



MACHINE LEARNING DISCOVERY: TURN YOUR DATA INTO DOLLARS



TABLE OF CONTENTS

Introduction and Overview	3
Approach	4
Explore	5
Hypothesise	7
Prove & Build	8
Why Klarrio	9
Use Case Scenarios	10
FAQs	15
Pricing	19
Contact	20

INTRODUCTION AND OVERVIEW

Klarrio's Machine Learning Discovery (MLD) process is a turnkey service that unveils the value of your organisation's data. The goal of this service is to demystify both data science and machine learning (ML), and to transform the hype and hyperbole into tangible output within 6 to 8 weeks—at a low, fixed price.

Depending on your specific needs, your MLD could include:

- Strategic business insights revealed by a machine-learning model
- Proving or validating a pre-defined strategic hypothesis
- A proof-of-concept ML-based application, or
- Any number of other scenarios ML can help resolve

Whether you have a great deal of experience with machine learning or you're just now putting it to work for you, Klarrio's MLD service will deliver immediate value. With nothing more than a basic data set, Klarrio can embark on a data exploration process to formulate and prove potential use cases that will add significant value to your organisation.

These uses for ML can be applied across any part of an organisation—from marketing to product development to operations. Potential value-added outcomes include:

- The ability to predict and classify relevant processes
- The ability to efficiently replicate and scale human capabilities, such as interpreting language, images, and patterns
- To segment, cluster, and group relevant variables
- To make recommendations and informed suggestions
- To discover the root cause of important outcomes by better understanding the key variables that drive them

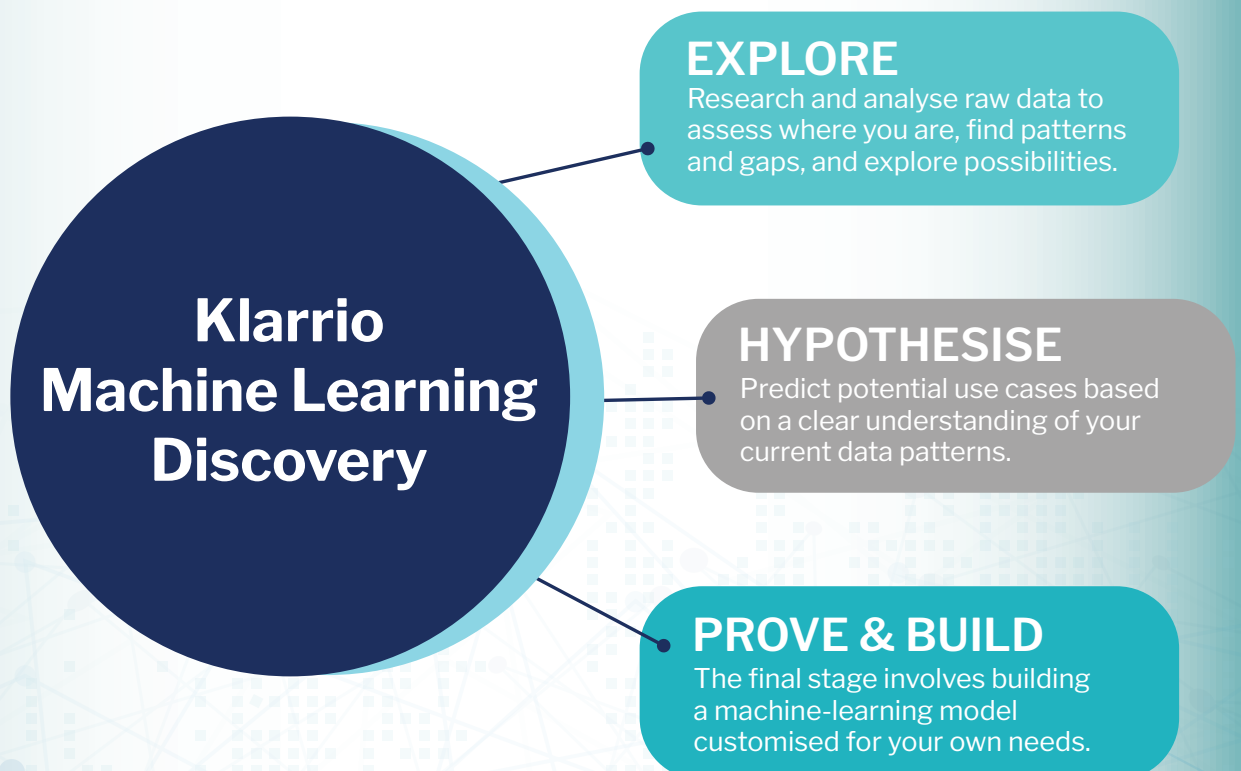
APPROACH

We take a scientific and experimental approach to exploring your machine-learning opportunities. Our data scientists will analyse your data to understand patterns and correlations between variables, and incorporate our findings into tools, applications, and recommended strategies to improve desired outcomes.

Where possible, we base our solutions entirely on open-source technologies. These are the same technologies used by global tech companies and made available via open-source licenses. This allows us to rapidly deliver an ML-based proof of concept tailored to your business needs without exorbitant licensing or subscription fees.

Klarrio uses a three-step approach throughout the MLD process:

- Explore
- Hypothesise
- Prove and Build



STEP ONE: EXPLORE

The first step is to get a clear picture of where you are today and any specific ideas you'd like to explore. If you're keeping an open mind to all possibilities, you may simply wish to provide some data sets you'd like us to consider. In either case, we know your resources are stretched, so we make every effort to minimise the number of interactions required to get the job done.

We will conduct a few short interviews up-front to identify the nature of your data, any issues with your data, and specific hypotheses regarding applications you may have. One or two 2-hour workshops with key personnel may follow this up. We'll also review any documentation needed to understand your business and strategic objectives.

The real exploration begins when you deliver samples of your data. As mentioned, our process is designed for minimal disruption. As such, Klarrio accepts data in any format that's most convenient to you. This could range from a single, simple csv file, multiple proprietary database table dumps, xml files, or any of an unending list of other industry standards.

STEP ONE: EXPLORE

To facilitate exploration, this raw data may need to be manipulated (or, to use a common industry term, “wrangled”) into a format that’s more readily analysed. This could include:

- “De-normalising” multiple database tables into a single table where each field can more readily be explored side by side for patterns and relationships.
- Experimenting with newly created, more informative fields derived from raw data. For example, a location address by itself is not particularly informative. Its latitude and longitude or its distance from some other important location may be more helpful.
- Flattening hierarchical data structures. Some formats, for instance, allow complex data structures, such as lists or dictionaries within a single column of data.
- And general cleaning, like dealing with missing values, managing corrupt characters, or ambiguous field delimiters.

Manual exploration and visualisation of data tables can then illustrate the existence of any patterns. Things to look for include any temporal patterns, like seasonality; spatial patterns, such as geographical features; statistical distributions of fields; correlations between fields; or linear and non-linear relationships between fields.

Even in this exploratory phase, it may be useful to apply machine learning models to tease out relationships and their strength within the data. If no pre-conceived hypotheses have been suggested, these patterns can seed ideas for creating them.

STEP 2: HYPOTHESISE

With the data patterns and strategic objectives revealed through the exploration step, we can begin to hypothesise several data-driven conclusions, such as:

- Key drivers of the business
- Potential predictable outcomes
- Manual processes that could be automated or improved with machine learning
- Opportunities to better serve customers
- Or specific applications.

In this phase, we will:

- Review any pre-determined hypotheses and identify new ideas
- Quickly evaluate each hypothesis at a high level by:
 - Rapid prototyping of various ML models
 - Assessing the validity of each model using proven statistics
 - Assessing the business impact of each
 - Assessing practicalities of productising ideas related to applications
 - And determine scalability of the system.

STEP 3: PROVE AND BUILD

Once an idea has been isolated for deeper exploration, Step 3 could involve any number of activities, depending on the outcomes of the previous steps, the quality of the data, and the specific brief discussed upfront with the customer.

This may include:

- Development of an appropriate machine-learning model that involves the following:
 - Model selection (e.g. Random Forest, Gradient Boost Machines, Support Vector Machines, Logistic Regression, etc.)
 - Splitting the data into training and testing
 - Identifying the most important variables
 - Model evaluation
- Development of a secondary explanatory model that explains the drivers of the primary ML algorithm. This is specifically useful for strategy insights where both models can reveal drivers of outcomes
- Interactive visualisations
- Applications leveraging the ML models
- A recommendation on how to productise proof-of-concept models.

WHY KLARRIO

Klarrio is not a consulting firm. We are a systems integration and application-development company that specialises in helping organisations optimise and scale their data processing capabilities.

We build from scratch and/or integrate your existing capabilities to develop:

1. Batch/Real-Time Data-Capture Platforms
2. Machine Learning Applications
3. Customised Software Solutions
4. Cutting-Edge Data Processing Capabilities.

MLD is specially designed for organisations that collect data, but feel they aren't leveraging it to its full potential, and are interested in proving the value of machine learning at an affordable price point.

We invite you to learn more of how a streamlined approach that's laser-focused on the power of your data can accelerate your ability to empower your strategic growth and development.

USE CASE SCENARIOS

Example #1: Transport

Logistics and transport organisations need to:

- Match supply and demand
- Optimise jobs and loads per commodity and per destination
- Optimise profit margins
- Predict price elasticity
- Identify optimal routes
- Increase profitability, and more.

Machine-learning models can better address each of these needs through automation or by providing insights that aid decision-making.

USE CASE SCENARIOS

Example #2: Healthcare

Patients often come to Emergency Departments before being admitted to a hospital. At the same time, most hospital resources are stretched beyond their designed capacities, and government health expenditures are growing at rates significantly greater than GDP.

Hospitals need to manage their patient loads, and unless it's done optimally, beds can stay empty. Even worse, a patient in desperate need can't have access to a bed that's already filled. Machine-learning models can be used as a crucial aid to managing hospital operations by predicting:

- Patient length of hospital stay
- The number of patients likely to arrive in the Emergency Department
- The probability of certain diseases
- Many other important outcomes.

Benefits can include significant improvements in resourcing, profitability, strategic decision-making, and, most importantly, successful patient outcomes.

USE CASE SCENARIOS

Example #3: Music

The music industry ecosystem is highly complex and continually changing. With the explosive growth in digital streaming services, it's increasingly challenging to:

- Match downloads with the right artists
- Pay royalties quickly
- Achieve the highest accuracy possible at the lowest cost structure.

In addition to applying modern data engineering to scale royalty-matching processes, machine learning algorithms are particularly effective in improving accuracy.

USE CASE SCENARIOS

Example #4: Smart Cities

Cities and municipalities face myriad challenges. With data from a multitude of sensors, systems and databases, a Smart City can use machine learning to predict outcomes that will help optimise operations.

Applications range from:

- Predicting demand for bike-sharing programmes
- Using AI to identify cars for parking compliance
- Using intelligent security cameras to detect criminal behaviour in real-time
- Predict and reduce traffic congestion, and more.

Intelligent solutions can be hypothesised and proven with a broad range of data to create tangible proof-of-concept applications.

USE CASE SCENARIOS

Example #5: Telecommunications

Telecommunication companies collect massive amounts of data from a variety of different sources including:

- Elements within their networks (wireline and wireless)
- Devices within their customers' premises
- Their own enterprise systems:
 - Customer Relationship Management
 - Accounting
 - Financials
 - Etc.

The application of machine learning to these data sources could yield many use cases such as:

- Identifying and addressing network failures before they occur
- Recommending appropriate actions to such network failures
- Identifying and remedying service degradation on customers' premises
- Pre-empting situations that can lead to customer churn.

FAQ: FREQUENTLY ASKED QUESTIONS

What is Machine Learning?

Machine learning describes a set of techniques for programming a computer to achieve a well-defined outcome by making inferences based on examples provided. It differs from traditional computer programmes that rely on the programmer to provide specific rules. For a machine-learning algorithm to work, it must first be “trained” on large data sets representing real-world data samples.

Machine learning also consists of three major sub-categories:

- **Supervised learning**—where the computer is trained to make predictions based on historical examples that show how input training data maps to actual outcomes. These data sets are referred to as being “labelled”, whereby the labels refer to the actual historical outcomes. An example would be a model to predict the probability of cardio-vascular disease in which each row of input data has a label indicating disease or no disease.
- **Unsupervised learning**—where the computer finds patterns in un-labelled datasets, such as clustering items into similar groups that aren’t immediately self-evident.
- **Reinforcement learning**—where a machine learns by interacting with its environment through trial and error, using feedback from its own actions and experiences. Unlike supervised learning, where the algorithm is given examples of the correct set of actions to take for performing a task, reinforcement learning accumulates feedback from its trial and error actions. Reinforcement algorithms learn, much like a child learns to walk by taking reward and punishment feedback from its actions. Example applications include uses in autonomous vehicles where the machine learns over time.

FAQ: FREQUENTLY ASKED QUESTIONS

Why is Machine Learning important to my organisation?

Your organisation operates in a complex environment. If we think of an organisation's choices as having direct impact on specific measures and KPIs of interest, there are potentially 100s of choices across multiple dimensions of price, product, brand, promotion, channels, and other factors.

Each will individually impact customers, stakeholders, or processes. For example, we may increase the probability of a customer churning, attracting a new customer, increase positive or negative word of mouth, increase usage, or inadvertently increase inventory levels.

We may want to predict or optimise some of these outcomes. Alternatively, we may like to classify some customers for special treatment or uncover the scope to automate decisions. Machine learning will facilitate solutions to all of these needs.

Which parts of a business are most likely to benefit from Machine Learning technology?

Most commonly, ML helps facilitate the following operational and business aspects:

- Relieve the pain points via automation where certain tasks can be replaced by machines
- Aid decision makers with recommendations and useful supporting information, which could also be useful in training
- Explore new customer segments by combining a large number of different factors
- Explore impactful features that drive various key metrics in the business (i.e. customer churn, sales, etc.).

FAQ: FREQUENTLY ASKED QUESTIONS

How does Machine Learning differ from Artificial Intelligence?

Machine Learning is a subfield of Artificial Intelligence. According to MIT Professor Thomas W. Malone, Artificial Intelligence (AI) is broadly defined as “the capability of a machine to imitate human behaviour ...” In just the last five or 10 years, machine learning has become the most critical way most parts of AI are done.

What hurdles do companies face when considering using Machine Learning technology?

No matter where you apply machine learning, you will undoubtedly have to deal with a few problems. These may include:

- Accessing and cleaning data which, in even mature data analytics organisations, may be fragmented and siloed
- Your existing BI tools may be unable to deal with unstructured data. A different toolset may need to be adopted by the organisation
- It also may be infeasible to build and deploy a scalable ML model or application into the organisation’s operations
- Finally, you need to ensure data is used responsibly, abiding by privacy and governance laws. This may require new processes and tools to ensure compliance.

Such hurdles may be the reason many organisations have been reluctant to start their journey to utilise machine learning; however, these are exactly the problems experienced data scientists and data engineers deal with on a daily basis.

FAQ: FREQUENTLY ASKED QUESTIONS

What are some examples of Machine Learning applications?

ML applications are virtually unlimited.

- The marketing team may want to predict the probability of individual customers churning; further, if a customer's lifetime value can be predicted, you can decide how to deal with this churn risk.
- Customers hate being held in long queues. If you could predict queue lengths, you could ensure resources are on hand to minimise them.
- If you could classify a caller correctly, you could improve the likelihood of connecting them to staff who can deal with their specific problem or speak their language.
- In network operations, if you monitor tell-tale variables in your infrastructure, you could predict faults before they occur and introduce predictive maintenance. You could also use machine learning to automatically classify a fault so the appropriate staff can be called to address the problem.
- Across an organisation's various channels, you could analyse the language in social media, call centre calls, and online chat sessions to assess customer sentiments and attitudes, and classify the topics of conversation into relevant categories.
- Businesses often want to segment or cluster customers into meaningful segments defined by similar behaviours or needs to better target specific offerings.
- For operational purposes, you may wish to cluster temporal and spatial/geographic usage patterns to more cost-effectively deliver services.
- Anyone who has online shopping sites understands the power of recommendations for upselling and cross-selling opportunities.
- Finally, you may want to understand the fundamental drivers of some trend in a metric or a recurring problem, or you may want to reduce the number of dimensions of a problem. Here, explanatory models and dimension reduction techniques can be invaluable.

PRICING

Klarrio offers a Machine Learning Discovery package for a fixed price of \$49,500.

The price includes all deliverables outlined in this document including a proof-of-concept machine learning application as appropriate.

CONTACT US

Klarrio APAC is the Asia Pacific arm of Klarrio, a systems integration, consulting and software development firm that offers a broad range of data engineering, data science, cloud-native, and open-source capabilities for digital transformation.

With offices spanning Asia Pacific, Europe and North America, Klarrio is known for its strength in building cloud-agnostic solutions that seamlessly process huge volumes of data. We're also known for our ability to deliver valuable results, along with our willingness to tell you the truth from the very beginning.

Our goal is to help you take full advantage of the countless benefits streaming data and digital transformation can offer over traditional IT architectures.

For more information on Klarrio's Machine Learning Discovery program, please contact:

Mark Aquilina

Chief Operating Officer, Klarrio APAC

Mark.Aquilina@Klarrio.com

+61 402 850 059



Klarrio
STREAMING AHEAD

[KLARRIO.COM/AU](https://klarrio.com/au)

Klarrio APAC | Suite 4, Level 11 | 189 Kent Street | Sydney 2000
Australia | +61 402 850 059 | info.aus@klarrio.com

