# **1. Camera Recommendation for Deployment**

For e\_Auto, where the objective is accurate car brand recognition in real-world settings, the camera should meet these key requirements: high resolution, good frame rate, weather resistance, and night vision capabilities.  
  
 Recommended Cameras:  
 - Logitech Brio 4K Ultra HD Camera (for prototyping or low-budget deployments)  
 • Resolution: 4K (3840 x 2160)  
 • Features: Auto light correction, HDR, 90° field of view  
 • Cost-effective and plug-and-play for early testing  
  
 - Axis Communications P1448-LE Network Camera (for real deployment)  
 • Resolution: 4K Ultra HD with deep learning analytics support  
 • Designed for outdoor environments (dust, rain, sun)  
 • IR Illumination: Supports nighttime image clarity  
 • Edge analytics support: Can do inference on the device

# **2. Camera Positioning for Best Data Collection**

To ensure optimal image capture and model inference:  
  
 Entry-Point Installation:  
 - Mount the camera at 2.5–3 meters height angled 30–45° downward  
 - Position where the vehicle front is visible (logo & grille area)  
 - Ensure consistent lighting (use IR or LED support in low light)  
  
 Coverage Area:  
 - Use wide-angle lenses or multi-camera setups to ensure all vehicle types are captured within frame  
  
 Avoid:  
 - Glare from sunlight  
 - Motion blur (ensure at least 30 FPS)  
 - Partial captures of cars

# **3. Improving Model Accuracy Further**

Dataset Enhancements:  
 - Add diverse lighting conditions (day/night, cloudy/sunny)  
 - Include different vehicle angles (front, slight side)  
 - Balance classes: Ensure roughly equal images per brand  
  
 Model Techniques:  
 - Try Ensembling (combine EfficientNet + MobileNet)  
 - Use Transfer Learning with pre-trained vehicle datasets  
 - Perform fine-tuning instead of feature extraction  
  
 Augmentation Tweaks:  
 - Simulate real-world noise (motion blur, contrast changes)  
 - Use CutMix, MixUp, or Random Erasing  
  
 Continuous Learning:  
 - Add misclassified images back into training loop  
 - Maintain a pipeline to regularly retrain with new incoming images

# **4. Deployment Strategy**

Recommendation: Cloud Deployment  
  
 Why?  
 - Easy scalability  
 - Integrated monitoring and logging  
 - Auto hardware management  
 - Global access with high uptime  
  
 When to Consider On-Premises:  
 - Sensitive/secure data (e.g., private parking systems)  
 - No reliable internet connectivity

# **5. Top 3 AI Cloud Service Providers**

Google Cloud Platform (GCP):  
 - Strong TensorFlow & AutoML integration  
 - Vertex AI for full ML lifecycle  
 - Slight learning curve  
  
 Amazon Web Services (AWS):  
 - Scalable services like SageMaker  
 - Robust monitoring  
 - Complex pricing

Microsoft Azure:  
 - Good for integration with enterprise tools  
 - Azure ML Studio is easy to use  
 - Slower GPU instance provisioning at times  
  
 Best Fit for e\_Auto:  
 - GCP using Vertex AI + Cloud Run for model deployment  
 - Allows fast inference and easy integration with a web or mobile dashboard