ML Model Comparison Report

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Executive Summary

This analysis compares state-of-the-art object detection models for deployment in autonomous vehicle systems.

Model Analysis

RT-DETR (Recommended)

RT-DETR represents a breakthrough in real-time object detection:

* \*\*Architecture\*\*: End-to-end transformer-based detector
* \*\*Performance\*\*: 42.3 mAP @ 31.2 FPS on COCO dataset
* \*\*Key Advantages\*\*:
* No NMS post-processing required
* Consistent inference time
* Strong performance on small objects

Implementation Example

**Code (python):**

import torch

from rt\_detr import RTDETR

# Load model

model = RTDETR.load\_pretrained('rtdetr\_r50vd\_6x\_coco')

# Inference

results = model.predict(image, conf\_threshold=0.5)

for detection in results:

print(f"Class: {detection.class\_name}, Confidence: {detection.confidence}")

Deployment Considerations

When deploying RT-DETR in production:

1. \*\*Hardware Requirements\*\*

* Minimum: RTX 3070 or equivalent
* Recommended: RTX 4080+ for multiple camera streams

2. \*\*Optimization Strategies\*\*

* TensorRT conversion for NVIDIA GPUs
* ONNX export for cross-platform deployment
* INT8 quantization for edge devices

Conclusion

RT-DETR emerges as the optimal choice for real-time autonomous vehicle object detection, balancing accuracy and speed requirements effectively.