

SIMCORP TECHNOLOGY LAB WHITE PAPER

INCREASE **OPERATIONAL EFFICIENCY** AND IMPROVE **CLIENT EXPERIENCE** WITH **MACHINE LEARNING**

Four innovative use cases for the
investment management industry



CONTENTS

INTRODUCTION BY IBM	3
WHAT IS ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	4
CLOUD SERVICES ADOPTION CREATING A FOUNDATION FOR MACHINE LEARNING	5
HOW TO IMPLEMENT MACHINE LEARNING	7
MACHINE LEARNING USE CASES FOR INVESTMENT MANAGERS	8
1. REACTIVE AUTOMATION	9
2. PRE-EMPTIVE AUTOMATION	9
3. AUGMENTED DECISION-MAKING	9
4. TECHNICAL OPERATIONS	9
HOW TO GET STARTED WITH MACHINE LEARNING	10
NEXT STEPS FOR INVESTMENT MANAGERS	11

INTRODUCTION

Using machine learning to drive business outcomes

Artificial Intelligence and machine learning...

these were two of the key buzzwords of 2018-19 and interest in them is predicted to continue into the new decade. Strategy conversations are dominated by discussion of how these connected fields can deliver an edge to business leaders faced with ever increasing rates of business change and the emergence of new – and often unexpected – competition.

Yet Artificial Intelligence and machine learning are not new fields. In fact, they date back to the 1950s. The term machine learning was coined by an IBM researcher, Arthur Lee Samuels, who created one of the very first self-learning programs. He used the term machine learning in a paper describing his approach that was published in the IBM Journal of Research and Development in 1959.

So, if machine learning is not new then what has changed? Why is it now attracting so much attention? Machine learning is an application of Artificial Intelligence that enables systems to learn from the data they are exposed to, rather than from explicit programming. The system relies on patterns and inferences to perform specific tasks and to improve and adapt as the data itself changes over time. Machine learning algorithms refine the models they create by processing new data and training the system to adapt to changing patterns and associations in that data. Our understanding of how to use and apply these algorithms has improved steadily over the years but a crucial change is the dramatic increase in the availability of computing power to run those algorithms. Innovations in storage, and the ability to distribute compute processing across clusters of computers, has led to faster performance and the ability to analyze far larger data sets than was conceivable even a few years ago.

And here we see a second tipping point in the evolution of machine learning; the vast amounts of data that is now available. Data is everywhere in today's

interconnected world and its volume is growing exponentially. At the same time, the costs associated with storing and managing large volumes of data have decreased.

Finally, there is the impact of cloud computing which is allowing even the smallest companies access to the infrastructure that will enable them to benefit from machine learning. The importance of such access should not be underestimated as predictions suggest that, over the next five years, the computational resources used in Artificial Intelligence will increase five-fold. By 2023 Artificial Intelligence is expected to be the top category of workloads driving infrastructure decisions.

Yet, incredible though machine learning is, its only value to an organization is if it can be used to drive business outcomes. The value of machine learning lies in its ability to allow companies to gain insights from the data generated by their businesses that were not previously available, spotting patterns and associations that, due to their complexity and size, are unlikely to be recognized by a human reviewer. Such insights can lead to process improvements – perhaps freeing up staff to perform other tasks or providing them with information to augment key decisions – and the prediction of business change that allow companies to react ahead of their competitors.

Machine learning offers exciting possibilities for companies not just to survive but to thrive in the presence of ongoing and rapid industry change. Investment managers will neglect it at their peril as early adopters are likely to gain genuine competitive advantage over their peers.

KIM GRAVELL,
Partner Ecosystem Marketing Leader,
IBM Services, UKI and Nordic

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING EXPLAINED

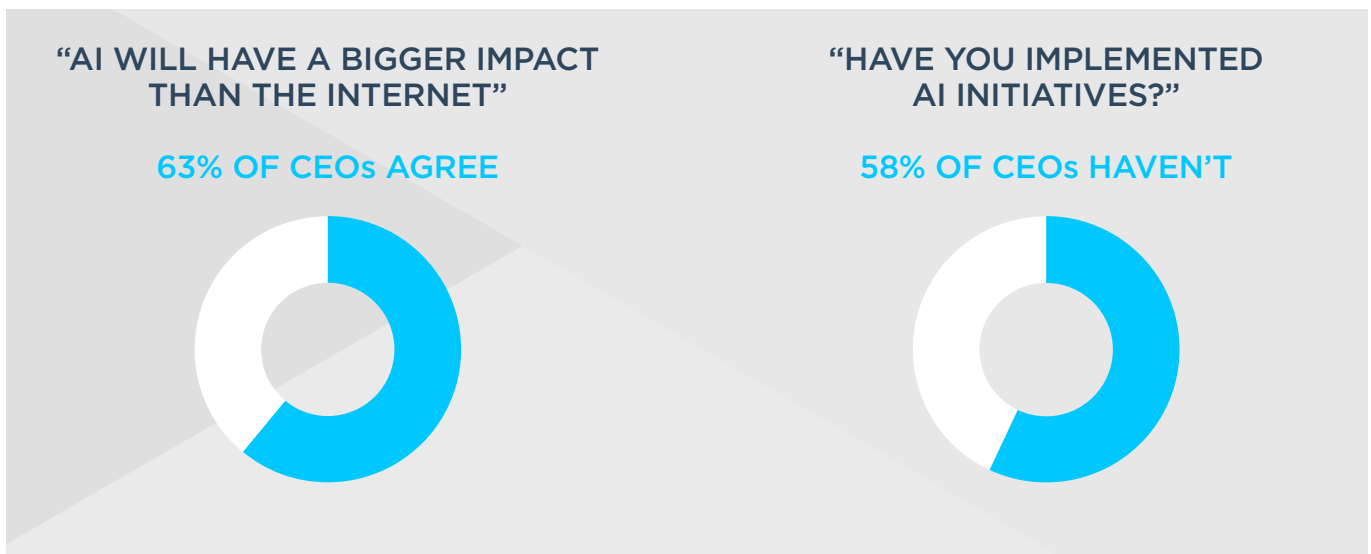
Let us start to explain what artificial intelligence and machine learning exactly are. The Encyclopedia Britannica defines, “artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.” Intelligent beings are those that can adapt to changing circumstances.

As a subset of AI, machine learning (ML) is defined by Amazon as “a collection of algorithms that can learn from and make predictions based on recorded data, optimize a given utility function under uncertainty, extract hidden structures from data and classify data into concise descriptions”.

In short, ML can help organizations to find hidden insight and predict future outcomes based on the

huge amount of historical data they own across their multiple databases and systems landscape.

According to a recent PWC global CEO Survey report¹, 63% of CEOs agree that AI will have a bigger impact on the world than the internet, but 58% have not introduced any AI initiatives to transform their business or serve their customers.



The objective of ML is to make better informed decisions or to guide faster smart actions with or without human intervention. The major advantage of ML in

contrast with many other approaches is its ability to automatically improve over time based on historical data.

¹ 22nd Annual Global CEO Survey, PWC, 2019

CLOUD SERVICES ADOPTION CREATING A FOUNDATION FOR MACHINE LEARNING

When investment managers move to the cloud, the typical drivers are to alleviate infrastructure costs. But the cloud will also create data management functions that allow efficient deployment of business innovation such as artificial intelligence and machine learning.

In addition to cost benefits, moving from on-premise software solutions to subscription-based solutions have several other advantages. For example:

EFFORTLESS USE AND CONSUMPTION

The cloud offers the possibility for business users to log in and work directly in an environment that is user-friendly, easy to onboard and supportive. It creates a great experience with minimal effort.

BUSINESS AGILITY

On the platform and infrastructure side, investment management solutions are hosted and maintained in a self-healing and elastic private or public environment. The cloud improves transparency for system operations and reduces manual interventions and hardware requirements with on-demand distribution of computer power. On the application side, continuous upgrades, systems testing, and configuration delivery provide a business environment that is always accurate and in mint condition to support your business objectives. Time to market for new strategic initiatives, onboarding clients or investment in new asset classes is greatly improved.

SECURITY

The cloud is more secure than any other on-premise IT environment. There are several services to maintain privacy and control of network access including firewalls, encryptions and various connectivity options to meet the requirements of the most security-sensitive organizations.

DATA PROTECTION AND PRIVACY

Today, processing data requires diligent efforts to protect the rights of parties such as employees, clients, suppliers, partners, applicants, etc. The cloud offers tools and processes to better protect and separate personal data within the applications to maintain compliance with regulations such as GDPR in the EU, The Massachusetts Data Security Regulations and Red Flag Rules in the US or the UK Cyber Essentials Scheme. In addition to processes and tools, the cloud offers the benefits of being easily auditable by the regulators.

COST EFFICIENCY AND PREDICTABILITY

On the financial side, the possibility to “pay-as-you-go” and “use as needed” offers the flexibility required to run your business cost-effectively. Cloud providers are offering the environments, tools, and repeatable processes required to support multiple clients with similar needs, hence enabling economies of scales and lower costs. Subscription models embrace the preference to be able to better predict IT expenses over time and better control the total cost of solutions ownership (TCO) by moving from capital expenses to operational expenses.

However, enabling a software as a service in the cloud makes it possible to blend it with other services to form new combined services providing future unforeseen opportunities for investment managers.

DEMOCRATIZATION OF BUSINESS INNOVATION, BIG DATA AND ARTIFICIAL INTELLIGENCE

The emergence of the cloud changes the relationship between IT and the rest of the business. IT departments are no longer the only ones providing technology, so the business can now assess the right tools faster. This evolution fosters greater experimentation by a broader set of users within investment management firms. Application Programming Interfaces (APIs) and cloud hosting make it easier to access data and functions to enable trial and error experimentation.

Cloud solution vendors are introducing new standard components and solutions to adapt swiftly to changing market demands. Artificial intelligence and machine learning are leveraging the increasing volume of data available, easy-to-use algorithms and automated data processing. Already now, we see pilot initiatives to improve performance, comply with new regulations, execute client orders more efficiently, forecast price movements, perform trading strategy optimization or automate currency trading.

KEY OPPORTUNITIES FOR CLOUD ADOPTION TODAY AND TOMORROW

COST SAVINGS

Capital expenses converted to operating expenses



REDUCED RISK

Hedge risk by transferring data to the cloud



INNOVATION

Machine learning, artificial intelligence, intelligent insights



SCALABILITY

Scale-up or down on-demand, as configured or scheduled



BUSINESS CONTINUITY

Fault-tolerant approach to continuous deliver



BIG DATA

Increasingly large data sets, benefits of sharing



TIME TO MARKET

Shortened considerably, including time to provision/deploy



COLLABORATION

Increased synergies for Business, IT & Operations



STANDARDIZATION

Technology, implementation, lifecycle and DevOps



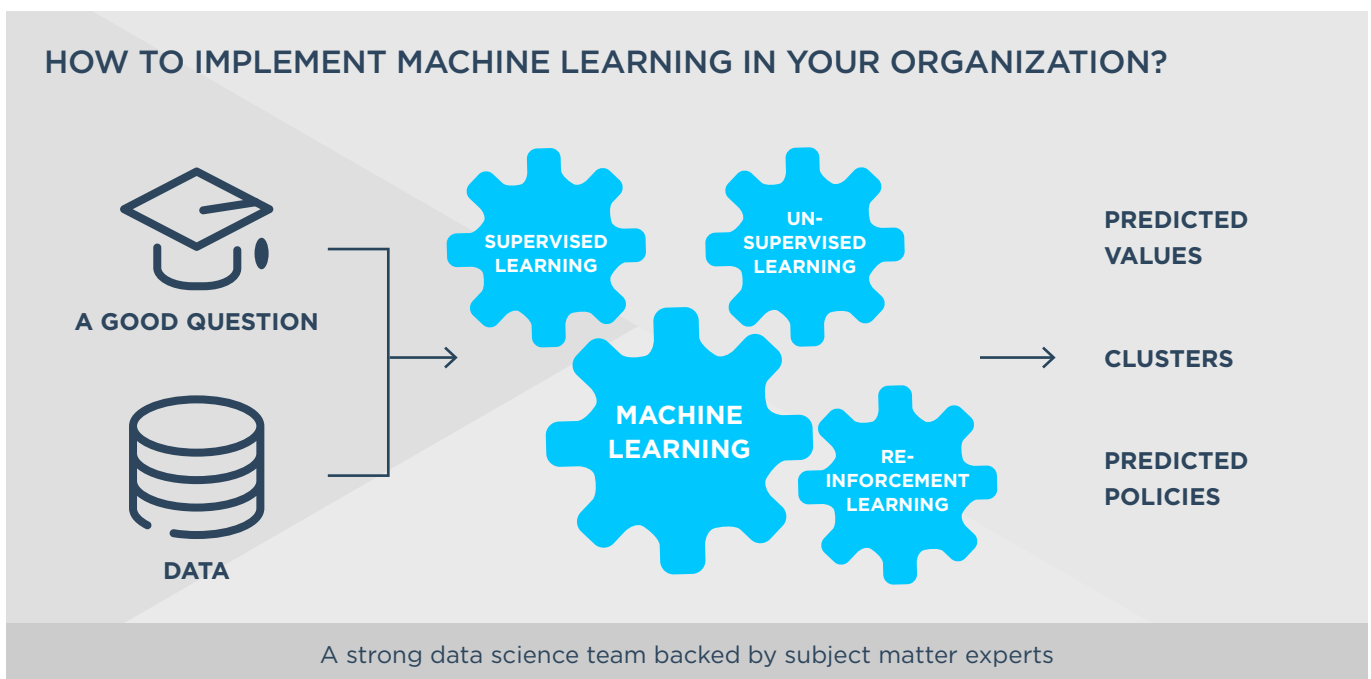
If you have not made the move to the cloud, we can only recommend starting your transition today, rather than tomorrow. If you are not yet convinced, keep on reading, this whitepaper will zoom through a number of intelligence and analytics innovation opportunities that machine learning could bring to your organization.

HOW TO IMPLEMENT MACHINE LEARNING

The first step is to identify a good question or problem to which a prediction would benefit the business if properly defined. The second step is to collect the relevant data, as it is the key ingredient to any ML initiative.

The development of ML models tends to be an iterative process that first requires a pre-processing that involves cleaning the collected data and ensuring its good quality. Then comes the application of various machine learning algorithmic approaches. These are typically open source components which work in different ways and sometimes in combination to find patterns and correlations in the data. This phase is an experimentation and prototyping phase where the objective is to explore and find the best machine learning model for a given use case and validate its feasibility.

If the use case was successfully validated by the prototype, it is time to use the model. If the use case was a one-off analysis task, you're done. But there is a lot of potential value in bringing machine learning into operations. Both in processing-type tasks where it may help automate manual steps or in automation breaks or in decision-making workflows which rely on significant volumes of analytics. In most cases the most robust and cost-efficient way to achieve that is to have the features built into the systems you already use.



MACHINE LEARNING USE CASES FOR INVESTMENT MANAGERS

We are at an early stage with machine learning in the investment management industry. Overall, however, we can foresee that current research and pilot projects will soon yield new products and services

aiming to increase efficiency through standardization and automation of processes at multiple points in the value chain where there are still many labor intensive manual tasks.

“

SimCorp wants to offer machine learning based tools to avoid automation breaks in the first instance where at all possible, and ease the remediation in the rest. Further, SimCorp aims to deliver a new generation of decision support tools and options based on new insights to bring new levels of productivity in managing investment portfolios.”

ANDERS KIRKEBY

Technical Fellow, VP, Enterprise Architecture on SimCorp's vision for machine learning

Innovation does not happen in a vacuum. It happens in ecosystems when companies, partners, suppliers and clients create an experimental environment where interactions build on each other to shape future ideas, and ultimately bring unique value for stakeholders. Let us share with you a few use cases we are currently prototyping with anticipated benefits split into four categories:

1. REACTIVE AUTOMATION
2. PRE-EMPTIVE AUTOMATION
3. AUGMENTED DECISION MAKING
4. TECHNICAL OPERATIONS



USE CASE 1: **REACTIVE AUTOMATION**

Apart from actual decision-making, automation is largely the norm in most standard processes in investment management. But the automation fails regularly for a multitude of reasons. This translates directly into cost as employees have to fix the issue to enable the automation to continue. The cost of these issues can be reduced with machine learning. One of the cases SimCorp has looked at is to automatically analyze unstructured data arriving as PDFs. These may be fee invoices, income statements from illiquid investments or contracts.

In the case of invoices the automated process is to receive the PDF document, convert the file if needed to generate characters and then identify which relevant values correspond to the fields we are looking for in the concrete case. The outcome is structured data from an unstructured document. To achieve that outcome requires a high volume of reasonably similar documents to train a machine learning model to accurately identify and extract all the needed information. If this can be done with a high enough precision, we can remove a costly, and perhaps a bit boring task.

USE CASE 2: **PRE-EMPTIVE AUTOMATION**

Some of the automation breaks we encounter regularly could be avoided in the first place, or could at the very least be handled earlier. A case SimCorp has prototyped in this space is to predict the likelihood of a particular trade being matched automatically.

The goal is to predict the likelihood of a first time match for transactions sent to a third party confirmation platform such as Omgeo CTM. If the likelihood of a match is high, the transactions are left to flow through to the platform. If the likelihood is lower than a predefined threshold we looked at two different outcomes. One is to proactively flag the transaction as being very likely to require manual intervention, for example via an alert in the alerts inbox.

Another is to make a holistic view of costs and calculate the likelihood of a first time match before the order is committed. If the order is deemed unlikely to match automatically the trader is informed of suggestions of alternative order attributes which would lead to a higher likelihood. The system would not make the call itself because there may be several reasons why the trader picked a particular broker for a particular instrument and geography, but sometimes there is a choice and in those cases the system lets the trader make the best choice for the overall cost base of the firm.

USE CASE 3: **AUGMENTED DECISION-MAKING**

A particularly exciting area for machine learning is to facilitate decision-making. We will likely see a future where decisions with significant impact may be taken by machines on their own. But from a regulatory and accountability point of view we are not quite ready, and neither is the technology. That's why we talk about augmented decision-making which means empowering the user to make decisions faster or to do so on a richer analysis.

One case we are looking at is how to execute larger orders within a certain timeframe without moving the market much. This is not a trivial task. But what we can do is to look at the trade history for larger orders and compare the prices struck with the best possible prices. With enough good quality data points this can be used to suggest one or more efficient ways to slice up such large orders, including additional cost factors and execution risks.

USE CASE 4: **TECHNICAL OPERATIONS**

The three previous use cases solve for business processes. But there are also more technical applications of machine learning. At SimCorp we have built and deployed a machine learning model to help us triage incoming application errors to be fixed by developers and to optimize the scalability versus runtime balance for parallel tasks.

HOW TO GET STARTED WITH MACHINE LEARNING

Investment managers can take the advantage of ML by gradually taking the following actions, while monitoring trends and market changes and apply them to individual business cases.

1

Streamline your target operating model focusing on your strategic long-term value drivers and investigate for automation and simplification opportunities in your value chain, front to back and across all your asset classes.

2

Identify problems or good questions to which predictions would benefit your portfolio managers to maximize the wealth of your clients, hence your own revenues.

3

Be part of the innovation process by joining your peers in the user groups working on prototyping ML cases together with industry and technology experts.

4

Move to the cloud, public or private, to help you consolidate your data across your applications landscape. In this area, 1 + 1 makes at minimum 3, since insights will spring out of the patterns found in combining data from multiple source systems. Operating your business in the cloud will not only facilitate data access and interactions, but will allow you benefit from artificial intelligence and ready-to-use algorithms embedded in your provider cloud platform.

5

Start using available managed services that deliver value beyond technology and maximize business impact to better serve your customers.



NEXT STEPS FOR INVESTMENT MANAGERS

SimCorp is already poised to deliver its core investment management system, SimCorp Dimension, as a service, with several clients opting for this delivery model.

We are currently investing significant resources in a scalable unified platform that allows highly scalable workloads to be added to the SimCorp Dimension platform. ML is a natural part of such an expansion.

If you are already on top of ML, great. But if you would like help to get started with ML, SimCorp now offers a machine learning innovation service to help identify the best cases for using machine learning and build prototypes to validate them. Interested in joining us on this innovation journey?

FIND OUT MORE BY REACHING OUT
TO ANDERS.KIRKEBY@SIMCORP.COM



ABOUT SIMCORP

SimCorp provides integrated, best-in-class investment management solutions to the world's leading asset managers, fund managers, asset servicers, pension and insurance funds, wealth managers, banks and sovereign wealth funds. Regardless of how you deploy it, SimCorp's core solution, SimCorp Dimension®, and its life-cycle services support the entire investment value chain and range of instruments, all based on a market-leading IBOR. SimCorp invests around 20% of its annual revenue in R&D, helping clients develop their business and stay ahead of ever-changing industry demands. Listed on Nasdaq Copenhagen, SimCorp is a global company, regionally covering all of Europe, North America, and Asia Pacific.

For more information, please visit www.simcorp.com

ONE SYSTEM FOR A COMPLEX WORLD



LEGAL NOTICE

The contents of this publication are for general information and illustrative purposes only and are used at the reader's own risk. SimCorp uses all reasonable endeavors to ensure the accuracy of the information. However, SimCorp does not guarantee or warrant the accuracy, completeness, factual correctness, or reliability of any information in this publication and does not accept liability for errors, omissions, inaccuracies, or typographical errors. The views and opinions expressed in this publication are not necessarily those of SimCorp. © 2019 SimCorp A/S. All rights reserved. Without limiting rights under copyright, no part of this document

may be reproduced, stored in, or introduced into a retrieval system, or transmitted in any form, by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose without the express written permission of SimCorp A/S. SimCorp, the SimCorp logo, SimCorp Dimension, and SimCorp Services are either registered trademarks or trademarks of SimCorp A/S in Denmark and/or other countries. Refer to www.simcorp.com/trademarks for a full list of SimCorp A/S trademarks. Other trademarks referred to in this document are the property of their respective owners.