What are the capabilities & technologies enabled by deep learning?

A deep learning model can identify, classify and analyze structured data, images, text or sound.

Computer Vision

Computer vision includes comprehending a visual environment and its context. For forming a computer vision model, there are three steps:

- acquiring an image from data sets
- processing the image automatically with deep learning algorithms
- identifying the image and its class.

The types of computer vision include image classification & segmentation, object detection & tracking. Feel free to explore our research on [computer vision](#).

Image classification and s**egmentation**

Deep learning models can discriminate an image from others and classify it by using predefined and labeled categories. Convolutional neural networks (CNN) are deep learning networks and are mostly used in this domain. To ease the analysis of the image, image segmentation models are used. Today, image classification and segmentation algorithms are used in different areas from our daily activities to future technologies. For instance, this technology allows us to

- analyse medical images more accurately
- develop self driving cars
- do fingerprint, iris and face matching for biometric processes
- look up details for artworks
- have smarter home security systems

Feel free to read our [image recognition research](#).

Object detection and tracking

An image contains various objects and object detection algorithms are applied for localisation and classification of these objects. Object detection models build bounding boxes around objects and determine the objects within the bounding box. Object tracking can be implemented after detection of the object. When an object moves in the bounding box, object tracking

models track this object into the next images and update the bounding boxes. These models are used for

- face recognition from images
- identification a specific individual in the photos/images

Natural language processing (NLP)

[Natural language processing](#) algorithms interpret and analyse natural language data in textual or verbal forms. It enables generating human language, speech or identifying the speaker based on differences in voice.

[NLP deep learning applications](#) include speech recognition, text classification, sentiment analysis, text simplification and summarisation, writing style recognition, machine translation, parts-of-speech tagging, and text-to-speech tasks. This technology helps us for

- [virtual voice/smart assistants](#)
- [Digital workers](#)
- e-mail filters
- autocorrect & autocomplete text checks
- communicating with [chatbots](#)
- translating languages in real time

Feel free to check our [related research about NLP](#).

Automated predictions

As we mentioned in our [deep learning software guide](#), deep learning models can provide better, faster, cheaper and valuable predictions compared to other machine learning approaches. This is especially true in cases where a large volume of high quality training data is available. Predictive models based on deep artificial neural networks (i.e. deep learning) can work with vast amounts of data, realize nonlinear relationships and figure out complex patterns.

What are deep learning use cases in different industries and sectors?

Agriculture

1. Optimize yield production by using data from sensors and satellites taking into account temperature, humidity, etc.

Aerospace & Defence

2. Identify objects from images acquired via satellites
3. Use surveillance cameras to detect suspicious events or gather intelligence

Automotive

4. Develop autonomous things including vehicles. There are numerous deep learning models used in such devices including those for detecting traffic signs & lights, other vehicles, pedestrians, etc.

Financial services

5. Trading: Estimate future stock market prices
6. Fraud detection: Detect fraudulent activities with higher accuracy and fewer false positives
7. Evaluate a client's creditworthiness by analyzing information from multiple sources and responding to loan applications faster
8. Personalization: Identify next best actions for each customer

Feel free to read our article on deep learning use cases in finance for more.

Healthcare

11.   Diagnose diseases leveraging medical imaging solutions, for example recognition of potential cancerous lesions on radiology images
12.   Personalize medical treatments
13.   Determine patients most at risk in the healthcare system

Feel free to read our article on deep learning use cases in healthcare for more.

Insurance

14.   Automate claims and damage analysis from reports or images
15.   Image-based risk prediction for home insurance
16.   Pricing risk

Manufacturing

Manufacturing companies including discrete manufacturing like automotive or other industrial companies (e.g. oil&gas) rely on deep learning algorithms:

17.   Provide advanced analytics tools for processing big data about manufacturing
18.   Generate automated alerts about the issues of production lines (e.g. on quality assurance or safety) using sensor data to notify relevant teams on time

19. Support [predictive maintenance](#) systems by analyzing images and other sensor data
20. Empower industrial robots with sensors and computer vision skills
21. Monitor working environment around heavy machineries automatically to ensure people and items are at a safe distance

Feel free to [read our article on deep learning manufacturing use cases](#) for more.

Pharmaceuticals & Medical Products

22. Drug discovery: Prediction of drug effects, monitoring the use of drug and identifying its side effects
23. Enable precision medicine which includes remedies based on genetic, environmental or lifestyle factors (also called personalised medicine)

Public sector

24. Make predictions about population health risks
25. Facial recognition for security checks

Retail & **E-commerce**

26. Offer new shopping experiences such as "Just Walk Out" stores, and checkout-less shopping. For more, feel free to [read our article on cashierless stores](#).
27. Other shopping experiences powered by deep learning include voice-enabled shopping and in-store robots.
28. Image search: Scanning the image of the product to find the product on the store or suggest similar alternatives
29. Forecasting product demand more accurately according to buying habits analysis and future trend predictions
30. Deliver effective inventory management to prevent of out-of-stock and oversupply
31. Provide personalised shopper experience based on browsing/purchasing history in-store or online
32. Formulate personalized recommendations and reminders, such as style matches for fashionistas

What are deep learning use cases in different departments or functions?

Analytics

33. Most deep learning applications empower analytics solutions. Therefore analytics departments rely on deep learning in numerous cases

Customer success

34. [Chatbots](#) offering immediate and personalized customer service
35. Monitor customers' responses, reviews and social media activity to identify what they say about the brand
36. Churn prevention: Examine data in customer feedback forms/texts, identify potential churners and communicate with the customer without losing time

Cybersecurity

35. Intrusion detection/prevention systems (IDS / IPS): Investigate user activities and network traffic to [prevent malicious activities](#) and reduce false alerts

Operations

36. Automatically extract data from documents using deep learning models

Sales & Marketing

- Create personalised advertisements according to browsing data
- Identify potential clients that are most likely to buy the solution
- Logo and counterfeit item detection in social media for brand protection

Supply Chain

40. Optimize routing to reduce costs, [carbon footprint](#) and delivery times
41. Identify driver or vehicle performance improvement suggestions based on sensor data