

## Drone Security Analyst Agent - Project Report

# 1. Introduction

This project implements a Drone Security Analyst Agent that processes simulated drone telemetry and video frames, detects objects or events, generates security alerts, and indexes video frames for querying. The agent enhances security through automated monitoring and real-time alert generation.

# 2. Assumptions

- **Dataset Choice:** Simulated video frames with text descriptions were used instead of real drone footage due to project constraints.
- **Vision-Language Model (VLM) Selection:** OpenAI's CLIP was used for object detection due to its ability to match images with textual descriptions.
- **System Design:** The agent was designed with a simple modular architecture for ease of implementation and testing.

# 3. Tool and Configuration Justification

- **Google Colab:** Used for development due to its built-in GPU support and ease of execution.
- **SQLite:** Chosen for lightweight storage and retrieval of indexed frames and alerts.
- **Python:** Preferred language due to extensive AI/ML libraries and ease of integration.
- **FFmpeg & OpenCV:** Used for processing video frames efficiently.
- **CLIP (Contrastive Language-Image Pretraining):** Selected over BLIP due to its strong zero-shot image-text matching capabilities.

# 4. Implementation Overview

## (a) Simulated Video Frames with Telemetry

- Each frame was assigned a timestamp, location, and object description.

## (b) AI-Generated Component

- CLIP was used to detect objects in frames and classify them based on textual descriptions.
- Rule-based alert system was developed to flag unusual activities (e.g., loitering).

## (c) Frame Indexing

- Data was stored in an SQLite database with searchable frame details.

## (d) Testing and Quality Assurance

- Unit tests were created to verify:
  - Correct log recording
  - Alerts triggering for suspicious activity
  - Querying indexed data

## 5. Results & Sample Output

- **Logs:** "Blue Ford F150 spotted at garage, 12:00"
- **Alerts:** "Person loitering at main gate, 00:01"
- **Querying Indexed Frames:** Frames retrieved based on time or object description.

## 6. Potential Improvements

- **Advanced VLM Integration:** Using BLIP or a fine-tuned CLIP model for better object recognition.
- **Real-time Processing:** Implementing a streaming pipeline for live video analysis.
- **Video Summarization:** Summarizing events to reduce storage and improve review efficiency.

## 7. AI Assistance in Development

- **Claude Code:** Helped generate initial LangChain agent code, later customized for specific needs.
- **Code Suggestions:** AI-assisted debugging and optimization of database queries and object detection.

## 8. Submission Details

- **Videos:** Attached separately / Available at :  
<https://drive.google.com/file/d/16B8qbsir5EHOpI0QiIXtx5p9V-kjHB2R/view?usp=sharing>
- **GitHub Repository:** <https://github.com/Aditi432002/Drone-Security-Analyst.git>