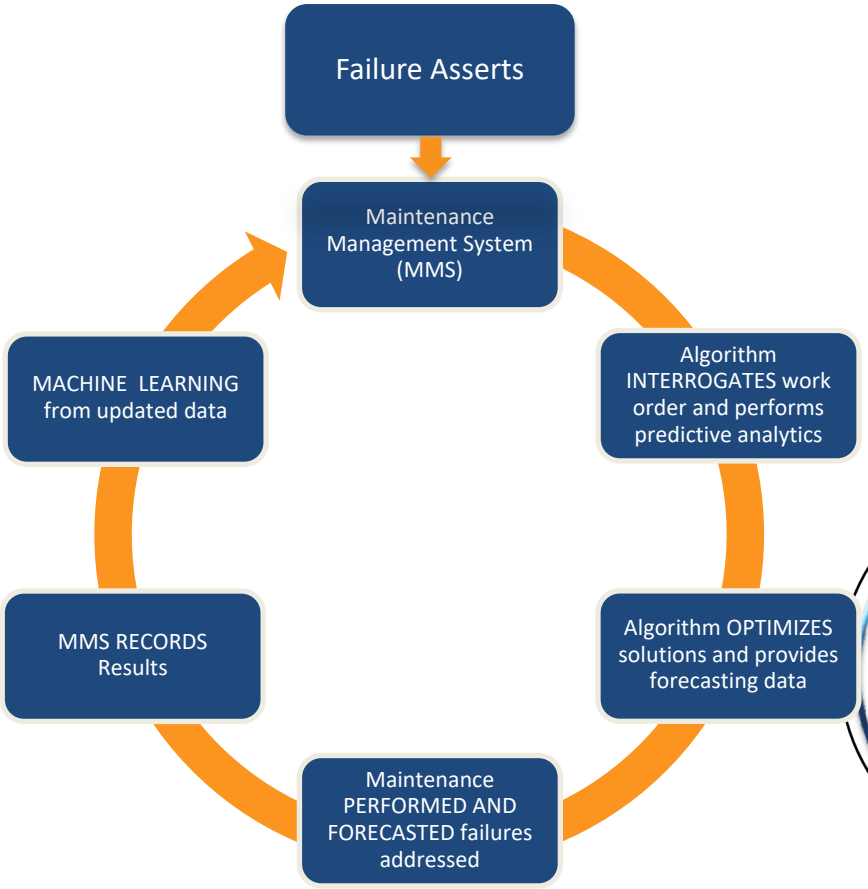
Artificial Intelligence Prognostic Steering™

A Product of Andromeda Systems Inc. & NLP Logix

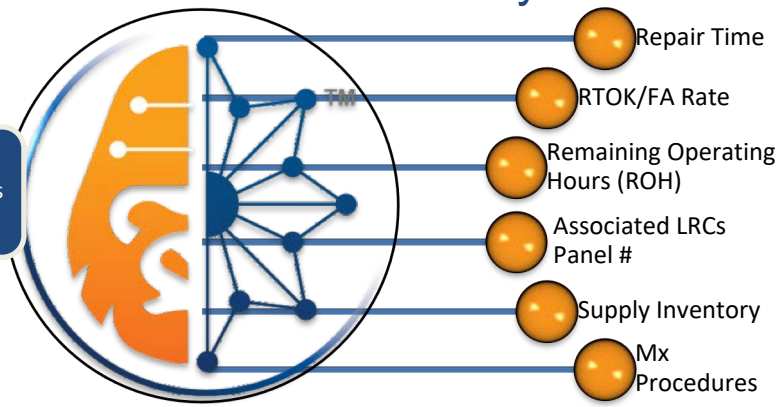
Fault Detection and Isolation up to Now

- Historically, Fault Detection & Isolation has been dependent on in-depth maintainer training and experience as well as extensive engineering and technical data.
- Progress over time has provided the maintainers with electronic, interactive technical manuals for troubleshooting with minimal fault isolation assistance but lacked embedded fault analysis and prioritized solution recommendations.
- Failure analysis is performed off-line using service specific software tools making enterprise-wide data collaboration difficult.
- Sharing of successful resolution results and maintenance procedures outside of a single location is limited.

Artificial Intelligence Prognostic Steering™



Predictive Analytics



Perpetual Process to Failure Mode Resolution

Failure Asserts

- Failure Identified and a WO is created within the Maintenance Management System (MMS)

Interrogates

- AIPS runs algorithm to interrogate provided maintenance data

Optimizes

- AIPS prioritizes solutions based upon customer defined parameters such as:
  - Likelihood of resolving the failure
  - Time to Repair
  - Cost
  - Etc.

Perpetual Process to Failure Mode Resolution

Performed

- Maintenance is performed, and results are fed into the MMS
  - Failure Resolved
  - Failure unresolved
  - False Alarm

Records

- MMS records results and feeds data into AIPS

Machine Learning

- AIPS collects and calculates new data set and adjusts solution steps accordingly

MMS

- The Maintenance Management System directs the next step
  - Close WO
  - Next Solution
  - False Alarm

Intro to Machine Learning / AI

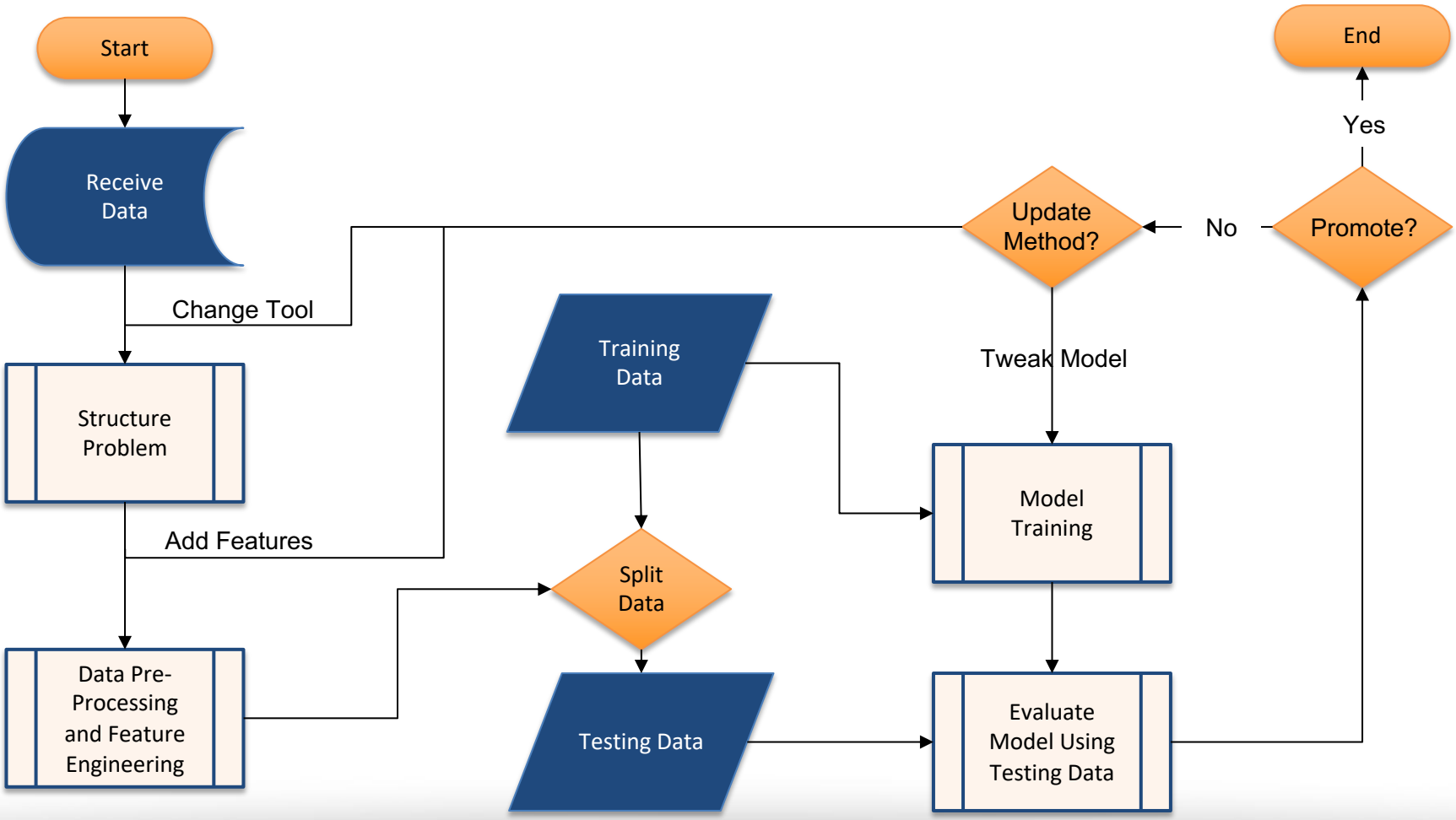
Beyond the hype, Machine Learning - and AI - are the implementation of statistical models and techniques within an information system architecture that enables iterative:

1. Collection of new data
2. Machine-driven adjustment of the model parameters to improve performance

In similar fashion to most engineering work, developing a machine learning algorithm involves:

1. Structuring the problem in a way that it can be addressed by one (or a combination of) the tools available. Not every problem can be turned into the proverbial nail, but it needs to be turned into one of a finite set of structures so it can be processed using an existing tool - proverbially speaking it needs to be structured into either a nail, a screw, a bolt, or a fastener.
2. Processing the raw data to clean, extract, and identify the relevant features.
3. Feeding the a subset of the processed data into a mathematical model.
4. Adjusting the model parameters to optimize its performance against a separate subset of test data.
5. Developing an information system that allows for the periodic retraining of the model.

Machine Learning Workflow



AIPS Capability Dashboard

AIPS Analytics

Choose an HRC:

2713000 29 9002

Health Reporting Code (HRC):
FCS IBIT Failure Active Sidestick Controller Assembly on Branch A

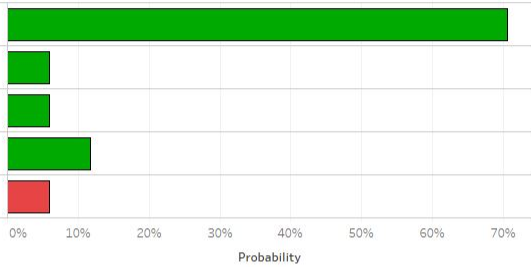
Probability Cutoff

Hover over the ? below for more details

65

AIPS Output

LCN	LCN Description	Likelihood	AFRS	AIPS
A2700001	SYS PHM/TROUBLESHOOTING	70.59%	1	1
A2713012	INCEPTOR CONTROL UNIT	5.88%	3	2
A7610001	SYS PHM/TROUBLESHOOTING	5.88%	Null	3
A2713010	ACTIVE SIDE STICK CONTROL ASSY	11.76%	2	4
A2742010	ELECTRONICS UNIT, HORIZ STB,RH	5.88%	Null	5



In the AIPS training data there have been

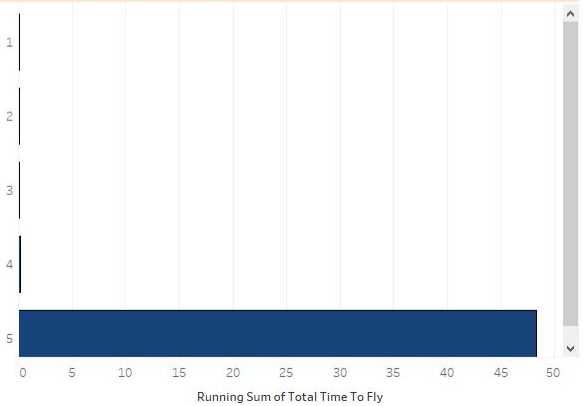
21

occurences of the HRC with

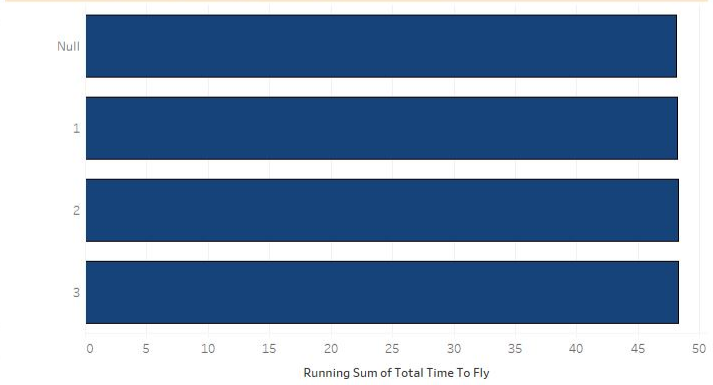
None

False Alarms (FAs) associated with this HRC.

Time To Fly Based on Progressive Use of AIPS



Time To Fly Based on Progressive Use of AFRS



LO Required
No LO Required

Multiple Application Options

AIPS was developed with a wide variety of applications in mind

- Air, Land and Sea
  - Defense
  - Transportation
  - Energy
  - Commercial

Virtually any maintenance environment where point of performance data is collected

Stand-Alone

- AIPS can be utilized as a Stand-Alone application in support of existing Maintenance Management Systems

Embedded in Existing MMS

- AIPS can be embedded within an existing Maintenance Management System

Department of Defense Testing

AIPS testing within the Department of Defense

- Improved 1st attempt failure resolution by 300%
- Reduced solution sets size by an average of 40%
- Reduced 54% of solution sets to a single solution
- Increased False Alarm identification by 72%
- Decreased Maintenance due to False Alarms by 70%
- Decreased repair times by an average of 15.4%

AIPS Features

What AIPS CAN Do Today

- Increase Readiness rates
- Forecast Failures by component, time and location
- Identify False Alarms (FA)
- Optimize Maintenance Procedures
- Reduce Maintenance Costs
- Reduce Maintenance Times
- Reduce Panel Intrusions
- Reduce Unnecessary Maintenance due to FA
- Provide Opportunistic Maintenance Events (OME)
- Improve Root Cause Analysis

AIPS NEXGEN Features

What we are working on now

- Account for weather in failure prediction
- Account for Operations in failure prediction
- Adjudicate Maintenance Data
- Feed Supply for optimized provisioning

What we will develop next

- Account for Operator/Maintainer in failure forecasting
- Feed Mission Planning/Forecasting

Summary

Maintenance time and logistical delays drives high sustainment costs across any maintenance environment.

Artificial Intelligence/Machine Learning can automate the analysis in order to optimize maintenance planning, scheduling and execution.

AIPS provides this automation and is scalable to diverse data structures and advanced optimization.

As a Stand-Alone or Integrated within an existing maintenance management system, AIPS provides the most current analysis of the most recent data available.

Questions