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ARTIFICIAL INTELLIGENCE: PERSPECTIVES AND PREDICTIONS

(Extended Abstract)

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> At the end of the century, the use of words and general educated opinion will have changed so much that one is able to speak of "machines thinking" without expecting to be contradicted.
>
> A. Turing, 1950

PERSPECTIVES

A multitude of human activities, such as planning a combined journey by coach and rail, understanding spoken language, proving mathematical theorems, making a medical diagnosis, and seeing and recognizing scenes and objects, clearly require intelligence, irrespective of how one defines this term. Artificial Intelligence or AI to give it its popular acronym, involves the scientific investigation of such cognitive activities using computers. It is a striking feature of this research that it has extensive potential for industrial applications as is now well attested to by the extensive world-wide investment it has attracted.

Until recently AI has been regarded as a sub-field of computer science, not least because of its implications for the future use and design of computers. However though much of this research lies firmly within computer science, there is reason to believe that AI may soon develop into an autonomous scientific discipline, and in doing so will eventually sever the umbillical cord to computer science.

The most significant technological impact of AI (and computer science for that matter) is becoming apparent in two main areas of society - administration and manufacturing. In administration, the "paperless" automated office will become the norm, initially based on standard data processing technology and then increasingly influenced by AI technology. In manufacturing, the production of goods will be characterized by ever increasing automation and the use of robots eventually resulting in the fully automated factory.

This may well have farreaching social consequences. For example just as the mechanization of farming methods has led to a situation where, in highly industrialized countries, only 8-10% of the population produce a country's food supplies (as compared with 50-90% in developing countries), the proportion of the population employed in administration and manufacturing, currently more than 50% in most industrialized countries, will fall to a much smaller percentage, possibly approaching that currently engaged in agriculture. This will mark a significant change in the nature of our society - a change from a society in which the majority of people have to work in order to satisfy their basic needs, to one in which a considerably smaller fraction of the population will have to work in order to meet the basic needs of all.

AI is developing into a scientific field, and though still young, the sheer amount of AI research already carried out is such that it can no longer be completely mastered by any one person. Of course this has been the case for at least a century in older disciplines such as chemistry, mathematics and physics. AI is a field which, together with the biological sciences such as genetics and the neurosciences, will be among the most important sciences of this century, fields which could dominate the end of the 20th century just as physics and chemistry dominated the end of the previous century and the beginning of the present.

In the first part of this paper a brief elementary introduction is given to Artificial Intelligence which is intended for a general audience. In the second part, predictions are made about future developments in each of what are arguably the five major subfields of AI (Natural Language Processing, Expert Systems, Automated Deduction Systems, Robotics, Computer Vision). These predictions evolved over a timespan of about two years. Initial versions of them drawn from the literature and elsewhere, were distributed to a number of experts working in the various subfields, revised following their criticisms and suggestions, distributed again, and so on for a number of iterations. Not surprisingly, no clear consensus emerged and thus we are solely responsible for the final form they take. The second part also takes up some broad questions concerning the

future economic significance of these developments and the likely social changes they will bring about.

The paper is based on a report called "Künstliche Intelligenz" commissioned by the German Ministry of Science and Technology in 1984. A translation was edited, substantially revised and rewritten by Michael A. McRobbie and Jörg. H. Siekmann, while Michael McRobbie was a Visiting Professor at the University of Kaiserslautern, funded under DFG (Sonderforschungsbereich 314). The paper appeared as a joint departmental report of the Computer Science Department, University of Kaiserslautern, West Germany as well as of the Center for Information Science Research, Australian National University, Canberra, Australia. The full and final version is to appear in the European Journal "AI Communications", Michael A. McRobbie, Jörg H. Siekmann; "Artificial Intelligence: Perspectives and Predictions", (1988)