Using Machine Learning & Artificial Intelligence
for Aircraft Inventory Management

What Is Machine Learning?

Machine learning is an automated process that reveals relationships in multidimensional, complex data and subsequently uses those relationships to make predictions. Using subject matter expertise and quantitative analysis skills, data scientists apply a set of methods (not a monolithic tool) to the data, using mostly open-source software. While sophisticated machine learning libraries can be freely downloaded from software providers such as TensorFlow, expert-level skills for selecting methods and interpreting models are needed to ensure the model's lack of bias and maximum predictive ability.

When implemented properly, machine learning is a way of achieving artificial intelligence (AI). Layers of various machine learning models form networks that are optimized for performing a specific task. Over multiple learning cycles, the network can be refined (or refines itself) to make the same, expected choices of a decision maker. As task complexity increases, more advanced machine learning methods, such as "deep learning," are used to train the model.

How Is Veracity Using Machine Learning?

Aircraft inventory management lends itself well to machine learning solutions. Multiple variables affect the availability and configurations of usable aircraft, combined with the demand for those aircraft in USN and USMC operating units. To date, Veracity-designed forecasting engines enable the Naval Aviation Enterprise to take a forward-looking, data-driven approach to managing aircraft inventory. Veracity seeks to continually enhance these capabilities with machine learning.

For example, Veracity recently used a machine-learning process to improve forecasts for aviation utilization. After exploring alternate methods (K-means clustering, random forest, neural networks), Veracity's data scientists developed a machine learning algorithm using unsupervised clustering regression analysis in a multidimensional space of historic aircraft observations. The result was improved forecasting for certain aircraft, especially those that have not flown for months or years.

What More Can Be Done?

Veracity believes we are in the very early innings of understanding how naval aviation would benefit from implementation of machine learning. In the near term, machine learning can be applied to other subsets of aircraft inventory management, such as the parts supply chain, modification scheduling, etc. For example, Veracity has begun exploratory work to forecast depot turnaround time using a machine learning process.

Over a longer period, as machine learning adoption grows, the opportunity exists to employ artificial intelligence to model the optimal choices for a decision maker. Today, predictions are manually reviewed to determine if a plan change is required. In the future, with the right data fidelity and with enterprise-wide employment of machine learning tools, this decision support cycle may be nearly entirely automated, as seen in the figure below.
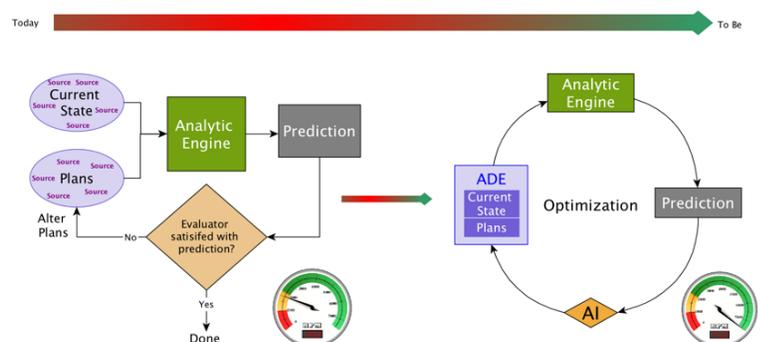
Veracity's team of skilled data scientists are increasingly focused on employing machine learning solutions as part of continuous improvement in aircraft inventory management.

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