**Use case 3**

**Domain: Aviation**

**Context:**

**Predicting Engine Fan Blade Wear in Commercial Aircraft.**

**Objective**

**Reduce downtime and Enhance safety by using AI.**

**Background**

Traditionally Maintenance is carried out based on scheduled intervals or after a certain number of flight hours. However, these approaches might lead to either unnecessary maintenance, increasing costs, or insufficient maintenance, potentially compromising safety.

**Data**

AI can be employed to analyze vast amounts of data collected from aircraft sensors, flight logs, and historical maintenance records. By applying machine learning algorithms, AI systems can detect patterns and anomalies in this data to predict when a component or system is likely to fail.

**Methods**

**Predictive Modeling**

Following Data can be collected from Sensors:

* **Vibration Data**: Sensors placed on the aircraft's engines can measure vibration levels. Unusual vibration patterns might indicate imbalances, misalignments, or wear in the engine components.
* **Temperature Readings**: Temperature sensors monitor the temperature of various engine components. Higher than normal temperatures could indicate excessive friction or other issues.
* **Pressure Measurements**: Pressure sensors track air pressure within the engine. Deviations from expected pressure values might signify leaks or inefficiencies in the engine.
* **Oil Quality and Usage**: Sensors in the engine monitor the quality and consumption of engine oil. A decrease in oil quality or higher-than-normal consumption could point to engine wear.
* **Flight Data**: Information about the aircraft's flight parameters, such as altitude, speed, and maneuvering, is recorded. This data can help correlate engine stress with potential wear.

The data collected for predictive maintenance is often transmitted to ground-based systems in real-time or stored locally on the aircraft's onboard maintenance systems.

**Benefits**

* **Proactive Maintenance**: By identifying early signs of engine fan blade wear, airlines can address issues before they become critical, minimizing the risk of in-flight failures.
* **Cost Savings**: Early maintenance can prevent extensive damage and costly repairs, leading to significant cost savings.
* **Operational Efficiency**: Proactive maintenance reduces unplanned downtime, ensuring that aircraft remain available for scheduled flights.
* **Safety Enhancement**: By preventing engine-related failures, the overall safety of the aircraft and passengers is improved.

**Conclusion**

In this use case, AI-driven predictive maintenance helps airlines monitor engine fan blade wear through various sensor readings, enabling timely interventions and enhancing the overall operational reliability of their aircraft.