Housekeeping AI

- ML-POWERED BED INSPECTION FOR CONSISTENT QUALITY STANDARDS

TEAM LABRATS
TEAM NO. 311

THE CHALLENGE

IN-PERSON SUPERVISION REQUIRED FOR QUALITY CHECKS

CURRENT STATE

Constant in-person supervision is required to ensure quality checks of beds

- **Time-consuming** to individually check beds across hotel
- Difficult to track which housekeepers are doing a good job and who is not
- May miss out on key details due to surface-level checks

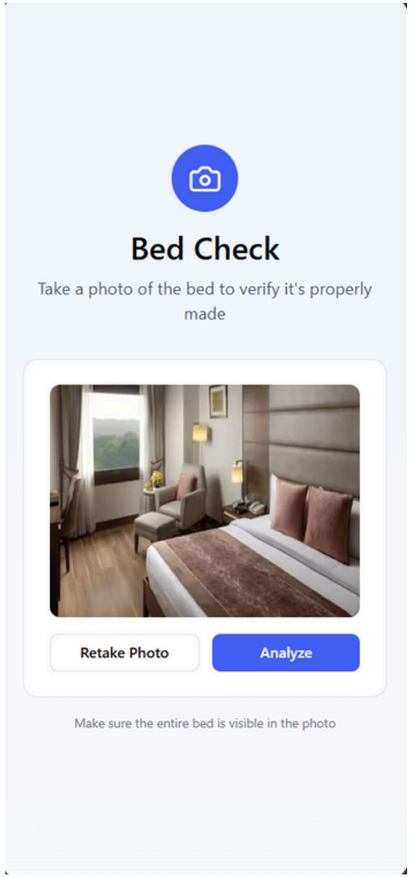
TARGET USER

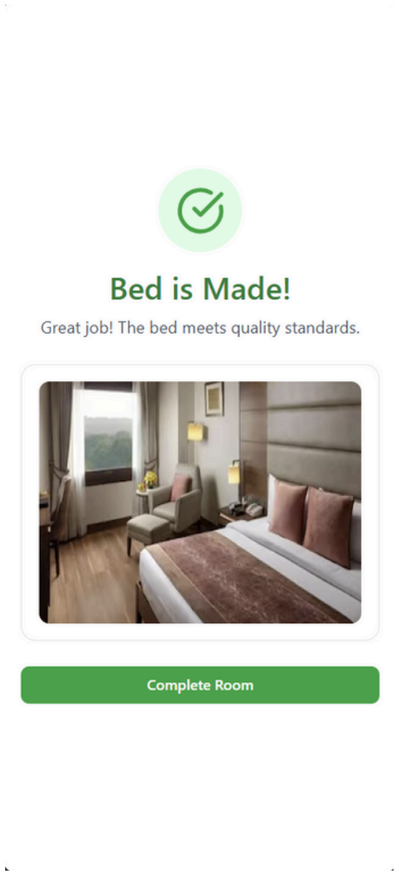
Hotel managers / supervisors

Need to be able to manage and have an overview of all room beds' status and housekeepers' performance

SOLUTION

AI - ASSISTED QUALITY AND PERFORMANCE INSPECTION





01 **Capture**
Housekeeper uploads bed image taken real-time via mobile phone

02 **Analyse**
ML model evaluates bed quality

03 **Review**
System labels ‘made‘ or ‘unmade’ + confidence level of AI

04 **Decide**
Supervisor checks low AI confidence and flagged cases

PRODUCT WORKFLOW

Image Upload

Single RGB photo captured on mobile device

ML Processing

Two-stage inference pipeline runs analysis

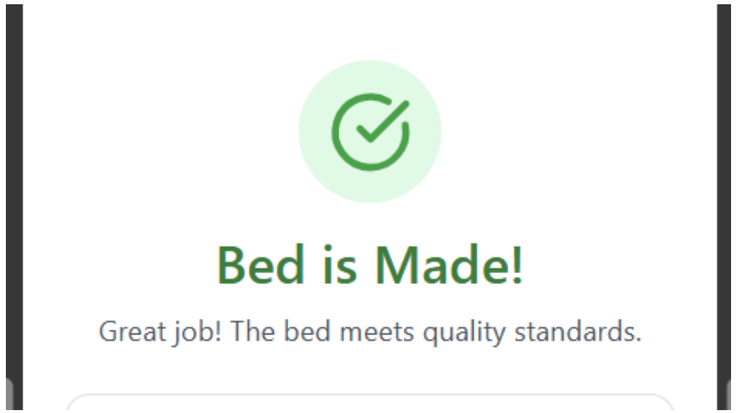
Result Display

Pass/fail decision, defect labels, confidence score

Supervisor Action

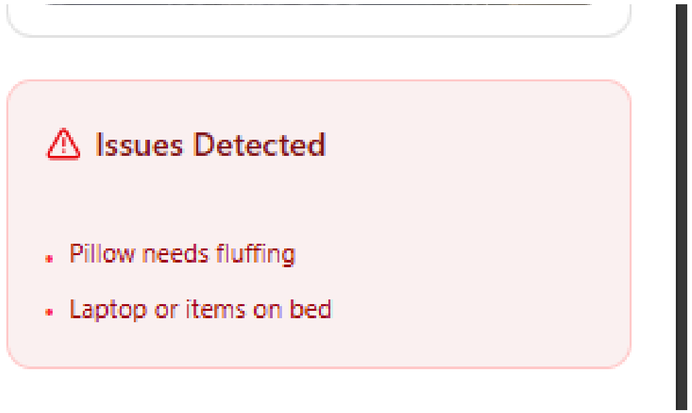
Approve for guest or flag for rework

FINAL DESIGN



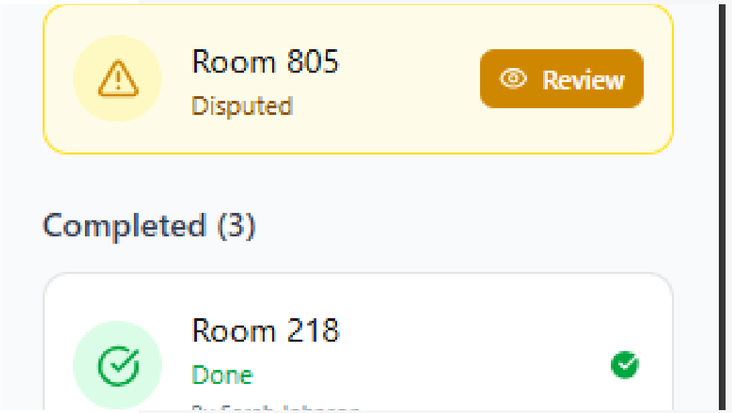
Visual Status Indicator

Color-coded pass/fail (green/red) for instant recognition.



Description of improvements

Short, clear text descriptions of identified issues.



Brief presentation of details

Design enables supervisors to quickly understand issues and take action.

TWO-STAGE ML PIPELINE

TECHNICAL ARCHITECTURE

Stage 1: Binary Classification - *Pass or Fail*

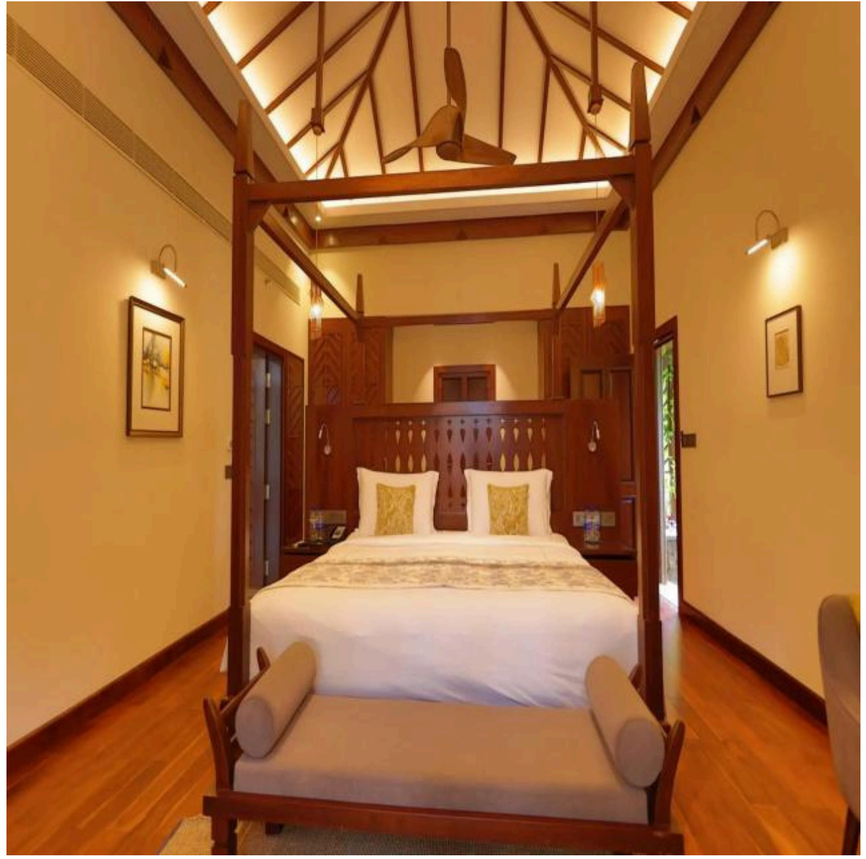
Initial quality gate determines if bed meets standards

Stage 2: Multi-Label Detection - *Defect Identification*

Identifies and lists specific issues: wrinkles, pillow misalignment, stains, loose corners etc.

FUNCTIONALITY

HOW THE AI MODEL ASSESSES CLEANLINESS



01 **Pass/Fail Label**: *Primary decision indicator*

Rooms with failed beds are flagged for immediate attention. These results allow to easily pinpoint rooms that need the beds to be remade.

02 **Defect List**: *Specific issues identified*

The AI model lists down the issues it has highlighted to support it’s claims on the pass/fail remark.

03 **Confidence Score**: *Model certainty percentage*

The model assesses the condition of cleanliness and updates the algorithm accordingly as a score. The supervisor can use this to gauge the standards of cleanliness and if tips are necessary.

SUPERVISOR DECISION PATH

A **Pass Result**
Room approved and released as ready for guest check-in

B **Fail Result**
Supervisor assigns room to be re-cleaned to fit appropirate requirements for hospitality.

C **Documentation**
All results saved for quality tracking and review.

PRODUCT DEMONSTRATION

Bed Check

Hotel Room Management System

Sign In As

Housekeeper
Clean and verify rooms

Supervisor
Review and monitor progress

My Rooms

5 rooms pending

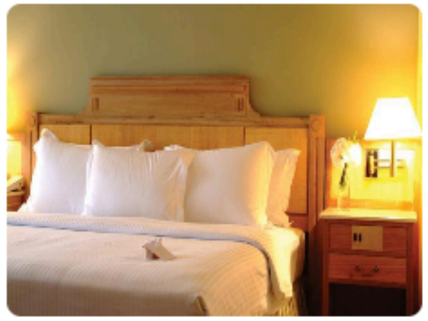
Logout

Pending (5)

- Room 218 — Tap to verify bed
- Room 403 — Tap to verify bed
- Room 507 — Tap to verify bed
- Room 612 — Tap to verify bed
- Room 805 — Tap to verify bed

Bed Check

Take a photo of the bed to verify it's properly made

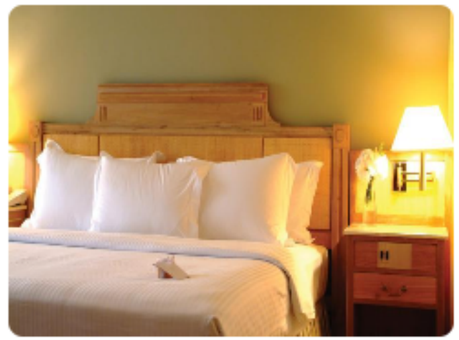


Retake Photo | Analyze

Make sure the entire bed is visible in the photo

Bed is Made!

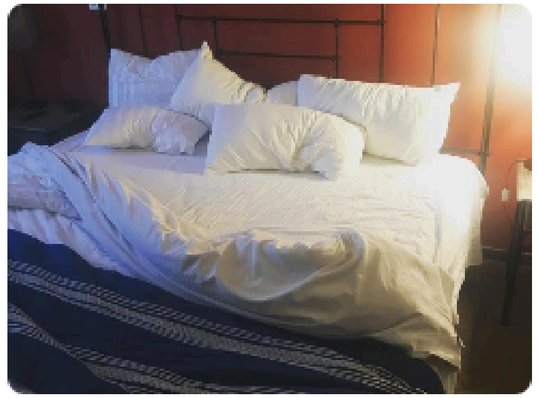
Great job! The bed meets quality standards.



Complete Room

Bed Needs Work

Please address the following issues:



Issues Detected

- Pillow needs fluffing
- Laptop or items on bed

Retake Picture

Disagree with AI - Send to Supervisor

Room Overview

3/5 rooms completed

Logout

Disputed (1)

Room 805
Disputed
Review

Completed (3)

Room 218
Done
By Sarah Johnson

Room 403
Done
By Sarah Johnson

Room 612
Done
By Sarah Johnson

Pending (1)

Room 507
Pending

Back to Dashboard

Dispute Review

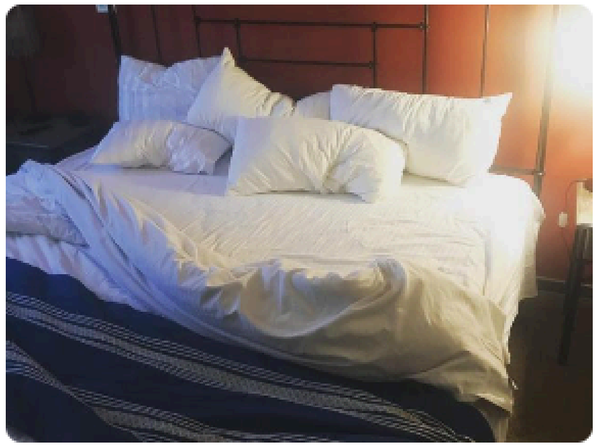
Room 805

Housekeeper disagrees with AI assessment

Review the photo and AI findings to make a decision

Submitted by: Sarah Johnson

Submitted Photo



AI Detected Issues

- Pillow needs fluffing
- Laptop or items on bed

Make your decision:

Approve - Bed is properly made

Reject - Bed needs to be redone

PRODUCT SCOPE

IN SCOPE

- Single bed classification
- Image-based decision
- Basic reason tags for unmade beds.
- Confidence score for the prediction.
- Multi-Label Classification
- Automated checks at Scale
- Optional Human Intervention
- High Inference speeds for faster outputs

OUT OF SCOPE

- Full room cleanliness scoring
- Identifying specific brands/linen types
- Multi-bed suites
- Real-time video analysis
- Detailed analysis for why bed is made/unmade

KEY ASSUMPTIONS

Image Sufficiency

Single photo provides adequate information for quality assessment.

Mobile Capability

Standard smartphone cameras capture sufficient image quality.

Lighting Conditions

Typical room lighting enables consistent ML performance

Human Oversight

Supervisor retains final decision authority on room approval.

THANK YOU!