**THREAD-TIME OPTIMISER FOR AUTO-PILOT SYSTEM**

* INTRODUCTION:
  + Project Problem Statement:

The project addresses a critical problem statement in the context of a multi-threaded environment within an aircraft system. Specifically, it aims to determine the time taken by individual threads to process information. This processing time has a direct impact on the functioning of various sensors in an aircraft. The primary objective of this project is to develop an algorithm or model capable of analysing a dataset containing processing times for different threads in an aircraft’s auto-pilot system at each frame count, generated through integrated software. The model's purpose is to predict the likelihood of a time limit exceeded error occurring in a specific thread known as the 'Data\_Logging' thread.

* PROBLEM DESCRIPTION:

In an aircraft auto-pilot system, multiple threads are responsible for processing critical information. These threads must operate within specified time limits to ensure the system's sensors function properly. If the 'Data\_Logging' thread exceeds its time limit, it can lead to errors and affect the aircraft's overall performance and safety. Therefore, it is imperative to predict when such time limit exceeded errors may occur to take proactive measures.

* DATASET:
  + Dataset Selection:

To address this problem, we needed a suitable dataset for classification tasks. We selected a dataset generated by integrated software within the aircraft testing system. This dataset contains valuable information about the processing times of various threads during each frame count.

* + Data Gathering and Curation:

To ensure the dataset's quality and representativeness, the following steps were taken:

- Gathered the Dataset: Data was collected directly from the integrated software, ensuring comprehensive coverage of observations.

- Dataset Curation: The dataset underwent a thorough review to identify and rectify inconsistencies, duplicates, or irrelevant data points. This step was essential to maintain data integrity.

* DATA PREPROCESSING:
  + Initial Data Exploration:

Before proceeding with data pre-processing, the following tasks were performed:

- Understanding the Dataset: We familiarized ourselves with the dataset's structure and content, including data columns and their meanings.

- Identifying Pre-processing Requirements: Through exploratory data analysis, potential pre-processing needs were identified, such as handling missing values and feature scaling.

* + Data Pre-processing:

Data pre-processing was carried out using Python's Pandas library, and it encompassed the following steps:

- Data Formatting: The data was formatted into a tabular format suitable for feeding into machine learning algorithms.

- Data Cleaning: Missing values, outliers, and data quality issues were addressed to ensure the dataset's integrity.

- Feature Scaling: Feature scaling techniques were applied for consistency and improved model performance.

* WHY LOGISTIC REGRESSION?
  + Logistic Regression was chosen as the classification algorithm for this project for several reasons:

- Interpretability: Logistic Regression provides easily interpretable results, which are important in safety-critical applications like aircraft systems.

- Efficiency: It is computationally efficient and can handle large datasets with a relatively small number of features.

- Baseline Model: Logistic Regression serves as a suitable baseline model for binary classification tasks.

* TECH STACK:
  + The following technologies and tools were employed in this project:

- Programming Language: Python

- Data Analysis and Pre-processing: Python's Pandas library

- Machine Learning: Scikit-learn library

- Classification Algorithm: Logistic Regression

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By addressing the problem statement, curating a relevant dataset, performing data pre-processing, and selecting the appropriate classification algorithm, this project aims to develop a model that can predict the occurrence of time limit exceeded errors in the 'Data\_Logging' thread of an aircraft system, contributing to enhanced safety and reliability in aviation.

Enclosing project code link for the above:

[LOGISTIC REGRESSION PROJECT](https://colab.research.google.com/drive/1iwaYD2QBHAt9SwUQZ0pDZvOzho3cC76K?usp=sharing)