CHAPTER 1 AND 2 DEFENSE SCRIPT

SLIDE 1 — TITLE (shara)

“Good day everyone. We are here to present our research entitled **Development and Evaluation of an Edge-AI-Based Computer Vision System for Real-Time Detection of Unauthorized Waste Disposal and Automated Alerting in Urban Areas.**

Our study focuses on developing a system that can monitor a defined area, detect possible unauthorized waste disposal using Edge AI and computer vision, and automatically generate an alert when a disposal event is detected.”

CHAPTER 1 (chaster)

SLIDE 3 — PROJECT CONTEXT AND RATIONALE

“Illegal or unauthorized waste disposal is still a problem in urban areas. One of the challenges is that public areas cannot always be monitored continuously by people.

Because of this, some disposal events may not be noticed immediately, which can result in delayed detection and intervention.

Our study proposes an automated approach where a camera continuously monitors a defined area, while an Edge-AI-based computer vision system analyzes the video and identifies possible unauthorized disposal events.

The main need that our project addresses is **real-time, automated, and intelligent monitoring**, instead of relying only on manual observation.”

SLIDE 4 — STATEMENT OF THE PROBLEM (frances)

“Based on this problem, our general problem is:

How can unauthorized waste disposal be detected and reported in real time using Edge AI?

To answer this, we have four specific problems.

First, how can the system detect unauthorized disposal events?

Second, how can Edge AI process these events in real time?

Third, how can detected events trigger automated alerts?

And lastly, how can the performance of the system be evaluated?”

SLIDE 5 — OBJECTIVES OF THE STUDY (brix)

“To address our research problems, our general objective is to **develop and evaluate an Edge-AI computer vision system for real-time unauthorized waste-disposal detection and automated alerting.**

Specifically, we aim to:

First, detect unauthorized waste disposal.

Second, process the video using Edge AI.

Third, generate automated alerts.

And lastly, evaluate the performance of the system.

These objectives are directly aligned with our statement of the problem.”

SLIDE 6 — CONCEPTUAL FRAMEWORK (Chaster)

“For our conceptual framework, we use the **Input-Process-Output model**.

INPUT

For the input, we have five main components.

First is the **camera**, which provides the video or image frames of the monitored area.

Second is the **AI model**, which will be trained to recognize the relevant objects involved in our defined disposal scenario.

Third is the **Edge Device**, which is where the AI processing will take place.

Fourth is our **dataset**, which will be used to train and evaluate the AI model.

And lastly, we have the **detection area**, which defines the specific location that the system will monitor.

PROCESS

For the process, the camera continuously captures video frames from the defined area.

The frames are then processed by the Edge device, where the AI model performs object detection.

The system can detect relevant objects such as a person, vehicle, or waste, depending on the scenario defined in our study.

After detection, object tracking is used to follow the movement of these objects across consecutive frames.

Then, the system performs **temporal or behavioral event analysis**.

This is important because our system does not simply assume that the presence of garbage means unauthorized disposal.

Instead, the system looks at the **sequence of actions**.

For example, a person or vehicle approaches the area, waste is detected or placed, the person or vehicle moves away, and the waste remains.

This sequence provides the basis for identifying a possible unauthorized disposal event.

OUTPUT

If the observed sequence meets the conditions defined by our system, it will be classified as a potential unauthorized disposal event.

The system will then generate an automated alert and provide the relevant event information or evidence.

So, in simple terms, our system works as:

Camera captures → AI detects → Tracking follows the objects → Event analysis evaluates the sequence → Alert is generated.”

SLIDE 7 — SIGNIFICANCE OF THE STUDY (frances)

“Our study can benefit several stakeholders.

For **LGUs and authorities**, the system can provide faster notification of possible disposal incidents.

For **enforcement personnel**, it can support continuous automated monitoring.

For the **community**, improved monitoring can help contribute to cleaner public spaces.

And for **future researchers**, our study can serve as a baseline for future research involving Edge AI and computer vision for environmental monitoring.”

SLIDE 8 — SCOPE AND DELIMITATION (brix)

“For the scope, our system focuses on real-time video monitoring, detection of defined waste-disposal events, Edge-AI processing, automated alerting, and application within a defined urban or public-area setting.

However, our study also has limitations.

The system will use a **fixed camera location** and will only monitor a **defined detection area**.

It will also focus only on the **selected waste-disposal scenarios** included in our dataset and system design.

The system will not perform facial recognition, and it will not automatically enforce or issue penalties to individuals.

Therefore, the system's output should be understood as an **automated detection and alert**, and not as an automatic legal determination that a person committed an offense.”

CHAPTER 2

SLIDE 10 — THEORETICAL FOUNDATIONS AND FRAMEWORK

A. COMPUTER VISION AND OBJECT DETECTION

“First is **Computer Vision and Object Detection**.

Computer vision provides the foundation of our system because we are analyzing video captured by a camera.

It allows the system to extract meaningful information from the video frames, such as detecting persons, vehicles, and waste objects.

These detections will provide the information needed for the next stages of our system.”

B. YOLO

“For object detection, we use **YOLO**, which stands for **You Only Look Once**.

YOLO is designed for real-time object detection.

The input is the video frame, and the output includes the detected objects, their bounding boxes, and confidence scores.

In our proposed system, YOLO will be used to detect the relevant objects, such as a person, vehicle, or waste.

However, YOLO alone does not determine whether illegal or unauthorized disposal happened.

The detections from YOLO will be used together with object tracking and event analysis.”

C. OBJECT TRACKING

“After the objects are detected, object tracking allows the system to follow their position across consecutive video frames.

This is important because we need to understand what happens to the objects over time.

For example, the system can track the movement of a person or vehicle and observe its relationship with the detected waste.

This helps us analyze whether the waste was placed and subsequently left behind."

D. TEMPORAL OR BEHAVIORAL EVENT ANALYSIS

"This part is important because unauthorized disposal is not simply an object-detection problem.

The system needs to analyze a **sequence of actions**.

For example:

A person or vehicle approaches the area.

Then waste is detected or placed.

The person or vehicle moves away.

And the waste remains.

By analyzing this sequence across time, the system can identify a potential unauthorized disposal event.

So, the difference is that **garbage detection tells us that waste is present, while event analysis helps determine whether a disposal activity may have occurred.**"

E. EDGE AI ARCHITECTURE

"Lastly, we have **Edge AI Architecture**.

Edge AI means that the AI processing is performed near the source of the data instead of relying completely on a remote cloud server.

In our system, the camera provides the video, and the Edge device processes the video locally.

This supports our project because it can reduce dependence on continuous cloud connectivity and can help reduce delay during detection.

The overall architecture can be summarized as:

Camera → Edge Device → AI Detection → Tracking → Event Analysis → Alert.

This architecture supports our goal of real-time and continuous monitoring."

SLIDE 11 — RELATED STUDIES / LITERATURE MATRIX

"For our related studies, we selected three closely connected works.

The first is **Green Guard: AI Camera for Detection and Evidence Collection of Illegal Waste Dumping**.

This study focuses on detecting illegal waste dumping using YOLOv8, person tracking, distance calculation, and event validation.

It is closely related to our study because it also focuses on detecting waste that is left behind.

The second study is **Delivery Garbage Behavior Detection Based on Deep Learning**.

It uses YOLOv5, DeepSORT, and MobilePose to analyze human posture and garbage movement.

This study shows how object detection and tracking can be used to analyze disposal behavior.

The third is a local study from **Guimaras State University**, entitled **Smart Waste Management System Using Computer Vision**.

It uses an ESP32 camera, Edge Impulse, and Blynk for waste classification, automated segregation, and real-time updates.

However, its main focus is waste classification and segregation using a smart bin, rather than detecting unauthorized disposal behavior through a surveillance camera.

Overall, these three studies gave us a basis for developing our proposed system.

They helped us identify the technologies and approaches that can be applied, while also showing the gaps that our study aims to address.

Our study focuses on integrating **Edge AI, real-time detection, object tracking, event analysis, evidence collection, and automated alerting** for unauthorized waste disposal in a defined monitoring area."

ENDING / TRANSITION

"That concludes our discussion of Chapters 1 and 2.

Our study aims to develop and evaluate an Edge-AI-based computer vision system that can detect a defined unauthorized waste disposal event in real time and automatically generate an alert.

Thank you, and we are ready for your questions."

POSSIBLE PANEL QUESTIONS AND ANSWERS

1. Why did you choose Edge AI instead of Cloud AI?

"We chose Edge AI because the AI processing happens near the camera or data source.

This reduces the need to continuously send video to a cloud server and can reduce dependence on internet connectivity.

Since our system focuses on real-time detection, local processing is suitable for our project."

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2. What exactly is your Edge Device?

"The Edge device is the local computing hardware where our AI model will run.

It will receive the camera input, perform the AI processing, handle the detection and event analysis, and initiate the alert when the defined conditions are met."

If they ask for the exact device:
State the exact hardware your group selected. Do not guess.

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3. What camera are you using?

“The camera is the visual input of our system.

It will continuously capture the defined monitoring area and provide the video frames that will be processed by the Edge-AI system.”

If the panel asks for the exact camera model, state the model you selected.

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4. What AI model will you use?

“We will use a YOLO-based object detection model because YOLO is designed for real-time object detection.

It will detect the relevant objects in our disposal scenario, while tracking and temporal analysis will be used to analyze the activity over time.”

If your group has already selected a specific YOLO version, mention the exact version.

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5. How does the system decide that the disposal is unauthorized?

“The system does not determine unauthorized disposal simply because it detects garbage.

It analyzes a defined sequence of events.

For example, a person or vehicle approaches, waste is placed or detected, the person or vehicle leaves, and the waste remains.

If this sequence meets the conditions defined in our system, it is identified as a potential unauthorized disposal event.”

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6. What happens after detection?

“After a potential disposal event is detected, the system triggers the automated alert and records the relevant event information or visual evidence.

This allows the responsible personnel to be notified and provides information about the detected event.”

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7. How is the alert sent?

“Once the event meets the detection criteria, the Edge device triggers the alerting mechanism through the communication method implemented in our system.

The alert informs the responsible user or authority that a potential disposal event has been detected.”

If your group has a specific alert method, such as a messaging platform, email, or another method, state the exact one.

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8. What evidence will be collected?

“The primary evidence will be the captured image or video associated with the detected event.

We can also include event information such as the date and time of detection.

The purpose is to document what the system detected and support verification of the incident.”

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9. How fast is ‘real-time’?

“For our study, real-time means that the system continuously processes the camera input and produces a detection and alert with minimal delay while the event is happening.

The actual processing speed and response time will be measured during system evaluation rather than assuming a specific speed.”

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10. What happens if the camera detects something incorrectly?

“False detections are possible, especially under conditions such as poor lighting, different camera angles, occlusion, or situations that are different from the training data.

Because of this, we will evaluate the model using appropriate performance metrics and test it under different conditions.

These results will help us determine the accuracy and limitations of the system.”

If they ask, “So is your system 100% accurate?”

“No, we cannot guarantee 100% accuracy.

Our goal is to develop and evaluate the system based on measurable performance and determine how well it performs under the conditions of our study.”

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11. What makes your study different from the existing studies?

“Our contribution is the integration of several components into one system.

These include real-time computer vision detection, Edge AI processing, object tracking, temporal event analysis, evidence collection, and automated alerting for unauthorized waste disposal.

Instead of only detecting the presence or type of waste, our study focuses on analyzing the activity surrounding the disposal event and using that detection to trigger an automated response.”

EXTRA IMPORTANT QUESTIONS

“Where did you get the information about the existing technologies used by these studies?”

“It is based on the existing studies that we reviewed.

We got the information from their methodology, results, and discussion, particularly the technologies and approaches that they used.”

If they ask, “Which study?”

“The information came from the specific existing study that we cited in our related literature.”

If they ask, “Did you conduct that study?”

“No, sir/ma'am. That information came from the existing study.

We reviewed it as part of our related literature to understand their approach, limitations, and how it relates to our proposed system.”

If they ask, “How did you identify the gap?”

“We identified the gap based on our analysis of the existing studies, particularly their scope, approach, and limitations.

We compared these with what our proposed system aims to accomplish.”

⭐ ONE ANSWER TO MEMORIZE

If the panel suddenly asks:

“Explain how your entire system works.”

> “The camera captures the monitored area. The video is processed by the Edge device. YOLO detects the relevant objects, such as the person, vehicle, or waste. Object tracking follows these objects across frames. Then, temporal event analysis examines their sequence of actions, such as approaching, placing waste, leaving, and the waste remaining. If the sequence satisfies our defined criteria for a potential unauthorized disposal event, the system generates an automated alert and records the relevant event information.”