

# **Battery Attack Detection in Unmanned Aerial Vehicle using Artificial Intelligence**

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# Introduction

Unmanned Aerial What is UAV? Vehicles that are driven by remote technology without pilot



How is

operated

UAV



Unmanned Aerial Vehicles are operated by experts using Ground Control System.

Application

UAVs Agricultural production, Monitoring and tracking traffics, Medical and emergency services



Jamming attack, Satellite Spoofing attack,

**UAV-based** Attacks

# **Proposed Solution**

#### **Develop Energy consumption model**

Done Design	Environment	Done dynamics	Delivery operations	Data Collection
<ul> <li>Drone weight</li> <li>Number of rotors</li> <li>Size of rotors</li> <li>Size of drone body</li> <li>Battery weight</li> <li>Battery energy capacity</li> <li>Size of battery</li> <li>Power transfer efficiency</li> <li>Maximum speed &amp; payload</li> <li>Lift-to-drag ratio</li> <li>Delivery mechanism</li> </ul>	<ul> <li>Air density</li> <li>Gravity</li> <li>Wind condition</li> <li>Weather(rain, snow etc.)</li> <li>Ambient temperature</li> <li>Regulation</li> </ul>	<ul> <li>Airspeed</li> <li>Motion(take-off, landing, hover, cruise)</li> <li>Acceleration &amp; deceleration</li> <li>Flight angle</li> <li>Flight altitude</li> <li>Riding on another vehicle</li> </ul>	<ul> <li>Payload weight</li> <li>Size of payload</li> <li>Empty return</li> <li>Fleet size</li> <li>Delivery mode</li> <li>Area of service region</li> </ul>	Data Preprocessing Feature Selection Model Development Model Testing & Validation Model Deployment & Monitoring

- Collect relevant data from UAV
- Clean and preprocess the collected data.
- Identify the most relevant features that are likely to influence energy consumption
- Select machine learning algorithm, train the model, and evaluate its performance.
- Fine-tune the model, test it, and validate its accuracy.
- Deploy the model for real-time energy consumption



Eavesdropping attack, Distributed Denial of Service (DDoS) attack, Replay attack, etc.

## **Objectives**

Find a solution to mitigate the security threat and provide countermeasure against the Depletion of Battery (DoB) attack.



**DoB attack** is a security which the attack in energy of a device is depleted in processing

The Depletion of battery attack (DoB)

- Can cause the mission
- failure and crash the drone.
- Compromises the battery's availability and its information integrity and confidentiality
- Can cause the replacement of the out of battery devices which increases the maintenance cost
- Resulting battery degradation and potentially an explosion
- Reduces battery life and may cause mission failure or even crash

prediction and monitor its performance.

### **Depletion of Battery attack detection**







Workflow diagram for the proposed DoB attack detection on UAV using AI

- Collect data from different industrial partners. Alternatively, we will use existing available dataset or dataset developed by simulation.
- Pre-process all the data that required for modelling purposes.
- Select machine learning algorithm, train the model and validate the model
- Evaluate the performance of the model using performance matrix.
- Detect anomalous based on the input features.

After identifying the source of attack, we will activate the safe operating mode and isolate the malicious node to secure the UAV.