Title:	**TUTORIAL: MACHINE LEARNING IN QUANT FINANCE**
Speaker:	Walter Alden Tackett, NxE12 LLC

Importance: Why this matters

Machine learning applies brute force computing power supplanting the small sample statistical techniques designed for hand computation. This opens up the use of very large databases and algorithms that can be fed streams of new data that modify and improve the model.

Investigation: "Speaker analyzed XXX data to address the questions yyy, zzz, etc."

Computer Science is the study of *mechanistic problem solving*, starting from three deeply intertwined aspects:

- PROBLEM: Formally states the input elements and the goal to achieve
- ALGORITHM: The step sequence required to achieve the goal
- MECHANISM: The system that physically executes the algorithm steps

Together, the three aspects determine the complexity of a problem/solution pair in terms of Time (# of steps) and Space (memory) required to achieve a goal.

The process is train/test/validate.   Machine systems improve their response to new input using test data and automated adjustment to minimize a loss function. When additional out-of-sample data is available, the learning algorithm updates to re-estimate to the minimal loss.

Innovation: Are there new techniques of interest in the data or approach to the problem?

Most of our familiar statistical methods, such as hypothesis testing, linear regression, analysis of variance, and maximum likelihood estimation, were designed to be implemented on mechanical calculators.

Modern computers facilitate new statistical methods that require fewer distributional assumptions than their predecessors and can be applied to more complicated estimators.

These methods allow the scientist to explore and describe data and draw valid statistical inferences without the usual concerns for mathematical tractability. This is possible because traditional methods of mathematical analysis are replaced by specially constructed computer algorithms.

Insights: 1-2-3, what are the three most important things the speaker offered?

1. Mathematics has not disappeared from statistical theory. It is the main method for deciding which algorithms are correct and efficient tools for automating statistical inference.
2. Online Adaptation: feedback-based response to real-time events, minimizing error between desired and actual system state, usually guided by a predictive model (classic example: a thermostat; think also of anti-lock brakes, driverless cars, and steady-cams)
3. Machine based learning, often directed in one way or another, using curated data or environments to determine system.

Audience rating: