

Using Predictive Analytics to Improve Collections Management, Mitigate Fraud Risk, and Mitigate Credit Risk

## **Predictive Analytics and Machine Learning with Altair Knowledge Studio**



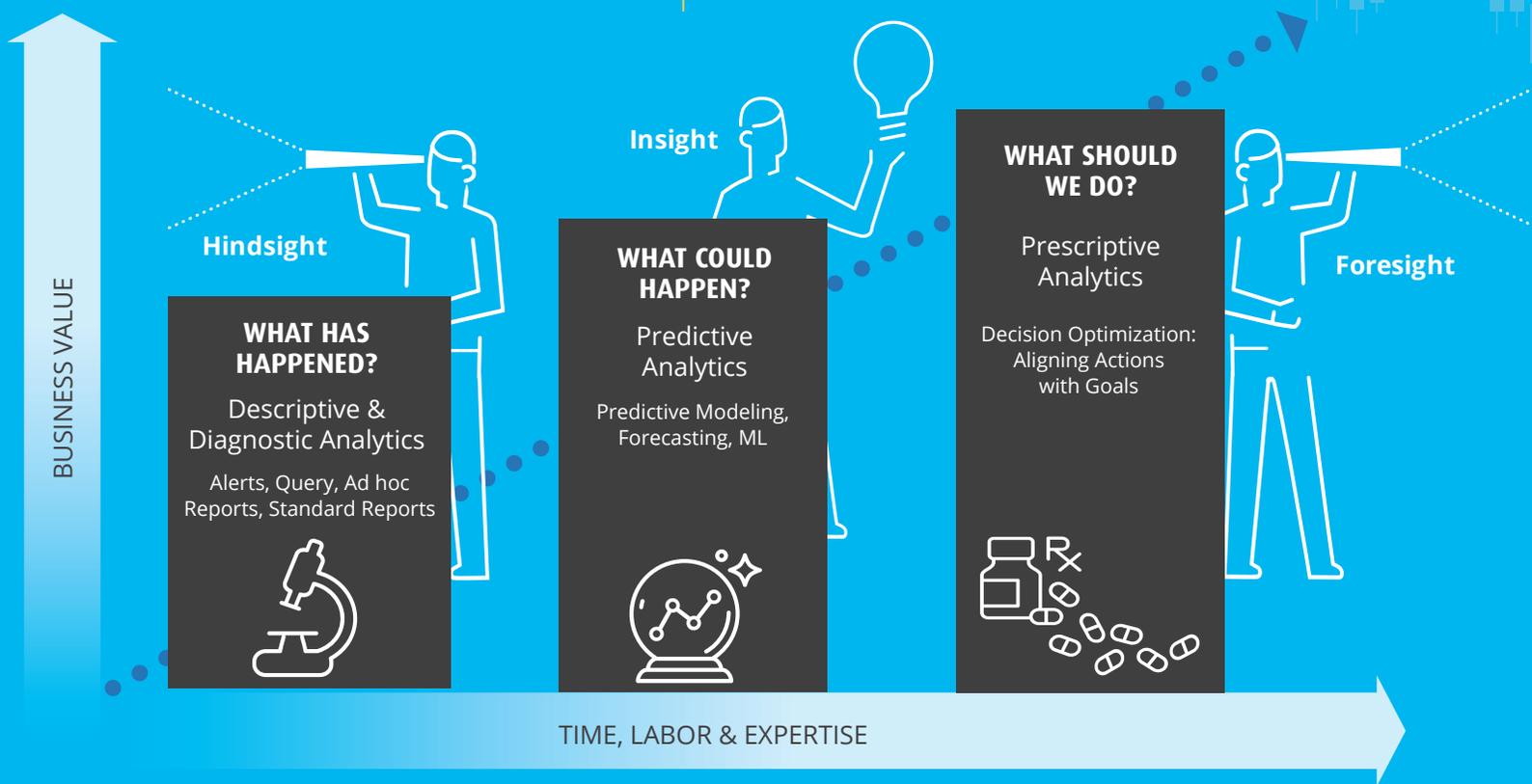
# Executive Summary

In the era of the new digital economy, financial services executives are looking for ways to distinguish their organizations, remain relevant to customers, find new markets that will drive growth and revenue, and to leverage technologies that increase margins and reduce risks.

With so much data available to them, financial institutions that take advantage of Data Science, specifically Predictive Analytics and Machine Learning (PAML), can empower people to make better decisions mapped to defined business objectives. Accurately predicting future consumer behavior allows credit risk analysts, financial marketing analysts, and fraud detection teams to better deploy strategies to capitalize on opportunities while deploying strategies that act as preventative measures against disruptive forces to their business models.

Altair Knowledge Studio provides market-leading PAML solutions that combine common data science methodologies and sophisticated statistical algorithms with an interface that business analysts and data scientists can use to find insights about their consumers and prospects within data. These insights can lead to new opportunities, increase loyalty, and reduce risk that could impact not only bottom line revenue, but brand equity as well.

## Data & Analytics Maturity Curve

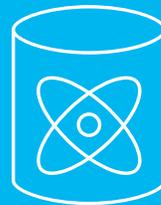




## Why Data Science?

Executives today are looking for answers to drive solutions that will accelerate their transformation into the new digital era. Accelerating cost-efficiencies and developing faster time-to-market strategies require a rethink of process automation, workforce mobility, and supply chain efficiencies. Growing revenue and increasing loyalty requires optimized messaging and marketing campaigns, leveraging real-time information, and personalized engagement with consumers. In the digital economy, data centric services and universal data access will unlock new revenue streams and reach new markets.

Businesses today retain more data than ever before. Getting insight out of terabytes or petabytes of data to make actionable decisions is the job of data science teams. Empowering better decision making, identifying new opportunities, making decisions based on trusted and quantifiable data are the by-products of data science teams using various statistical tools and analytical methodologies. Data science models can now quickly develop outputs from significantly large datasets in real or near real-time. These outputs help predict what likely will happen in the future; model algorithms are sophisticated enough to adapt to fluctuations in data as consumer behavior patterns change. Data science has become an essential component to how businesses go to market with new products and services, and how businesses control costs and reduce risk.

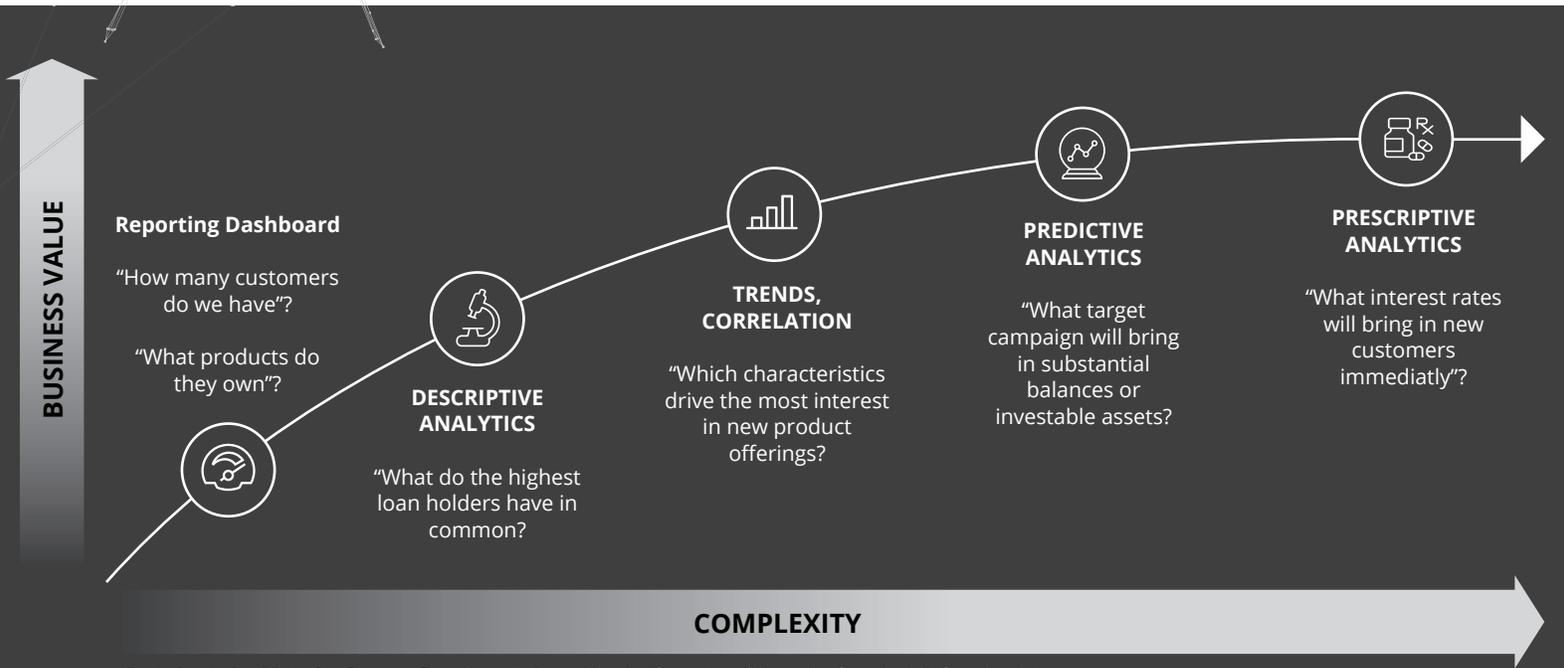


### Data Science includes Predictive Analytics and Machine Learning

By simple definition, data science is an interdisciplinary field that uses scientific methods, statistical algorithms, and computational systems to find insight from data. Typically, this data comes from disparate sources, can be voluminous, and often requires preparation and manipulation before data analytics can commence. As analytic models become more complex, greater insight is made possible; this insight moves from showing what happened to predicting what will happen in the future. The goal of predictive analytics is to find patterns of behavior in historical data from which to draw conclusions. Outputs are applied against predefined business questions and objectives and can help refine approaches towards how organizations can enter new markets, increase loyalty and revenue, reduce risk, or achieve other similar business goals. The power of predictive analytics is fully realized when algorithms can learn to adjust to new data patterns and refine analyses without relying on human intervention to tweak the underlying programming.

## Predictive Analytics

Predictive Analytics is the continuation of the analytical journey towards finding insight faster than previously capable of. Organizations that have become successful in overcoming the complexities of data analytics are not only able to conclude when or how something may happen but can answer what will happen in the future based on changes in how data is measured.



Data Analytics Maturity Curve: *Complex solutions yield significant tangible results from insight found in data.*

Predictive Analytics can be viewed as a preventative measure against disruptive forces to a business' success. To prevent, one needs to first predict. If you can predict, you can prescribe a treatment to a business problem.



Predictive analytics looks at historical data using a variety of statistical algorithms. These basic or complex mathematical models are used to derive meaning, insight, and inference from ...data. The conclusions drawn from the analyzed data assume that the future will follow past patterns.

# Machine Learning

Machine Learning is a subset of predictive analytics and is foundational to the development of robotics that cognitively interpret, understand, learn, perform and adapt in real-time when executing analytical routines against data that is constantly changing. In the context of predicting consumer behavior with regards to credit risk or responding to a marketing campaign, Machine Learning is defined by algorithms and systems that improve themselves without relying on explicit programming to adapt to changing patterns and recommend appropriate actions. Machine Learning will learn from observing millions, or even trillions, of data points. Common use cases in Financial Services include anticipating consumer financial goals, and providing smart recommendations to consumers as they complete transactions on their mobile devices.

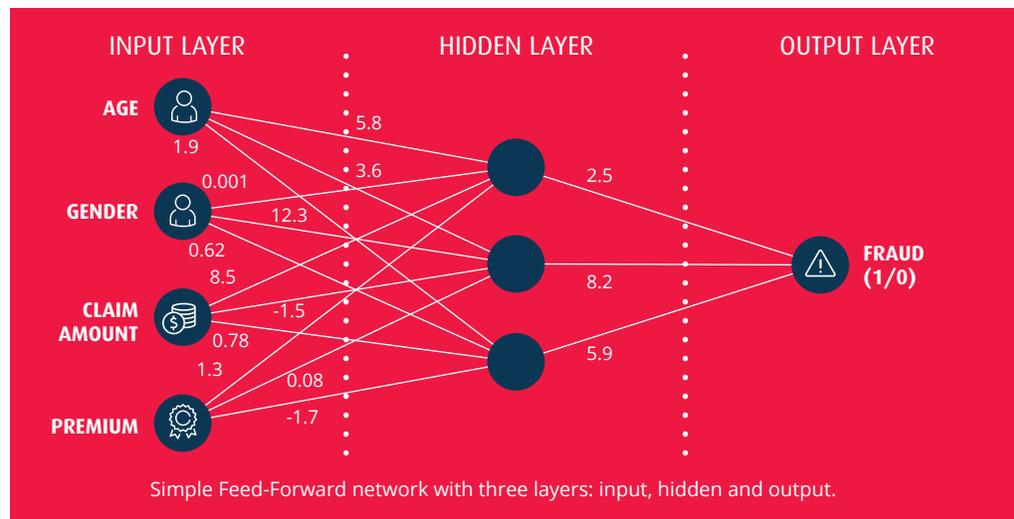
Predictive Analytics and Machine Learning both endeavor to reach the same end: to provide insight from the hundreds or thousands of dimensions people cannot see. Predictive Analytics relies on a person's ability to work out and test the relationships between cause and effect. This is accomplished by

refreshing the data in the models being used, or manually updating the model design itself. Machine Learning removes the person from this step by recalibrating models after their initial design.

A subset of Machine Learning is a concept known as Deep Learning or Multi-Layer Neural Networks. Artificial Neural Networks (ANN) adapt and learn from vast amounts of data. Relatively new to statistics and data mining, ANN are based on human brain functionality, and attempt to emulate the process by which we make a decision. Neural

Networks emulate the human brain to perform nonlinear deductions. Neural Network systems produce better decisions by learning from previous interactions or transactions to formulate conclusions.

The algorithmic emulation of a human Neural Network is more precisely referred to as an Artificial Neural Network (ANN). An Artificial Neural Network has an input layer, a set of variable values, one or more hidden layers, and an output layer.



**Predictive Analytics**



**Machine Learning**



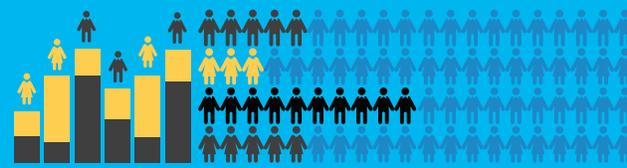
**Neural Network**

## Applying Machine Learning with Altair Knowledge Studio

Data encodes the collective or aggregate experience of an organization. Using a Predictive Analytics and Machine Learning Platform (PAML), such as Altair Knowledge Studio, allows financial services firms to learn from their data and make decisions at the level of the individual consumer, or even per-transaction. With this level of detail, decisions can be made that will drive operations more effectively. For example, PAML solutions can be leveraged to:

- Predict which financial transaction will be fraudulent, or manage financial credit risk by predicting the risk level (good or bad) of each loan applicant or holder.
- Create target messaging campaigns based on predictions about who is likely to buy a new financial product/service, or who will respond to requests to pay back credit debt.

Analyzing large amounts of data requires algorithms to actively and continuously learn as more data is fed into the analytic workflow. The flexibility of Knowledge Studio allows data science teams to build out predictive analytic workflows that include machine learning and neural networks algorithms, without having to rely on writing complex code. Altair Knowledge Studio financial services customers around the world have successfully resolved complex business problems that affect risk, revenue and market share.



## Propensity Scoring for Collections

Propensity modeling is a statistical approach and series of techniques used by data scientists to estimate the likelihood of consumers to act on certain behaviors, like the propensity to buy a new financial product or service, or to repay outstanding line of credit debt. Essentially, different probabilities are assigned to consumers based on shared features (i.e. income range or age groups) to create accurate predictions of future behavior. Predictive analytics work well with multi-dimensional data and enable financial organizations to create propensity scoring models to better understand how their consumers will respond to tailored messaging campaigns.

Optimization builds on traditional predictive modeling techniques that provide probabilities of an outcome, moving analytics to prescriptive capabilities. Giving an analyst the ability to automatically embed decisions that maximize or minimize an objective related to debt collections builds predictive analytic models that have already segmented and scored card holders into a variety of profile views. With optimized collections, financial institutions can better determine an individual's propensity to pay outstanding debt, which has been proven to result in higher collection rates by using a targeted messaging approach.

## Mitigating Credit Risk

Traditional rules-based systems are made ineffective as soon as fraudsters change tactics. Simply adding more rules is inefficient; it is difficult to detect anomalous behavior in large transactional datasets, especially when there are many forms of constantly changing fraudulent tactics.

Fraud detection and prevention is about connecting multiple data points to discover potential fraudulent behavior before it happens. Using predictive analytics allows financial service organizations to discover events that, when compared to commonly observed behavior, are deemed anomalous. Finding interactions between devices, products, locations and other data points, and aggregating relating data points to the entity level (the customer, the employee, and/or the business) effectively connects substantial quantities of knowledge with all people who have previously interacted with that knowledge.



## Mitigating Fraud Risk

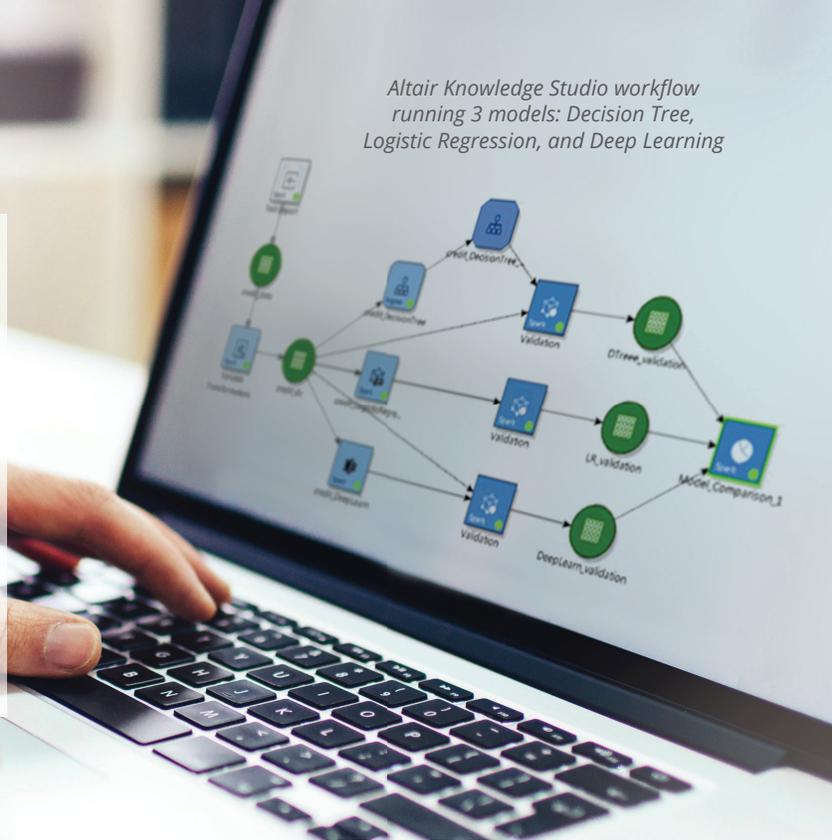
Financial companies struggle to find balance between maximizing revenue when offering a line of credit to an applicant and minimizing the propensity of the applicant to default on payment. Combining disparate datasets with large amounts of transactional data, bank account/product held data, and demographic data to create an accurate credit risk scoring model is difficult to do. Predictive Analytics helps financial organizations better segment product holders and create scoring models that identify new opportunities, offering increased limits while minimizing non-payment losses. Such scoring models can be built out of internal data and combined with external sources of data, such as data that comes from risk score providers. Machine Learning expands the model learning process, allowing more accuracy and consistency in results as new data is added to analytic routines.



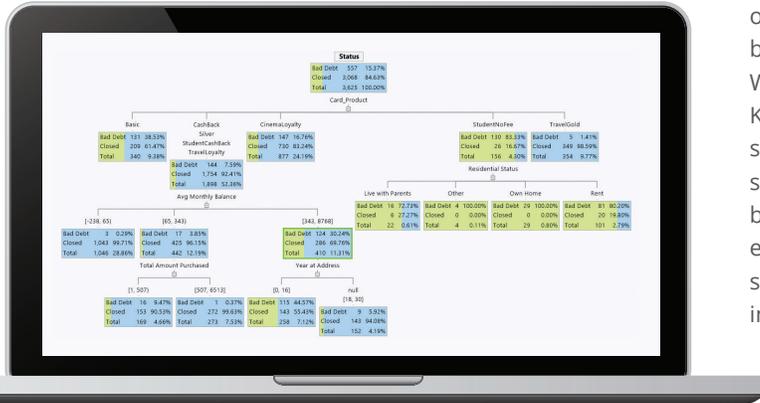
# Altair Knowledge Studio

Altair Knowledge Studio workflow running 3 models: Decision Tree, Logistic Regression, and Deep Learning

Altair Knowledge Studio is designed for data scientists and citizen scientists/business analysts alike. Its open, flexible approach allows data science teams to create complex analytical workflows and build sophisticated statistical models using preferred algorithms and programming languages. Additionally, Knowledge Studio does not require code to be generated, enabling business analysts with less experience in data science modeling techniques to build and deploy models. The intuitive and interactive approach of Knowledge Studio removes inherent complexity from data science, allowing financial organizations to quickly get insight from trusted data to make faster, more confident decisions.



Decision Trees are but one of many models supported in Altair Knowledge Studio.



Knowledge Studio supports a wide range of analytic algorithms that can be used in models that may or may not leverage machine learning and neural networks. Regardless of the approach taken, financial services organizations can discover hidden insight from data to better manage credit risk, fraud risk, and collections. Without adding complexity to the data science process, Knowledge Studio enables sophisticated use cases — such as recommenders, scenario optimization, sentiment analysis, large-scale anomaly detection, and business forecasting — to be leveraged effectively. For example, the Decision Tree technology allows data science teams and business leaders to quickly visualize insight found within data.

Predictive Analytics and Machine Learning has potential to create a better customer experience for financial service organizations that will increase growth and profit.

Predictive models are exposed to new data machine learning, allowing them to independently adapt and learn from previous computations to produce trusted, repeatable results.

## Machine Learning Models

### Classification (Supervised Learning)

- Decision Trees
- Neural Networks
- Ensamble Methods
- Logistic Regression

### Regression (Supervised Learning)

- Decision Trees
- Neural Networks
- Ensamble Methods
- Linear Regression

### Clustering (Unsupervised Learning)

- Principle Component Analysis
- K-Means

# Key Points To Remember

Predictive Analytics looks at historical data and finds insight to help predict consumer behavior and prescribe treatments to capitalize on this awareness. The acumen found in data using solutions such as Altair Knowledge Studio should be viewed as a preventative measure against forces that disrupt growth, revenue, and success.

Finding insight from multi-dimensional data that goes unseen is possible using advanced predictive technologies and techniques. Knowledge Studio is a leading data science solution that can mine large amounts of disparate data sources for insight. Machine Learning aids in the accuracy of results without relying on explicit programming to adapt to changing patterns in data. This results in data science models that efficiently recommend actions appropriate to improve strategies aiding in debt collection, risk mitigation, and fraud mitigation.

## Customer Quotes:



“Within Decision Trees we’re able to quickly pinpoint major variables which are significant in identifying fraud, and how to create rules from those variables. Also, it’s very easy to look at visualizations in the data. That helps us in building the strategies to counter fraud.”

**Anita Xia Risk Strategy Team,  
TD Bank**



“Knowledge Studio software has greatly helped us to identify risk layering and what types of loans fit in multiple categories that are deemed risky, and what variables impact risk. At M&T Bank we have utilized predictive analytics in various ways to meet our performance objectives”

**Stephanie Polsky Quantitative Risk Analyst,  
M&T Bank**

