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# RL2: ACCOUNTING FOR CONTRACTORS' TOOLS AND EQUIPMENT


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# PRESENTATION OUTLINE

# CURRENT PAIN POINTS

**Manual and Tedious Process**

**Time Consuming**

**Prone to Human Error**

# ADDRESSING PAIN POINTS WITH TECHNOLOGY

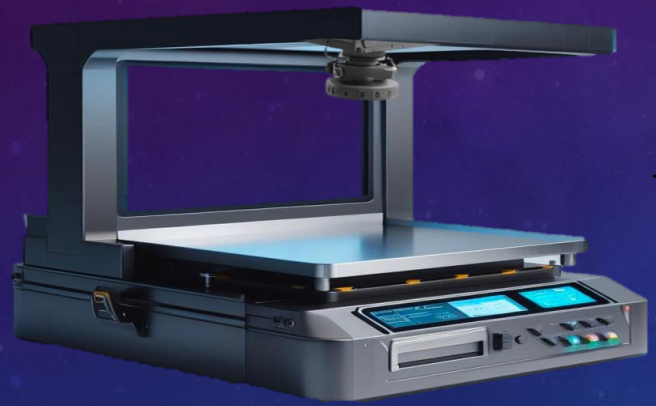
**Automation for Efficiency and Ease of Use**

**Reduced Processing Time**

**Enhanced Accuracy and Security**

# INTRODUCING VISTA :

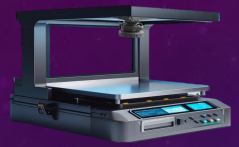
## Vision Integrated System for Tool Accountability




**VISTA TOOL DETECTION UNIT**

**VISTA ONLINE FORM**

Contractors enter Prison Complex



**VISTA**
**Tool Detection Unit**

**VISTA**
**Online Form**


**Risk Assessment Score**

**Contractors carry out maintenance and repair works**

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Contractors exit Prison Complex

# VISTA TOOL DETECTION UNIT

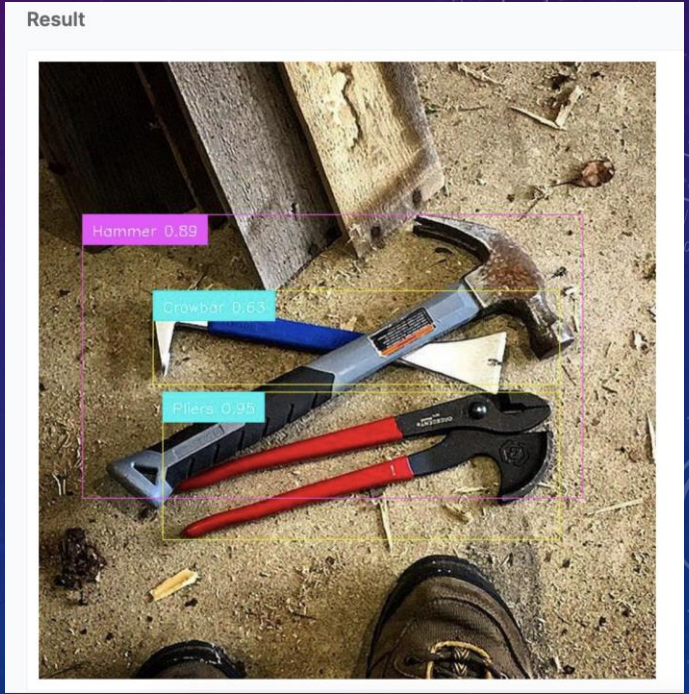

**High-Definition Camera** for Computer Vision implementation.

**Weight-Sensitive Platform** for accurate detection of tools placed.

**Display Panel** for clear and concise instructions to users.

# OBJECT DETECTION

- Trained a YOLOv8 Computer Vision model on METU-ALET Dataset
- Real-time Detection & Confidence Ratings
- Continuous Model Refinement & Improvement



# WEIGHT DETECTION

## Large Tools


## Small Tools

# WEIGHT DETECTION

## Large Tools

- **Larger weighing platform** for **bulky** tools and equipment.
- **iPad camera** to be used to capture **image** of the equipment.
- **Captured image** will be processed by **Computer Vision** and appear in the online form, upon successful recognition.

# WEIGHT DETECTION

## Small Tools

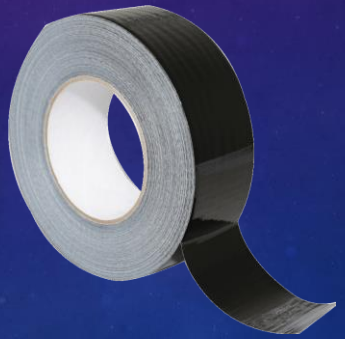
- **Weight-Sensitive Platform** for accurate detection of tools placed.
- **High-Definition Camera** for Computer Vision implementation.

# WEIGHT DETECTION

Discrepancies in **start** and **end weights** may be due to consumables.

***Examples***

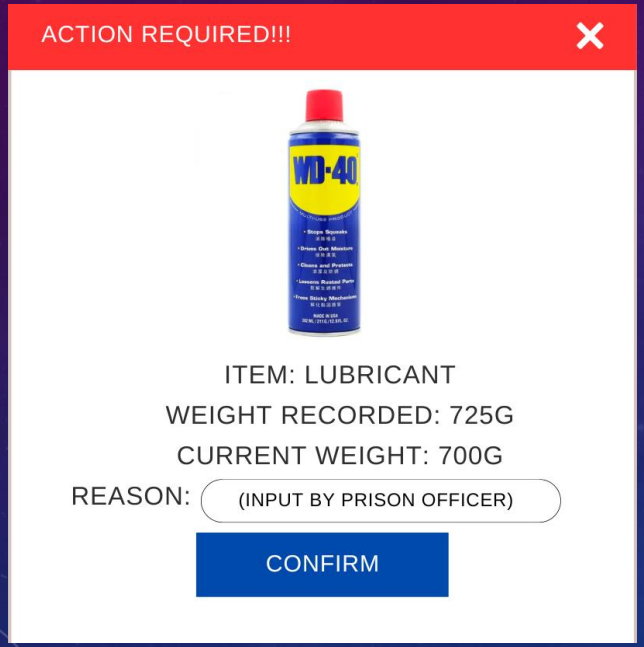

**Lubricants**



**Tape**

**Dirt in Vacuums**

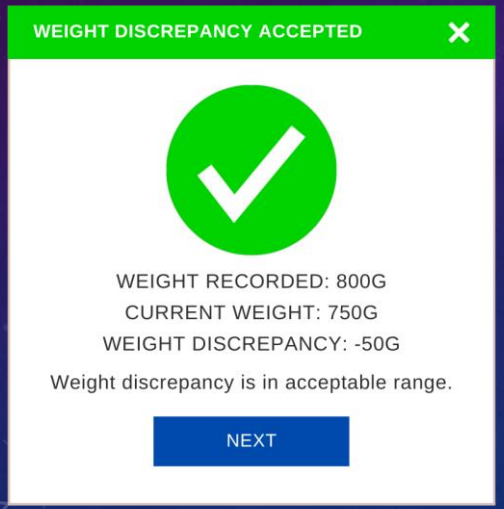
# WEIGHT DETECTION: MACHINE LEARNING INTEGRATION




If the weight discrepancy is deemed to be **safe** and **valid**, it's **reason** can be indicated in the tool **checkout Form**, by the reviewing officer.

# WEIGHT DETECTION: MACHINE LEARNING INTEGRATION

| Tool | Weight Difference (g) | Reasons |
|---|---|---|
| Vacuum Cleaner | 500 | Dirt accumulated from repair work |
| Lubricant | -30 | Lubricant used for machinery |
| Paint (20L) | -4000 | Paint used for restoration work |
| | | |

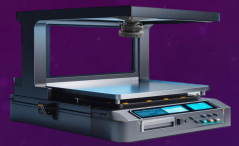



When a weight discrepancy occurs, **a reviewing officer** will need to review and **accept** the warning pop-up.

The **discrepancies** are **incorporated** into the model via **Reinforcement Learning.**

Model learns and automatically adjusts the **threshold** for weight discrepancies **specific** to the tool.

Contractors enter Prison Complex



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Contractors exit Prison Complex


# VISTA ONLINE FORM

Form would be **auto filled** by **VISTA**, contractors and officers would only carry out **verification**, **increasing efficiency** and **reducing** any **human error**.

## AUTO-FILLING OF TOOL DETAILS

The tools that are brought in by contractors will be:

1. Detected and Recognised by **Computer Vision** Implementation
2. **Weight** will be recorded individually as tools are placed on the **platform**

Company Name: _____ contractors: _____

Work Location: _____ Contact No.: _____

Description of work: _____

Total number of tools brought IN: AUTOFILL

Total number of tools brought OUT: AUTOFILL

Total weight of tools brought IN: AUTOFILL

Total weight of tools brought OUT: AUTOFILL

Tools Detected:

| No. | Type | Qty | Weight (Kg) | Total Weight |
|---|---|---|---|---|
| 1 | Screwdriver | 2 | 0.08 | 0.16 |
| 2 | Wrench | 1 | 4.4 | 4.40 |
| 3 | Hand driver | 1 | 1.2 | 1.20 |
| 4 | Plier | 3 | 0.07 | 0.21 |
| 5 | Electric drill | 1 | 1.5 | 1.50 |
| | ADD MORE ⊕ | | | |
| | | | | 7.47 |

# MANUAL ENTRY FOR TOOL DETAILS

In cases where Computer Vision struggle with **complex** or **unique** tools, contractors can manually input the details. This process involves:

1. **Capturing an image of the unrecognised tool.**

2. **Entering a description of the tool.** This information will be fed into the AI model, facilitating further training and improving tool recognition over time.

| No. | Type | Qty | Weight (Kg) | Total Weight | |
|---|---|---|---|---|---|
| 1 | Screwdriver | 2 | 0.08 | 0.16 | |
| 2 | Wrench | 1 | 4.4 | 4.40 | |
| 3 | Hand driver | 1 | 1.2 | 1.20 | |
| 4 | Plier | 3 | 0.07 | 0.21 | |
| 5 | Electric drill | 1 | 1.5 | 1.50 | |
| | ADD MORE ⊕ | | | | |
| | | | | 7.47 | |

I hereby declare that the information provided is true and correct. ____

For official use only

Acknowledged by: _____

Date: _____

of tools brought IN: AUTOFILLED

t of tools brought OUT: AUTOFILLED

ted:

Sort by:

| Type | Qty | Weight (Kg) | Total Weight | Verified? |
|---|---|---|---|---|
| ewdriver | 2 | 0.08 | 0.16 | ☑ |
| Vrench | 1 | 4.4 | 4.40 | ☑ |
| nd driver | 1 | 1.2 | 1.20 | ☐ |
| Plier | 3 | 0.07 | 0.21 | ☐ |
| ctric drill | 1 | 1.5 | 1.50 | ☐ |
| MORE ⊕ | | | | |
| | | | 7.47 | |

are that the information provided is true and correct.

## SIMPLIFIED VERIFICATION PROCESS

Contractors and officers will only need to **confirm** and **verify** the **automatically populated** tools declaration form, then mark the checkbox.

In case of any **errors** or **inconsistencies**, the system will prompt the user to provide an **explanation**. This step will be overseen by a **reviewing officer** for accuracy.


# ONLINE FORM IMPLEMENTATION

**Automation for Efficiency and Ease of Use**

**Reduced Processing Time**

**Enhanced Accuracy and Security**

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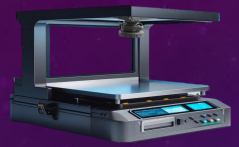

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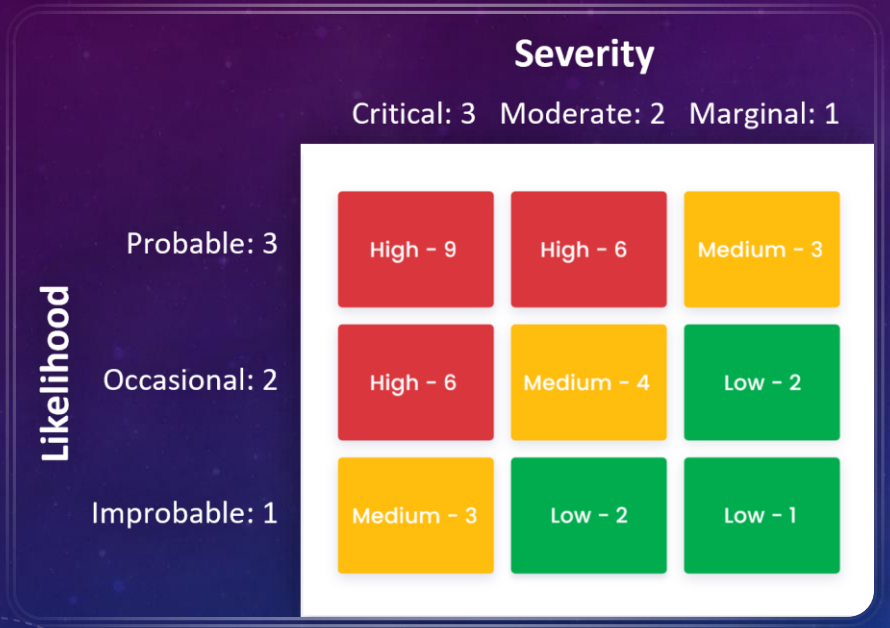
# RISK ASSESSMENT SCORE




- Visual representation that combines "**Severity**" and "**Likelihood**" assessments to categorize different contractor visits.
- **Form data** will be utilized to generate a **precise risk score** for each contractor visit.
- The score will allow for more **targeted security measures** and **informed decision-making.**

# ACTIONS FOR EACH RISK LEVEL


Visual check for irregularities

Minimal Supervision

# ACTIONS FOR EACH RISK LEVEL


Conduct thorough inspection

Periodic Supervision

# ACTIONS FOR EACH RISK LEVEL


Conduct thorough inspection

Constant Supervision

# KEY FACTORS IN RISK ASSESSMENT

## 01

### No. of Tools Brought in

A larger number of equipment brought in may increase **likelihood** of **miscounts**, **thefts** or **misplaced** tools.

## 02

### Location where Contractor Visits

Different areas have **varying levels** of **potential risks**. Cell blocks with maximum security may be categorized as a **higher risk** location.

## 03

### Unknown Tools

Model has not encountered such equipment before and will be flagged as a higher risk tool.

# CONSIDERATIONS


Use of Microsoft Azure Services and specialized hardware may entail significant costs.

Machines can produce false positives or negatives. Over reliance on the machine may lead to missed security risks.

Hardware components require regular maintenance and calibration to ensure accurate measurements.

# THANK YOU!

Presentation by Triple L for HacX! 2023

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