Tools, Constraints, and Potential

Overview
This document summarizes the integration of AWS Rekognition, OCR logic, and Regular Expressions (Regex) in the automated label recognition project. It also outlines key operational constraints, underlying assumptions, and future AI-driven potential for enhancement.

1. AWS Rekognition — Machine Learning–Based OCR
Used to extract raw text and layout information from beverage label images via the *detect_text* API. Rekognition provided bounding boxes and confidence scores for each detected text line, forming the base OCR layer. **2. OCR Post-Processing Logic**
Organized and interpreted raw OCR output based on label layout, using geometry and size to infer hierarchy: largest text for brand names and lower text for manufacturers. **3. Regular Expressions (Regex)**
Applied rule-based pattern extraction to parse structured values such as alcohol percentage, volume, addresses, and country of origin.

Constraints
1. **OCR Accuracy Dependency** — Performance depends on image clarity, font quality, and lighting.
2. **Static Rules** — Regex-based parsing must be updated when label formats change.
3. **Layout Sensitivity** — Assumes label structure where key text regions (brand, manufacturer) appear in consistent areas.
4. **Cloud Dependency** — Requires stable AWS connectivity for real-time Rekognition access.

Assumptions
- Label images are high-resolution (≥ 500×500 px).
- Text may be slightly rotated but remains legible and not severely angled.
- Follows standard U.S. labeling conventions for alcohol, manufacturer, and health warnings.
- User-provided reference data is properly formatted and error-free.

AI Extension Potential
Each detection function (e.g., brand, manufacturer, or health warning) can evolve into an AI or API-trained module specialized on agency datasets for higher accuracy. Future modules may include:
• Brand Detection CNN/Transformer trained on beverage label datasets.
• Manufacturer Entity Recognition using NLP trained on agency databases.
• Health Warning Classifier verifying uppercase and legal compliance.
• Automated Compliance Model validating alcohol content and regional labeling standards.

These extensions would significantly enhance accuracy, scalability, and automation for regulatory or industrial use cases.