



Inspection AI

Intelligent Contamination Detection System

Kasadara

Enterprise AI Solutions

2025



Executive Summary

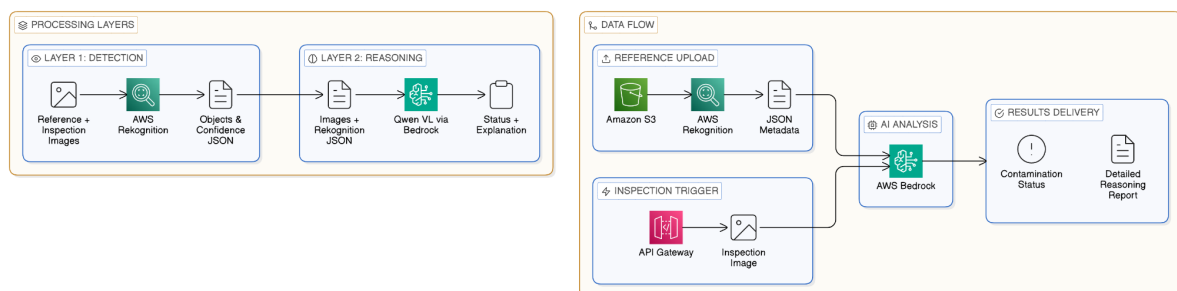
Inspection AI is an advanced AI Analysis system designed to detect dirt, debris, and contamination by comparing baseline floor images against new inspection captures. The solution delivers enterprise-grade automated contamination detection with human-like contextual understanding.

Key Capabilities

- Leverages AWS Rekognition for robust object detection and labeling
- Utilizes AWS Bedrock with Qwen 3 VL for intelligent visual reasoning
- Delivers automated contamination detection with contextual analysis
- Designed for enterprise deployment with scalable architecture
- Ensures secure data handling and seamless workflow integration

Business Value

The system enables facility management teams to maintain pristine environments through automated monitoring, reducing manual inspection efforts while improving detection accuracy and consistency across multiple locations.



Technology Foundation

The Floor Inspection AI system is built on a robust, modern technology stack designed for enterprise scalability and reliability. The architecture leverages industry-leading cloud services and frameworks to deliver optimal performance.

Backend Framework

The application backend is built using Python 3.10+ with FastAPI, providing high-performance API endpoints and efficient request handling. Uvicorn serves as the ASGI application server, ensuring asynchronous processing capabilities for high-throughput scenarios.

Storage Infrastructure

AWS S3 provides scalable, durable storage for all image assets and metadata. The storage architecture implements timestamp-based folder structures to enable horizontal scaling and efficient data organization.

AI/ML Services

The following table outlines the core AI/ML services integrated into the system:

Layer / Component	Technology Used	Purpose
Backend Framework	Python 3.10+, FastAPI	API endpoints & request handling
Storage	AWS S3	Image & metadata persistence
Vision AI	AWS Rekognition	Object detection & labeling
Reasoning AI	AWS Bedrock (Qwen 3 VL)	Visual comparison & analysis
Server	Uvicorn (ASGI)	Application server

Table 1: Technology Stack Overview

Intelligent Analysis Architecture

The system employs a sophisticated multi-layer analysis pipeline that combines computer vision with advanced reasoning capabilities to deliver accurate contamination detection.

Data Flow

- 0. **Reference Upload:** Reference image is uploaded to S3 with Rekognition analysis stored as structured JSON metadata
- 1. **Inspection Trigger:** New inspection image triggers the comparison workflow via API request
- 2. **AI Analysis:** Both images and Rekognition data are sent to AWS Bedrock for comprehensive analysis
- 3. **Results Delivery:** Analysis results returned with contamination status and detailed reasoning

Processing Layers

The processing architecture consists of two primary layers working in concert:

Layer	Function	Output
Layer 1: Detection	AWS Rekognition analyzes both images	JSON with detected objects & confidence scores
Layer 2: Reasoning	Qwen VL compares images using structured data	Contamination status + explanation

Table 2: Processing Layer Architecture

AI/ML Integration

AWS Rekognition

AWS Rekognition provides the foundation for object detection, automatically identifying and labeling objects in uploaded images with confidence scores. This service handles the initial image analysis, creating structured data that feeds into the reasoning layer.

Qwen 3 VL Model

The Qwen 3 VL (Vision-Language) model, accessed through AWS Bedrock, performs advanced visual reasoning to distinguish between actual contamination and environmental noise. This multimodal AI capability enables human-like contextual understanding of visual differences.

Four-Step Analysis Process

- Area Verification - Confirms the inspection area matches the reference zone
- Change Detection - Identifies visual differences between baseline and current images
- Classification - Categorizes detected changes as contamination or acceptable variance
- Reasoning Generation - Produces natural language explanations for findings

Scalability Features

- Timestamp-based folder structure enables horizontal scaling
- Async processing support via FastAPI for high-throughput scenarios
- Auto-scaling AWS services adapt to workload demands
- Distributed architecture supports multi-location deployments

Use Case Demonstration

The following workflow demonstrates the practical application of the Floor Inspection AI system in a real-world facility management scenario:

Baseline Image Capture

A clean floor area is photographed to establish the reference baseline. This image is uploaded to S3 and analyzed by AWS Rekognition to catalog the normal environmental features.



Inspection Image Capture

During routine inspection, a new image of the same area is captured and submitted for analysis. The system compares this against the stored baseline reference.



Analysis Result

The system returns a comprehensive analysis indicating contamination status with detailed reasoning. Results include confidence scores and specific areas of concern identified during the comparison.

```
{
  "area_id": "11",
  "same_area": true,
  "new_contamination_detected": true,
  "reason": "Additional items like a cable, pen, and cloth are present in the current image."
}
```

Multi-Language Support

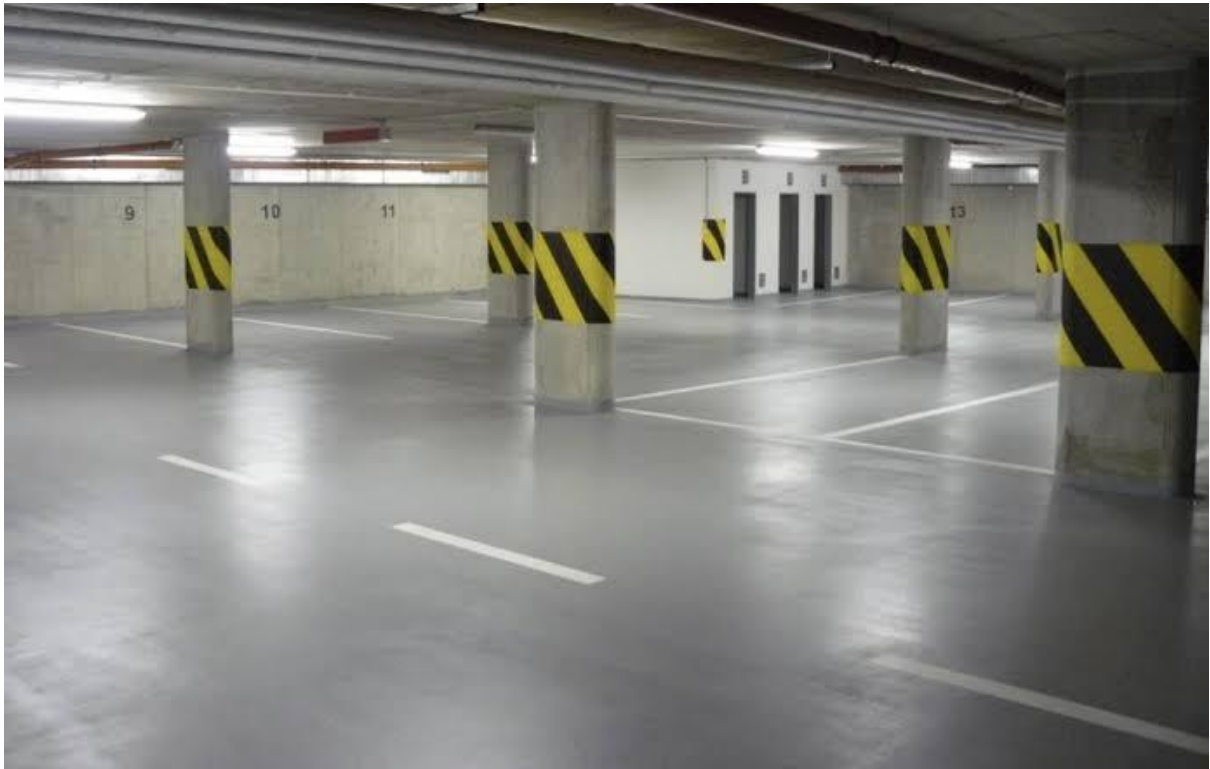
The system supports multiple languages to accommodate diverse operational environments and user bases. Multi-language functionality is implemented using **Sarvam AI**, which enables accurate and efficient language processing and translation.

Odia	Tamil	Kannada	Hindi
Supported	Supported	Supported	Supported

Table 3: Supported Languages

Additional language support can be configured based on deployment requirements and regional needs.

Hindi Language



```
{
  "analysis_id": "e5619cab-4bec-4e1d-a8d3-d49cf0d208e3",
  "dealer_id": "string",
  "checkpoint_id": "string",
  "image_url": null,
  "analyzed_at": "2026-02-23T09:09:39.175258Z",
  "classification": "Clean",
  "confidence": 95,
  "reasoning": "कोई दिखाई देने वाला गंदगी का मलबा या दाग मौजूद नहीं है",
  "detected_labels": [
    {
      "name": "शुद्ध",
      "confidence": 95,
      "category": "cleanliness"
    },
    {
      "name": "कोई दिखाई देने वाला गंदगी का मलबा या दाग मौजूद नहीं है",
      "confidence": 100,
      "category": "reasoning"
    }
  ],
  "model_id": "qwen.qwen3-v1-235b-a22b",
  "provider": "bedrock"
}
```

Odia Language



```
{
  "analysis_id": "a0b6b32a-7729-4d46-9817-1ecf3145b626",
  "dealer_id": "string",
  "checkpoint_id": "string",
  "image_url": null,
  "analyzed_at": "2026-02-23T09:12:16.090488Z",
  "classification": "Messy",
  "confidence": 88,
  "reasoning": "କଞ୍ଚିତ ହୋଇ ପୃଷ୍ଠରେ ମାଟି ବାଗ ଦୃଶ୍ୟମାନ",
  "detected_labels": [
    {
      "name": "ଅଶାନ୍ତ",
      "confidence": 88,
      "category": "cleanliness"
    },
    {
      "name": "କଞ୍ଚିତ ହୋଇ ପୃଷ୍ଠରେ ମାଟି ବାଗ ଦୃଶ୍ୟମାନ",
      "confidence": 100,
      "category": "reasoning"
    },
    {
      "name": "ମଇଳା",
      "confidence": 79.2,
      "category": "detected_item"
    },
    {
      "name": "ବାଗ",

```

Kannada Language



```

"reasoning": "ಅವಶೇಷಗಳು ಮತ್ತು ಧೂಳು ಪಾದಚಾರಿ ಮಾರ್ಗದಲ್ಲಿ ಗೋಚರವಾಗಿ ಚದುರಿಹೋಗಿವೆ.",
"detected_labels": [
  {
    "name": "ಅವ್ಯವಸ್ಥಿತ",
    "confidence": 95,
    "category": "cleanliness"
  },
  {
    "name": "ಅವಶೇಷಗಳು ಮತ್ತು ಧೂಳು ಪಾದಚಾರಿ ಮಾರ್ಗದಲ್ಲಿ ಗೋಚರವಾಗಿ ಚದುರಿಹೋಗಿವೆ.",
    "confidence": 100,
    "category": "reasoning"
  },
  {
    "name": "ಅವಶೇಷ",
    "confidence": 85.5,
    "category": "detected_item"
  },
  {
    "name": "ಧೂಳು",
    "confidence": 85.5,
    "category": "detected_item"
  }
],
"model_id": "qwen.qwen3-v1-235b-a22b",
"provider": "bedrock"
}

```

Tamil Language



```
{
  "analysis_id": "4253f412-08dd-412f-aba9-019b3e6bab36",
  "dealer_id": "string",
  "checkpoint_id": "string",
  "image_url": null,
  "analyzed_at": "2026-02-23T09:16:19.813531Z",
  "classification": "Clean",
  "confidence": 85,
  "reasoning": "எந்தக் கறையும் குப்பையும் தென்படவில்லை.",
  "detected_labels": [
    {
      "name": "தூய்மையான",
      "confidence": 85,
      "category": "cleanliness"
    },
    {
      "name": "எந்தக் கறையும் குப்பையும் தென்படவில்லை.",
      "confidence": 100,
      "category": "reasoning"
    }
  ],
  "model_id": "qwen.qwen3-v1-235b-a22b",
  "provider": "bedrock"
}
```

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