

1. What do you think it occurred during this model development (training & evaluation)?

The issue likely stems from a combination of dataset bias, insufficient robustness, and inadequate evaluation metrics during model development:

1. **Insufficient Data Diversity:**
The model was likely trained on a limited dataset, possibly lacking examples of visually similar plates (e.g., 'O' vs '0', 'B' vs '8') and diverse plate designs or lighting conditions. As a result, it cannot generalize well to real-world edge cases.
2. **Overfitting to Clean Data:**
If the training data included mostly clean, well-lit images, the model may fail to handle challenging real-world scenarios such as motion blur, low lighting, dirt, or occlusions.
3. **Lack of Strong Evaluation Criteria:**
The evaluation might have focused on accuracy per character rather than full plate correctness, which is problematic in high-risk applications like license plate recognition. Even a single-character error can lead to misidentification.
4. **Inadequate Post-processing or Validation:**
There may be no validation step (e.g., plate checksum, vehicle-brand consistency check) to detect implausible OCR results before issuing a fine.

2. How would you fix this behavior? Please provide at least 2 options explaining their pros and drawbacks

Option 1: Improve Data Augmentation & Synthetic Data

- Use synthetic plate generation with varied fonts, lighting, occlusion, and distortion.
- Apply data augmentation (blur, perspective warp, shadows, dirt overlay).

Pros:

- Cheap and scalable.
- Covers edge cases that are rare in real datasets.
- Can simulate different countries' plate formats.

Drawbacks:

- May introduce unrealistic features if not carefully designed.
- Synthetic data might still diverge from real-world distributions.

Option 2: Add Post-processing Validation System

Implement a cross-check module after OCR that:

- Compares recognized plate with a known plate database.
- Confirms match with vehicle type/model/color from a secondary model or external DB.

Pros:

- Reduces false positives by filtering uncertain predictions.
- Maintains explainability and traceability.

Drawbacks:

- Slower pipeline.
- Requires integration with additional vehicle information systems.

3. What do you think it will occur when running this AI in a different country with different plates formats? How would you ensure system accuracy?

I think that the model's performance will drop significantly due to different plate formats (font, size, structure, background, special symbols). For example, the chinese or the arab plates have nothing to do with UK plates.

To ensure system accuracy I would:

- Fine-tune the model with local data from the target country.
- Retrain with multilingual or multi-format plates, including new character sets if needed.
- Use domain adaptation techniques to help the model generalize to different environments (e.g., different backgrounds or camera types).
- Create modular recognition pipelines, where format detection precedes OCR (e.g., detecting country → applying country-specific OCR rules).

4. Do you know any OCR (Optical Character Recognition) algorithms (Deep learning based) that could be used here?

CRNN (Convolutional Recurrent Neural Network)

- Combines CNN for feature extraction and RNN for sequence modeling.

- Works well for unsegmented sequences like license plates.
- Often used with CTC (Connectionist Temporal Classification) loss.

Transformers for OCR

- Models like TrOCR or Donut (by Microsoft) use encoder-decoder transformer architecture.
- Very strong performance on scene text recognition.

5. Explain a Computer Vision / Artificial Intelligence project in which you have participated (goals, your role, difficulties you found, how they were solved, ...)

I have participated in a project during my IA course where I had to make an itinerary in a museum. This itinerary depended on the preferences of the visitors, I had to know the time they got, the period of time they were interested, their favorite artists and many other variables. Also I had to create the database including the paintings with all the information it requires like the author or the style. The most difficult thing about that was to make the logic relation of the variables in a new language that I didn't work before.