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# PITCH DECK

## DRONE UAV PRESENTATION

## TEAM 25


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# OBJECTIVE

- Build an anomaly-detection & predictive-maintenance pipeline for commercial drones using the DronePropA dataset.
- Detect faults, identify probable origin, and assess severity to guide maintenance actions.
- Expected impact: improved availability, safety and lifespan of drones.

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# OUR DATASET

### Files Format

MATLAB (.mat) files loadable via scipy.io

### Volume of the Dataset

130 files, 3 main categories, include healthy (F0) and 3 fault types (F1, F2, F3).

### Goals and Deliverables

- GitHub repo
- Pitch deck (.pdf)
- Demo video (≤ 5 min)

# DATA PIPELINE

- Ingest .mat files → normalized Pandas DataFrames.
- Per-flight cleaning (null values...).
- Feature extraction (statistical summaries per signal).
- Scaling, dimensionality reduction (PCA for EDA).
- Supervised models (Random Forest + hyperparameter search).
- Evaluation, feature importance.

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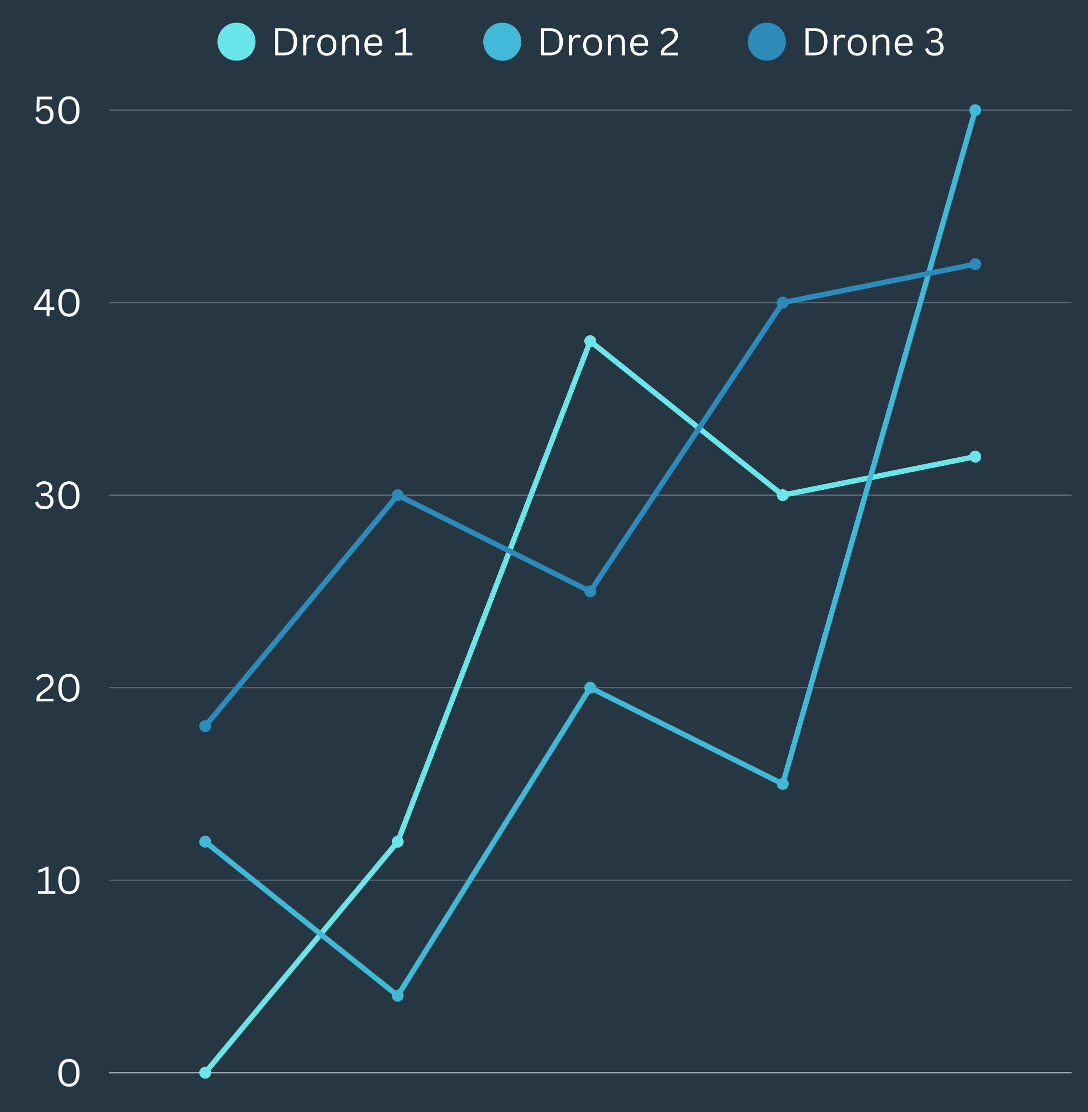
# FEATURE ENGINEERING

**Total features ≈ 114 × 11 = 1254 per flight**

Per-flight statistical features per signal (114 signals):

- mean, median, std, min, max
- q25, q75, IQR
- skewness, kurtosis
- range



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# EXPLORATORY DATA ANALYSIS (EDA)

## Class Balance

Fault classes moderately imbalanced

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## PCA Analysis

Visual separation of fault groups confirms feature relevance

## Flight Statistics

Average duration ~45s, sampled at 1 kHz.

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# MODELING APPROACH

## Baseline Model

★★★★★

Random Forest Classifier : interpretable, fast, robust.

## Optimization

★★★★★

RandomizedSearch CV with 50 iterations, 5-fold CV

## Targets Modeled

★★★★★

Fault Group, Severity, and Speed

## Metrics Used

★★★★★

Accuracy, F1-score, confusion matrices, CV mean ± std.

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# MODELS RESULTS

**Modèle 1 - Fault Detection :**

Accuracy test : **84.6%**
Accuracy cross-validation : **82.6% ± 3.8%**
Détection parfaite (100%) des pannes sévères (F3)
Aucun cas critique manqué

**Modèle 2 - Severity Assessment :**

Accuracy test : **83.0%**
Accuracy cross-validation : **80.0% ± 3.2%**
Détection parfaite (100%) des sévérités critiques (SV3)
Stabilité exceptionnelle (variance CV la plus faible)

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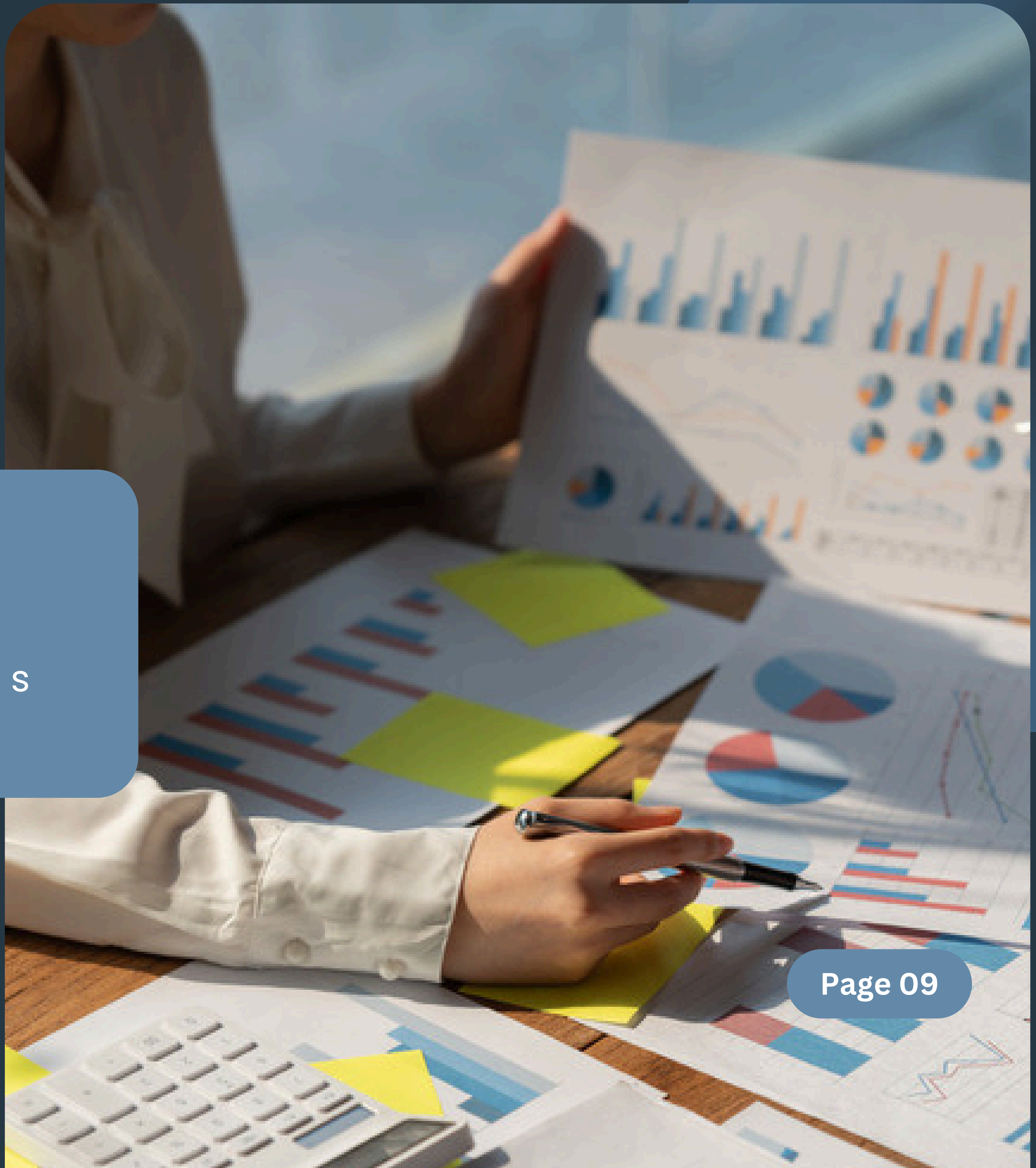
# NEXT STEPS & EXTENSIONS



## Alternative

01. Extract advanced temporal features and test deep learning models (CNN/LSTM)

## Improvement

02. Implement online monitoring dashboard s (alerts, thresholds...)

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# THANK YOU

## FOR YOUR ATTENTION