TECHCARE
Solutions to outperform

MACHINE LEARNING APPLIED ON AIRLINE RELIABILITY DATA

MAYARA YUKINO

EMBRAER

EMBRAER DATA OVERVIEW

MONTHLY BASIS

AIRLINE DATA RECEIVED

80+

FLIGHT INTERRUPTION

7K

COMPONENT REMOVAL

22K

PILOT AND MAINTENANCE REPORT

100K

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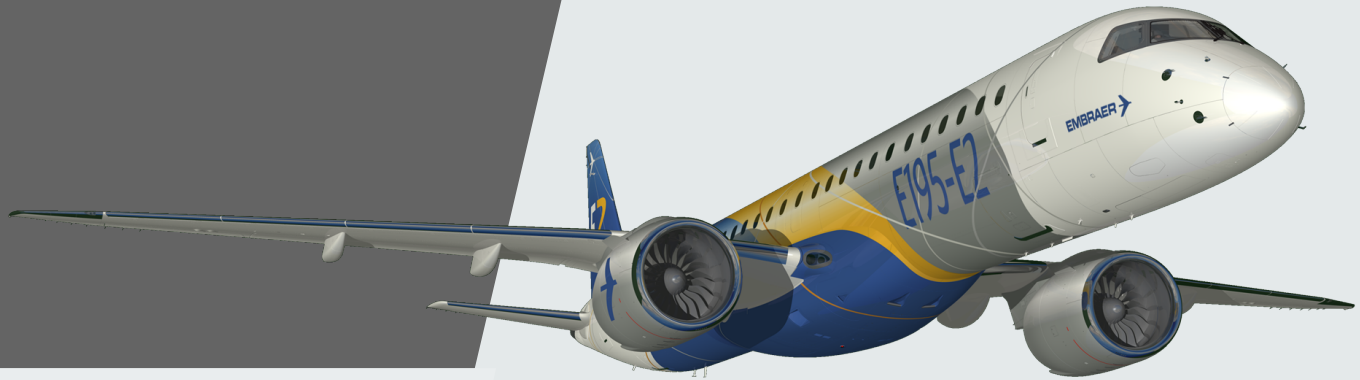
RELIABILITY CONCEPT



"Reliability is the **probability** of a system or component to perform its **required functions**, **without failure**, under stated **conditions** for a specified **period of time**."

Source: Reliasoft

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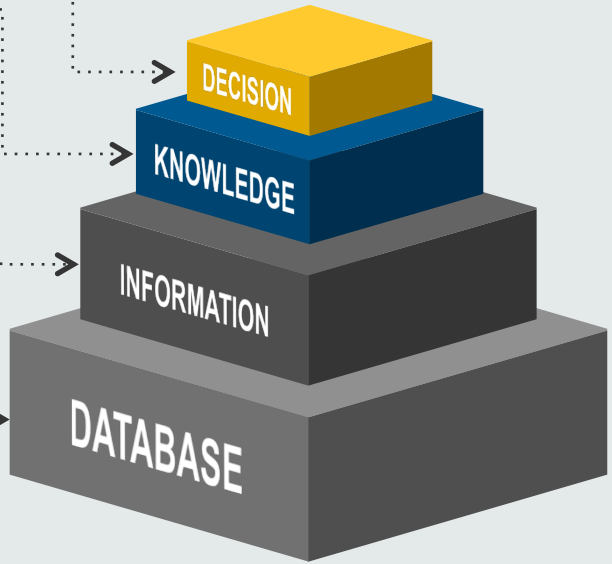
RELIABILITY OVERVIEW

Decision -making
- Preventive actions
- Technical solutions development
- SB implementation
- Trainings

Engineering analysis
- Repeaters
- Root cause
- Solutions available
- Prediction analysis

Indicators
- Component failure
- Aircraft dispatch reliability
- Statistical rates

Field data
- Interruptions
- PIREP / MAREP
- Removals & installations
- Service bulletin incorporation
- Shop findings
- Scheduled maintenance



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RELIABILITY DATA

CLASSIFICATION

INTERRUPTION | LOGBOOK REPORT | COMPONENT REMOVAL

PROBLEM: AVNX MAU 1 A FAULT / MULTI MSG MAU 1 FAULT

ACTION: R/R MAU 1 GEN I/O CARD IAW EMB. 175 AMM TASK 31-41-06

FAIL CODE: AVNX MAU FAULT
TECHNICAL PROBLEM
ACTION: REMOVED AND REPLACED

RELIABILITY DATA

CLASSIFICATION

INTERRUPTION	LOGBOOK REPORT	COMPONENT REMOVAL
PROBLEM: AVNX MAU 1 A FAULT / MULTI MSG MAU 1 FAULT	**PROBLEM:** SEAT BELT NEEDED REPLACEMENT	
ACTION: R/R MAU 1 GEN I/O CARD IAW EMB. 175 AMM TASK 31-41-06	**ACTION:** MAINT. REPLACED SEAT BELT	

FAIL CODE: PASSENGER SEAT BELT INOP

RELIABILITY DATA

CLASSIFICATION

INTERRUPTION	LOGBOOK REPORT	COMPONENT REMOVAL
PROBLEM: AVNX MAU 1 A FAULT / MULTI MSG MAU 1 FAULT	**PROBLEM:** SEAT BELT NEEDED REPLACEMENT	**REMOVAL REASON:** SENSOR AMBIENT TEMP FAIL
ACTION: R/R MAU 1 GEN I/O CARD IAW EMB. 175 AMM TASK 31-41-06	**ACTION:** MAINT. REPLACED SEAT BELT	

REMOVAL: UNSCHEDULED

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RELIABILITY DATA

PREVIOUS CLASSIFICATION PROCESS

Language

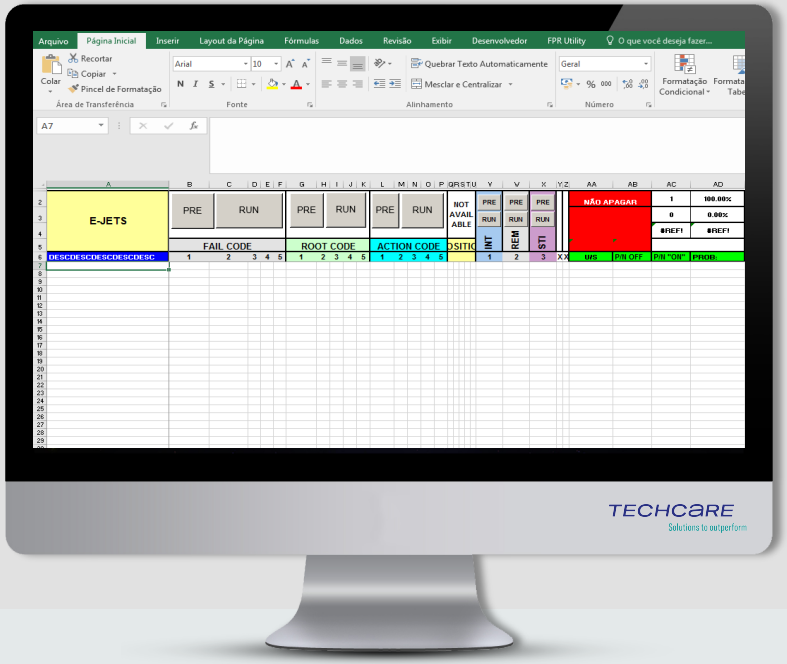
The **Visual Basic Macro** classifies the Fail Code and Maintenance Action Code

Approach

By key words, the Visual Basic Macro classifies a Fail Code or a Maintenance Action Code in an Event

Improvement

Hard to improve because each word has to be well associated with a code



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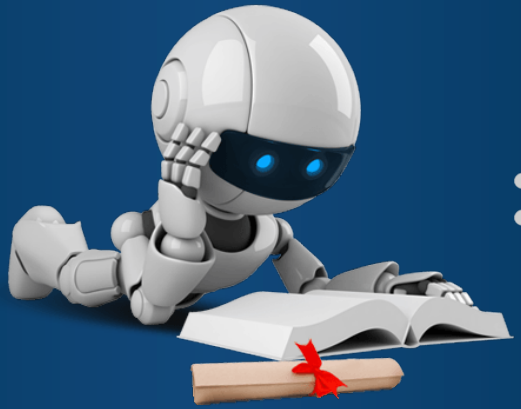
MACHINE
LEARNING

Methodology
Project Details &
Preliminary Results
MACHINE
LEARNING

MACHINE LEARNING

METHODOLOGY

Ability to learn without being explicitly programed



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Learn from **DATA**

Follow Instructions

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MACHINE LEARNING

METHODOLOGY

Supervised Learning

A set of data with the right answers is given to the algorithm

Unsupervised Learning

By data trends, the machine will create natural vectors and clusters.

MACHINE LEARNING

METHODOLOGY

Supervised Learning

Classification

A classification is when the output variable is a category, such as “red” and “blue” or “disease” and “no disease.”

Regression

A regression is when the output variable is a real number, such as “euros” or “weight.”

Methodology

Project Details &
Preliminary Results

MACHINE LEARNING

MACHINE LEARNING

PROJECT DETAILS

Language

The R **programming algorithm** classifies the Fail Code, Maintenance Action Code and Chargeable and Exclusion codes of the events

Approach

By supervised machine learning, a series of events will be "learned" by the machine and it will classify an event based on past experience

Improvement

Easier to improve by exposing and teaching the algorithm based on new events

MACHINE LEARNING

PROJECT DETAILS

INPUT WITH NEW DATA

DATA ALREADY LABELED

LEARNED PROGRAM

CLASSIFIED DATA

SUPERVISED LEARNING

Data validation

Comparison between manual and machine learning classification during one year

Database

Importance to have a good quality database

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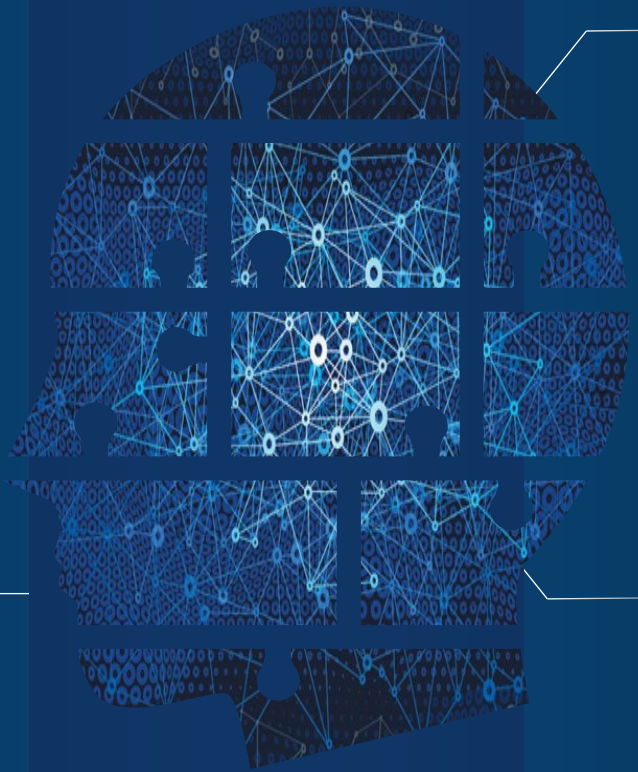
MACHINE LEARNING

PRELIMINARY RESULTS



AVERAGE ACCURACY

90%

FAIL CODE

ACTION CODE

TECHNICAL

REMOVAL CLASSIFICATION

ROBUST DATABASE BASED ON MANUAL CLASSIFICATION

1M+

LABELED DATA

30%

CLASSIFICATION WORK LOAD REDUCTION

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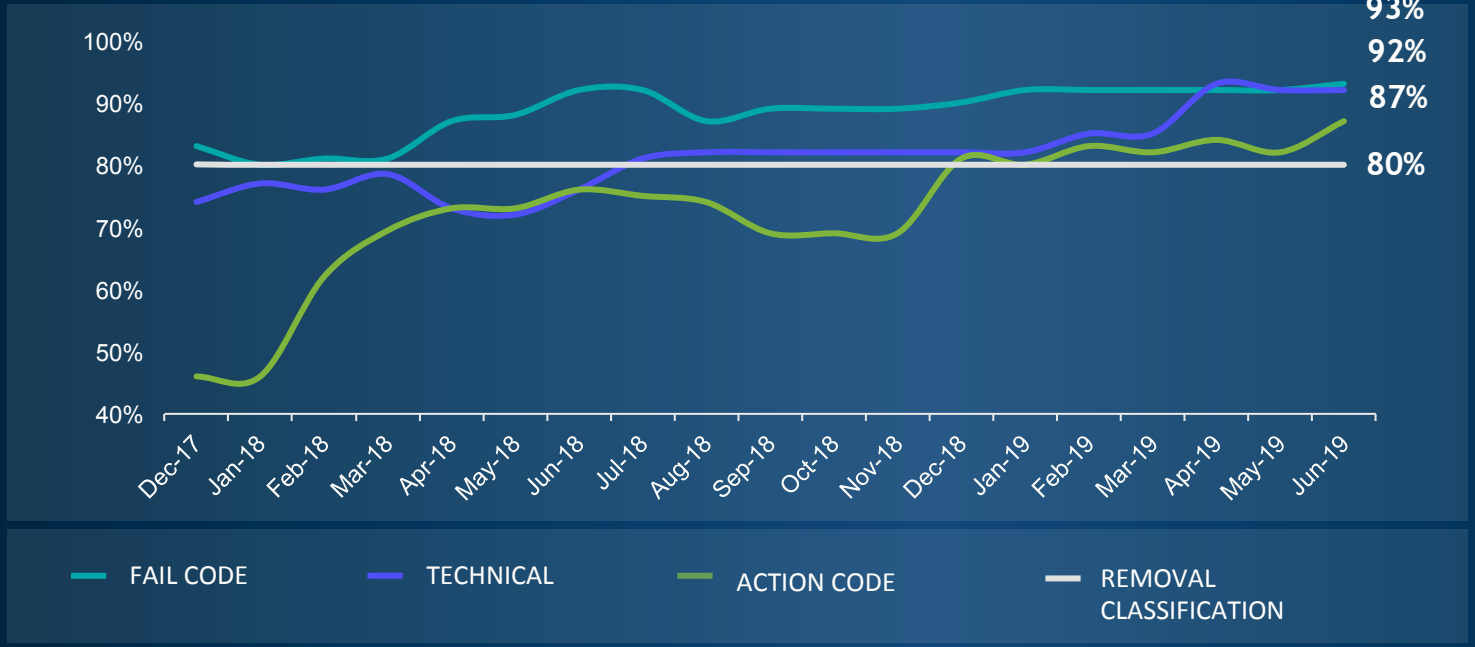
MACHINE LEARNING

ACCURACY

PREVIOUS PROCESS

82% ACCURACY



Keep improving the accuracy & focus on removals

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EMBRAER OVERVIEW

AIRLINE DATA RECEIVED

80+

COMPONENT REMOVAL

22K

FLIGHT INTERRUPTION

7K

PILOT AND MAINTENANCE REPORT

1M

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mayara.castilho@embraer.com.br
+55 12 3927-1009

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