Data science and artificial intelligence

Part of the Future Technology series from Zenitech

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Introduction

While there's been growing interest in data science and artificial intelligence (AI) over the past few years, these technologies have been around for a long time – around thirty years. (Of course, computing power and storage capabilities weren't good enough to let us benefit from these technologies in previous decades.)

AI is only as intelligent as it is now because it has huge amounts of data to learn from – something impossible in previous decades due to the lack of storage capacity. Now, with the right conditions in place, AI is learning fast, and responds and decides much faster than it did five to 10 years ago.

What role does data science play in this? Well, data science and AI are two parts of the same process.

Data science involves understanding data in an intelligent or automated way. It teaches the machine what's inside the data (such as "column A is money and column B is time").

AI is what we do with the data afterwards.

You input the data, making it available (either automatically or semi-automatically) for a machine learning algorithm (the AI). It's this AI that gives 'knowledge' to the system which applies 'intelligence'.

AI reads whatever we input into it, tries to understand the information and either makes a decision or gives us the insight to make it ourselves.

How does AI learn?

There are three main ways we use this technology – supervised learning, reinforcement learning and unsupervised learning.

1. Supervised learning

AI can learn via classification and regression.

In the case of classification, you feed a lot of data into a system and ask the AI to classify it into types, or clusters. For example, classifying images on a street – which shows a person, which a car, and which a bicycle. It detects patterns and is, therefore, very useful in fraud detection (such as spotting when a financial transaction doesn't fit your spending pattern and sending it to a human to check).

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We use regression to create predictions, using forecasting based on past data. For example, if you're an event manager, and you want to predict how many people will attend your event, you can input past data and get a prediction for a future event.

2. Reinforcement learning

Reinforcement learning involves giving feedback to the algorithm to teach it to anticipate something that's going to happen. For example, in 2017, Google's AlphaGo AI defeated a human Go champion after the AI was given data about previous matches and played "thousands of games against itself".

At the time, data scientists said that while it was an interesting achievement, the AI didn't have the intelligence to realise it was playing a game – it was simply repeating patterns and acting on feedback.

3. Unsupervised learning

Unsupervised learning is a type of machine learning algorithm that makes inferences from data sets without relying on labeled data or having a predetermined outcome. It is used to discover patterns and relationships in data, and can be used to cluster data points into meaningful categories and to identify outliers. It can use for example:

> **"**
> *Computer vision is all about visual image processing (the computer processes visual data, images and videos). A colour matrix means AI with computer vision can identify different things.*

- **Dimension reduction.** This means you reduce the scope of the decision. The AI will only select the meaningful data and information it needs to make a decision. It filters out the noise and reduces the dimensions of the decision to focus on key data.
- **Clustering.** This means taking a lot of data and clustering it into areas or types. For example, if your shop has three main types of customers, looking for different things, you can cluster the data into those three types to gain better insight into what they need.

Computer vision and AI

Computer vision is all about visual image processing (the computer processes visual data, images and videos).

A colour matrix means AI with computer vision can identify different things. An example of a basic application would be when you drive into a car park, an AI will recognise your number plate on the way in, recognise it again on the way out and then charge you the right amount for the time you spent there.

A more intelligent solution considers other factors. What if you replaced the number plates while you were in the car park? A clever algorithm will read things like the shape, type and colour of the car, match it to the original plate number, and issue an alert if the plate doesn't match the car that drove in.

Retailers could use this type of visualisation in large supermarkets. The AI could use data from in-store cameras to watch the direction that customers move in, and tell the store where to place advertising for more expensive products, for example.

It can also be used to read travel boarding passes and authorise or track ID cards.

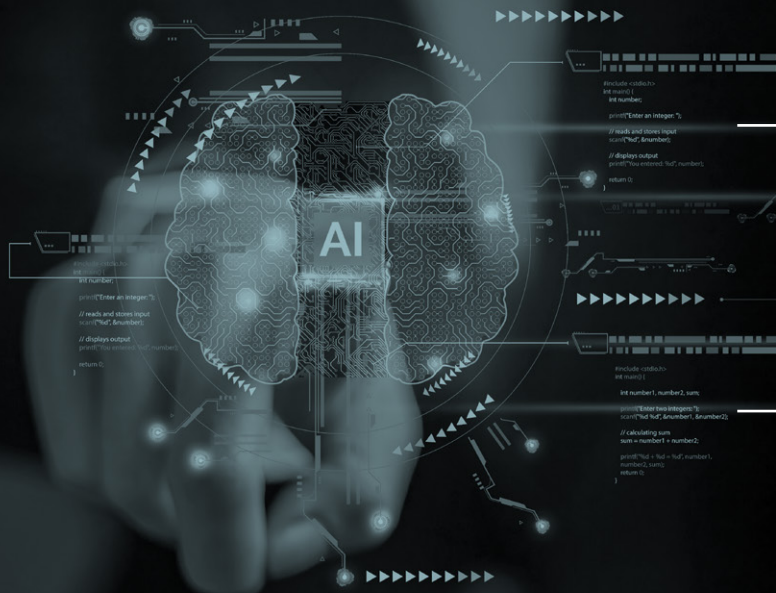## How Zenitech is using data science and AI to help our clients

At Zenitech Labs, we take new technologies and apply them to real-world situations to prove concepts before they are widely adopted by businesses. Right now, we're working on a number of projects using data science, AI and computer vision:

1. Making airports more efficient. An airport we work with had an issue that when it was foggy, the AI couldn't recognise aircraft, as the computer couldn't 'see' through the fog. Zenitech created a defogging tool which wipes the fog from the picture, allowing them to identify the plane that was on camera and speed-up decisions (for example, which gate or runway the aircraft should be allocated to).

 2. Monitoring eye health. We're all used to the cameras opticians use to examine our eyes. The cameras take images to show deterioration, for example – and early signs of disease. Zenitech implemented an application to recognise early signs of diabetes, which can alert the patient and their doctor, allowing them to take early action.

3. Managing traffic flow. We're working on a traffic management project, using AI that interprets images from cameras on public traffic lights. The AI monitors traffic and classifies which vehicle types are using the street, and optimises traffic flow based on those classifications, such as how long should lights be red or green. The AI can show when solutions like improvements to roundabouts may be useful and sends that data on to the local council.

4. Improving street planning. Zenitech is working on a public lighting project, installing sensors to measure air quality, noise and light. AI can interpret the data from these sensors, and offer a service based on the results. One instance is to help runners and cyclists plan their routes where there is better air quality on any given day. Another is to detect people or cars in the area, and increase and decrease street lighting in the evening accordingly (saving energy in the process).

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5. Improving energy networks. Zenitech works with Sagemcom, collecting data to monitor how energy was consumed in different areas of a city. It classifies households into categories and optimises the network based on that information, so you get the energy you need, at the time you need it (it also measures when you use that energy). It also makes it easier to detect fraud and set different types of price tariffs.

Steps to take to introduce data science and AI

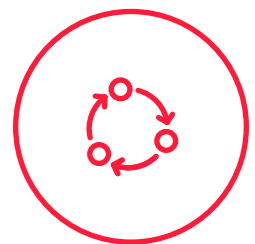How can your organisation work with data science and AI?

1. Define the business case. What do you want to know? What is the problem you're trying to solve? Consider how data science and artificial intelligence could help you solve these problems.

2. Know what success looks like. A retailer looking to use AI to analyse their customer footfall to improve store layouts and in-store ad positioning may have goals of improving the customer's journey around the store and increasing customer spend, for example. Understanding what success will look like for the project, will help you understand what to track and evaluate.

3. Define and clean your data. The best AI is as good as the data that feeds into it. You need high-quality, clean data to avoid a rubbish in, rubbish out scenario.

4. Develop a proof of concept. Run a trial of the project in a smaller, more contained situation and evaluate its success before rolling the project out on a larger scale.

Find areas to improve

**Select a problem
and
create the MVP**

**Build the product
and
integrate it into processes**

> "
> *What do you want to know? What is the problem you're trying to solve? Consider how data science and artificial intelligence could help you solve these problems.*

![Zenitech logo]

The Zenitech approach

At Zenitech, we live and breathe R&D into new technologies. It's why we formed Zenitech Labs. We start with a laser focus on the business outcome you need. The introduction of new technologies can contribute to revenue growth, business scaling, cost reduction, increased customer interactions, or competitive edge.

We will give you the advice you need to create the best outcome for your business using new technology, collaborating closely with you to create the very best technical solutions to address your business challenges.

If you want to explore how data science and artificial intelligence could impact your business, contact us to see how we can help. You can also read about how organisations are using AR and VR to improve their businesses in the first guide in our future tech series, available here.

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