Symbolic Artificial Intelligence, a new paradigm for information use in organisations.

Communication in natural language has been an aspiration for computer users since the origins of computer technology. Designed both to train machines to follow any operation as instructed, and to recover the data output in these operations, communication methods range from primitive cards with punched holes to high-level programming languages.

The first attempts to write software that could simulate conversations in natural language were a disappointment. The strategy was based on pre-programming a limited group of questions associated with a previously defined answer. These programs did not give any impression of intelligence beyond the exchange of polite words. Even today, this strategy is still used with further support from neural networks, which is why software applications appear to have a certain level of intelligence. Nevertheless, these processes seem closer to sensationalist magic tricks than signs of intelligent behaviour, in a similar way to a parrot that repeats sentences without actually knowing the meaning.

In recent times we have been living in an era of growing interest in Artificial Intelligence (AI), which has as one of its attributes the capacity for interaction in natural language. Software manufacturers are gradually starting to offer applications that can simulate a very accurate understanding of simple orders, or summarise and classify texts by subject, indicating that software is no longer limited to reading data but can also investigate the meaning of the information.

Symbolic Artificial Intelligence puts forward ways to investigate the meaning of texts. Symbolic reasoning is a human attribute that develops in the first 18 months of life, and allows us to create and manage representations of reality, meaning symbols. A child playing with a piece of wood can symbolise it as a telephone and simulate a phone call as part of the game. Straight afterwards, he can symbolise it as a car and move it across the ground, pretending to go out on a trip with his family. In both scenarios, the piece of wood is not actually the symbolised object.

Symbolic AI studies the computational programming of symbolic reasoning, firstly by confronting the problem of how to represent reality and secondly how to process the symbols independently from representations and meanings. As an indirect consequence, natural language is found to be the following: a group of conventional symbols that are given a representation and a meaning. For example, an apple can be represented in many ways: the word "apple", a photograph, an illustration, or even a genuine, edible apple. An apple can also have a range of meanings: it can be a fruit, a sign of temptation, or a well-known multinational North-American company.

If a way is found to store the real object in relation to its symbolic form and meaning, this provides a solution to a third of the equation for natural language. The second part of the equation is the interpretation -

reasoning - verbalization process, with the target of respectively converting a question into symbols, processing the symbols by associating them with symbols that have previously been learned until an answer is found, and reconverting the symbols in the answer into natural language. The third part is comprised of the symbols that have previously been learned, as mentioned in the reasoning process in the above sentence, or what human beings call 'common sense'. The more common sense possessed by the Symbolic AI, the greater its capacity to provide an answer.

One of the great advantages of Symbolic AI is that common sense can be applied to knowledge provided by structured databases, unstructured databases or directly by human programmers relating their experiences. It therefore does not require large amounts of information or a long training process to return useful results; the Big Data paradigm is complemented by Smart Data, meaning less but more useful and high-quality information.

There is an uncountable number of ways to apply Symbolic AI, and we are discovering them in Atomian as we open our cognitive computing solutions to the market: the most obvious is the use of all of the information stored in the database of an organization through questions in natural language. For example, we are currently working on data analysis tools in the Health sector, assisting doctors with access to knowledge in the medical records of patients, with questions such as "How many cases of appendicitis were there in January?" This simple and fast way to access information represents a leap forward in terms of quality for professionals without an IT background.

Another useful application of Symbolic AI is the automation of processes that require a certain degree of complex reasoning. By correctly calibrating symbolic common sense, texts can be analysed and key data can be extracted. This might include reading a contract and recording the names of the contractor and contracted party, the signature date, the type of contract, and so on. These uses represent a large reduction in costs for the Banking and Insurance sectors, which currently carry out these actions as manual tasks. Artificial symbolic reasoning effectively opens up a whole new world of opportunities in computer technology.

Germán García de Gurtubay, COO of Atomian.

Biography

Germán García de Gurtabay holds a Master's degree in Computer Science from the University of Deusto (Spain), and has acquired 20 years of experience as an ICT consultant in several disciplines and sectors. In the '90s, he wrote educational software that earned him the CIDE award from the Spanish Ministry of Education and Culture and the Leonardo da Vinci award from IBM. He has taken part in R+D+i projects in industrial simulation, funded by the EU. He has also worked as the director of Business Intelligence projects for the Banking sector in Spain, web development and systems integration for the European Commission, and infrastructure in the US Energy sector. He is currently the Chief Operations Officer in Atomian, a company that produces cognitive computing software in Barcelona.