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Extending the frontiers of artificial intelligence

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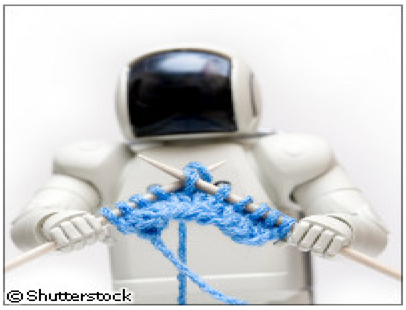

The world of artificial cognitive systems and machine learning is moving at a fast pace and is becoming a major international research challenge. New techniques are being developed in this field that will transform many aspects of our day-to-day lives and work. The SIMBAD project (' Beyond features: Similarity-based pattern analysis and recognition'), backed by the EU with EUR 1.65 million in financing, is looking at some of the ways that this research may be put to use.

SIMBAD aims to fully develop the new technology that is emerging within the pattern recognition and machine learning fields, and is researching the use of 'similarity information' in place of the standard 'feature-based' approach, says the project's scientific coordinator, Professor Marcello Pelillo of 'Ca' Foscari Venezia' University Italy.

Society is increasingly developing complex machines such as robots to carry out many of our everyday needs, he says. Artificial cognitive systems (ACSs) are now becoming a top international research priority and in accordance with this priority the European Commission has made this area one of the seven key research areas that Europe must develop in order to become one of the world leaders in next-generation information and communication technologies (ICT).

Fruitful research into this area will lead to the development of many tools that will have a great social and economic impact on the EU, he adds. Vehicle control, control of communication networks, medical diagnostics, and human-machine interaction are just a few of the areas that will benefit. There will also be many economic benefits that will boost European competitiveness.

'We are devoting a substantial effort towards tackling two large-scale biomedical imaging applications. We are contributing towards providing effective, advanced techniques to assist in the diagnosis of renal cell carcinoma and diagnosis of major psychoses such as schizophrenia and bipolar disorder,' Professor Pelillo explains. 'These sorts of problems are not amenable to being tackled using traditional machine learning techniques due to the difficulty of deriving suitable feature-based descriptions.'

A successful outcome to these research applications would prove that SIMBAD's approach is highly suitable for use in biomedicine and this would be a good springboard for further research to be carried out in this area, he explains. Using pattern recognition techniques in medicine and health services would bring huge improvements to healthcare industries throughout the EU and open up many opportunities for health industry technology.

'A successful outcome of our experimentation would provide evidence as to the practical applicability of our approach in biomedicine, thereby fostering further research along the lines set up by SIMBAD, both at the methodological and at the practical level,' Professor Pelillo remarks. 'This would potentially open [up] new opportunities in health and disease management and bring radical improvements to the quality and efficiency of our healthcare systems,' he notes. 'The field of pattern recognition is concerned with the automatic discovery of regularities in data through the use of computer algorithms, and with the use of these regularities to take actions such as classifying data into different categories, with a view to endow artificial systems with the ability to improve their own performance in the light of new external stimuli.'

Six partners from five European countries (Italy, the Netherlands, Portugal, Switzerland and the UK) are participating in SIMBAD - an international consortium that reflects an international field of research.

'The competences needed to achieve our goals cannot be found on a local or national level. The European dimension of the project guarantees a critical mass of researchers with complementary experiences and expertise, thereby boosting the likelihood of success,' Professor Pelillo says. 'Also, the potential impact of this research goes well beyond the national scale and the EU will benefit from presenting itself as an active player on the world scene of artificial cognitive systems, which is largely dominated by the USA.'

Countries

Switzerland, Italy, Netherlands, Portugal, United Kingdom

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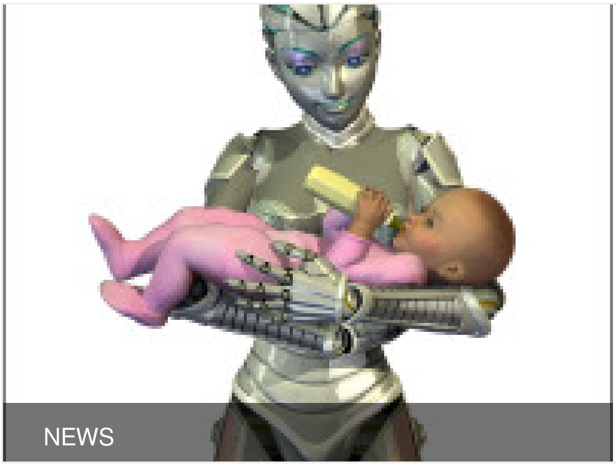

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