



Studio
Shodwe

EEE4113F PROJECT

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THE PROBLEM

The penguins at the de Hoop nature reserve colony
are under threat from the surrounding predators

PENGUIN CONSERVATION

Aid penguin preservation by
keeping predators away from
their enclosure

HOW?

Use a deterrence system and
notify conservationists if there
is an intrusion



GOALS AND OBJECTIVES

Purpose

Deter predators and notify conservationists about predators near fences for penguin conservation

Why does this help?

Provide real time information about high risk areas and notify conservationists if something is detected,
Allows action to be taken

HIGH LEVEL OVERVIEW

- 01 PIR sensor detects a creature near the fence
- 02 Camera trap triggers and verifies that the animal is a threat – deterrence system triggers
- 03 Fence monitoring notifies the user if an animal has begun climbing the fence
- 04 User views this data easily on the web application



Motion detected → AI identifies predator → deterrent activated → back to sleep

A light sensor automatically triggers LED illumination only when needed, t.

Cam stays asleep

The system conserves power in deep sleep mode until the PIR sensor detects motion within a 7-meter radius, instantly waking the ESP32-CAM.

Captures Image when triggered

The captured image is wirelessly transmitted to Azure Custom Vision AI,

AI Classification

s When a honey badger is detected with >85% confidence, the system simultaneously activates deterrent systems, uploads evidence to cloud storage, and sends real-time alerts to conservation teams.

Response Actions

After completing the detection cycle, the system returns to ultra-low power sleep mode, ready for the next potential threat.

Return to Sleep



Colony Guardian

Penguin Protection System

Email Address

Enter your email

Password

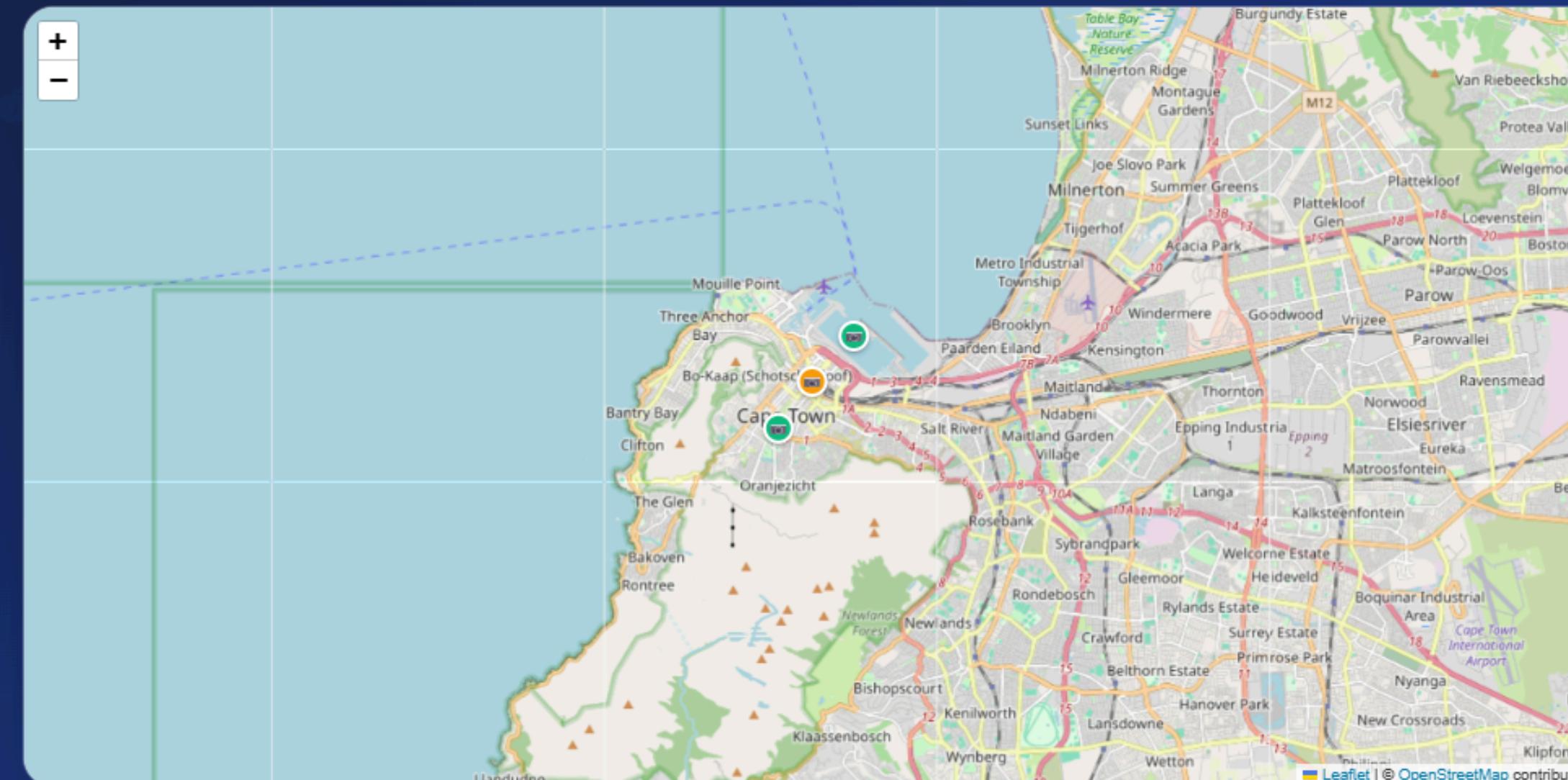
Enter your password

Enter the Colony

✖ Demo: Use any email and password to explore the colony

Coastal Monitoring Stations

Real-time monitoring of predator activity near penguin colonies. Click any location marker to view recent camera captures and predator alerts.



Active Stations
3



High Alert
0



Medium Alert
1



Secure Zones
2

Colony Protection Status



Honey Badger Trail
Primary monitoring location for honey badger activity

8 recent detections

Last: May 25, 2025, 08:23 PM



River Crossing Point
Secondary monitoring point near water source

0 recent detections



Valley Perimeter

0 recent detections

Honey Badger Trail

Primary monitoring location for honey badger activity

MEDIUM ACTIVITY

Path: /honey-badger

Number of Images Date Range

10 images

Last 7 days

⟳ Refresh Feed

8 Predator Detections

Captured in the last 7 days • Sorted by most recent activity

● Live Feed Active



honey_badger_20250525_182322...

733.41 KB

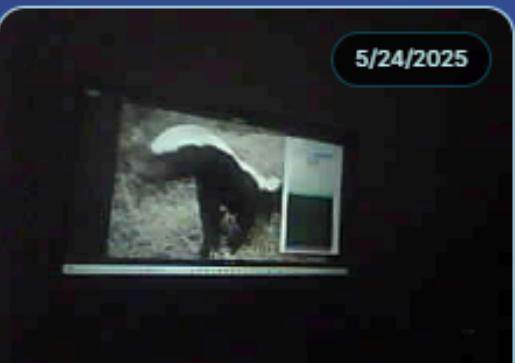
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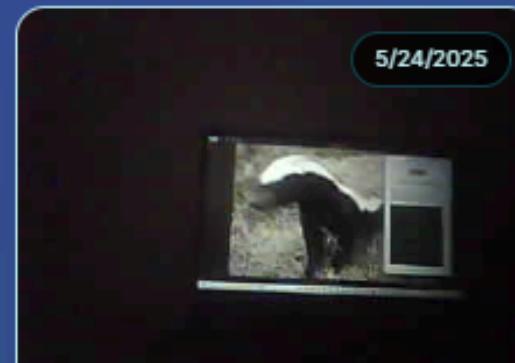
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● Active



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● Active



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● Active



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758.85 KB

● Active



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3.92 KB

● Active



honey_badger_20250524_173938...

1.14 MB

● Active

Filter

Add images

Delete

Tag images

Select all

<

1

Iteration

Workspace

▼

Tags

+

Tagged

Untagged

Showing: all tagged images

Search For Tags:

 honey-badger 158 ... non-honey-badger 235 ...

Filter

Delete

Tag images

Iteration

Iteration 2

Tags

Showing: all predicted images

Search For Tags:

honey-badger

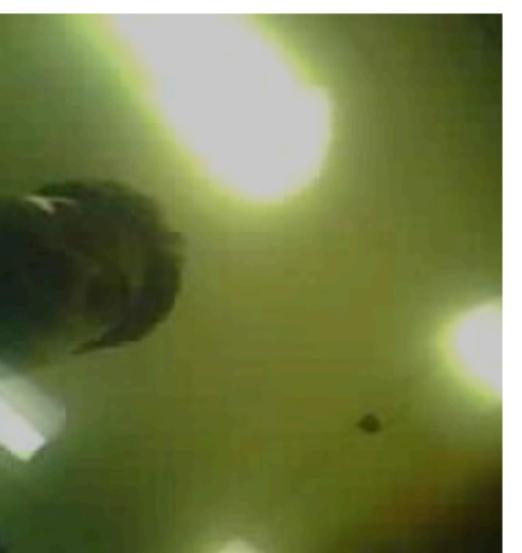
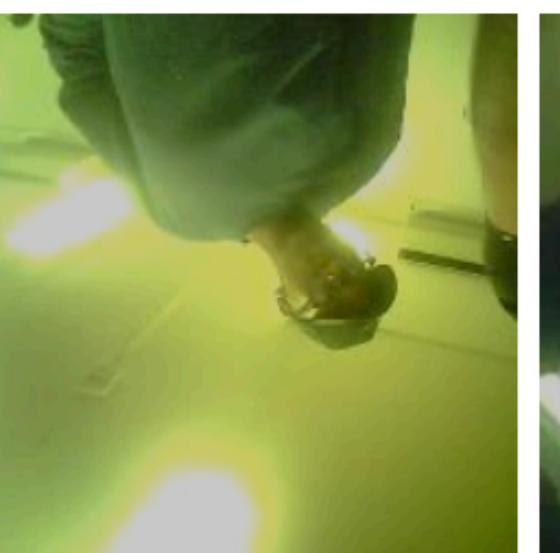
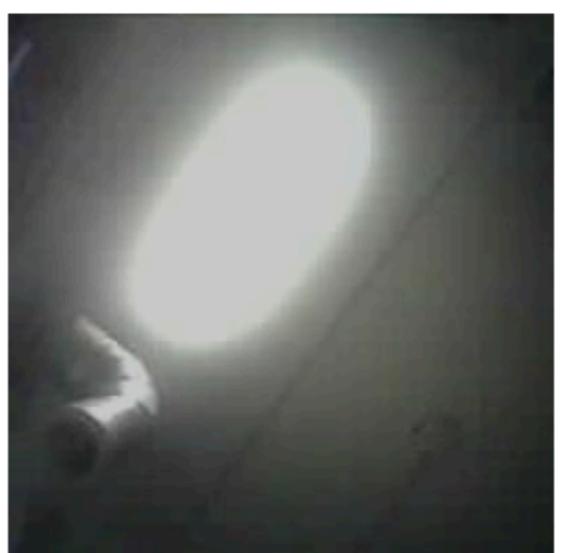
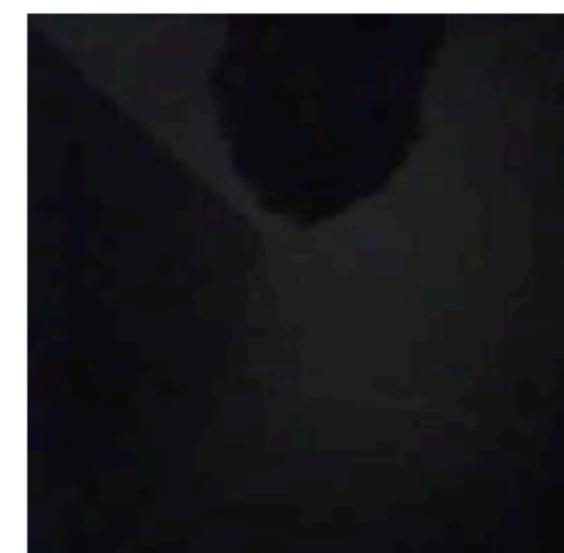
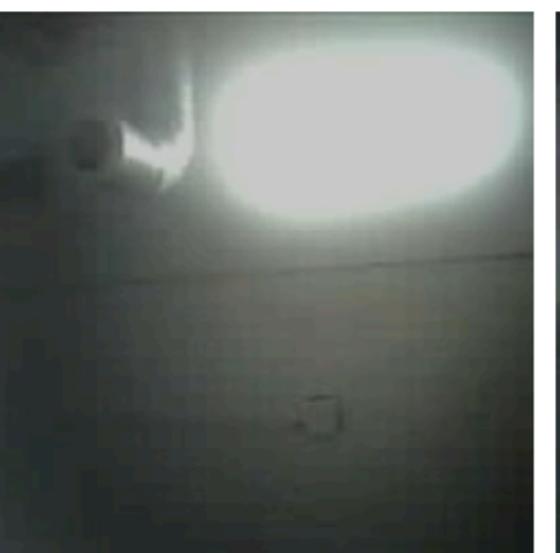
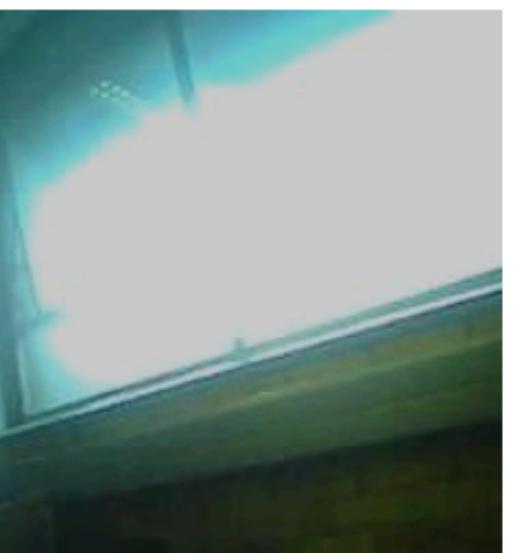
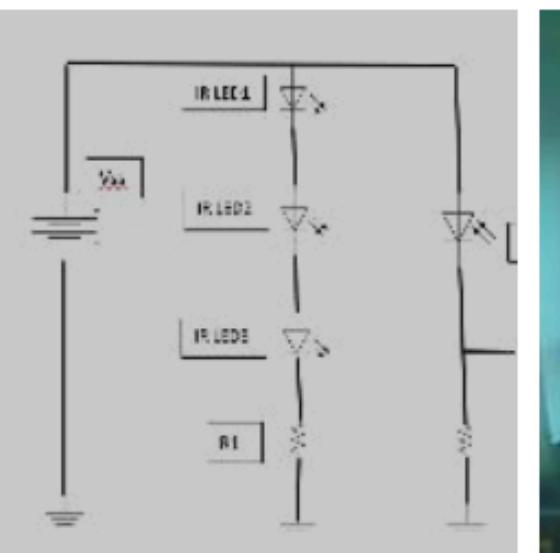
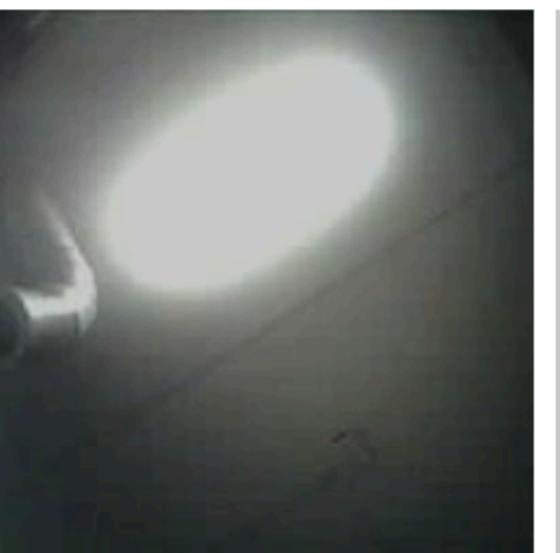
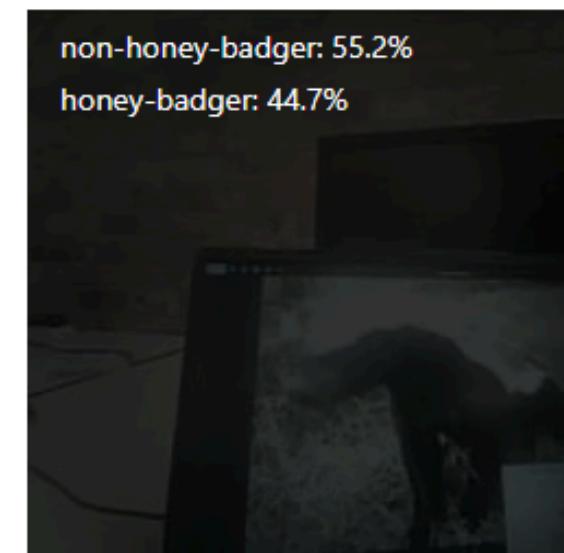
non-honey-badger

Sort

Suggested

Newest

Oldest





Search

Invite members

Start

All files

honey-badger

Recents Starred

Name	Who can access	Modified ↑
istockphoto-1461358561-612x612.jpg	Only you	11/4/2025 10:39 pm
istockphoto-1391291035-612x612.jpg	Only you	11/4/2025 10:39 pm
istockphoto-1031581284-612x612 (1).jpg	Only you	11/4/2025 10:39 pm
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a professional looking UI with ease of navigation

Easy UI to navigate

Latency tested is quick and allows deterrence to take place as soon as a detection occurs

High Risk Area Identification

Highlight high risk areas on the UI, this allows additional measures to be taken if needed.

Push Notifications

Send users notifications as soon as a detection occurs.

moderate latency

Easy Scalability

System Architecture easily allows for improving accuracy of the system without requiring additional hardware.



MONITORING FENCES



What is being monitored?

- Holes
- Strain
- Tampering
- Animals climbing fence



How is it typically done?

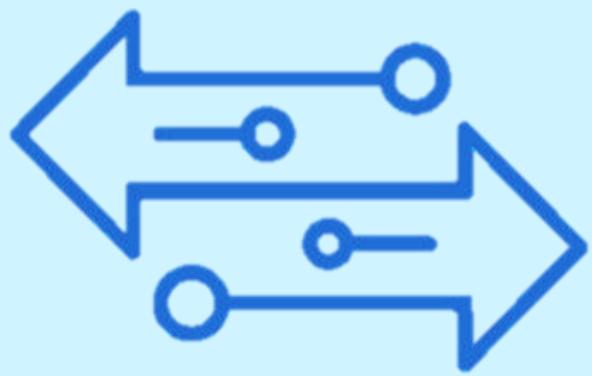
- Manually
- In person
- Infrequently



Goal?

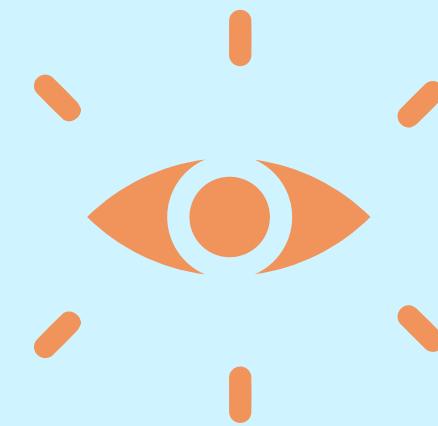
Propose a solution for autonomous monitoring for real-time updates using fibre optics

RESEARCH QUESTIONS



What affects light transmission?

Length?
Thickness?



Can fibre be used for detection

Depending on the thickness and configuration of the fibre



Is it a viable option

There are pros and cons

Results

Light conduction barely affected by fibre length/thickness.

Looped fibre detects pressure (drop in light = detection).

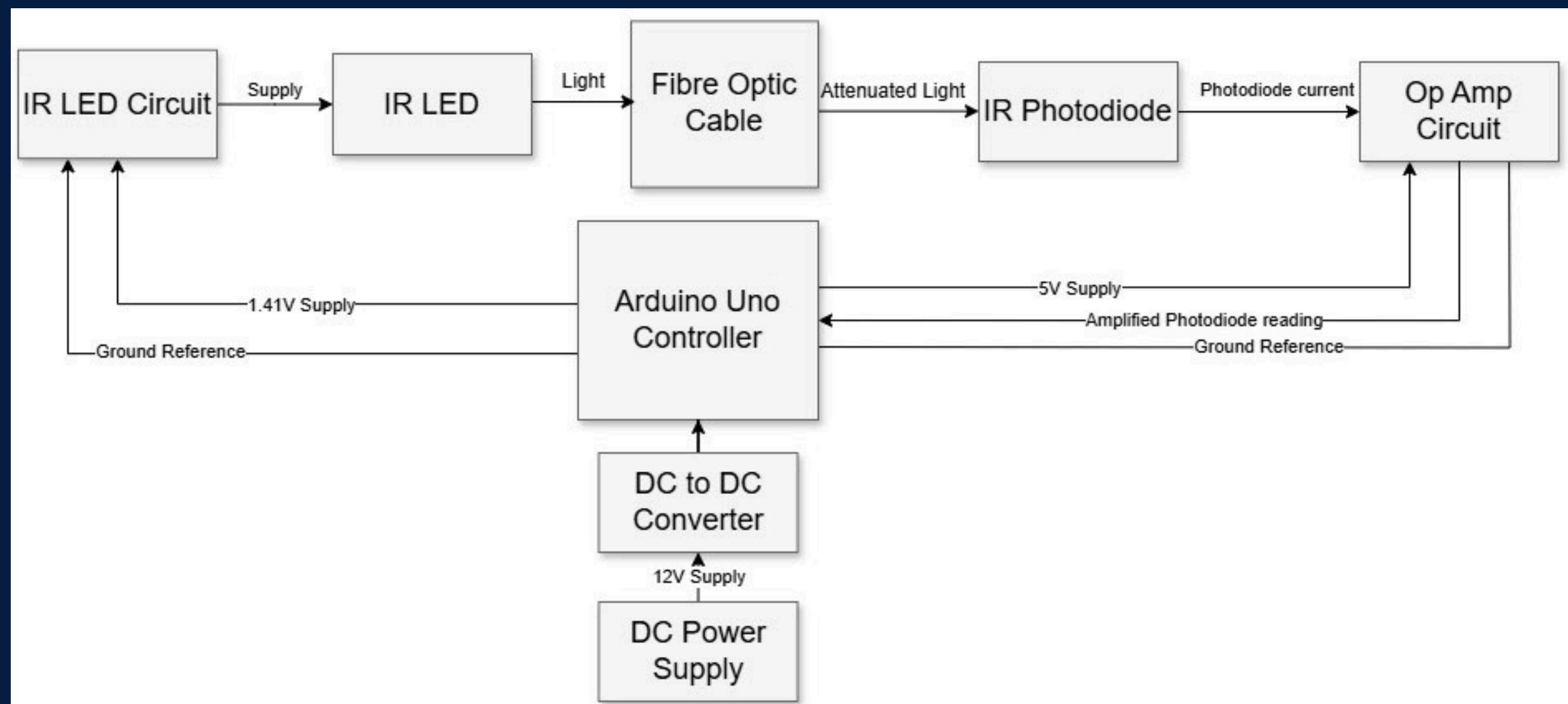
System built with:

- IR LED & photodiode
- Fibre loop
- Arduino Uno

Cost: ~R250 | Power usage: very low

Challenges:

- Fibre memory (doesn't reset)
- Signal noise in readings



REAL WORLD APPLICATION

What the system can detect:

- Climbing animals
- Leaning poles / tension
- Fence breaks

Benefits:

- Real-time alerts
- Rust/weather-resistant
- Covers long distances affordably

Next steps: improve fibre flexibility & reduce signal noise

