



# Drone for environmental protection

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## Background

**project statement** :Design and develop a drone system that can detect and report environmental hazards in remote areas using solar power to boost the flight time and AI technology.

### Specifications:

- The drone system should be able to detect and report environmental hazards in remote areas.
- The drone system should be using solar power to boost the flight time
- The drone system should use night vision technology to operate in low-light conditions.
- The drone system should be lightweight and portable.
- The drone system should be easy to operate and maintain.
- The drone system should be safe and reliable.
- The drone system should be three mode flights: autonomous flight , semi autonomous flight, manual control.

### Constraints:

- Challenging weather conditions
- Privacy concerns
- Legal considerations
- Limited battery life

## Prototype Design

### The prototype design components:

- **Drone motors:** Electric motors rated at 1400KV with a rotation speed of 1400 RPM without load at 1 volt.
- **Propellers:** 1045-inch propellers for stability and improved performance.
- **Flight controller:** Pixhawk flight controller manages all drone operations, including pre-programmed flight paths.
- **Frame:** Fiberglass F450 frame chosen for high strength, resistance to bending, and durability.
- **Solar panel:** 20W, 12V solar panel weighing 100-150g, with dimensions of 10 x 2 x 2.7 inches.
- **Rechargeable battery:** 77.7Wh, 11.1V battery weighing 400g.
- **Charge controller:** Regulates voltage and current, protecting the battery from overcharging and deep discharges, harmonizing with solar panel voltage.
- **The Raspberry Pi 4** is used in our project for AI purposes, specifically running the Object Detection model.
- **Raspberry Pi camera:** Designed for the Raspberry Pi, this camera captures high-definition video and images in daylight and night vision modes

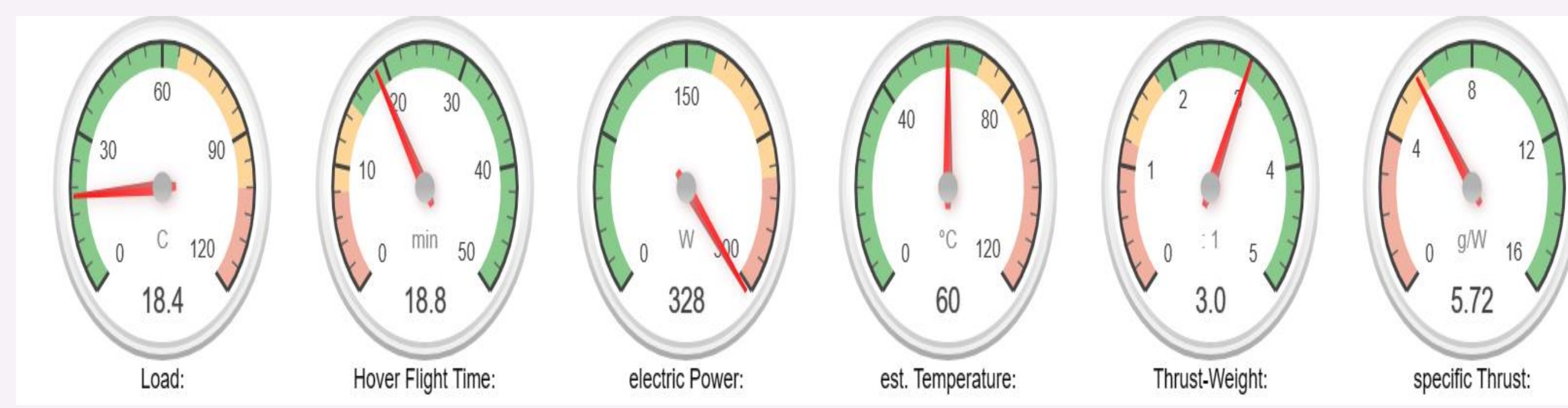
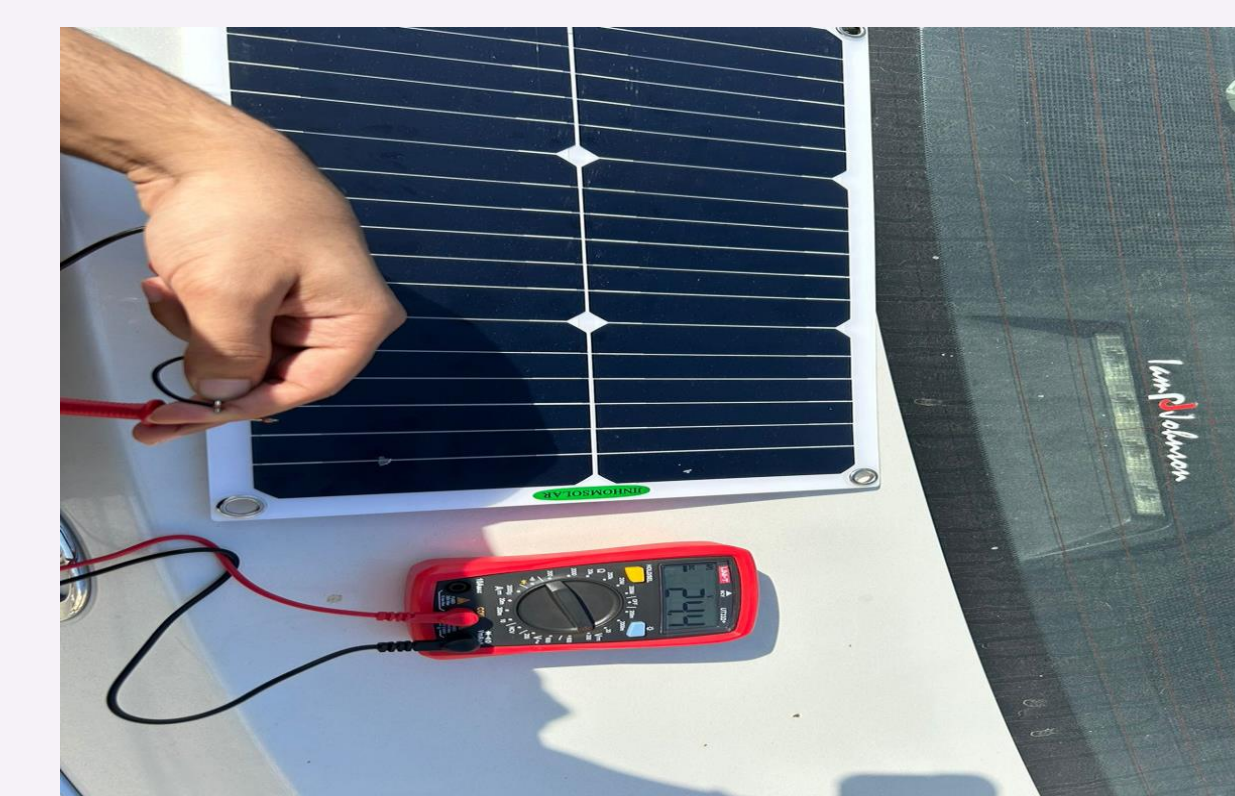
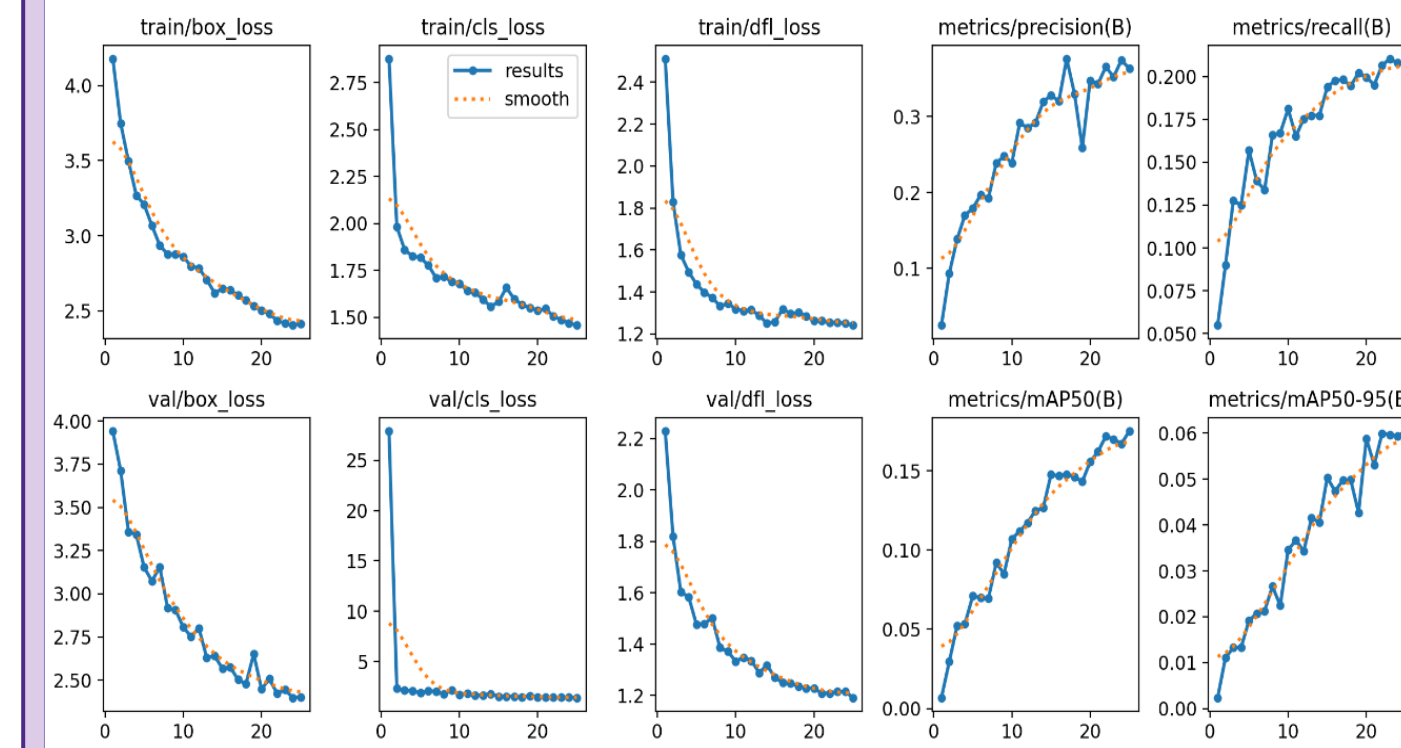


## Student and Depts

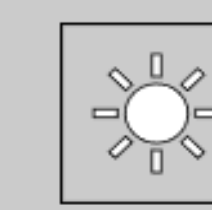
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## Testing/Validation

The prototype of Drone has been tested against the given specifications and successfully meets all requirements.



## Significant Details



### Panels Specifications

voltage	→	12	(V)
Power	→	20	(W)
Wight	→	100-150	(g)
Dimensions	→	10 x 2 x2.7	(inches)



### Battery Specifications

Energy	→	77.7	(Wh)
Voltage	→	11.1	(V)
Battery Weight	→	400	(g)
Capacity	→	7000	(mAh)

### Drone specification

Drone Weight	1380g
Flight Range	10-12.5 Km
Altitude	40 m
Flight Duration	17-22 Min
Velocity	30-38 km/h
<b>Computing and Camera Specifications</b>	
Image resolution	1080-2160 p
Accuracy of detection	80-90 (%)
Data processing speed	500-1000 ms

## Conclusions

The Senior Design Project focused on developing a drone system integrated with artificial intelligence (AI) technology to monitor and protect the environment. The project involved interdisciplinary collaboration and extensive research to meet the specific needs and requirements of environmental protection using drone technology. The final prototype included features such as solar panels, performance testing, range estimation, and the detection of environmental violations. The project aimed to serve public and private entities engaged in environmental conservation activities by providing a time-efficient, real-time solution for detecting and responding to environmental violations. The project also addressed the overall cost and bill of materials. In conclusion, the Senior Design Project successfully developed an innovative drone system with AI technology to contribute to the preservation of ecosystems and the enforcement of environmental regulations.