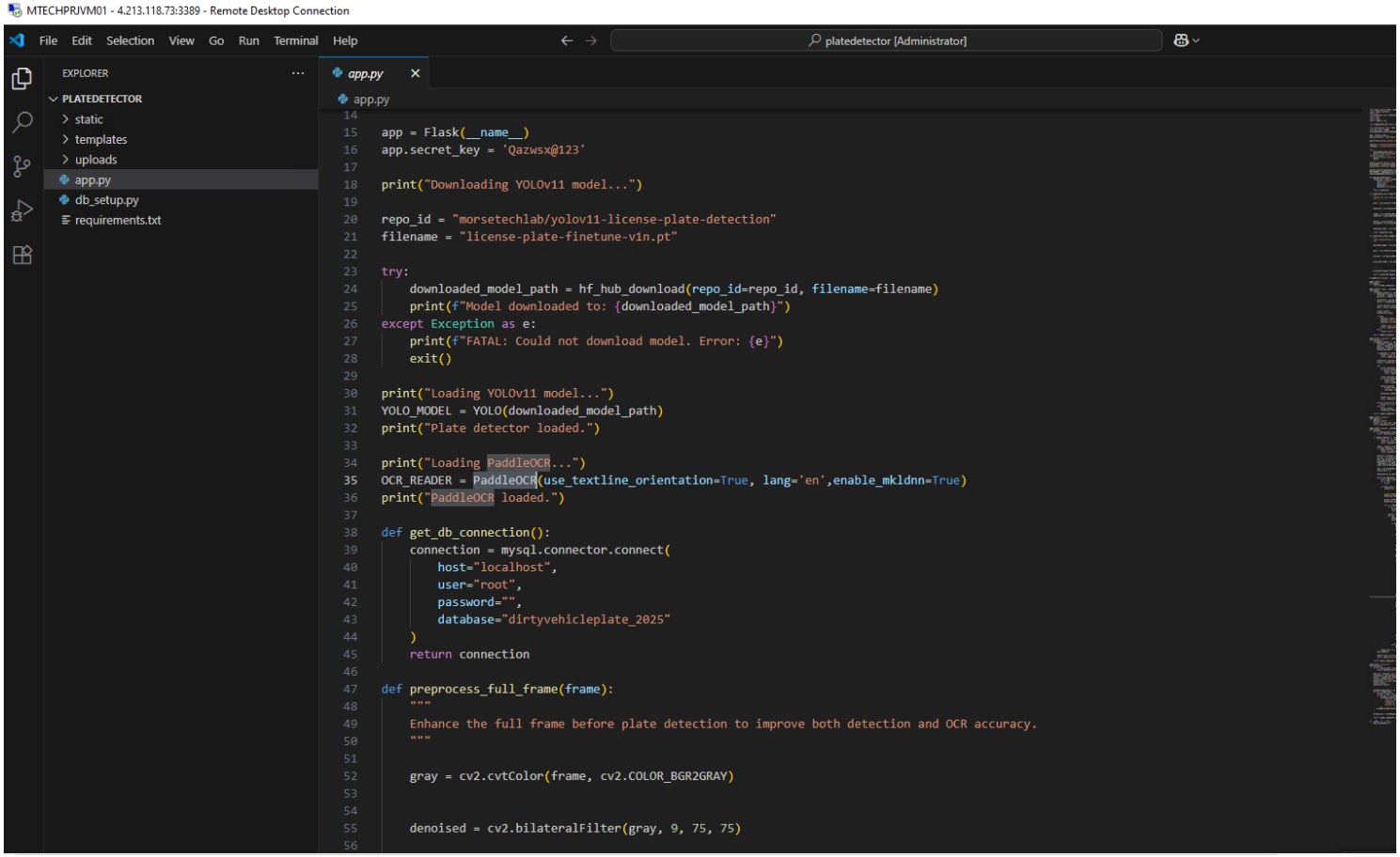
If repeated

Data Sets

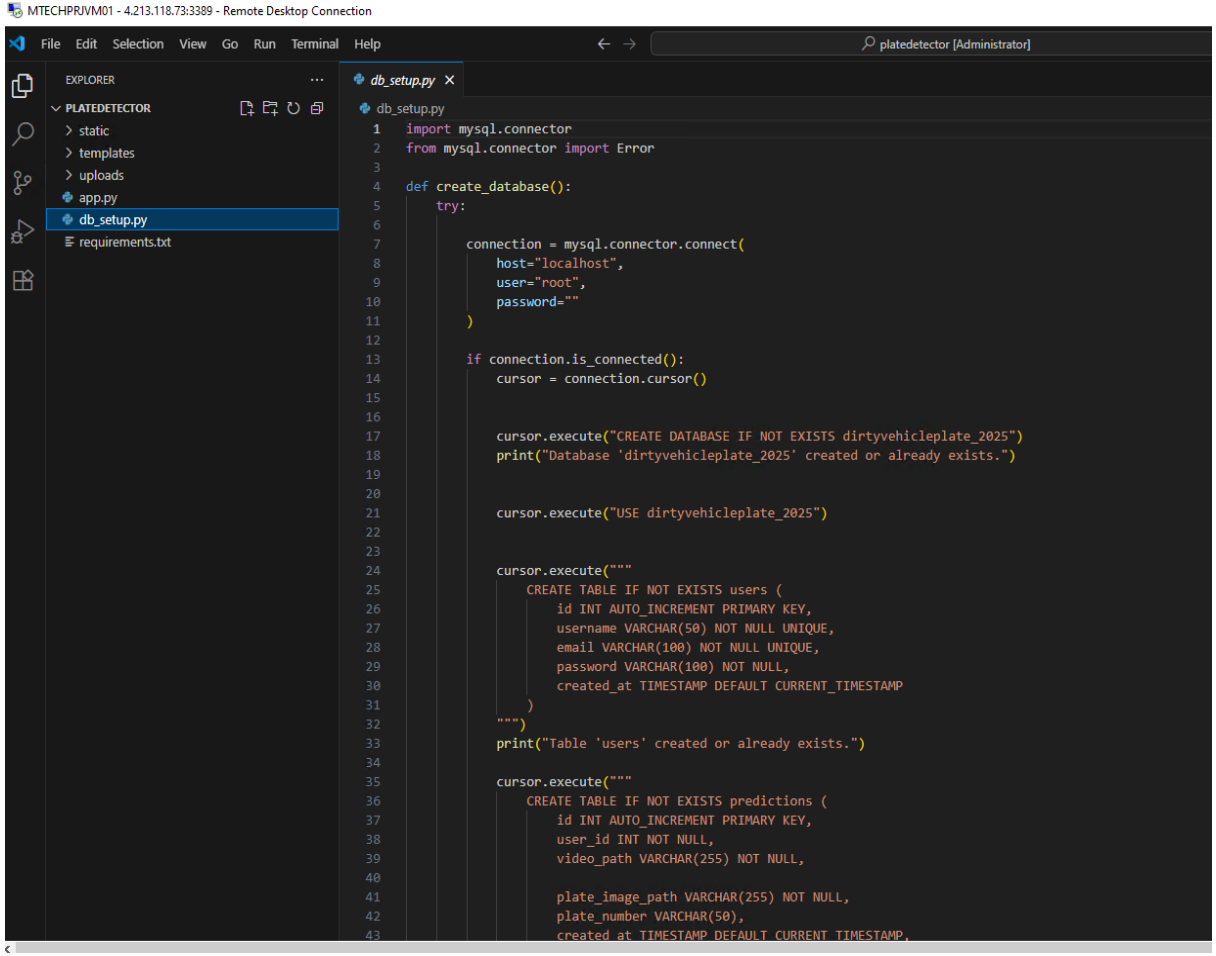
- https://github.com/detectRecog/CCPD
- https://www.kaggle.com/datasets/saisirishan/indian-vehicle-dataset
- We have added MP4 Vdos as inputs

- Git link https://github.com/j33tu/mtechpes25.git

Python app


MTECHPRJVM01 - 4.213.118.73:3389 - Remote Desktop Connection
File Edit Selection View Go Run Terminal Help
platedetector [Administrator]
EXPLORER
PLATEDETECTOR
static
templates
uploads
app.py
db_setup.py
requirements.txt
app.py
app.py
app = Flask(__name__)
app.secret_key = 'Qazwsx@123'
print("Downloading YOLOv11 model...")
repo_id = "morsetechlab/yolov11-license-plate-detection"
filename = "license-plate-finetune-v1n.pt"
try:
downloaded_model_path = hf_hub_download(repo_id=repo_id, filename=filename)
print(f"Model downloaded to: {downloaded_model_path}")
except Exception as e:
print(f"FATAL: Could not download model. Error: {e}")
exit()
print("Loading YOLOv11 model...")
YOLO_MODEL = YOLO(downloaded_model_path)
print("Plate detector loaded.")
print("Loading PaddleOCR...")
OCR_READER = PaddleOCR(use_textline_orientation=True, lang='en',enable_mkldnn=True)
print("PaddleOCR loaded.")
def get_db_connection():
connection = mysql.connector.connect(
host="localhost",
user="root",
password="",
database="dirtyvehicleplate_2025"
)
return connection
def preprocess_full_frame(frame):
"""
Enhance the full frame before plate detection to improve both detection and OCR accuracy.
"""
gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
denoised = cv2.bilateralFilter(gray, 9, 75, 75)

DB configuration

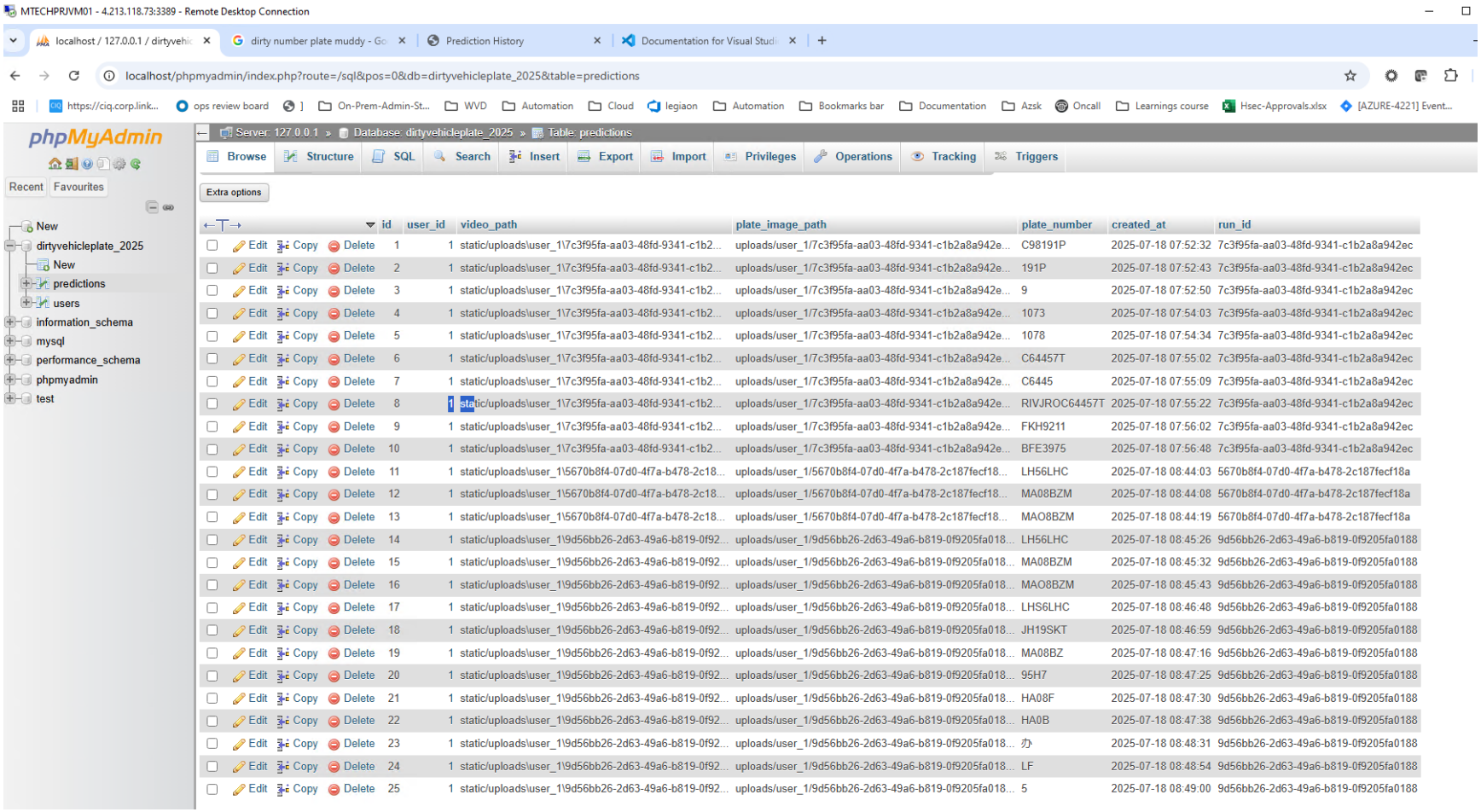


Single Database
Has 2 tables

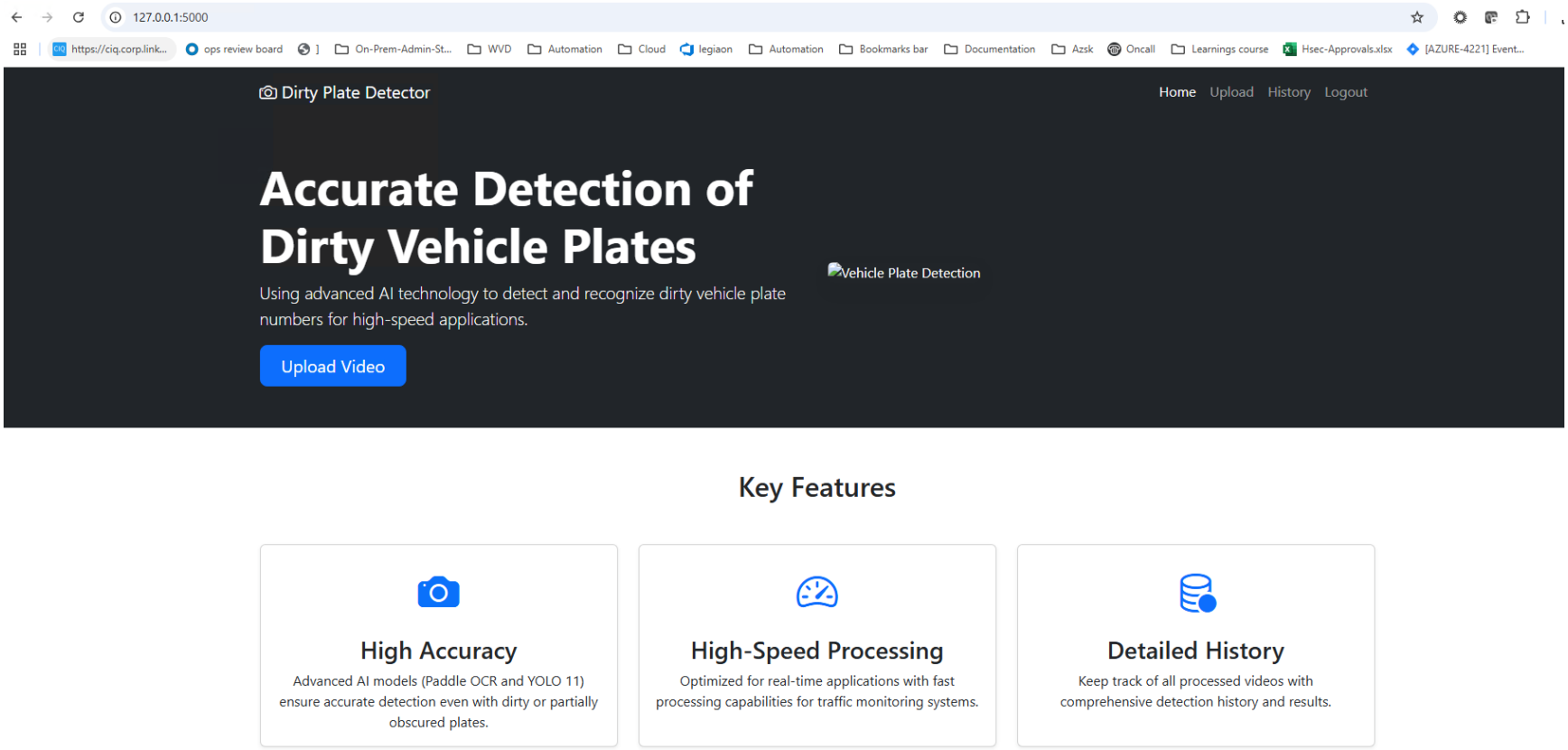
Users: where registered users information to be saved

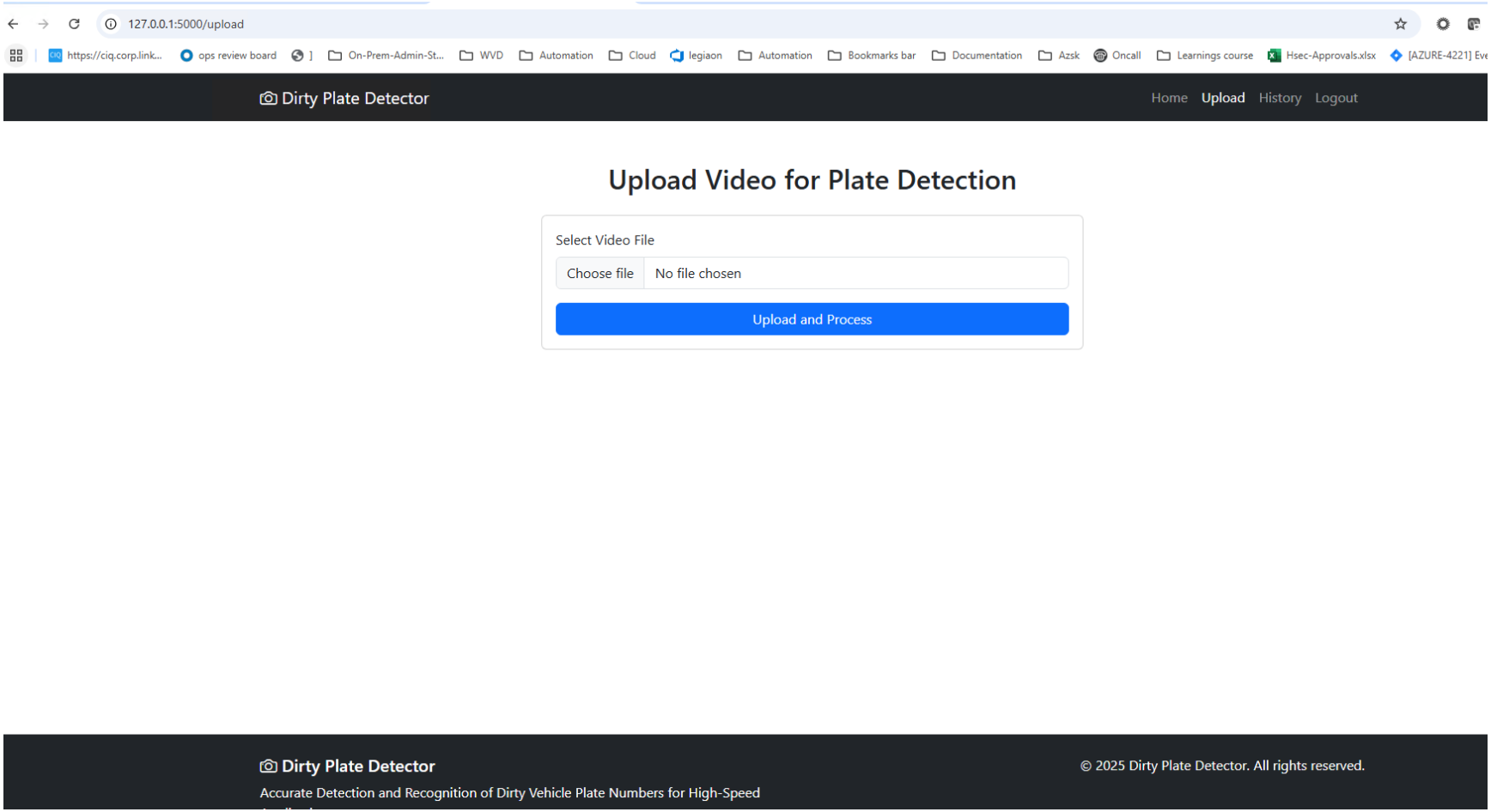
Predications : where out put number plates are saved

Predictions



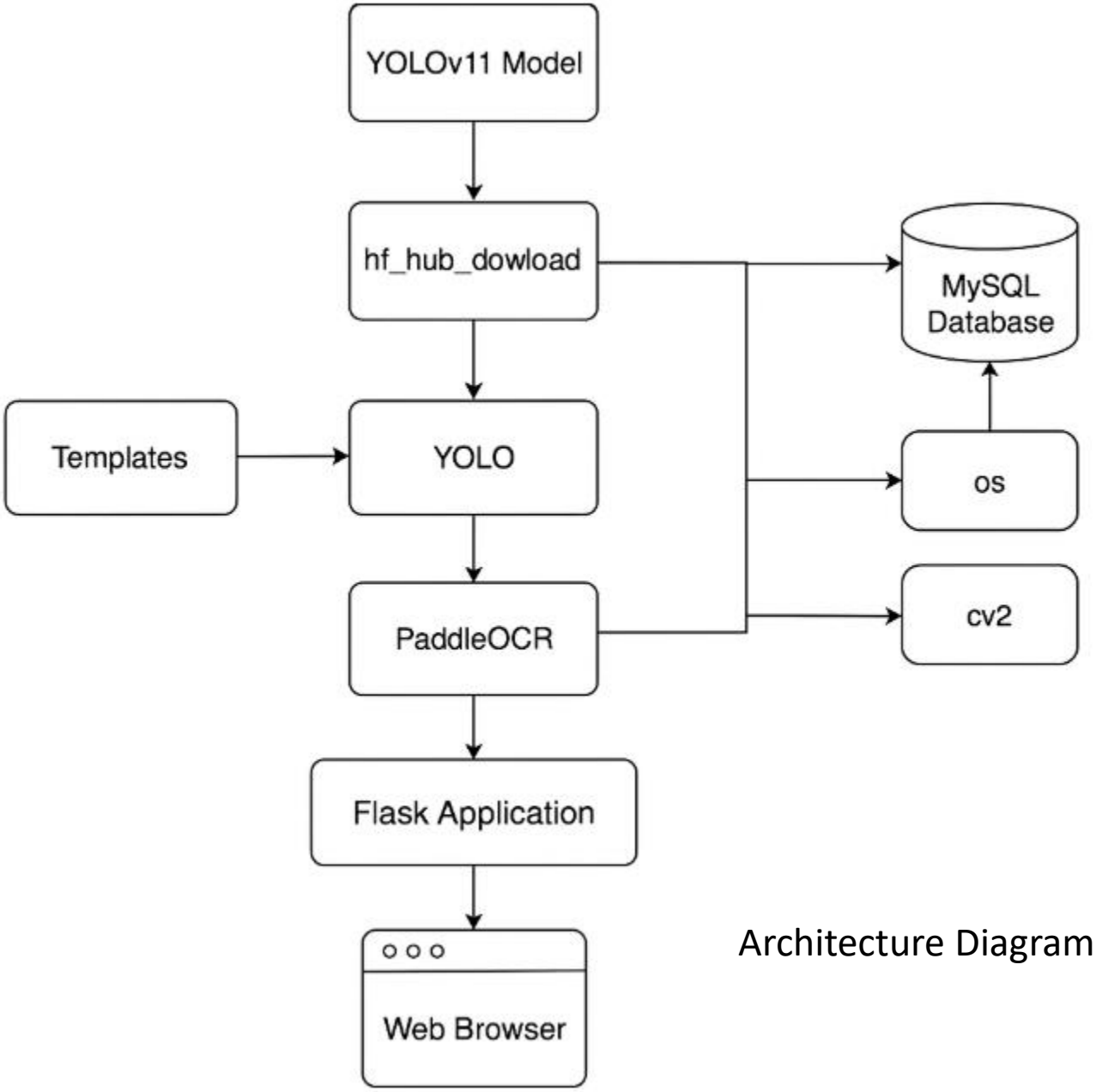
Portal User / registration




127.0.0.1:5000/upload
Dirty Plate Detector
Home
Upload
History
Logout
Upload Video for Plate Detection
Select Video File
Choose file
No file chosen
Upload and Process
Dirty Plate Detector
Accurate Detection and Recognition of Dirty Vehicle Plate Numbers for High-Speed
© 2025 Dirty Plate Detector. All rights reserved.

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...
```



Architecture Diagram