



# Machine Learning for Superior Analytics

HOW MACHINE LEARNING IS DRIVING REVENUE GROWTH, INCREASING EFFICIENCIES, AND IMPROVING CUSTOMER ENGAGEMENT

# Foreword

For more than a quarter-century, Dun & Bradstreet has been researching, developing, and employing machine learning to help bring value to its customers. As leaders in the field, our experts continue to offer faster and superior analytical models, advanced data capabilities, and greater business insights by combining their human intelligence, subject matter expertise, and expertise in machine learning methodology. As a data-inspired organization, we know that reliable, accurate data is crucial to machine learning. Today businesses can use machine learning to automatically process large quantities of data to deliver answers, recommendations, and predictions.

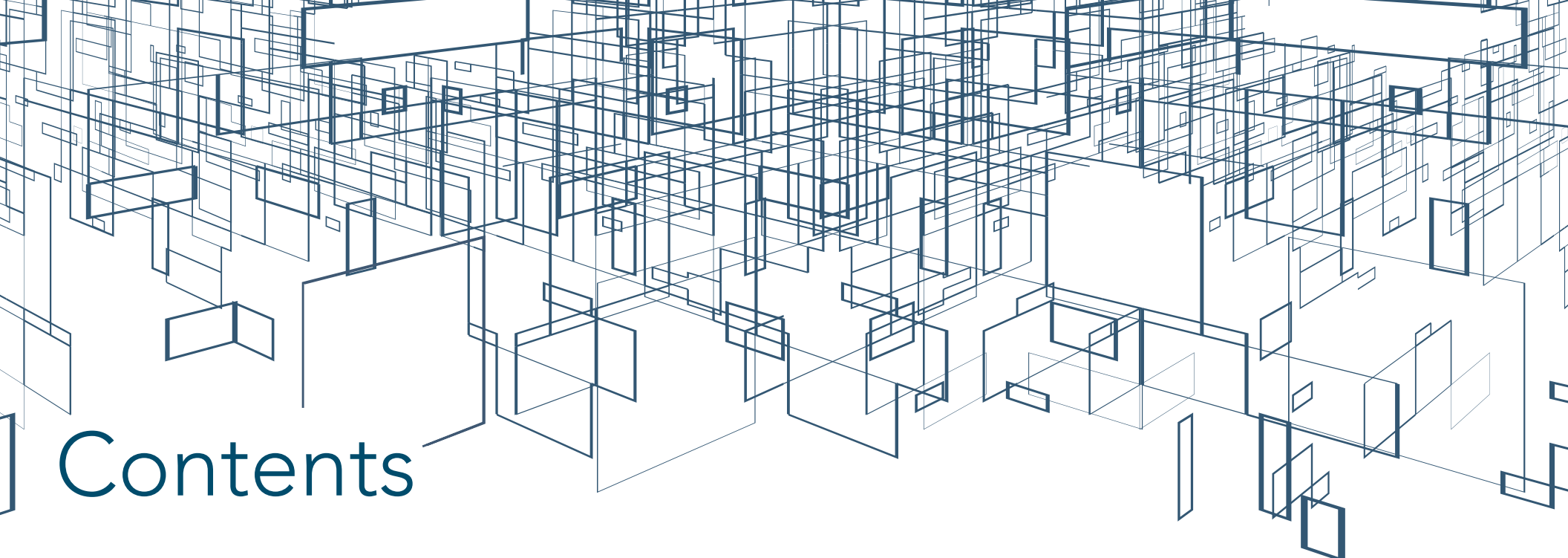
In addition to the pure processing power that machine learning can deliver, it also leads to the democratization of analytics. Companies that are not in the analytics business will take advantage of this and will be able to use non data-scientists for many tasks. Winners will be those who can differentiate themselves with superior analytics enabled by machine learning and performed on quality data – either in-house or outsourced to analytics companies.



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# Contents

Chapter 1: Introduction .....	4
How Does Machine Learning Help? .....	6
Chapter 2: From the Lab to the Enterprise – Machine Learning Brings Real-World Benefits .....	7
Chapter 3: Machine Learning Enhances Data and Content – Delivering Better Insights, Faster .....	9
Chapter 4: Machine Learning and Analytics for Targeted Marketing – Accelerating Time to Value .....	11
Chapter 5: Machine Learning and Analytics for Risk Management – Increasing Precision for Better Decisions .....	12
Chapter 6: Machine Learning for Deeper Company Insights – Knowing Your Customers Better .....	14
Chapter 7: Conclusions: Machine Learning Opportunities for Enterprises .....	16

## CHAPTER 1:

# Introduction

Businesses want to leverage the ever-growing amounts of available data to improve operational efficiencies, decision-making, customer reach, customer satisfaction, and profitability. As a result, analytics now drives today's enterprise, from the formation of business strategy to powering operational excellence.

Whether it is a single department making use of customer data to improve one aspect of its operations or an enterprise-wide undertaking, the guiding principles are the same. By quickly identifying patterns and analyzing vast amounts of data, businesses hope to derive insights to drive revenue growth, increase efficiencies, and improve customer engagements.

Two essential elements of achieving success are the use of trusted data and innovative analytics to turn that data into actionable insights. Machine learning (ML) is at the forefront of many new efforts in both areas.

This technology has long been used in the sciences. Now the same techniques are being applied in business applications to improve the quality of data and complement traditional predictive analytics methods. With machine learning, a form of artificial intelligence (AI) that uses smart algorithms, businesses can automatically process large quantities of data to deliver answers, recommendations, and predictions. Machine learning in its many forms has been around for decades. Today ML systems extend the benefits of predictive analytics by carrying out autonomous operations that would normally be performed by a human – but at a much faster rate.

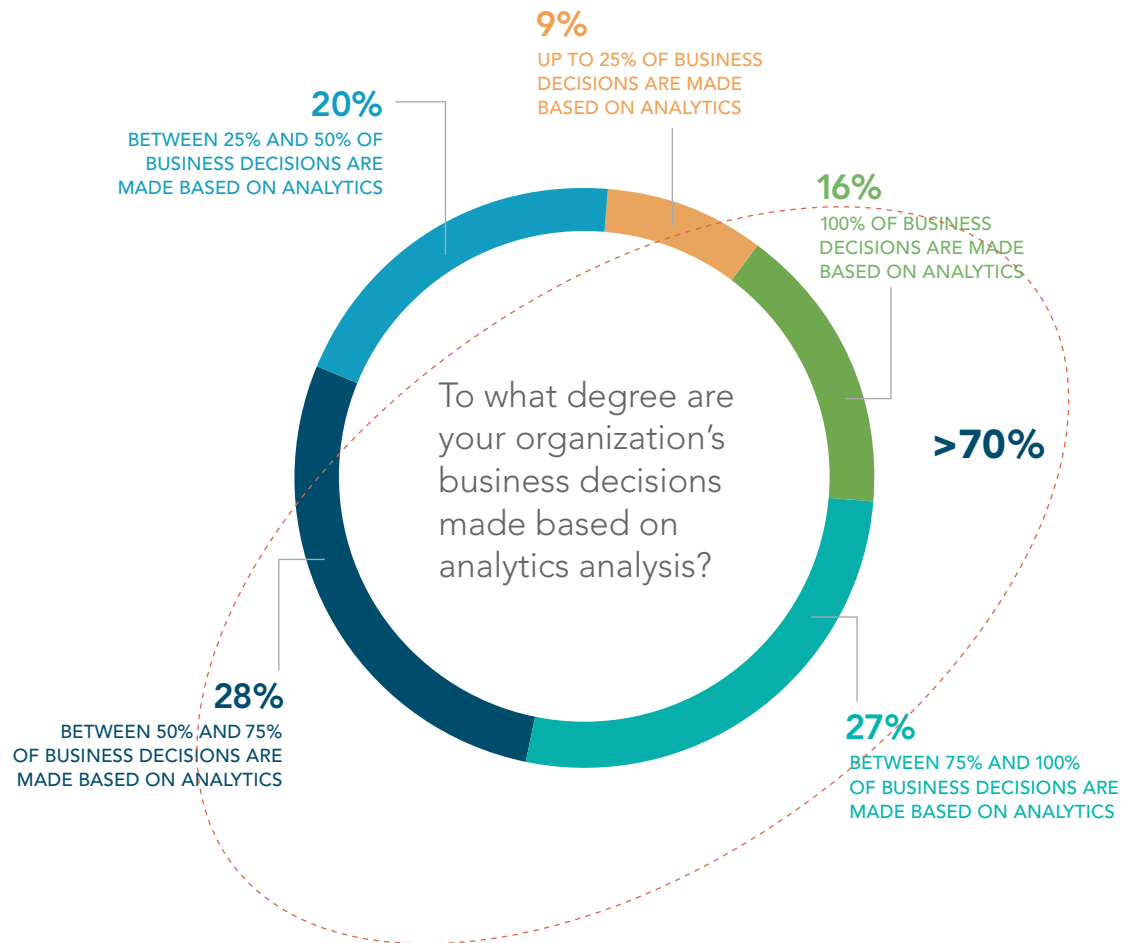




Additionally, machine learning speeds the pace of analytic model development and improves the accuracy of the insights those models output.

These improvements are critical as global businesses face growing complexity and market volatility. Today, all business functions are turning to data-driven analytics and insights to manage this increasing uncertainty, while better understanding their organizations' customer bases and growing their businesses. Analytics is the primary enabler to derive meaning from data. This information is then used to drive business growth.

The [2017 Enterprise Analytics Study](#) from Dun & Bradstreet and Forbes Insights confirmed this point. The study revealed a rapid acceleration of analytics adoption across the enterprise. In fact, 71 percent of the survey respondents said that 50 percent or more of their business decisions are now based on analytics.



## HOW DOES MACHINE LEARNING HELP?

Most industries have adopted ML to meet the challenges of the constantly changing business landscape. In most companies, non-data scientists perform a greater volume of sophisticated analysis than data scientists. Gartner says [this group will grow five times as fast](#) as the trained data scientist group.

In response to the demands of the non-data scientists, advanced analytics platforms must be easier to use. That's an area where machine learning has something to offer.

Machine learning systems work by classifying information in the same way a human brain does. They can be taught to recognize patterns and anomalies and classify them according to elements they contain. Based on the data fed to it, an ML system can make statements, decisions, or predictions and assign a degree of certainty to these predictions. The addition of a feedback loop enables "learning." By sensing or being told whether its decisions are right or wrong, a machine learning system can modify the approach it takes in the future.

Leading businesses that have incorporated machine learning into their analytics operations are using the systems to accelerate digital transformation, increase speed to results, and optimize cost structures. A [2017 survey of global CIOs](#) found that 90 percent of CIOs championing ML in their organizations today expect improved decision support that drives greater top-line revenue growth.

One way to look at these trends is that today there are two types of companies that use machine learning. Companies in Group A offer analytics to their customers, and analytics is their main product. Group B companies provide other services, be it banking, IT, telecom, or insurance, etc. For this second group, analytics is an enabler – not the main product.

For Group A, using machine learning by itself isn't enough to get the job done: their goal of this group is to be better than their competition at providing quality analytics solutions. These companies will continue to hire exceptionally trained data scientists, combining human intelligence with machine learning to best advantage.

Group B companies can be divided into two sub-categories: (1) firms who see their analytics as a competitive advantage – and who, like Group A, use data scientists to coax maximum benefit from ML-based analytics programs – and (2) firms who rely on ML's capacity to democratize analytics, eschewing heavy use of data scientists.

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## CHAPTER 2:

# From the Lab to the Enterprise –

## MACHINE LEARNING BRINGS REAL-WORLD BENEFITS

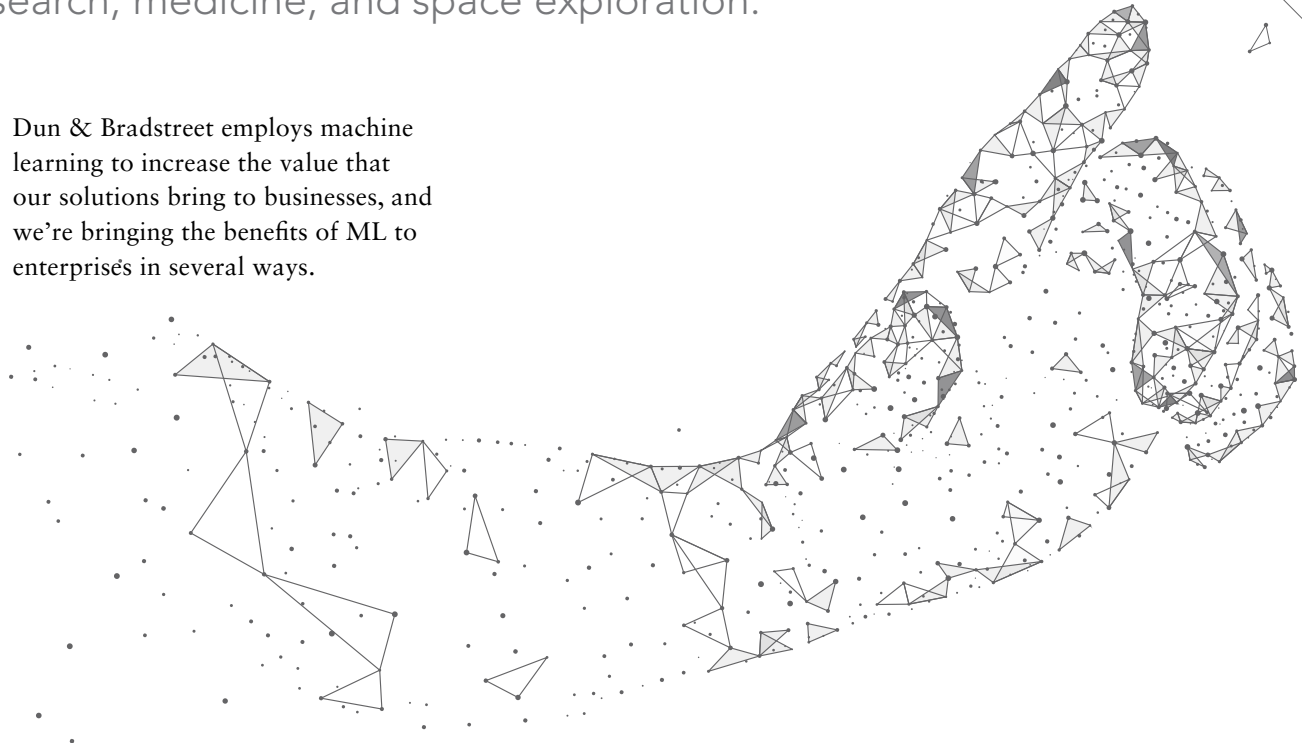
Scientists have long used machine learning to accelerate research and make new discoveries. The technology has been used in a wide range of applications covering basic scientific research, medicine, and space exploration.

The conditions that drove the use of machine learning in the sciences now exist in the business environment.

Businesses today have vast volumes of data available to make decisions. That data must be quickly analyzed to be of use. Patterns and anomalies must be identified and flagged. Analytic methods must produce predictions to support actions, and decision-makers need details on the confidence of those predictions.

Application areas for machine learning in business include risk assessment, sales acceleration, revenue growth, finding opportunities for funding business growth, and increasing operational efficiencies.

Dun & Bradstreet employs machine learning to increase the value that our solutions bring to businesses, and we're bringing the benefits of ML to enterprises in several ways.



To start, Dun & Bradstreet uses machine learning to improve the accuracy of the data we deliver to our customers. In different application areas, machine learning can improve the quality of existing Dun & Bradstreet data and content sets by using new data sources to fill in missing information, complement existing data, and quickly identify changes. All of this serves to enhance our customers' ability to leverage our data for their own business benefit, either directly or through our SaaS applications.

In addition, machine learning helps us improve the insights our analytical models deliver, especially in the sales/marketing and credit/risk management spaces. Machine learning improves the accuracy of a model, the speed to completion of the model, or both. However, as the following figure indicates, we've found that some analytically derived scores are better suited to improvements through machine learning than others.

## SOME SCORES ARE BETTER SUITED FOR MACHINE LEARNING

### FRAUD SCORE

#### EXCELLENT USE CASE

Machine learning algorithms with adaptive components are required to create successful Fraud scores to address the constantly changing behavior of fraudsters

### FAILURE SCORE

#### VERY GOOD USE CASE

These machine learning scores have a well-defined target variable that is uniform across all customer applications

### DELINQUENCY SCORE

#### GOOD USE CASE

These scores require a combination of customization with machine learning methods, as each customer has its own definition of target variable





## CHAPTER 3:

# Machine Learning Enhances Data and Content –

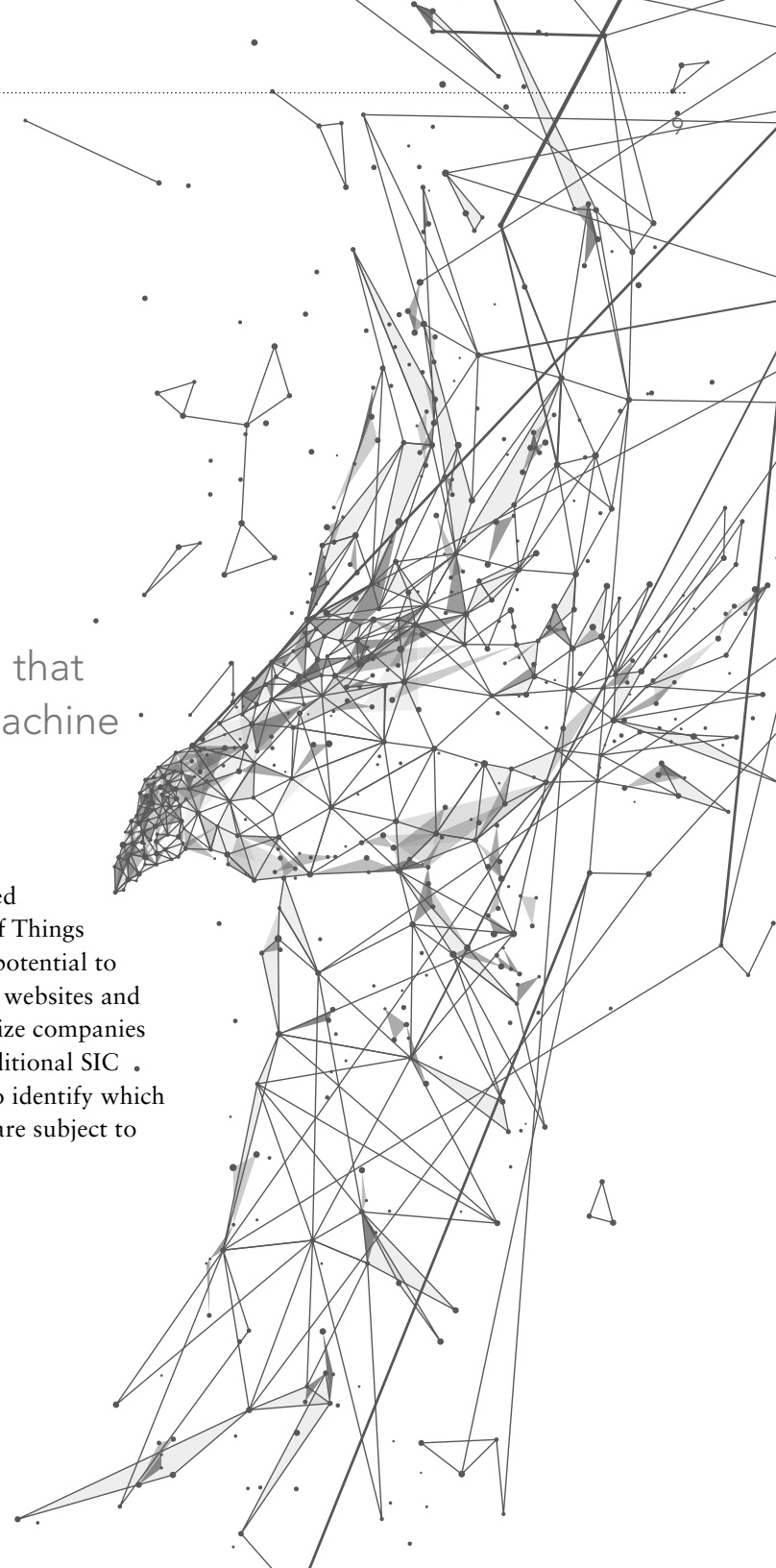
## DELIVERING BETTER INSIGHTS, FASTER

Before we get into ML-based analytics models, it is worth noting that there are several broad areas where Dun & Bradstreet is using machine learning to improve the data it provides to customers.

First, there is **improved categorization**. Using ML-based neural nets, Dun & Bradstreet looks through information about a company on its website and from other sources. We have a model that helps identify and assign a standard industrial classification (SIC) code for a company based on what that company says on its website.

How does this help? A SIC code denotes what kind of business a company does. So, for example, an insurer can identify that the manufacturing firm it's looking at is more specifically a furniture maker, which has a different risk profile than a toy maker. Information generated by machine learning helps the insurer make more informed decisions about how to approach its customers.

For companies that are not easily categorized (e.g., emerging industries like the Internet of Things or green energy), machine learning has the potential to speed information collected from corporate websites and published documents to segment or categorize companies in different ways than those covered by traditional SIC codes. For example, there might be a way to identify which companies are environmentally friendly or are subject to carbon emissions caps.



## A second area where machine learning is being used is in **clustering** company activities to derive “business signals.”

By scanning news and media events from diverse sources and making connections about the content, Dun & Bradstreet may be able to identify precursors to upcoming actions.

And business signals data is applied to creating a “business health index,” to help identify which companies demonstrate strong growth potential and which might fail in the next three months – thereby enabling better sales prospecting or better decision-making around credit terms.

When a company files for bankruptcy, it often comes as a surprise to the market, with the word “bankruptcy” never having appeared in their public announcements or in news articles until it was fait accompli. However, there may be telltale signs of a company’s poor health months in advance. For example, there may be a news report that a company is late in its payment to suppliers, has curtailed expansion activity, or has abandoned previously announced plans.

Similarly, there might be indicators that a company is poised for growth. News items might include the addition of a prominent market leader to the company’s board, the creation of a new position on the management team, or the completion of another round of financing.

By clustering reported activities, machine learning may help Dun & Bradstreet make an assessment that it should flag the business signal associated with that company, thereby indicating growth potential. Business signals help our customers make sales, marketing, and finance-related decisions. The faster – or more accurately – a signal can be generated, the better decision-making it supports.

One other broad area of exploration is the use of machine learning in natural language generation. This work is helpful in automating areas where humans are currently responsible for creating content that needs constant refreshing.

An example of this is the company description contained within a D&B Hoovers business report. Machine learning could scan public information and extract the latest products and services a company offers and its own description of itself to allow D&B Hoovers to present a timelier description of the company and its activities. That aggregated information could be presented to an editor through natural language generation to aid in writing updated reports, providing the most up-to-date information to customers more quickly.



One other broad area of exploration is the use of machine learning in **natural language generation.**

## CHAPTER 4:

# Machine Learning and Analytics for Targeted Marketing –

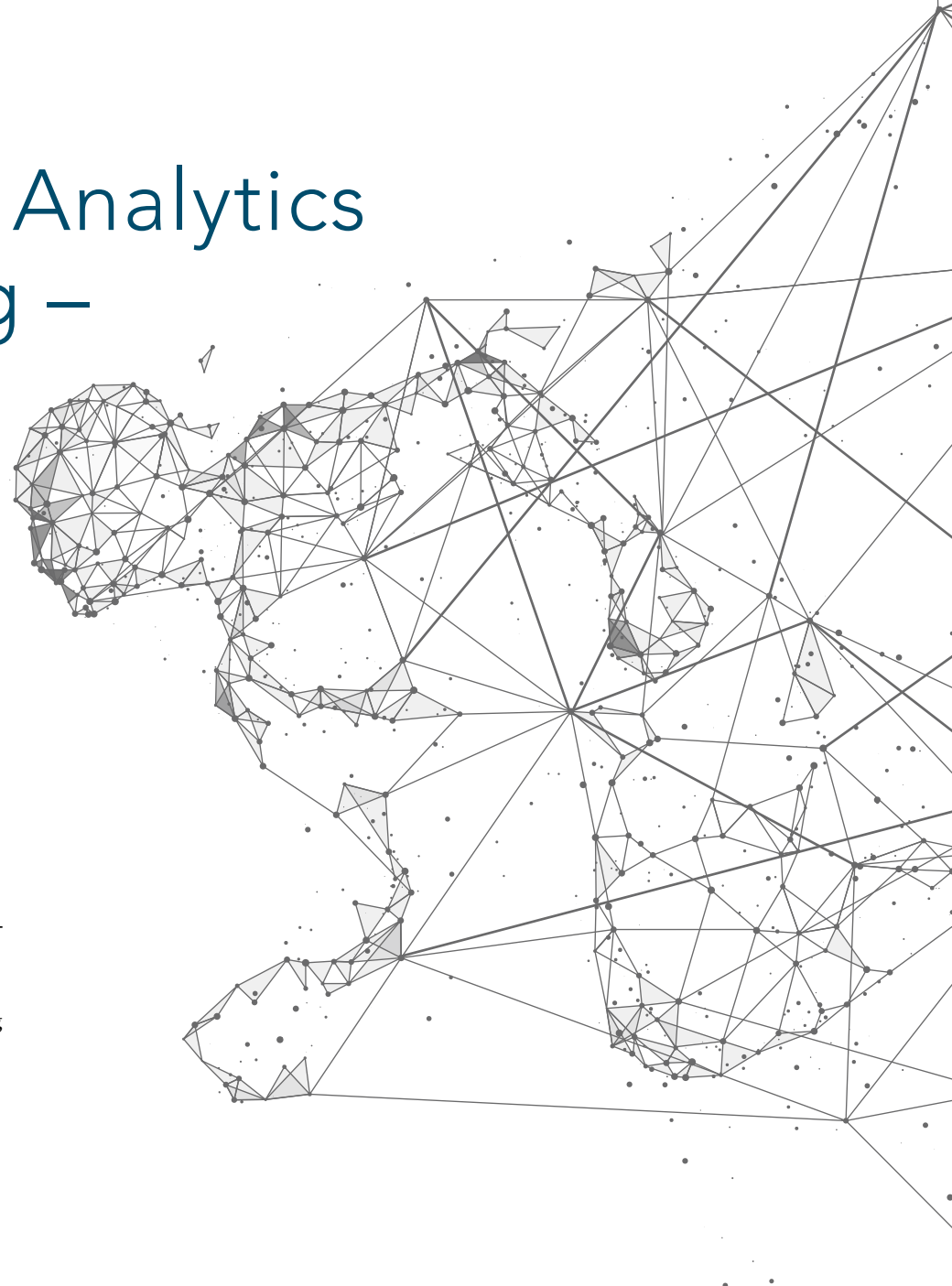
## ACCELERATING TIME TO VALUE

When it comes to segmenting customers and prospects for marketing purposes, marketing analysts would traditionally develop a segmentation schema internally or use custom modeling services.

Each approach has its advantages, but in both cases, the development process can take weeks and incur significant costs. This is not ideal, especially if the company is focused on rapid growth and capturing new business opportunities faster than the competition.

Enter targeted precision analytics (TPA), a marketing analytics solution from D&B that uses machine learning, firmographic data, and behavioral business data. TPA is a platform that allows the use of automated models to obtain the required customer and prospect insights in record time.

Once a target outcome is identified, the machine learning engine in TPA in many cases produces model results comparable to manually built custom models. The results are delivered in days, not months, dramatically increasing the opportunity to take advantage of the model's output – to target prospects and to increase sales. This enables the human experts to focus on defining the target outcomes, identifying the use cases where machines add the most value, and focusing on complex problems where intelligent humans are interacting with intelligent machines.



## CHAPTER 5:

# Machine Learning and Analytics for Risk Management –

## INCREASING PRECISION FOR BETTER DECISIONS

Modern risk/credit management organizations use a scorecard methodology to incorporate custom algorithms into credit decision-making. This scorecard methodology – used to manage portfolios of accounts and collections efforts – is a form of machine learning.

Dun & Bradstreet continues to lead in the credit scoring space by combining human intelligence, subject matter expertise, and predictive modeling expertise with state-of-the-art machine learning techniques. These machine learning methods offer greater precision of prediction, capturing the effect of subtle changes in data and granular segmentation. Human intelligence creates explainable results from ML-driven models.

In applications such as customer-delinquency models, delinquency models for alternative lenders, and fraud risk indices, traditional scorecard methods can be complemented by machine learning. Machine learning and artificial intelligence have the potential to change the benchmark for what can be achieved with analytics, helping customers lower business risk.

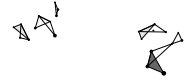
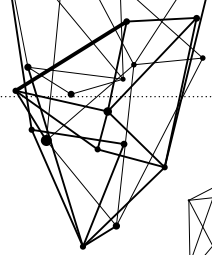
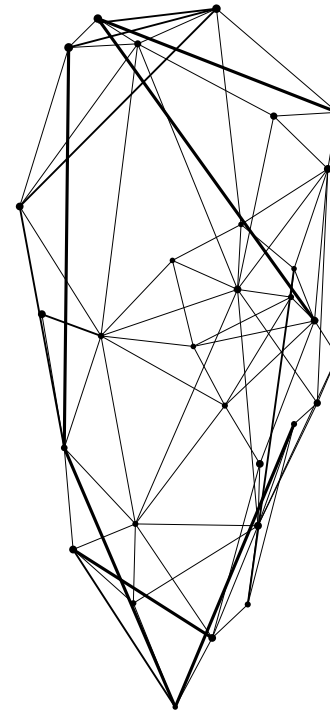
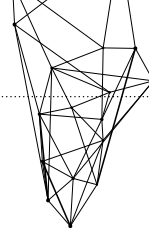


However, some risk scores can benefit more from machine learning than others. For example, fraud scores are best served by machine learning's adaptive-learning capabilities. Combining the traditional scoring methods that have been developed and used for years with machine learning leads to better results. In contrast, ML-derived delinquency scores require great amounts of customization. The reason: each customer has its own definition of delinquency.

That said, one of the biggest challenges with using machine learning for the financial industry is how to explain machine learning models. In other industries, machine learning is a black box. Little is known about the methods used to derive results.

This is not acceptable in the financial industry. Organizations must be able to explain their ML-based scores to customers and regulators. Dun & Bradstreet offers customers both its traditional model scorecard and the machine learning model. With this transparency, customers can see for themselves any improvements offered by adding machine learning to the mix.

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## CHAPTER 6:

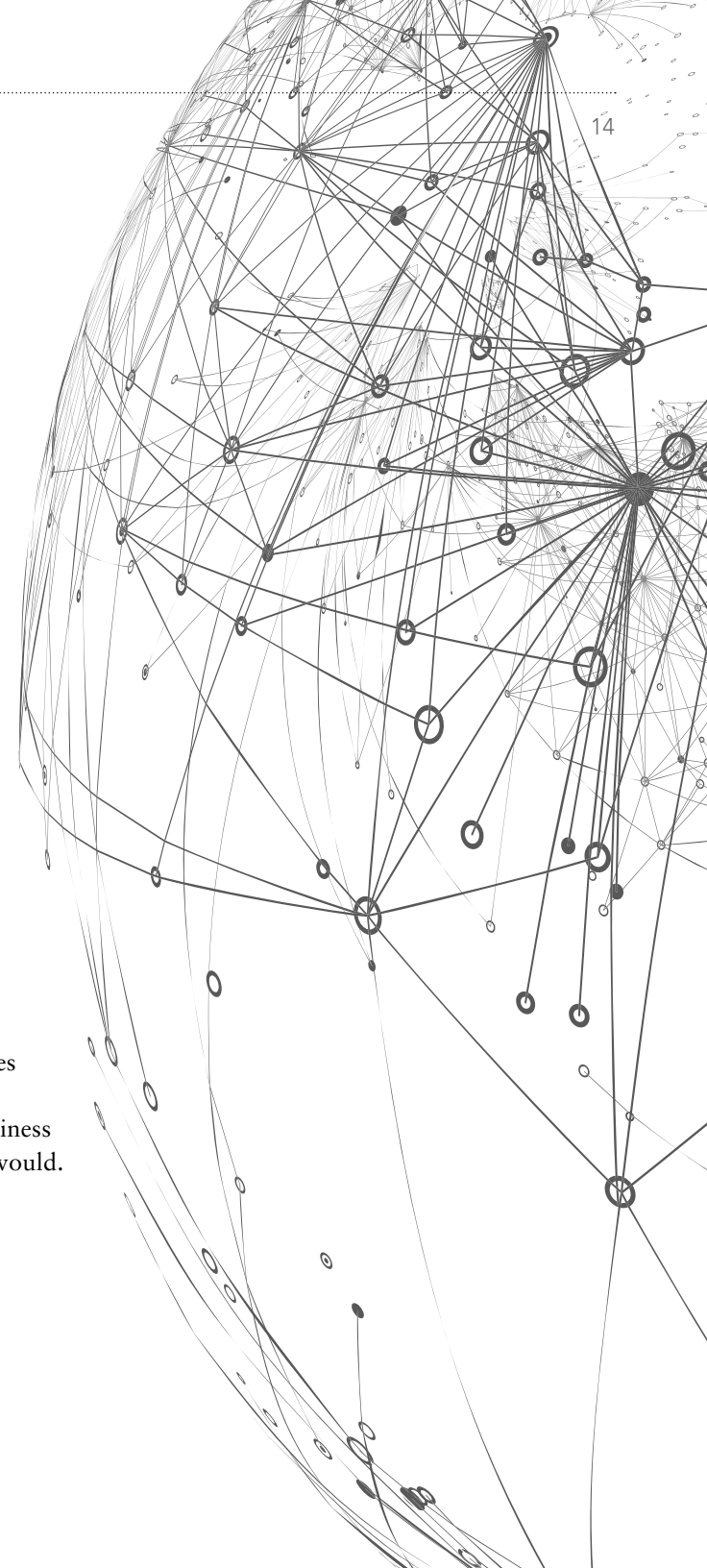
# Machine Learning for Deeper Company Insights –

## KNOWING YOUR CUSTOMERS BETTER

Another area where deeper company insights can be enhanced with machine learning is around corporate hierarchies, ownership, and interest.

In addition to tracking legal linkage (one business location having financial and legal responsibility for another business location), Dun & Bradstreet also tracks alternative forms of linkage. These are relationships where an affiliated company has no legal obligation for the debts of the other company. Alternative linkage information may include franchises, agents, dealers, and associations; partner and healthcare provider networks; minority ownership; and joint ventures. Machine learning algorithms scour websites, public documents, and other sources to gather such details

about such interrelationships. Additionally, Extended Linkage Insight, a new analytical solution from Dun & Bradstreet, provides even more transparency of the relations between businesses beyond legal and alternative linkages. It uses an automated approach to denote businesses as potentially related and uses a machine learning algorithm that “learns” the brand names from business names and “links” businesses as a linkage expert would.



# Before You Analyze: Master the Data

As any analytics practitioner knows, to be truly valid and trusted, analytics must be run on a trusted data set. When it comes to analytics around business relationships – customers, suppliers, and partners – D&B Master Data provides that trusted data set for business relationships. Master Data delivers a structure for all business relationship records: ensuring each company record has a unique identification code, plus hierarchies and linkages, and is categorized by segment (such as the SIC code discussed above). Creating a solid master data foundation is essential before applying analytics models of any type.

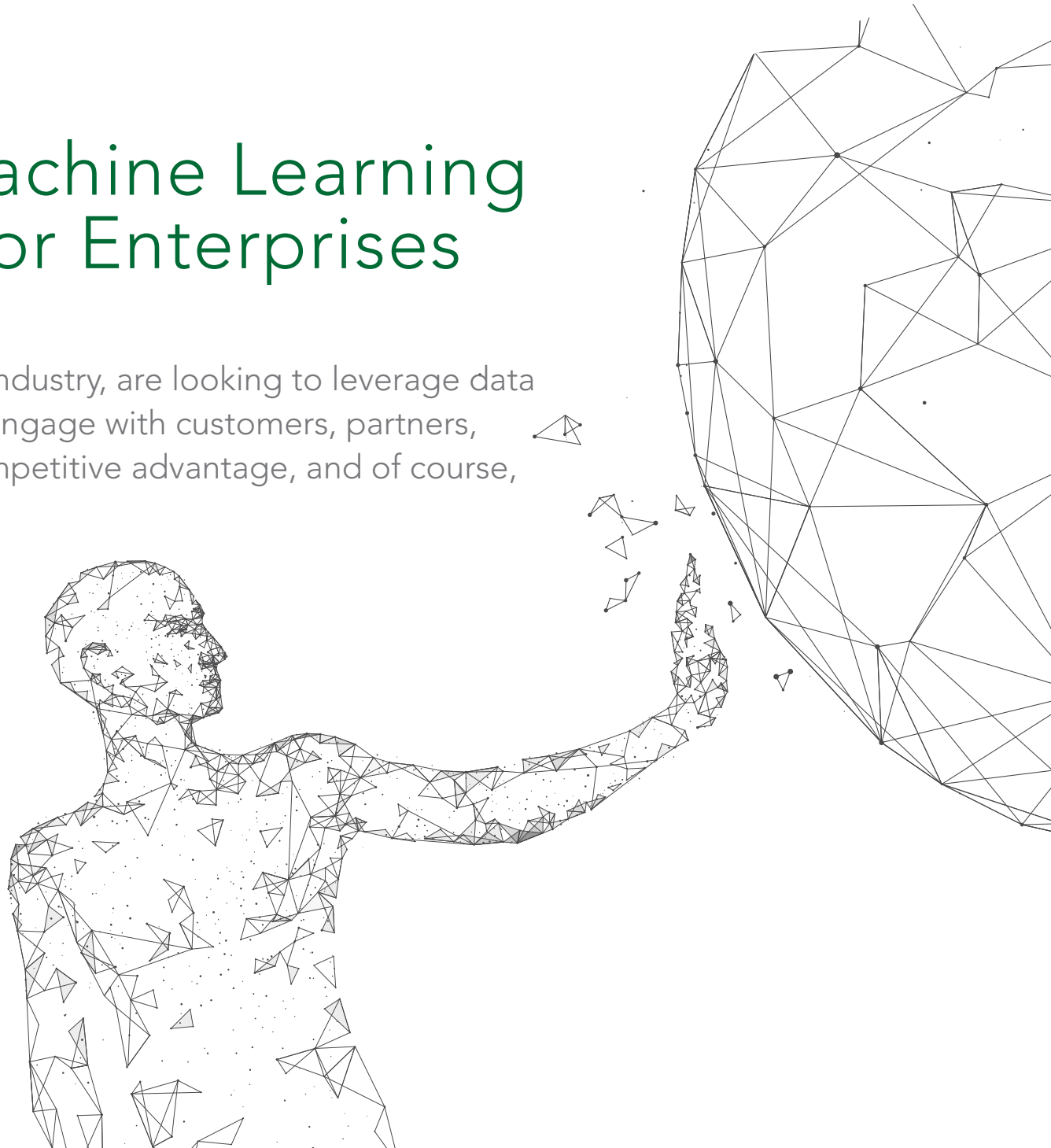
## CHAPTER 7:

# Conclusions: Machine Learning Opportunities for Enterprises

Companies, no matter their size or industry, are looking to leverage data to find new and innovative ways to engage with customers, partners, vendors, and suppliers to gain a competitive advantage, and of course, to build and maintain relationships.

Analytics should be at the heart of any company's operations. Machine learning improves the value analytics brings by speeding up pattern identification and analyzing vast amounts of data, deriving faster and better insights to drive revenue growth, reduce risk, increase efficiencies, and improve customer engagements.

As discussed above, Dun & Bradstreet is leveraging machine learning to improve both the data it delivers to customers and the insights it delivers via leading-edge analytics solutions. The examples provided are just a sample of the ways we are putting machine learning to practical use to expand the value our customers derive from our data, analytics, and SaaS applications.





## MAJOR THINGS TO REMEMBER ABOUT ML



### **MACHINE LEARNING IS MAGIC, BUT NOT OMNIPOTENT.**

Machine learning only works if the problem is actually solvable with the data we have

### **QUALITY OF INPUT DATA IS STILL MANDATORY**

Auditing input data and making sure that data makes sense is still the most important step in analysis: "Garbage in, Garbage out"

Creating powerful predictors from raw data is the key in creating best models

As Big Data processing and more sources of data become accessible, further advancements will emerge in our ability to view business entities globally. These expanded views will further accelerate the value customers derive from Dun & Bradstreet data, analytics, and applications in areas such as sales and marketing, risk management, and supplier management.

A competitive global marketplace demands greater precision and better intelligence to power decision-making. Organizations need confidence in the data they use to make these decisions and upon which they base their analysis. Machine learning is at the forefront of analytics as a disruptor, bringing benefits both in analytics models and in the underlying data on which analytics are based. Companies need to embrace this technology, or they'll find themselves at a competitive disadvantage in the marketplace.

To learn more about the exciting and novel ways that Dun & Bradstreet is applying analytics, machine learning, and other technologies in the business world, [check out our video library](#).



#### ABOUT DUN & BRADSTREET

Dun & Bradstreet (NYSE: DNB) grows the most valuable relationships in business. By uncovering truth and meaning from data, we connect customers with the prospects, suppliers, clients and partners that matter most, and have since 1841. Nearly ninety percent of the Fortune 500, and companies of every size around the world, rely on our data, insights and analytics. For more about Dun & Bradstreet, visit [DNB.com](https://www.dnb.com).

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