BLUELIFE
LEVERAGE THE POWER OF AI

Executive Briefing Course

FIVE EXCITING EMERGING FIELDS

Welcome to the course!

As you'll discover over these five modules, there is a wealth of new technologies that have a variety of business applications. These modules will teach you all about exciting new fields that are saving companies **millions of dollars** and **changing lives**.

This course covers the five most exciting, emerging fields:

- **Computer Vision** (CV)
- **Deep Learning** (DL)
- **Reinforcement Learning** (RL)
- **Natural Language Processing** (NLP)
- **Robotic Process Automation** (RPA)

This executive briefing course is made up of five short courses, where you will:

- Get a bird's eye view of the field
- Understand how each technology works
- Learn why it's one of the fields which can put your company lightyears ahead of the competition
- See real-world applications of the technologies

And all of that in under 30 per module minutes! Excited? Then let's jump in!

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Computer Vision

PART

01

Welcome to the first part of the course!

In this module you'll discover that computer vision (CV) is a **powerful technology** that has a variety of **business applications**.
This versatility-of-use makes CV a particularly exciting and fruitful area of artificial intelligence for multiple industries.

In this part of the course we'll revise and explore the **nuts and bolts** of this technology, the **two types of computer vision** (classic and deep learning), learn **why CV has been so disruptive** to so many industries (illustrated with examples), and **computer vision's potential applications**.
We will round off our analysis with **ten success stories from companies** that apply CV today.

What is computer vision?

CV is a field of artificial intelligence that trains machines to **understand and interpret the visual world**. Appliances that use or manipulate images tend to use CV.
This may sound futuristic, but CV has been around since the 1950s! The **barcode scanner** is one early example of CV in use.

Thanks to the technological advancements of the 21st century, computer vision's applications have entered many facets of our lives. As with many things we consume daily, we can take CV for granted. It is found in applications as varied as food sorting, image searches, and offsite monitoring.
When your **camera identifies a face** and auto-focuses on it; when **Facebook auto-suggests** whom to tag in a photo; even when **a car drives automatically** – these are all examples of CV in action.

Due to the **increased capturing and processing capabilities** of computers, CV now means big bucks for businesses.

Think about it:
We process about 90% of data in visual form, so computer vision can tackle all the jobs that rely on human vision – from traffic inspectors to MRI scan-analysis experts, sports umpires to checkout assistants, truck drivers to equipment inspectors.

By automating these tasks, computer vision can process them faster and with higher accuracy than human workers.

> Businesses can, therefore, implement CV to **increase efficiency and cut costs,** freeing up their teams to carry out more creative tasks.

How does computer vision work?

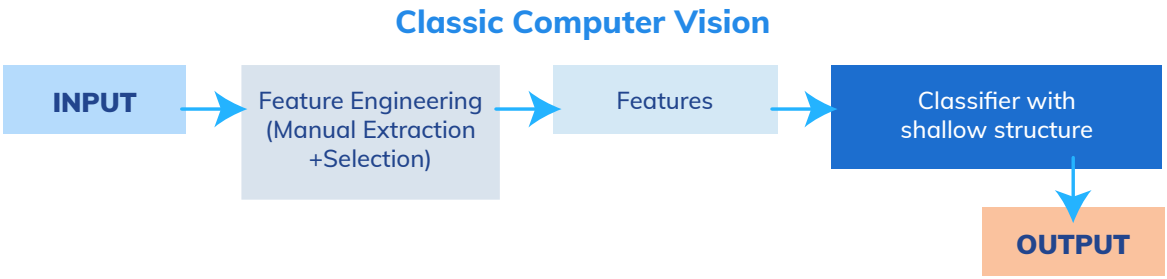
Two types of CV exist: Classic and deep learning.

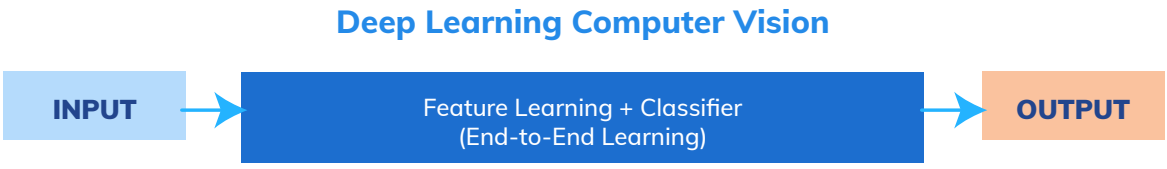
Classic CV

relies on **pre-built libraries of features**. It collects images, labels them according to similar characteristics, and groups them in a dataset, or library of features.

Deep learning CV

requires **neural networks** to function, specifically convolutional neural networks (CNN). The key difference between the two types is that classic CV uses features that we have already input into the library, while **deep learning CV generates its own library** of characteristics by using its CNN.





Computer vision can automate any task that requires the visual analysis of data, from tomato sorting to driving a car. In this course we'll use the former example to illustrate how easy it is to innovate with CV.

Applications of computer vision

Image classification

groups visual files into categories. It helps us to identify and categorize objects. E.g., pictures of dogs and cats; images of defective and working parts.

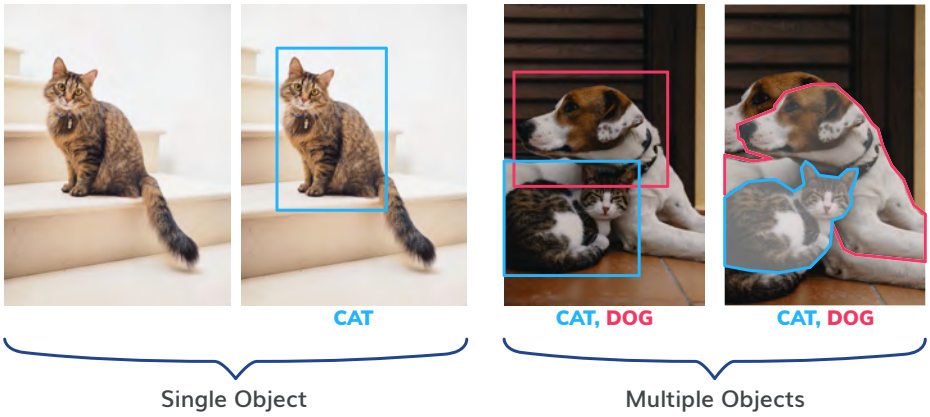


Image segmentation

partitions an image into multiple regions which can be examined / manipulated separately. E.g., Skype can now blur out the background behind a person on a call.

Object detection

helps to identify important parts of an image. Advanced object detection can recognize multiple objects in an image and draw identification boxes around them. E.g., identifying human life; oil spills.

Object tracking

monitors movement – a Tesla car was recently able to apply breaks on a highway seconds before a collision happened ahead of it. E.g., tracking pedestrian routes; monitoring car speeds.

Image generation

enables us to generate 3D-renders from 2D-images. E.g., Google Maps; transferring clothing patterns.

Edge detection

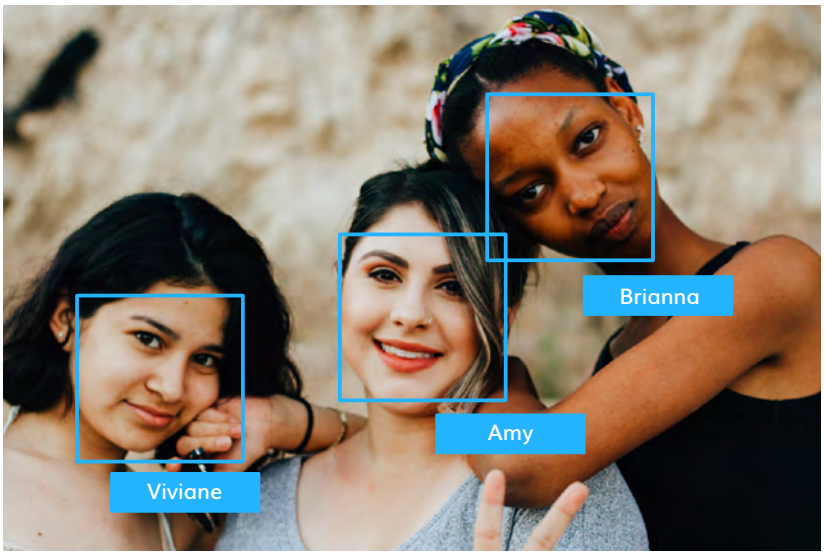
finds the outside edges of an object to identify image content accurately. E.g., night vision.

Facial recognition

identifies specific individuals. E.g., automating the process of photo tagging.

Face detection

facilitates applications to recognize facial features.
E.g., camera focus; identifying the number of faces in an image.



Optical character recognition (OCR)

recognizes words and numbers in scanned printed and hand-written documents, with accuracy rates of over 99%. E.g., manuscript study; note-taking.

Pattern detection

matches repeated shapes, colors and other visual indicators in images. E.g., handwriting recognition, fingerprint analysis.

Feature matching

finds similar characteristics and groups them together. E.g., similar objects in photographs.

Real-world use cases

At this point we will look at ten exciting, real world applications of CV from industry giants such as **eBay** and **Tesla**!

Deep Learning

PART

02

Welcome to the part two of the course!

Deep learning (DL) is an extremely powerful exponential technology which is used in applications ranging from cancer detection and mineral exploration to productivity tracking and fighting money laundering, saving companies **millions of dollars** and **changing lives**.

In this part of the course, you will get a bird's eye view of the field of DL understand how it works and why it's one of the most amazing fields of research which can put your company lightyears ahead of the competition. This part of the course will cover the ultimate essentials for you to get up-to-speed with DL and see **tangible examples** of how this technology can add **substantial value** to your business.

Applications of computer vision

DL is a family of **machine learning** methods based on **artificial neural networks.** There are two parts to this :

Machine learning

is defined as a discipline within AI that teaches computers how to make predictions based on data.

The human brain is the most sophisticated system for data analysis known to us, it is therefore understandable that we wanted to create something similar inside our computers.

Computer scientists have found a way to mimic the human brain inside machines: **Artificial neural networks**. The goal of using these neural networks is to approach and solve general and complex problems in a similar way to how a human brain does.

So, what sets DL apart from standard methods of analysis or even from ML?

The main difference is that in DL there is no pre-defined framework. In the case of non-DL methods there are certain frameworks that we tried to fit on the data to explain the patterns that we are seeing. If they work then great, if they don't – then we try something else, until we find something that fits the data well and helps us extract those insights.

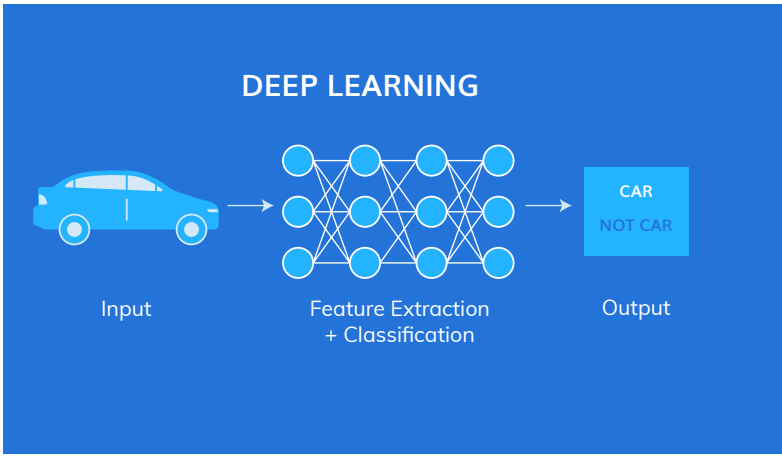
In the case of DL, there is no such thing. All we have is a **Deep Neural Network** (DNN) with multiple layers.

So, what is a DNN?

It's an artificial construct designed to mimic how the human brain works. The way to think about it is that a DNN will learn about your data set just as a baby will learn a language or how to differentiate between objects.

It has a brain, it has no predefined network that we put in there and simply by walking around and interacting with humans, it automatically and slowly learns how to talk, how to walk, and how to do other things. So that's how a DNN works as well – we try to mimic the human brain. And that is the beauty of DL; without having to put any framework on our data, we allow it to **learn on its own**.

The drawback with DL is that it requires a lot of data, much more data than other algorithms. It might require thousands, hundreds of thousands, or even millions of examples before it can come up with those features and truly learn. On the flip side, the benefits that we get are incredible.



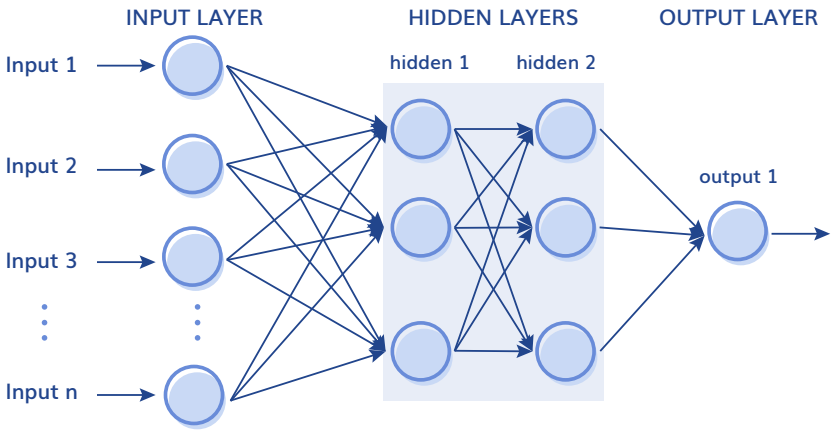
Building Neural Networks

If DL algorithms learn on their own, then why do we need data scientists or ML engineers to build them? And why are experts in this space so expensive?

Here we see a basic input-output type of neural network: It has one input layer with 4 neurons and one output layer with 1 neuron. Now what we can do is add another layer in-between the input and output layers. This layer is called a "hidden" layer and in this case it has 6 neurons. We can add another hidden layer, and another.

Each one of these neural networks – whether it has zero hidden layers, or one, or two or 10 – is a valid neural network. Moreover, we can also change the number of neurons in each layer. For example, the first hidden layer might have 8 neurons, while the 2nd hidden layer might have only 2 creating and then back to 6 in the 3rd hidden layer – forming a sort of a bottle-neck shape. That is also a valid neural network.

These different ways that neural networks can be constructed are called **architectures.**



Every purpose, every application, every challenge will have a different architecture that serves it best. Finding the right neural network architecture is actually a very creative process. And that's why expert ML engineers and data scientists who build DL algorithms are in such high demand and are so expensive to have on your team – because they are doing highly creative work which requires their unique touch and input.

And once a suitable architecture is set up, the algorithm will do the rest of the work itself.

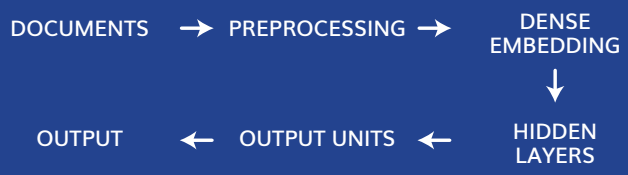
Deep Learning and other areas of AI

Other areas of AI such as Reinforcement Learning, Natural Language Processing and Computer Vision represent some of the most disruptive exponential technologies currently in existence.

What happens when we combine them with DL?

We can see that while these technologies exist within the domain of AI, they don't fully fall into DL.
And this in itself, is already a very important point – that Computer Vision, Natural Language Processing and Reinforcement Learning don't always require DL in order to function.

Deep Natural Language Processing.



However, when we do add DL to these technologies, what that means is that we're essentially adding the power of deep neural networks to those technologies:

1. Reinforcement Learning becomes Deep Reinforcement Learning.
2. Computer Vision becomes Deep Computer Vision.
3. Natural Language Processing becomes Deep Natural Language Processing.

As usual with neural networks, this approach has the drawback of more costly computation. However, if the computing power is available, then more often than not, adding a deep neural network can substantially improve accuracy of the algorithm. Simply because now it has additional room to think and experiment with different neural pathways.

You can often add DL to another exponential technology to enhance it.

Real-world use cases

When attempting to develop an understanding of new technologies and systems, it is imperative that we look beyond the hypothetical and examine some real-world examples.

At this stage we will look at examples of how various industries have incorporated DL into their corporate life.

You will gauge how global companies have used DL in practice to increase **productivity, profit, compliance** and **security** across diverse sectors.

Reinforcement Learning

PART

03

Welcome to the part three of the course!

Reinforcement Learning (RL) is an extremely powerful exponential technology which has helped companies gain the upper hand in a huge variety of situations – from Google cutting down their electricity bill by 40%, to Alibaba increasing their advertising ROI by 240%!

In this module, you will get a bird's eye view of the field of RL, understand how it works and why it's one of the most disruptive technologies which can take **operations**, **marketing** and even **innovation** to the next level.

What is Reinforcement Learning?

There are three main groups of algorithms in ML: Unsupervised Learning, Supervised Learning and Reinforce RL.

It can be valuable to appreciate the differences:

Unsupervised Learning

is used for discovery of new patterns.

For example, clustering of customers into groups based on their similarities. The core principle here is that the resulting groups did not exist prior, but rather are suggested by the machine in the process.

Supervised Learning

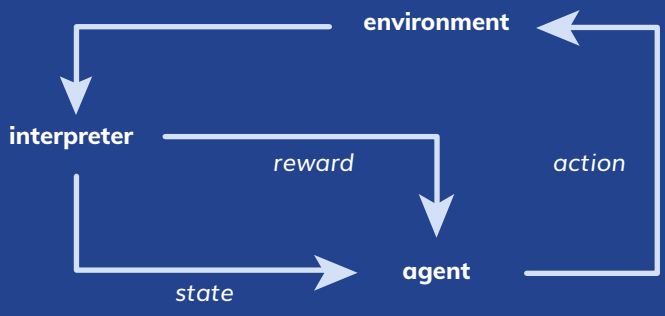
is when we teach a machine to search and identify patterns that we have seen before.

For example, classification of pictures of dogs and cats into the two categories “dogs” and “cats”.
First, we show the algorithm thousands of already labelled images so it can extract features that are essential to dogs and features that are essential to cats. After this the algorithm will be able to categorise new images as either of “dogs” or of “cats”.
The difference of this approach to unsupervised learning is that we have to first provide the labelled data for the algorithm to learn.

Reinforcement Learning (RL)

is something entirely different. RL is an area of ML where an imaginary agent is being presented with a problem and is being rewarded with a “+1” for finding a solution to the problem or punished with a “-1” for not finding a solution.

Unlike with Supervised Learning, the agent is not given instructions on how to perform the task. Instead, it performs random actions and interacts with its environment. It learns through trial and error which actions are good and which actions are bad.



Reinforcement Learning in Humans

RL is surprisingly similar to real life and is based on the same principles as a baby learning to walk, and because of that – because it is so similar to the way our own intelligence works – out of all existing algorithms, RL is the closest we have gotten to *true* AI.

Advantages of Reinforcement Learning

Since Supervised Learning relies on large labelled datasets, RL has a much higher scope of application than any form of Supervised Learning.

That is **the number one advantage of RL: It doesn't require large labelled datasets.**

This is a huge advantage because, as the amount of data in the world grows, it is becoming ever more costly to label it for all required applications

The second advantage: RL is innovative.

Supervised Learning is where the algorithm learns to imitate whoever provided the data set. The algorithm can learn to do the task as well as (or better than) the teacher but can never learn a completely new approach to solving the problem. On the other hand, RL algorithms can come up with entirely new solutions that were never even considered by humans.

The third advantage: RL is bias-resistant.

If there's bias in the way the data is labelled, Supervised Learning algorithms will pick it up. In this sense, RL algorithms are better tools to find solutions free from bias or discrimination.

The fourth advantage: On-line learning.

RL runs in real-time. RL combines exploration (when the machine tests new approaches on the fly to find better solutions) and exploitation (when the machine exploits the best solutions which it has already found). This means that it can bring results while improving at the same time. Other algorithms would require re-training and re-deployment. RL just keeps going.

The fifth advantage: RL is goal-oriented.

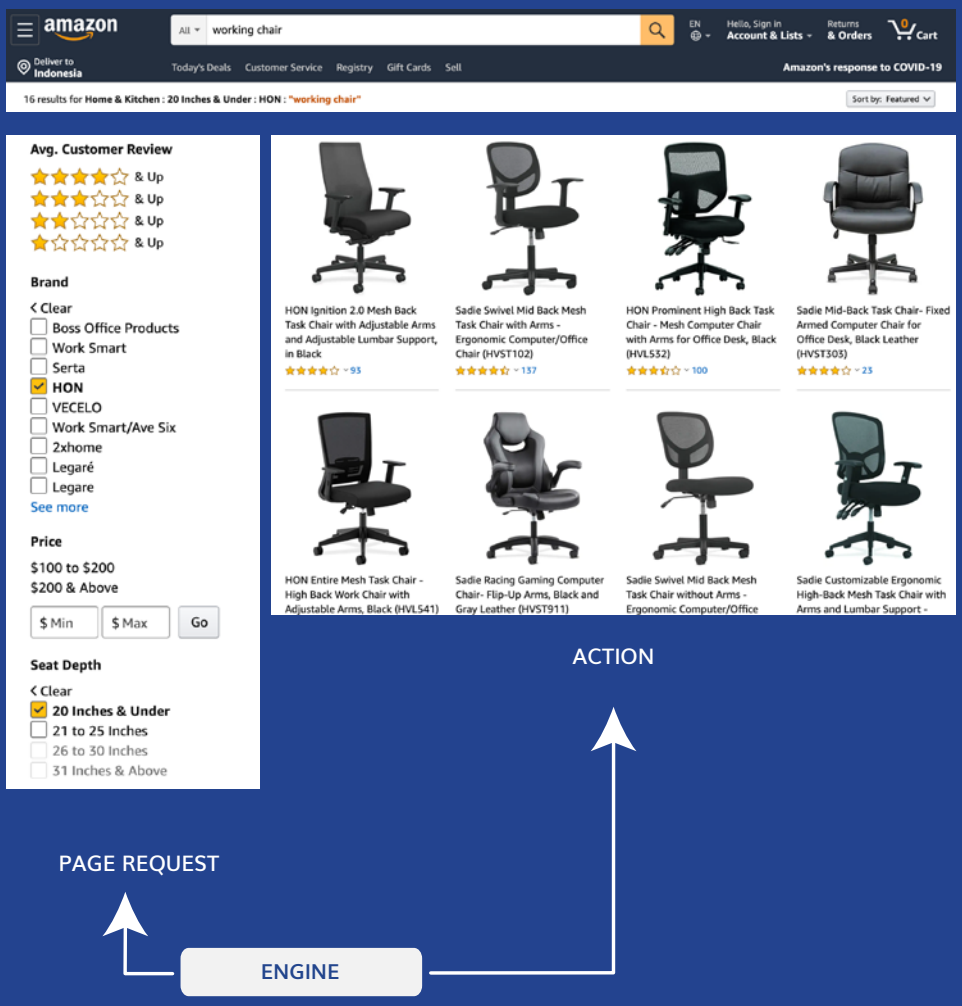
RL can be used for a sequence of actions.
While Supervised Learning is mostly used in an input->output manner, RL can be used for tasks with objectives – such as robots playing soccer or self-driving cars getting to their destinations.

Reinforcement Learning in Marketing

Because of its “on-line learning” advantage – the ability to auto-correct on the fly – RL’s most popular current business application is, perhaps, within marketing.

Virtually any business could benefit from cutting-edge tech in its marketing and that’s why in this section of the course we will look into 5 examples of how RL will revolutionize the way we do marketing and then further examples of how companies are already using RL.

RL in Marketing : Creating Personalized Recommendation



Natural Language Processing

PART

04

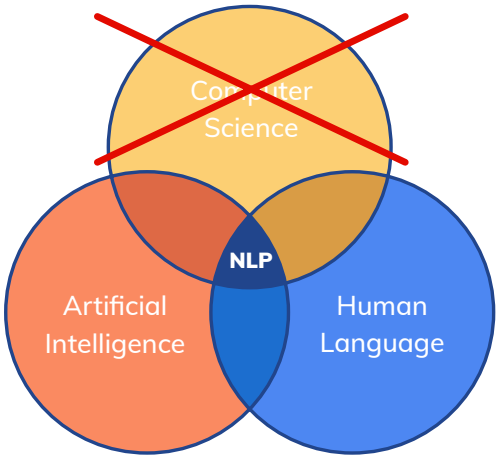
Welcome to the part four of the course!

Natural Language Processing (NLP) is an extremely powerful and potent platform which is used in applications ranging from virtual personal assistants and automatic translations to legal document reviews and chatbots - all of which save companies millions of dollars.

In part four of this executive briefing course you will get an enterprising perspective of NLP, understand how it works and how it can be used to **leverage AI and provide immense value** to your business.

What is Natural Language Processing?

NLP is the field of AI concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyze large amounts of natural language data.



But before we dive into NLP we need to understand the two types of data that exist: **Structured** and **unstructured.**

Structured data

is data that has a pre-defined specific format. For example, spreadsheets, tables, databases.

Unstructured data,

on the other hand, is data that doesn't follow a pre-defined specific format. For example, emails, chats, blogs, books, audio files, video files, images.

We humans communicate predominantly in unstructured data, specifically via natural language.

And that's why, based on various sources, unstructured data accounts for 70-90% of data in the world.
Most of this data contains text in some form – whether written or audio.

This data, like all data, contains power: Power to know your customers better, power to increase efficiency and the power to scale. However, because of its unstructured format, it is much harder to leverage. And that is why NLP is an exploding field right now. Businesses are in a race to be the first in their industry to unlock the potential of their unstructured data. In the following tutorials we will explore what opportunities might exist in your business to leverage NLP.

How does Natural Language Processing work?

There are Two parts to NLP : Natural Language Understanding (NLU) and Natural Language Generation (NLG).

Natural Language Understanding

refers to mapping the given input from Natural Language into formal representation and analysing it.

If the input is in the form of audio, then Speech Recognition is applied first to convert it into text. Then the hard part starts – interpreting the meaning from the text. Human language is complex, some words, for example, “bank” or “leaves” can carry different meaning depending on the context they are in.

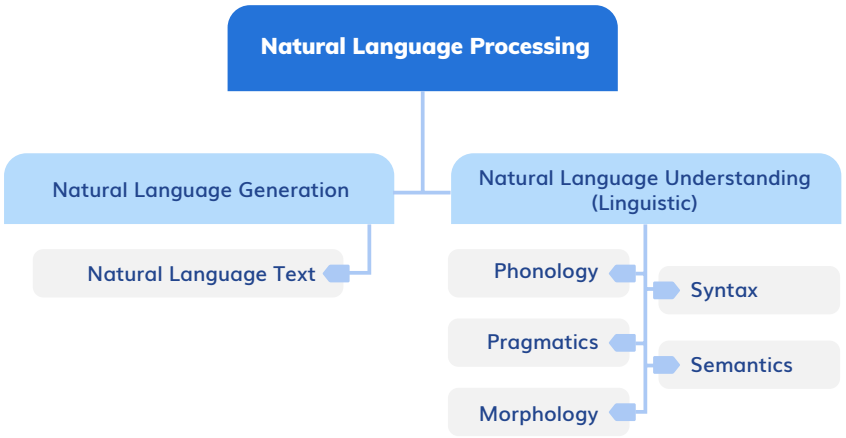
Once the meaning is extracted categorise the input and come up with an appropriate action or response.

This is where NLG, or Natural Language Generation, may be required.

Natural Language Generation

is the process of producing meaningful phrases and sentences in the form of natural language from some internal representation. NLG is generally much easier than NLU since when we know the meaning that needs to be expressed, there are certain rules of language such as syntax and semantics that need to be followed in order to create an appropriate sentence.

If the text needs to be put into audio, like in the case of Siri or Alexa, then Speech Generation comes in, but this is not always required.



Applications of Natural Language Processing

Every industry can leverage unstructured data in many different ways. In this part of the course we will look at some of the possible applications of NLP to help you innovate and come up with ideas for your business.

1	**Sentiment analysis**	to help you understand how users feel about your company or product
2	**Speech recognition**	to convert audio into text for further processing.
3	**Chatbots**	to provide 24/7/365 customer support.
4	**Machine translation**	to help you reach new markets with minimal investment.
5	**Autocompleting text**	similar to what Gmail does to help you increase your employee's efficiency through a centralized knowledge base. Or to improve how your customers interact with your product / website.
6	**Spell checking**	to make sure that documents don't contain errors. Especially relevant in industries with high compliance requirements such as banking, insurance and finance.
7	**Keyword search**	to locate relevant information faster across all data facilities, leading to increased efficiency.
8	**Advertisement matching**	For example, when you search for a new car on Google or write an email about it to a friend, you will later receive car adverts.
9	**Information extraction**	to extract the essence from large volumes of unstructured data.
10	**Spam detection**	to clean your email inbox .
11	**Text generation**	to create new text, e.g. client contracts, research documents, training materials, and so on.

12	**Automatic summarization**	to add summaries to existing documents.
13	**Questions answering**	to answer specific questions based on disparate information sources.
14	**Image captioning**	to annotate images.
15	**Video captioning**	Videos can take a long time to watch. Sometimes it's faster to extract information from them in the form of text and then process it further using other NLP techniques like summarization.

The future is Chatbots

> All NLP applications are growing fast. However, one of them is truly skyrocketing at astronomical rates in a huge variety of industries...
> **we're talking about chatbots!**

Over 250 billion customer support requests are made every year, and it costs businesses an incredible 1.3 trillion dollars to service them. Most of these requests are simple and can be answered by AI, as long as it has a deep knowledge base and is good enough at understanding natural language.

Robotic Process Automation

PART

05

Welcome to the final part of the course!

Welcome to the final part of the course! As you'll discover, robotic process automation (RPA) is a powerful and emerging field that has already demonstrated a variety of real-world applications. The potential for improved quality, increased savings and more efficient workflows mean that this is a vital growth area for businesses.

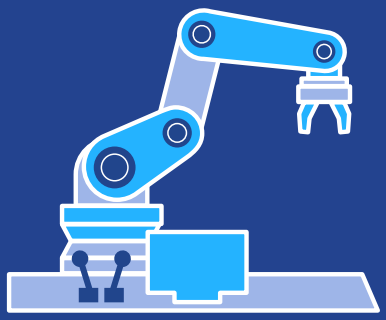
In this section we'll revise and explore the **nuts and bolts** of this resource, the **risks and benefits** of introducing RPA to your company. We will round off our analysis with **ten success stories** from companies that apply RPA.

With these informational tools, this video part of the course will show you just how easy it is to implement robotic process automation into your business.

Deep Learning and other areas of AI

RPA is the use of easily programmable software to handle high-volume, repeatable tasks that previously were manually performed by humans.

Robots are automating blue-collar jobs. For example, they are beginning to replace truck drivers, factory workers and many other labour-intensive roles. Increasingly, RPA is also automating white-collar jobs. Many companies are pivoting from people to software for high-volume highly-transactional manual processes.



It is essential to have a good grounding of what RPA is in order to understand its growing prevalence. We will go through these in this part of the course.

Despite its growth, RPA is sometimes misunderstood and confusion may arise between RPA and Intelligent Automation (IA). The difference lies in the fact that RPA is the application of technology which enables computer software configuration to partially or fully automate human activities which are manual, repetitive or rule-based. On the other hand, intelligent automation intends to mimic human behavior, such as perceiving, gathering evidence or reasoning. It is for this reason that IA is best for processes which involve unstructured data from non-standard sources.

RPA has developed slowly over the past decade and is now widely used due to its ability to give returns quickly and cost effectively. IA is enabled by and inherent to cognitive technologies and has huge transformative potential in the near future.

The increased use of RPA is having a marked impact on many sectors.

> “
>
> One of the reasons that RPA is proving increasingly popular is the fact that it is more **financially beneficial** to companies.
> On average, it provides **25-40% cost savings**, compared to 5-10% cost savings of using traditional outsourcing business models.
>
> ”

Benefits and risks of RPA

RPA has a number of benefits, hence it's growth.

However it also has some drawbacks.
In this part of the course, we will explore both!

Afterwards we will: examine some real-world examples of how various industries have incorporated RPA into their corporate life. Although some remain unnamed, you will gauge how larger companies and more comprehensive rollouts of RPA tend to result in increased savings and benefits.

Hungry for **more**?

Find us at **www.bluelife.ai**,
where you can join us on our other courses
that deconstruct exponential technologies
in under 30 minutes!