that we would feel the need to define artificial intelligence, since the field of AI has been in existence for more than 40 years. Why not accept the existing notion? The point is that there simply is no single universally recognized notion. What we have at our disposal was well described by Firebaugh (1988) in his book *Artificial Intelligence*:

The field of artificial intelligence is gradually and painfully emerging as a science. The reasons for the birth pains are not difficult to understand: uncertainty as to what constitutes the subject matter, uncertainty on the goals of AI research, and uncertainty on the most effective approaches. Since each AI researcher's mental model of the mind helped shape his/her definition of the discipline, there were nearly as many schools of thought in the early days of AI as there were researchers. This has led to many sharp confrontations and controversies within this discipline.

Later, contemplating on the definition of AI, Firebaugh observed: "Each worker in the field of AI has his/her own definition of AI which seems to best express the goals and methods of his/her research." Perhaps, this is the only point where all AI researchers agree (see, for example Fisher & Firschein, 1987; Genesereth & Nilsson, 1992; Ginsberg, 1993; and McCorduck, 1979). Indeed, many definitions of AI exist. let us consider only some of them.

Charniak and McDermott (1985) held that "Artificial Intelligence is the study of mental faculties through the use of computational models." "Artificial Intelligence is the study of ideas that enable computers to be intelligent," wrote Winston (1984). Dean, Allen, and Aloimonos were of the opinion that "Artificial Intelligence is the design and study of computer programs that behave intelligently" (1995). The definition preferred by the authors and credited to Minsky of MIT is as follows: "Artificial Intelligence is the science of making machines do things that would require intelligence if done by human beings" (Boden, 1979).

In the context of this definition, as well as most other definitions known to us, automated information retrieval is one of the most striking examples of the success of AI. Indeed, as we showed in Chapters 3 and 5, the search process done by a human being, especially that of information retrieval, is an excellent illustration of typical human intellectual activity. The fact that a computer is now capable of performing a search without human participation is an example of the success of AI.

It should be noted that many researchers realize this. This is why for decades various periodicals and conferences dedicated to AI have been considering the problem of developing IR systems. However, only a part of the research on IR systems has anything to do with AI. For instance, papers on creating and developing any kind of manual information processing have nothing in common with AI. Papers related to AI are only those that deal with creating algorithms for the automatization of any informational process in an IR system. It is understood that a work will be considered successful only if it results in an algorithm making it possible to carry out a process at an acceptable level of quality. Typical

examples of works related to AI are those on automatic abstracting, automatic indexing, and automatic feedback, although not all of these works can be considered successful.

It is clear that a number of papers in the field of information retrieval are not directly related to AI; however, this does not make them less significant. For instance, papers investigating information need or the creation of IRL are of utmost importance for the whole field both in practical and theoretical aspects. All we want to show is that the two fields of research, IR systems and AI, overlap to a certain degree. As a matter of fact, this overlap with AI is, to a large extent, the reason why the study of IR systems is one of the well-known fields in computer science.

Thus, we have discussed the relationship between the fields of information retrieval and AI. However, when discussing the importance of AI for future IR systems development, many IR systems researchers do not consider this well-known relationship. Therefore, we will now discuss what many researchers consider to be the application of AI to IR systems.

To begin with, research within the field of AI has branched out in a great number of very different directions, into areas such as game playing, expert systems, robotics, automated reasoning, machine learning, pattern recognition, natural language processing, and many others. To date, certain general ideas and approaches to AI have emerged that are applicable to all existing directions of research. However, each direction of research has its own specific approaches and ideas for solving problems that gave rise to a particular direction. Judging by available publications, these "foreign" ideas are most attractive to IR systems creators. In the very broad range of attempts to use specific ideas, the most popular directions of research stand out. Perhaps, the most frequently explored area of research addresses the study of natural language processing (NLP). Studies of the formal (computer) methods of using natural languages (for which the study of NLP has been developed) have been an important direction of AI research almost since the beginning of this field of learning. Two main goals motivate AI work on natural language. One is a theoretical goal that is close to the goal of the linguist, that is, to discover how we use language to communicate. The other is a technological goal, namely, to enable intelligent computer interfaces to be used in the future, thereby allowing natural language to become an important means of man–machine interaction.

So, what kinds of problems do IR system researchers contemplate solving using the approaches available (or anticipated) in NLP? Some of the researchers note that in the future foreign language documents could be dealt with automatically, which will make it possible, for example, to extend the automatic indexing techniques to include documents originally written in languages other than English (see, for example, Croft, 1995). This problem is undoubtedly of practical value and researchers have long been eager to solve it. For example, at the end of the 1960s there was an attempt to realize this idea for the IR system