FUJITSU

Machine Learning Platform Artificial Intelligence

The advance of artificial intelligence

By creating real-time dialog between things, machines, people and information, we are entering a hyperconnected era in which we will apply AI in real, everyday business situations

Understanding AI

What exactly is Artificial Intelligence?

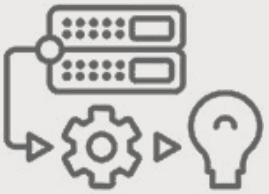
A problem with finding a definition for AI is that we are still not sure exactly what real, human intelligence is. A simple view would be to describe it along the lines of "the simulation of human intelligence by machines". In other words, AI relates to getting a computer to reason and to learn, and then to use this thinking as the basis to make decisions.

AI systems are excellent at pattern recognition. This means they can quickly spot anomalies and make predictions, often more consistently, more accurately and more reliably than humans. However, AI systems today are limited only to that. They essentially use probability and logic to make their analysis, but lack the ability to understand or be able to develop broad context in the way that humans can. Such an ability, which we could also call 'general intelligence', is still a long way off from current technologies … and may never be realized at all.

Unlike most traditional computing structures, today's AI systems are not centered around massive, complex central processors. Instead, they are based on neural networks, modelled loosely on the human brain – with a large number of processing elements or nodes that manage the flow of information between one another.

In computer science, AI is not a single, well defined entity, instead it incorporates many capabilities, models and methods. However, three elements in particular account for the huge acceleration and advances in AI of the past five years:

Machine Learning – a set of techniques (including many different types of algorithms such as reinforcement learning, rule-based machine learning and decision trees) that enable machines to learn from data, without being explicitly programmed for the task at hand.



Neural Networks – a computing model that arranges large numbers of processing nodes, from tens of thousands to millions, linked by an even larger number of connections, in a way that resembles how neurons and synapses are arranged in the human brain. The power of the system does not come from the individual nodes themselves, which use algorithms to carry out only simple tasks of forwarding information to other nodes, but is derived from the layered architecture of the neural network as a whole, which becomes adept at recognizing complex patterns.

Deep Learning – a machine learning technique that exploits the architecture of a neural network with several layers, some of them possibly specialized for certain characteristics and patterns. For example, deep learning can be used to recognize a picture of a cat (the iconic task of image recognition). A typical neural network is six or seven layers deep – while the number of layers in the most sophisticated networks now runs into the hundreds. At the deepest level, neural networks look at individual pixels, while higher levels identify elements like the tail, paws and ears – and the cat itself. The technique requires data – and lots of it – to work, but having been trained by looking at thousands or even millions of pictures, a neural network becomes very good at its task, better even than a human.

The real power is that the system only needs to learn once. Once learned, the system's knowledge (for example, 'what does a cat look like?', 'what do normal data packets (as opposed to a security breach) look like?' or 'what does an unhappy customer look like?') can be transferred to other applications, where this learned recognition can provide instant help in making decisions or recommending intervention. In some cases we even can use transfer learning, where not just the "how" but also "what" has been learned can be re-used, even if the task is a different one.

It is also worth noting that we often bundle other technologies, such as robotics, into the same conversation as AI. That's because AI and robotics are such complementary technologies, with AI enabling automated decision-making and robotics enabling the decisions to be fed into physical actions. For instance, autonomous (self-driving) vehicles are the result of combining AI and robotics.

AI Platform

AI Zinrai: Fujitsu Artificial Intelligence

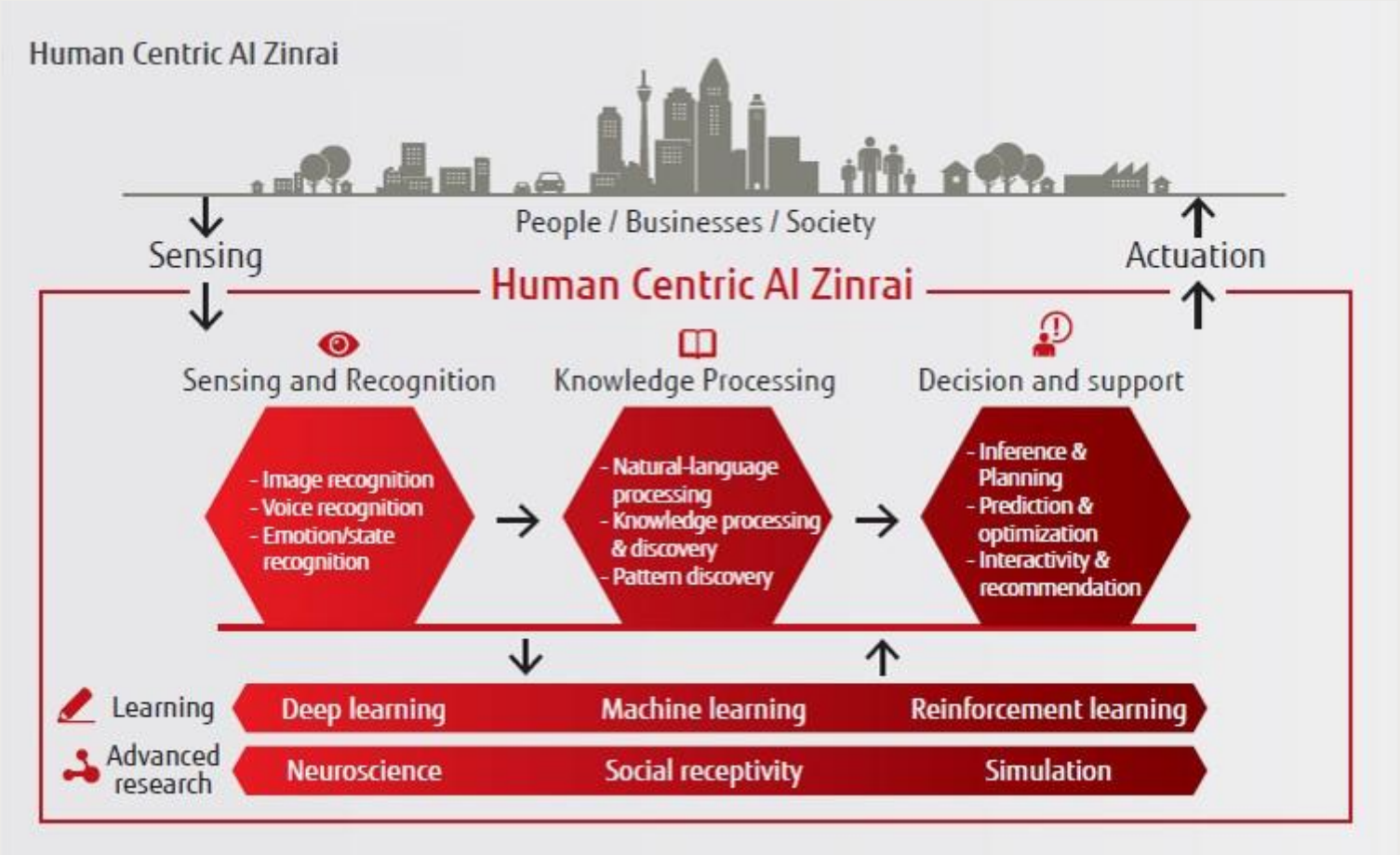
The Fujitsu brand for AI is Zinrai – a framework to bring together diverse development threads and AI techniques. Zinrai itself is not a product or a service, but a collective framework for the broad family of AI capabilities that Fujitsu is making available to our customers. These add a wide range of value-added services to the Fujitsu AI portfolio, which is focused on enabling customers to digitalize with confidence.

Zinrai takes a Human Centric, Solutions Driven approach to co-create valuable offerings for our customers using the best of breed technologies from across the globe, developed and deployed to meet ever-growing customer challenges. Combining the strength of Zinrai AI development in Japan and the rest of the world with carefully selected partner capabilities, Fujitsu delivers the optimal, AI supported solution to our customers' challenges.

Zinrai AI Machine Learning Platform

Our Zinrai Machine Learning Platform uses a number of tools, techniques, and AI ML algorithms to analyze data captured from multiple machine sensors that monitor equipment / machine condition to:

- Help business to determine when and where a problem or failure might occur
- Provide an exploratory analysis of data in real-time
- Deliver information via a visual environment
- Predict the timing of a failure in advance of it occurring with a high level of accuracy to reduce business discruption



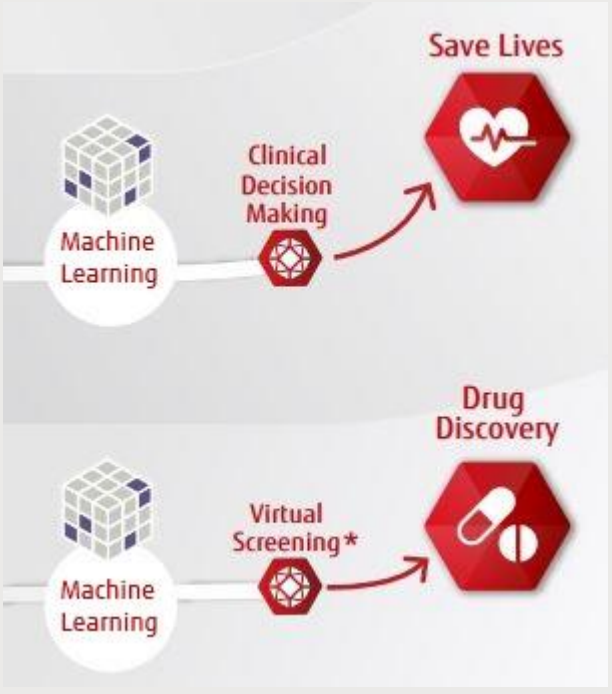
The distinguishing characteristic of this technology system is that it is structured by linking the diverse AI functions of sensing and recognition, knowledge processing, and decision and support, according to the flow of data. Most recent AI initiatives, especially those belonging to the third AI boom represented by deep learning, involve learning features from the data beforehand, and supporting judgment and actions based thereupon.

Sensing and Recognition

Features	
Image recognition	Is proven to revolutionize any operation involving a visual inspection. Through applying Artificial Intelligence Deep Learning it delivers greater business insight and flexibility than was possible with previous Machine Vision capabilities.
Voice recognition	Enables the recognition and translation of spoken language into text by computers
Emotion / State recognition	Process of identifying human emotion involves the analysis of human expressions in multimodal forms.

Knowledge Processing

Features	
Natural language	To automated reasoning, machine translation, text categorization from designated contectual information recognition sources
Knowledge processing	This is a cognitive technology that not only understands people, but can also create knowledge for mechanical processes
Pattern discovery	Data mining technique that provides an alternative to the frequent pattern discovery approach that underlies most association rule learning techniques.



Decision and Support

Features
Inference & Planning
Prediction & optimization
Interactivity & recommendation

Tranforming industries

Machine Learning Use Cases

In the business world, AI is transforming many industries thanks to its ability to identify patterns, adding a new dimension by detecting anomalies in mountains of digital information. Once trained, it is tireless in processing many standard tasks. For example, the addition of AI to service desks and call centers is freeing up staff from low-level, monotonous tasks, enabling them to concentrate instead on addressing more complex technical problems, or complicated requests, or delivering better customer experience or care.

One of the true strengths of AI is where patterns of any kind are involved. **Financial institutions** are using AI to model the potential direction of stock markets. AI is also extending the capabilities of analytics platforms. For instance, Fujitsu has undertaken a proof of concept to analyze signatures, helping to detect fraudulent patterns. We are also talking to banks about the use of facial recognition in ATMs, not only to improve security but also to personalize services.

Healthcare is also starting to take advantage of the benefits of AI. Since this is a field that generates large quantities of clinical data, AI is perfectly suited to extracting insight by analyzing this input. For example, Fujitsu's advanced clinical research information system HIKARI (a word that means 'light' in Japanese) uses AI to provide clinicians with insights that can aid their decision-making: a perfect example of human centric innovation and how AI is helping create value for people and society.

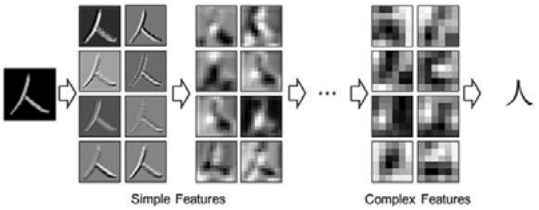
AI will also revolutionize the **transport** sector – as the brains of autonomous (self-driving)

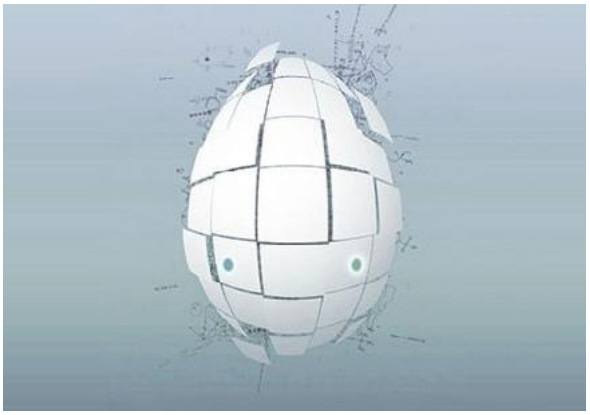
vehicles. Among the early wins in this field are logistics companies, who can already optimize delivery routes in real time to avoid delays caused by traffic congestion.

Manufacturing is also benefiting from AI, with machines taking on monotonous tasks such as looking for defects in product manufacturing. Not only does machine learning improve the level of accuracy, but also it reduces the time to analyze results. What's next is predictive maintenance, for instance in identifying the likelihood of product failure in the field.

When built, the Fujitsu K supercomputer was the fastest in the world. Although it has since been overtaken by a select few, K – named after a Japanese word meaning 'to the power of sixteen' – is still the outright leader in multiple processing benchmarks, thanks to fine-tuning of its original system design.

In 2015, Fujitsu's AI system achieved a 96.7% recognition rate for Chinese handwriting characters – more accurate than humans for the first time.





In 2016, the Todai Robot, which Fujitsu helped work on, reached the standard required to pass the math part of the entrance exam to Tokyo University