Violation rules implement DSL

Created	@November 12, 2025 10:21 AM
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Group 1: High Feasibility (Easy to Implement)

These violations are straightforward to detect and should be prioritized for the initial MVP. They rely primarily on **Object Detection** and user-defined **Zones**.

Violation Name	Legal Basis	Technical Requirements
1. Đi không đúng làn đường quy định *(Driving in the wrong lane)*	Article 5, Decree 100	**User-defined zones:** Administrator draws polygons for each lane type (e.g., "car_lane_1", "motorbike_lane"). **AI Detection:** Identify object type (car, bus, motorbike). **Rule Engine Logic:** `IF object.type IS "car" AND object.is_in_zone("motorbike_lane") THEN TRIGGER_VIOLATION`
2. Dừng, đỗ xe sai nơi quy định *(Illegal stopping or parking)*	Article 5, Decree 100	**User-defined zones:** Administrator draws prohibited parking/stopping zones (e.g., bus stops, crosswalks, intersections). **AI Tracking:** Detect and track vehicles. **Rule Engine Logic:** `IF object.is_in_zone("no_parking_zone") AND object.speed < threshold FOR 5_SECONDS THEN TRIGGER_VIOLATION`
3. Đi vào đường cấm, khu vực cấm *(Entering a prohibited road or area)*	Article 5, Decree 100	**Implementation:** Identical to "wrong lane" violation. Administrator defines "prohibited_zone" and sets rules for specific vehicle types.

Group 2: Medium Feasibility (Requires Tracking & Attribute Analysis)

These violations require advanced capabilities including **Object Tracking** for temporal analysis and **secondary AI models** for specific attributes.

Violation Name	Legal Basis	Technical Requirements
4. Đi ngược chiều *(Driving against traffic)*	Article 5, Decree 100	**User-defined direction:** Administrator defines valid direction vector for each lane/zone. **AI Tracking:** Track object trajectory across multiple frames. **Rule Engine Logic:** Calculate object movement vector and compare to predefined valid vector. If angle difference exceeds threshold (e.g., 120°), trigger violation.
5. Không chấp hành hiệu lệnh của đèn tín hiệu giao thông *(Running a red light)*	Article 5, Decree 100	⚠️ **Challenging.** Requires synchronized information: **User-defined "stop line" zone.** **Traffic light status:** Either (a) integration with city traffic control system, or (b) secondary AI model to detect traffic light color in specific frame region. **Rule Engine Logic:** `IF object.crosses_zone("stop_line") AND traffic_light.status IS "red" THEN TRIGGER_VIOLATION`
6. Người điều khiển xe mô tô, xe gắn máy không đội mũ bảo hiểm *(Motorbike driver not wearing helmet)*	Article 6, Decree 100	**Multi-stage pipeline:** **Primary AI:** Detect person and motorbike objects. **Relationship Logic:** Associate persons with motorbikes based on bounding box overlap and relative position. **Secondary AI Model:** Crop head region of each person on motorbike and pass to specialized **Image Classification model** that outputs helmet/no_helmet classification.