

27

AI: THE PRESENT AND FUTURE

In which we take stock of where we are and where we are going, this being a good thing to do before continuing.

In Chapter 2, we suggested that it would be helpful to view the AI task as that of designing rational agents—that is, agents whose actions maximize their expected utility given their percept histories. We showed that the design problem depends on the percepts and actions available to the agent, the utility function that the agent’s behavior should satisfy, and the nature of the environment. A variety of different agent designs are possible, ranging from reflex agents to fully deliberative, knowledge-based, decision-theoretic agents. Moreover, the components of these designs can have a number of different instantiations—for example, logical or probabilistic reasoning, and atomic, factored, or structured representations of states. The intervening chapters presented the principles by which these components operate.

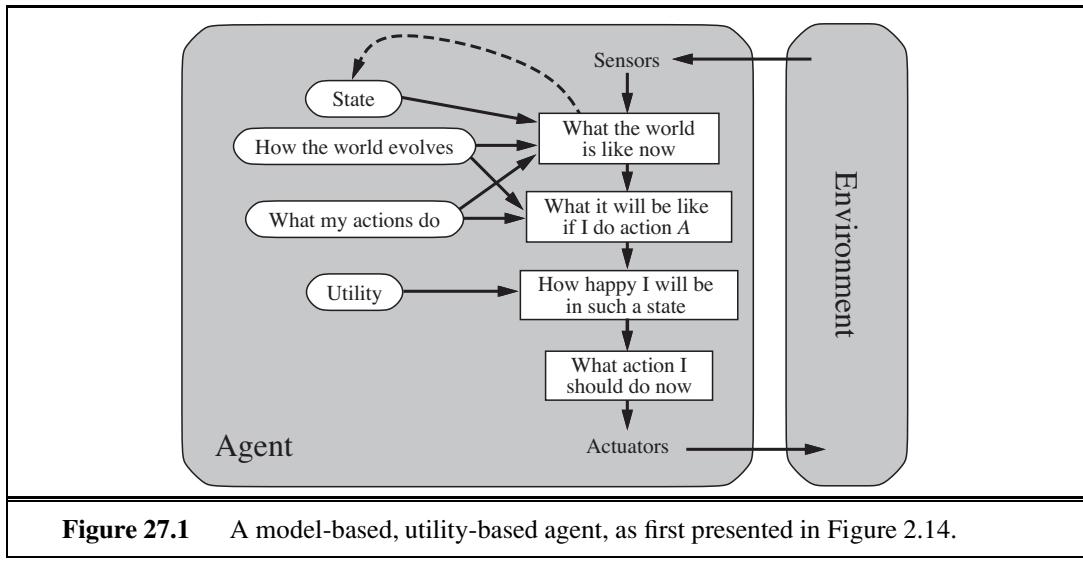


For all the agent designs and components, there has been tremendous progress both in our scientific understanding and in our technological capabilities. In this chapter, we stand back from the details and ask, “*Will all this progress lead to a general-purpose intelligent agent that can perform well in a wide variety of environments?*” Section 27.1 looks at the components of an intelligent agent to assess what’s known and what’s missing. Section 27.2 does the same for the overall agent architecture. Section 27.3 asks whether designing rational agents is the right goal in the first place. (The answer is, “Not really, but it’s OK for now.”) Finally, Section 27.4 examines the consequences of success in our endeavors.

27.1 AGENT COMPONENTS

Chapter 2 presented several agent designs and their components. To focus our discussion here, we will look at the utility-based agent, which we show again in Figure 27.1. When endowed with a learning component (Figure 2.15), this is the most general of our agent designs. Let’s see where the state of the art stands for each of the components.

Interaction with the environment through sensors and actuators: For much of the history of AI, this has been a glaring weak point. With a few honorable exceptions, AI systems were built in such a way that humans had to supply the inputs and interpret the outputs,



while robotic systems focused on low-level tasks in which high-level reasoning and planning were largely absent. This was due in part to the great expense and engineering effort required to get real robots to work at all. The situation has changed rapidly in recent years with the availability of ready-made programmable robots. These, in turn, have benefited from small, cheap, high-resolution CCD cameras and compact, reliable motor drives. MEMS (micro-electromechanical systems) technology has supplied miniaturized accelerometers, gyroscopes, and actuators for an artificial flying insect (Floreano *et al.*, 2009). It may also be possible to combine millions of MEMS devices to produce powerful macroscopic actuators.

Thus, we see that AI systems are at the cusp of moving from primarily software-only systems to embedded robotic systems. The state of robotics today is roughly comparable to the state of personal computers in about 1980: at that time researchers and hobbyists could experiment with PCs, but it would take another decade before they became commonplace.

Keeping track of the state of the world: This is one of the core capabilities required for an intelligent agent. It requires both perception and updating of internal representations. Chapter 4 showed how to keep track of atomic state representations; Chapter 7 described how to do it for factored (propositional) state representations; Chapter 12 extended this to first-order logic; and Chapter 15 described **filtering** algorithms for probabilistic reasoning in uncertain environments. Current filtering and perception algorithms can be combined to do a reasonable job of reporting low-level predicates such as “the cup is on the table.” Detecting higher-level actions, such as “Dr. Russell is having a cup of tea with Dr. Norvig while discussing plans for next week,” is more difficult. Currently it can be done (see Figure 24.25 on page 961) only with the help of annotated examples.

Another problem is that, although the approximate filtering algorithms from Chapter 15 can handle quite large environments, they are still dealing with a factored representation—they have random variables, but do not represent objects and relations explicitly. Section 14.6 explained how probability and first-order logic can be combined to solve this problem, and

Section 14.6.3 showed how we can handle uncertainty about the identity of objects. We expect that the application of these ideas for tracking complex environments will yield huge benefits. However, we are still faced with a daunting task of defining general, reusable representation schemes for complex domains. As discussed in Chapter 12, we don't yet know how to do that in general; only for isolated, simple domains. It is possible that a new focus on probabilistic rather than logical representation coupled with aggressive machine learning (rather than hand-encoding of knowledge) will allow for progress.

Projecting, evaluating, and selecting future courses of action: The basic knowledge-representation requirements here are the same as for keeping track of the world; the primary difficulty is coping with courses of action—such as having a conversation or a cup of tea—that consist eventually of thousands or millions of primitive steps for a real agent. It is only by imposing **hierarchical structure** on behavior that we humans cope at all. We saw in Section 11.2 how to use hierarchical representations to handle problems of this scale; furthermore, work in **hierarchical reinforcement learning** has succeeded in combining some of these ideas with the techniques for decision making under uncertainty described in Chapter 17. As yet, algorithms for the partially observable case (POMDPs) are using the same atomic state representation we used for the search algorithms of Chapter 3. There is clearly a great deal of work to do here, but the technical foundations are largely in place. Section 27.2 discusses the question of how the search for effective long-range plans might be controlled.

Utility as an expression of preferences: In principle, basing rational decisions on the maximization of expected utility is completely general and avoids many of the problems of purely goal-based approaches, such as conflicting goals and uncertain attainment. As yet, however, there has been very little work on constructing *realistic* utility functions—imagine, for example, the complex web of interacting preferences that must be understood by an agent operating as an office assistant for a human being. It has proven very difficult to decompose preferences over complex states in the same way that Bayes nets decompose beliefs over complex states. One reason may be that preferences over states are really *compiled* from preferences over state histories, which are described by **reward functions** (see Chapter 17). Even if the reward function is simple, the corresponding utility function may be very complex. This suggests that we take seriously the task of knowledge engineering for reward functions as a way of conveying to our agents what it is that we want them to do.

Learning: Chapters 18 to 21 described how learning in an agent can be formulated as inductive learning (supervised, unsupervised, or reinforcement-based) of the functions that constitute the various components of the agent. Very powerful logical and statistical techniques have been developed that can cope with quite large problems, reaching or exceeding human capabilities in many tasks—as long as we are dealing with a predefined vocabulary of features and concepts. On the other hand, machine learning has made very little progress on the important problem of constructing new representations at levels of abstraction higher than the input vocabulary. In computer vision, for example, learning complex concepts such as *Classroom* and *Cafeteria* would be made unnecessarily difficult if the agent were forced to work from pixels as the input representation; instead, the agent needs to be able to form intermediate concepts first, such as *Desk* and *Tray*, without explicit human supervision. Similar considerations apply to learning behavior: *HavingACupOfTea* is a very important

high-level step in many plans, but how does it get into an action library that initially contains much simpler actions such as *RaiseArm* and *Swallow*? Perhaps this will incorporate some of the ideas of **deep belief networks**—Bayesian networks that have multiple layers of hidden variables, as in the work of Hinton *et al.* (2006), Hawkins and Blakeslee (2004), and Bengio and LeCun (2007).

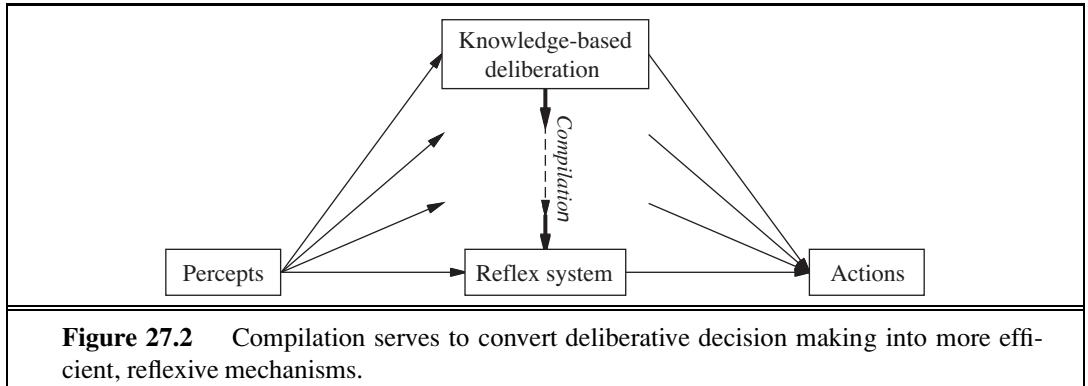
The vast majority of machine learning research today assumes a factored representation, learning a function $h : \mathbb{R}^n \rightarrow \mathbb{R}$ for regression and $h : \mathbb{R}^n \rightarrow \{0, 1\}$ for classification. Learning researchers will need to adapt their very successful techniques for factored representations to structured representations, particularly hierarchical representations. The work on inductive logic programming in Chapter 19 is a first step in this direction; the logical next step is to combine these ideas with the probabilistic languages of Section 14.6.

Unless we understand such issues, we are faced with the daunting task of constructing large commonsense knowledge bases by hand, an approach that has not fared well to date. There is great promise in using the Web as a source of natural language text, images, and videos to serve as a comprehensive knowledge base, but so far machine learning algorithms are limited in the amount of organized knowledge they can extract from these sources.

27.2 AGENT ARCHITECTURES

It is natural to ask, “Which of the agent architectures in Chapter 2 should an agent use?” The answer is, “All of them!” We have seen that reflex responses are needed for situations in which time is of the essence, whereas knowledge-based deliberation allows the agent to plan ahead. A complete agent must be able to do both, using a **hybrid architecture**. One important property of hybrid architectures is that the boundaries between different decision components are not fixed. For example, **compilation** continually converts declarative information at the deliberative level into more efficient representations, eventually reaching the reflex level—see Figure 27.2. (This is the purpose of explanation-based learning, as discussed in Chapter 19.) Agent architectures such as SOAR (Laird *et al.*, 1987) and THEO (Mitchell, 1990) have exactly this structure. Every time they solve a problem by explicit deliberation, they save away a generalized version of the solution for use by the reflex component. A less studied problem is the *reversal* of this process: when the environment changes, learned reflexes may no longer be appropriate and the agent must return to the deliberative level to produce new behaviors.

Agents also need ways to control their own deliberations. They must be able to cease deliberating when action is demanded, and they must be able to use the time available for deliberation to execute the most profitable computations. For example, a taxi-driving agent that sees an accident ahead must decide in a split second either to brake or to take evasive action. It should also spend that split second thinking about the most important questions, such as whether the lanes to the left and right are clear and whether there is a large truck close behind, rather than worrying about wear and tear on the tires or where to pick up the next passenger. These issues are usually studied under the heading of **real-time AI**. As AI



systems move into more complex domains, all problems will become real-time, because the agent will never have long enough to solve the decision problem exactly.

Clearly, there is a pressing need for *general* methods of controlling deliberation, rather than specific recipes for what to think about in each situation. The first useful idea is to employ **anytime algorithms** (Dean and Boddy, 1988; Horvitz, 1987). An anytime algorithm is an algorithm whose output quality improves gradually over time, so that it has a reasonable decision ready whenever it is interrupted. Such algorithms are controlled by a **metalevel** decision procedure that assesses whether further computation is worthwhile. (See Section 3.5.4 for a brief description of metalevel decision making.) Example of an anytime algorithms include iterative deepening in game-tree search and MCMC in Bayesian networks.

The second technique for controlling deliberation is **decision-theoretic metareasoning** (Russell and Wefald, 1989, 1991; Horvitz, 1989; Horvitz and Breese, 1996). This method applies the theory of information value (Chapter 16) to the selection of individual computations. The value of a computation depends on both its cost (in terms of delaying action) and its benefits (in terms of improved decision quality). Metareasoning techniques can be used to design better search algorithms and to guarantee that the algorithms have the anytime property. Metareasoning is expensive, of course, and compilation methods can be applied so that the overhead is small compared to the costs of the computations being controlled. Metalevel reinforcement learning may provide another way to acquire effective policies for controlling deliberation: in essence, computations that lead to better decisions are reinforced, while those that turn out to have no effect are penalized. This approach avoids the myopia problems of the simple value-of-information calculation.

Metareasoning is one specific example of a **reflective architecture**—that is, an architecture that enables deliberation about the computational entities and actions occurring within the architecture itself. A theoretical foundation for reflective architectures can be built by defining a joint state space composed from the environment state and the computational state of the agent itself. Decision-making and learning algorithms can be designed that operate over this joint state space and thereby serve to implement and improve the agent's computational activities. Eventually, we expect task-specific algorithms such as alpha–beta search and backward chaining to disappear from AI systems, to be replaced by general methods that direct the agent's computations toward the efficient generation of high-quality decisions.

ANYTIME ALGORITHM

DECISION-THEORETIC METAREASONING

REFLECTIVE ARCHITECTURE

27.3 ARE WE GOING IN THE RIGHT DIRECTION?

The preceding section listed many advances and many opportunities for further progress. But where is this all leading? Dreyfus (1992) gives the analogy of trying to get to the moon by climbing a tree; one can report steady progress, all the way to the top of the tree. In this section, we consider whether AI's current path is more like a tree climb or a rocket trip.

In Chapter 1, we said that our goal was to build agents that *act rationally*. However, we also said that

... achieving perfect rationality—always doing the right thing—is not feasible in complicated environments. The computational demands are just too high. For most of the book, however, we will adopt the working hypothesis that perfect rationality is a good starting point for analysis.

Now it is time to consider again what exactly the goal of AI is. We want to build agents, but with what specification in mind? Here are four possibilities:

PERFECT
RATIONALITY

Perfect rationality. A perfectly rational agent acts at every instant in such a way as to maximize its expected utility, given the information it has acquired from the environment. We have seen that the calculations necessary to achieve perfect rationality in most environments are too time consuming, so perfect rationality is not a realistic goal.

CALCULATIVE
RATIONALITY

Calculative rationality. This is the notion of rationality that we have used implicitly in designing logical and decision-theoretic agents, and most of theoretical AI research has focused on this property. A calculatively rational agent *eventually* returns what *would have been* the rational choice at the beginning of its deliberation. This is an interesting property for a system to exhibit, but in most environments, the right answer at the wrong time is of no value. In practice, AI system designers are forced to compromise on decision quality to obtain reasonable overall performance; unfortunately, the theoretical basis of calculative rationality does not provide a well-founded way to make such compromises.

BOUNDED
RATIONALITY

Bounded rationality. Herbert Simon (1957) rejected the notion of perfect (or even approximately perfect) rationality and replaced it with bounded rationality, a descriptive theory of decision making by real agents. He wrote,

The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world—or even for a reasonable approximation to such objective rationality.

He suggested that bounded rationality works primarily by **satisficing**—that is, deliberating only long enough to come up with an answer that is “good enough.” Simon won the Nobel Prize in economics for this work and has written about it in depth (Simon, 1982). It appears to be a useful model of human behaviors in many cases. It is not a formal specification for intelligent agents, however, because the definition of “good enough” is not given by the theory. Furthermore, satisficing seems to be just one of a large range of methods used to cope with bounded resources.

Bounded optimality (BO). A bounded optimal agent behaves as well as possible, *given its computational resources*. That is, the expected utility of the agent program for a bounded optimal agent is at least as high as the expected utility of any other agent program running on the same machine.

Of these four possibilities, bounded optimality seems to offer the best hope for a strong theoretical foundation for AI. It has the advantage of being possible to achieve: there is always at least one best program—something that perfect rationality lacks. Bounded optimal agents are actually useful in the real world, whereas calculatively rational agents usually are not, and sacrificing agents might or might not be, depending on how ambitious they are.

The traditional approach in AI has been to start with calculative rationality and then make compromises to meet resource constraints. If the problems imposed by the constraints are minor, one would expect the final design to be similar to a BO agent design. But as the resource constraints become more critical—for example, as the environment becomes more complex—one would expect the two designs to diverge. In the theory of bounded optimality, these constraints can be handled in a principled fashion.

As yet, little is known about bounded optimality. It is possible to construct bounded optimal programs for very simple machines and for somewhat restricted kinds of environments (Etzioni, 1989; Russell *et al.*, 1993), but as yet we have no idea what BO programs are like for large, general-purpose computers in complex environments. If there is to be a constructive theory of bounded optimality, we have to hope that the design of bounded optimal programs does not depend too strongly on the details of the computer being used. It would make scientific research very difficult if adding a few kilobytes of memory to a gigabyte machine made a significant difference to the design of the BO program. One way to make sure this cannot happen is to be slightly more relaxed about the criteria for bounded optimality. By analogy with the notion of asymptotic complexity (Appendix A), we can define **asymptotic bounded optimality** (ABO) as follows (Russell and Subramanian, 1995). Suppose a program P is bounded optimal for a machine M in a class of environments \mathbf{E} , where the complexity of environments in \mathbf{E} is unbounded. Then program P' is ABO for M in \mathbf{E} if it can outperform P by running on a machine kM that is k times faster (or larger) than M . Unless k were enormous, we would be happy with a program that was ABO for a nontrivial environment on a nontrivial architecture. There would be little point in putting enormous effort into finding BO rather than ABO programs, because the size and speed of available machines tends to increase by a constant factor in a fixed amount of time anyway.

We can hazard a guess that BO or ABO programs for powerful computers in complex environments will not necessarily have a simple, elegant structure. We have already seen that general-purpose intelligence requires some reflex capability and some deliberative capability; a variety of forms of knowledge and decision making; learning and compilation mechanisms for all of those forms; methods for controlling reasoning; and a large store of domain-specific knowledge. A bounded optimal agent must adapt to the environment in which it finds itself, so that eventually its internal organization will reflect optimizations that are specific to the particular environment. This is only to be expected, and it is similar to the way in which racing cars restricted by engine capacity have evolved into extremely complex designs. We

suspect that a science of artificial intelligence based on bounded optimality will involve a good deal of study of the processes that allow an agent program to converge to bounded optimality and perhaps less concentration on the details of the messy programs that result.

In sum, the concept of bounded optimality is proposed as a formal task for AI research that is both well defined and feasible. Bounded optimality specifies optimal *programs* rather than optimal *actions*. Actions are, after all, generated by programs, and it is over programs that designers have control.

27.4 WHAT IF AI DOES SUCCEED?

In David Lodge's *Small World* (1984), a novel about the academic world of literary criticism, the protagonist causes consternation by asking a panel of eminent but contradictory literary theorists the following question: "*What if you were right?*" None of the theorists seems to have considered this question before, perhaps because debating unfalsifiable theories is an end in itself. Similar confusion can be evoked by asking AI researchers, "*What if you succeed?*"

As Section 26.3 relates, there are ethical issues to consider. Intelligent computers are more powerful than dumb ones, but will that power be used for good or ill? Those who strive to develop AI have a responsibility to see that the impact of their work is a positive one. The scope of the impact will depend on the degree of success of AI. Even modest successes in AI have already changed the ways in which computer science is taught (Stein, 2002) and software development is practiced. AI has made possible new applications such as speech recognition systems, inventory control systems, surveillance systems, robots, and search engines.

We can expect that medium-level successes in AI would affect all kinds of people in their daily lives. So far, computerized communication networks, such as cell phones and the Internet, have had this kind of pervasive effect on society, but AI has not. AI has been at work behind the scenes—for example, in automatically approving or denying credit card transactions for every purchase made on the Web—but has not been visible to the average consumer. We can imagine that truly useful personal assistants for the office or the home would have a large positive impact on people's lives, although they might cause some economic dislocation in the short term. Automated assistants for driving could prevent accidents, saving tens of thousands of lives per year. A technological capability at this level might also be applied to the development of autonomous weapons, which many view as undesirable. Some of the biggest societal problems we face today—such as the harnessing of genomic information for treating disease, the efficient management of energy resources, and the verification of treaties concerning nuclear weapons—are being addressed with the help of AI technologies.

Finally, it seems likely that a large-scale success in AI—the creation of human-level intelligence and beyond—would change the lives of a majority of humankind. The very nature of our work and play would be altered, as would our view of intelligence, consciousness, and the future destiny of the human race. AI systems at this level of capability could threaten human autonomy, freedom, and even survival. For these reasons, we cannot divorce AI research from its ethical consequences (see Section 26.3).

Which way will the future go? Science fiction authors seem to favor dystopian futures over utopian ones, probably because they make for more interesting plots. But so far, AI seems to fit in with other revolutionary technologies (printing, plumbing, air travel, telephony) whose negative repercussions are outweighed by their positive aspects.

In conclusion, we see that AI has made great progress in its short history, but the final sentence of Alan Turing's (1950) essay on *Computing Machinery and Intelligence* is still valid today:

*We can see only a short distance ahead,
but we can see that much remains to be done.*

A

MATHEMATICAL BACKGROUND

A.1 COMPLEXITY ANALYSIS AND O() NOTATION

BENCHMARKING

ANALYSIS OF ALGORITHMS

Computer scientists are often faced with the task of comparing algorithms to see how fast they run or how much memory they require. There are two approaches to this task. The first is **benchmarking**—running the algorithms on a computer and measuring speed in seconds and memory consumption in bytes. Ultimately, this is what really matters, but a benchmark can be unsatisfactory because it is so specific: it measures the performance of a particular program written in a particular language, running on a particular computer, with a particular compiler and particular input data. From the single result that the benchmark provides, it can be difficult to predict how well the algorithm would do on a different compiler, computer, or data set. The second approach relies on a mathematical **analysis of algorithms**, independently of the particular implementation and input, as discussed below.

A.1.1 Asymptotic analysis

We will consider algorithm analysis through the following example, a program to compute the sum of a sequence of numbers:

```
function SUMMATION(sequence) returns a number
    sum ← 0
    for i = 1 to LENGTH(sequence) do
        sum ← sum + sequence[i]
    return sum
```

The first step in the analysis is to abstract over the input, in order to find some parameter or parameters that characterize the size of the input. In this example, the input can be characterized by the length of the sequence, which we will call n . The second step is to abstract over the implementation, to find some measure that reflects the running time of the algorithm but is not tied to a particular compiler or computer. For the SUMMATION program, this could be just the number of lines of code executed, or it could be more detailed, measuring the number of additions, assignments, array references, and branches executed by the algorithm.

Either way gives us a characterization of the total number of steps taken by the algorithm as a function of the size of the input. We will call this characterization $T(n)$. If we count lines of code, we have $T(n) = 2n + 2$ for our example.

If all programs were as simple as SUMMATION, the analysis of algorithms would be a trivial field. But two problems make it more complicated. First, it is rare to find a parameter like n that completely characterizes the number of steps taken by an algorithm. Instead, the best we can usually do is compute the worst case $T_{\text{worst}}(n)$ or the average case $T_{\text{avg}}(n)$. Computing an average means that the analyst must assume some distribution of inputs.

The second problem is that algorithms tend to resist exact analysis. In that case, it is necessary to fall back on an approximation. We say that the SUMMATION algorithm is $O(n)$, meaning that its measure is at most a constant times n , with the possible exception of a few small values of n . More formally,

$$T(n) \text{ is } O(f(n)) \text{ if } T(n) \leq kf(n) \text{ for some } k, \text{ for all } n > n_0.$$

ASYMPTOTIC ANALYSIS

The $O()$ notation gives us what is called an **asymptotic analysis**. We can say without question that, as n asymptotically approaches infinity, an $O(n)$ algorithm is better than an $O(n^2)$ algorithm. A single benchmark figure could not substantiate such a claim.

The $O()$ notation abstracts over constant factors, which makes it easier to use, but less precise, than the $T()$ notation. For example, an $O(n^2)$ algorithm will always be worse than an $O(n)$ in the long run, but if the two algorithms are $T(n^2 + 1)$ and $T(100n + 1000)$, then the $O(n^2)$ algorithm is actually better for $n < 110$.

Despite this drawback, asymptotic analysis is the most widely used tool for analyzing algorithms. It is precisely because the analysis abstracts over both the exact number of operations (by ignoring the constant factor k) and the exact content of the input (by considering only its size n) that the analysis becomes mathematically feasible. The $O()$ notation is a good compromise between precision and ease of analysis.

A.1.2 NP and inherently hard problems

COMPLEXITY ANALYSIS

The analysis of algorithms and the $O()$ notation allow us to talk about the efficiency of a particular algorithm. However, they have nothing to say about whether there could be a better algorithm for the problem at hand. The field of **complexity analysis** analyzes problems rather than algorithms. The first gross division is between problems that can be solved in polynomial time and problems that cannot be solved in polynomial time, no matter what algorithm is used. The class of polynomial problems—those which can be solved in time $O(n^k)$ for some k —is called P. These are sometimes called “easy” problems, because the class contains those problems with running times like $O(\log n)$ and $O(n)$. But it also contains those with time $O(n^{1000})$, so the name “easy” should not be taken too literally.

Another important class of problems is NP, the class of nondeterministic polynomial problems. A problem is in this class if there is some algorithm that can guess a solution and then verify whether the guess is correct in polynomial time. The idea is that if you have an arbitrarily large number of processors, so that you can try all the guesses at once, or you are very lucky and always guess right the first time, then the NP problems become P problems. One of the biggest open questions in computer science is whether the class NP is equivalent

to the class P when one does not have the luxury of an infinite number of processors or omniscient guessing. Most computer scientists are convinced that $P \neq NP$; that NP problems are inherently hard and have no polynomial-time algorithms. But this has never been proven.

NP-COMPLETE Those who are interested in deciding whether $P = NP$ look at a subclass of NP called the **NP-complete** problems. The word “complete” is used here in the sense of “most extreme” and thus refers to the hardest problems in the class NP. It has been proven that either all the NP-complete problems are in P or none of them is. This makes the class theoretically interesting, but the class is also of practical interest because many important problems are known to be NP-complete. An example is the satisfiability problem: given a sentence of propositional logic, is there an assignment of truth values to the proposition symbols of the sentence that makes it true? Unless a miracle occurs and $P = NP$, there can be no algorithm that solves *all* satisfiability problems in polynomial time. However, AI is more interested in whether there are algorithms that perform efficiently on *typical* problems drawn from a pre-determined distribution; as we saw in Chapter 7, there are algorithms such as WALKSAT that do quite well on many problems.

CO-NP The class **co-NP** is the complement of NP, in the sense that, for every decision problem in NP, there is a corresponding problem in co-NP with the “yes” and “no” answers reversed. We know that P is a subset of both NP and co-NP, and it is believed that there are problems in co-NP that are not in P. The **co-NP-complete** problems are the hardest problems in co-NP.

CO-NP-COMPLETE The class #P (pronounced “sharp P”) is the set of counting problems corresponding to the decision problems in NP. Decision problems have a yes-or-no answer: is there a solution to this 3-SAT formula? Counting problems have an integer answer: how many solutions are there to this 3-SAT formula? In some cases, the counting problem is much harder than the decision problem. For example, deciding whether a bipartite graph has a perfect matching can be done in time $O(VE)$ (where the graph has V vertices and E edges), but the counting problem “how many perfect matches does this bipartite graph have” is #P-complete, meaning that it is hard as any problem in #P and thus at least as hard as any NP problem.

Another class is the class of PSPACE problems—those that require a polynomial amount of space, even on a nondeterministic machine. It is believed that PSPACE-hard problems are worse than NP-complete problems, although it could turn out that $NP = PSPACE$, just as it could turn out that $P = NP$.

A.2 VECTORS, MATRICES, AND LINEAR ALGEBRA

VECTOR Mathematicians define a **vector** as a member of a vector space, but we will use a more concrete definition: a vector is an ordered sequence of values. For example, in two-dimensional space, we have vectors such as $\mathbf{x} = \langle 3, 4 \rangle$ and $\mathbf{y} = \langle 0, 2 \rangle$. We follow the convention of bold-face characters for vector names, although some authors use arrows or bars over the names: \vec{x} or \bar{y} . The elements of a vector can be accessed using subscripts: $\mathbf{z} = \langle z_1, z_2, \dots, z_n \rangle$. One confusing point: this book is synthesizing work from many subfields, which variously call their sequences vectors, lists, or tuples, and variously use the notations $\langle 1, 2 \rangle$, $[1, 2]$, or $(1, 2)$.

The two fundamental operations on vectors are vector addition and scalar multiplication. The vector addition $\mathbf{x} + \mathbf{y}$ is the elementwise sum: $\mathbf{x} + \mathbf{y} = \langle 3 + 0, 4 + 2 \rangle = \langle 3, 6 \rangle$. Scalar multiplication multiplies each element by a constant: $5\mathbf{x} = \langle 5 \times 3, 5 \times 4 \rangle = \langle 15, 20 \rangle$.

The length of a vector is denoted $|\mathbf{x}|$ and is computed by taking the square root of the sum of the squares of the elements: $|\mathbf{x}| = \sqrt{(3^2 + 4^2)} = 5$. The dot product $\mathbf{x} \cdot \mathbf{y}$ (also called scalar product) of two vectors is the sum of the products of corresponding elements, that is, $\mathbf{x} \cdot \mathbf{y} = \sum_i x_i y_i$, or in our particular case, $\mathbf{x} \cdot \mathbf{y} = 3 \times 0 + 4 \times 2 = 8$.

Vectors are often interpreted as directed line segments (arrows) in an n -dimensional Euclidean space. Vector addition is then equivalent to placing the tail of one vector at the head of the other, and the dot product $\mathbf{x} \cdot \mathbf{y}$ is equal to $|\mathbf{x}| |\mathbf{y}| \cos \theta$, where θ is the angle between \mathbf{x} and \mathbf{y} .

MATRIX

A **matrix** is a rectangular array of values arranged into rows and columns. Here is a matrix \mathbf{A} of size 3×4 :

$$\begin{pmatrix} \mathbf{A}_{1,1} & \mathbf{A}_{1,2} & \mathbf{A}_{1,3} & \mathbf{A}_{1,4} \\ \mathbf{A}_{2,1} & \mathbf{A}_{2,2} & \mathbf{A}_{2,3} & \mathbf{A}_{2,4} \\ \mathbf{A}_{3,1} & \mathbf{A}_{3,2} & \mathbf{A}_{3,3} & \mathbf{A}_{3,4} \end{pmatrix}$$

The first index of $\mathbf{A}_{i,j}$ specifies the row and the second the column. In programming languages, $\mathbf{A}_{i,j}$ is often written $\mathbf{A}[i, j]$ or $\mathbf{A}[i][j]$.

The sum of two matrices is defined by adding their corresponding elements; for example $(\mathbf{A} + \mathbf{B})_{i,j} = \mathbf{A}_{i,j} + \mathbf{B}_{i,j}$. (The sum is undefined if \mathbf{A} and \mathbf{B} have different sizes.) We can also define the multiplication of a matrix by a scalar: $(c\mathbf{A})_{i,j} = c\mathbf{A}_{i,j}$. Matrix multiplication (the product of two matrices) is more complicated. The product \mathbf{AB} is defined only if \mathbf{A} is of size $a \times b$ and \mathbf{B} is of size $b \times c$ (i.e., the second matrix has the same number of rows as the first has columns); the result is a matrix of size $a \times c$. If the matrices are of appropriate size, then the result is

$$(\mathbf{AB})_{i,k} = \sum_j \mathbf{A}_{i,j} \mathbf{B}_{j,k}.$$

Matrix multiplication is not commutative, even for square matrices: $\mathbf{AB} \neq \mathbf{BA}$ in general. It is, however, associative: $(\mathbf{AB})\mathbf{C} = \mathbf{A}(\mathbf{BC})$. Note that the dot product can be expressed in terms of a transpose and a matrix multiplication: $\mathbf{x} \cdot \mathbf{y} = \mathbf{x}^\top \mathbf{y}$.

IDENTITY MATRIX

TRANSPOSE

INVERSE

SINGULAR

The **identity matrix** \mathbf{I} has elements $\mathbf{I}_{i,j}$ equal to 1 when $i = j$ and equal to 0 otherwise. It has the property that $\mathbf{AI} = \mathbf{A}$ for all \mathbf{A} . The **transpose** of \mathbf{A} , written \mathbf{A}^\top is formed by turning rows into columns and vice versa, or, more formally, by $\mathbf{A}^\top_{i,j} = \mathbf{A}_{j,i}$. The **inverse** of a square matrix \mathbf{A} is another square matrix \mathbf{A}^{-1} such that $\mathbf{A}^{-1}\mathbf{A} = \mathbf{I}$. For a **singular** matrix, the inverse does not exist. For a nonsingular matrix, it can be computed in $O(n^3)$ time.

Matrices are used to solve systems of linear equations in $O(n^3)$ time; the time is dominated by inverting a matrix of coefficients. Consider the following set of equations, for which we want a solution in x , y , and z :

$$\begin{aligned} +2x + y - z &= 8 \\ -3x - y + 2z &= -11 \\ -2x + y + 2z &= -3. \end{aligned}$$

We can represent this system as the matrix equation $\mathbf{A} \mathbf{x} = \mathbf{b}$, where

$$\mathbf{A} = \begin{pmatrix} 2 & 1 & -1 \\ -3 & -1 & 2 \\ -2 & 1 & 2 \end{pmatrix}, \quad \mathbf{x} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}, \quad \mathbf{b} = \begin{pmatrix} 8 \\ -11 \\ -3 \end{pmatrix}.$$

To solve $\mathbf{A} \mathbf{x} = \mathbf{b}$ we multiply both sides by \mathbf{A}^{-1} , yielding $\mathbf{A}^{-1} \mathbf{A} \mathbf{x} = \mathbf{A}^{-1} \mathbf{b}$, which simplifies to $\mathbf{x} = \mathbf{A}^{-1} \mathbf{b}$. After inverting \mathbf{A} and multiplying by \mathbf{b} , we get the answer

$$\mathbf{x} = \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \\ -1 \end{pmatrix}.$$

A.3 PROBABILITY DISTRIBUTIONS

A probability is a measure over a set of events that satisfies three axioms:

1. The measure of each event is between 0 and 1. We write this as $0 \leq P(X = x_i) \leq 1$, where X is a random variable representing an event and x_i are the possible values of X . In general, random variables are denoted by uppercase letters and their values by lowercase letters.
2. The measure of the whole set is 1; that is, $\sum_{i=1}^n P(X = x_i) = 1$.
3. The probability of a union of disjoint events is the sum of the probabilities of the individual events; that is, $P(X = x_1 \vee X = x_2) = P(X = x_1) + P(X = x_2)$, where x_1 and x_2 are disjoint.

A **probabilistic model** consists of a sample space of mutually exclusive possible outcomes, together with a probability measure for each outcome. For example, in a model of the weather tomorrow, the outcomes might be *sunny*, *cloudy*, *rainy*, and *snowy*. A subset of these outcomes constitutes an event. For example, the event of precipitation is the subset consisting of $\{\text{rainy, snowy}\}$.

We use $\mathbf{P}(X)$ to denote the vector of values $\langle P(X = x_1), \dots, P(X = x_n) \rangle$. We also use $P(x_i)$ as an abbreviation for $P(X = x_i)$ and $\sum_x P(x)$ for $\sum_{i=1}^n P(X = x_i)$.

The conditional probability $P(B|A)$ is defined as $P(B \cap A)/P(A)$. A and B are conditionally independent if $P(B|A) = P(B)$ (or equivalently, $P(A|B) = P(A)$). For continuous variables, there are an infinite number of values, and unless there are point spikes, the probability of any one value is 0. Therefore, we define a **probability density function**, which we also denote as $P(\cdot)$, but which has a slightly different meaning from the discrete probability function. The density function $P(x)$ for a random variable X , which might be thought of as $P(X = x)$, is intuitively defined as the ratio of the probability that X falls into an interval around x , divided by the width of the interval, as the interval width goes to zero:

$$P(x) = \lim_{dx \rightarrow 0} P(x \leq X \leq x + dx)/dx.$$

The density function must be nonnegative for all x and must have

$$\int_{-\infty}^{\infty} P(x) dx = 1.$$

CUMULATIVE
PROBABILITY
DENSITY FUNCTION

We can also define a **cumulative probability density function** $F_X(x)$, which is the probability of a random variable being less than x :

$$F_X(x) = P(X \leq x) = \int_{-\infty}^x P(u) du.$$

Note that the probability density function has units, whereas the discrete probability function is unitless. For example, if values of X are measured in seconds, then the density is measured in Hz (i.e., 1/sec). If values of \mathbf{X} are points in three-dimensional space measured in meters, then density is measured in $1/m^3$.

GAUSSIAN
DISTRIBUTION

One of the most important probability distributions is the **Gaussian distribution**, also known as the **normal distribution**. A Gaussian distribution with mean μ and standard deviation σ (and therefore variance σ^2) is defined as

$$P(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/(2\sigma^2)},$$

STANDARD NORMAL
DISTRIBUTION
MULTIVARIATE
GAUSSIAN

where x is a continuous variable ranging from $-\infty$ to $+\infty$. With mean $\mu=0$ and variance $\sigma^2=1$, we get the special case of the **standard normal distribution**. For a distribution over a vector \mathbf{x} in n dimensions, there is the **multivariate Gaussian distribution**:

$$P(\mathbf{x}) = \frac{1}{\sqrt{(2\pi)^n |\Sigma|}} e^{-\frac{1}{2}((\mathbf{x}-\boldsymbol{\mu})^\top \boldsymbol{\Sigma}^{-1} (\mathbf{x}-\boldsymbol{\mu}))},$$

CUMULATIVE
DISTRIBUTION

where $\boldsymbol{\mu}$ is the mean vector and $\boldsymbol{\Sigma}$ is the **covariance matrix** (see below).

In one dimension, we can define the **cumulative distribution** function $F(x)$ as the probability that a random variable will be less than x . For the normal distribution, this is

$$F(x) = \int_{-\infty}^x P(z) dz = \frac{1}{2} (1 + \text{erf}(\frac{z-\mu}{\sigma\sqrt{2}})),$$

CENTRAL LIMIT
THEOREM

where $\text{erf}(x)$ is the so-called **error function**, which has no closed-form representation.

The **central limit theorem** states that the distribution formed by sampling n independent random variables and taking their mean tends to a normal distribution as n tends to infinity. This holds for almost any collection of random variables, even if they are not strictly independent, unless the variance of any finite subset of variables dominates the others.

EXPECTATION

The **expectation** of a random variable, $E(X)$, is the mean or average value, weighted by the probability of each value. For a discrete variable it is:

$$E(X) = \sum_i x_i P(X = x_i).$$

For a continuous variable, replace the summation with an integral over the probability density function, $P(x)$:

$$E(X) = \int_{-\infty}^{\infty} x P(x) dx,$$

ROOT MEAN SQUARE

The **root mean square**, RMS, of a set of values (often samples of a random variable) is the square root of the mean of the squares of the values,

$$RMS(x_1, \dots, x_n) = \sqrt{\frac{x_1^2 + \dots + x_n^2}{n}}.$$

COVARIANCE

The **covariance** of two random variables is the expectation of the product of their differences from their means:

$$\text{cov}(X, Y) = E((X - \mu_X)(Y - \mu_Y)).$$

COVARIANCE MATRIX

The **covariance matrix**, often denoted Σ , is a matrix of covariances between elements of a vector of random variables. Given $\mathbf{X} = \langle X_1, \dots, X_n \rangle^\top$, the entries of the covariance matrix are as follows:

$$\Sigma_{i,j} = \text{cov}(X_i, X_j) = E((X_i - \mu_i)(X_j - \mu_j)).$$

A few more miscellaneous points: we use $\log(x)$ for the natural logarithm, $\log_e(x)$. We use $\text{argmax}_x f(x)$ for the value of x for which $f(x)$ is maximal.

BIBLIOGRAPHICAL AND HISTORICAL NOTES

The $O()$ notation so widely used in computer science today was first introduced in the context of number theory by the German mathematician P. G. H. Bachmann (1894). The concept of NP-completeness was invented by Cook (1971), and the modern method for establishing a reduction from one problem to another is due to Karp (1972). Cook and Karp have both won the Turing award, the highest honor in computer science, for their work.

Classic works on the analysis and design of algorithms include those by Knuth (1973) and Aho, Hopcroft, and Ullman (1974); more recent contributions are by Tarjan (1983) and Cormen, Leiserson, and Rivest (1990). These books place an emphasis on designing and analyzing algorithms to solve tractable problems. For the theory of NP-completeness and other forms of intractability, see Garey and Johnson (1979) or Papadimitriou (1994). Good texts on probability include Chung (1979), Ross (1988), and Bertsekas and Tsitsiklis (2008).

B

NOTES ON LANGUAGES AND ALGORITHMS

B.1 DEFINING LANGUAGES WITH BACKUS–NAUR FORM (BNF)

CONTEXT-FREE
GRAMMAR
BACKUS–NAUR
FORM (BNF)

TERMINAL SYMBOL

NONTERMINAL
SYMBOL

START SYMBOL

In this book, we define several languages, including the languages of propositional logic (page 243), first-order logic (page 293), and a subset of English (page 899). A formal language is defined as a set of strings where each string is a sequence of symbols. The languages we are interested in consist of an infinite set of strings, so we need a concise way to characterize the set. We do that with a **grammar**. The particular type of grammar we use is called a **context-free grammar**, because each expression has the same form in any context. We write our grammars in a formalism called **Backus–Naur form (BNF)**. There are four components to a BNF grammar:

- A set of **terminal symbols**. These are the symbols or words that make up the strings of the language. They could be letters (**A**, **B**, **C**, ...) or words (**a**, **aardvark**, **abacus**, ...), or whatever symbols are appropriate for the domain.
- A set of **nonterminal symbols** that categorize subphrases of the language. For example, the nonterminal symbol *NounPhrase* in English denotes an infinite set of strings including “you” and “the big slobbery dog.”
- A **start symbol**, which is the nonterminal symbol that denotes the complete set of strings of the language. In English, this is *Sentence*; for arithmetic, it might be *Expr*, and for programming languages it is *Program*.
- A set of **rewrite rules**, of the form $LHS \rightarrow RHS$, where LHS is a nonterminal symbol and RHS is a sequence of zero or more symbols. These can be either terminal symbols, or the symbol ϵ , which is used to denote the empty string.

A rewrite rule of the form

$$Sentence \rightarrow NounPhrase\ VerbPhrase$$

means that whenever we have two strings categorized as a *NounPhrase* and a *VerbPhrase*, we can append them together and categorize the result as a *Sentence*. As an abbreviation, the two rules ($S \rightarrow A$) and ($S \rightarrow B$) can be written ($S \rightarrow A \mid B$).

Here is a BNF grammar for simple arithmetic expressions:

$$\text{Expr} \rightarrow \text{Expr Operator Expr} \mid (\text{Expr}) \mid \text{Number}$$

$$\text{Number} \rightarrow \text{Digit} \mid \text{Number Digit}$$

$$\text{Digit} \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$$

$$\text{Operator} \rightarrow + \mid - \mid \div \mid \times$$

We cover languages and grammars in more detail in Chapter 22. Be aware that other books use slightly different notations for BNF; for example, you might see $\langle \text{Digit} \rangle$ instead of Digit for a nonterminal, ‘word’ instead of **word** for a terminal, or $::=$ instead of \rightarrow in a rule.

B.2 DESCRIBING ALGORITHMS WITH PSEUDOCODE

The algorithms in this book are described in pseudocode. Most of the pseudocode should be familiar to users of languages like Java, C++, or Lisp. In some places we use mathematical formulas or ordinary English to describe parts that would otherwise be more cumbersome. A few idiosyncrasies should be noted.

- **Persistent variables:** We use the keyword **persistent** to say that a variable is given an initial value the first time a function is called and retains that value (or the value given to it by a subsequent assignment statement) on all subsequent calls to the function. Thus, persistent variables are like global variables in that they outlive a single call to their function, but they are accessible only within the function. The agent programs in the book use persistent variables for *memory*. Programs with persistent variables can be implemented as *objects* in object-oriented languages such as C++, Java, Python, and Smalltalk. In functional languages, they can be implemented by *functional closures* over an environment containing the required variables.
- **Functions as values:** Functions and procedures have capitalized names, and variables have lowercase italic names. So most of the time, a function call looks like $\text{FN}(x)$. However, we allow the value of a variable to be a function; for example, if the value of the variable f is the square root function, then $f(9)$ returns 3.
- **for each:** The notation “**for each** x **in** c **do**” means that the loop is executed with the variable x bound to successive elements of the collection c .
- **Indentation is significant:** Indentation is used to mark the scope of a loop or conditional, as in the language Python, and unlike Java and C++ (which use braces) or Pascal and Visual Basic (which use **end**).
- **Destructuring assignment:** The notation “ $x, y \leftarrow \text{pair}$ ” means that the right-hand side must evaluate to a two-element tuple, and the first element is assigned to x and the second to y . The same idea is used in “**for each** x, y **in** $pairs$ **do**” and can be used to swap two variables: “ $x, y \leftarrow y, x$ ”
- **Generators and yield:** the notation “**generator** $G(x)$ **yields** numbers” defines G as a generator function. This is best understood by an example. The code fragment shown in

```

generator POWERS-OF-2() yields ints
  i  $\leftarrow$  1
  while true do
    yield i
    i  $\leftarrow$  2  $\times$  i
  for p in POWERS-OF-2() do
    PRINT(p)
  
```

Figure B.1 Example of a generator function and its invocation within a loop.

Figure B.1 prints the numbers 1, 2, 4, . . . , and never stops. The call to POWERS-OF-2 returns a generator, which in turn yields one value each time the loop code asks for the next element of the collection. Even though the collection is infinite, it is enumerated one element at a time.

- **Lists:** $[x, y, z]$ denotes a list of three elements. $[first|rest]$ denotes a list formed by adding *first* to the list *rest*. In Lisp, this is the `cons` function.
- **Sets:** $\{x, y, z\}$ denotes a set of three elements. $\{x : p(x)\}$ denotes the set of all elements *x* for which $p(x)$ is true.
- **Arrays start at 1:** Unless stated otherwise, the first index of an array is 1 as in usual mathematical notation, not 0, as in Java and C.

B.3 ONLINE HELP

Most of the algorithms in the book have been implemented in Java, Lisp, and Python at our online code repository:



aima.cs.berkeley.edu

The same Web site includes instructions for sending comments, corrections, or suggestions for improving the book, and for joining discussion lists.

Bibliography

The following abbreviations are used for frequently cited conferences and journals:

AAAI	Proceedings of the AAAI Conference on Artificial Intelligence
AAMAS	Proceedings of the International Conference on Autonomous Agents and Multi-agent Systems
ACL	Proceedings of the Annual Meeting of the Association for Computational Linguistics
AIJ	Artificial Intelligence
AIMag	AI Magazine
AIPS	Proceedings of the International Conference on AI Planning Systems
BBS	Behavioral and Brain Sciences
CACM	Communications of the Association for Computing Machinery
COGSCI	Proceedings of the Annual Conference of the Cognitive Science Society
COLING	Proceedings of the International Conference on Computational Linguistics
COLT	Proceedings of the Annual ACM Workshop on Computational Learning Theory
CP	Proceedings of the International Conference on Principles and Practice of Constraint Programming
CVPR	Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition
EC	Proceedings of the ACM Conference on Electronic Commerce
ECAI	Proceedings of the European Conference on Artificial Intelligence
ECCV	Proceedings of the European Conference on Computer Vision
ECML	Proceedings of the The European Conference on Machine Learning
ECP	Proceedings of the European Conference on Planning
FGCS	Proceedings of the International Conference on Fifth Generation Computer Systems
FOCS	Proceedings of the Annual Symposium on Foundations of Computer Science
ICAPS	Proceedings of the International Conference on Automated Planning and Scheduling
ICASSP	Proceedings of the International Conference on Acoustics, Speech, and Signal Processing
ICCV	Proceedings of the International Conference on Computer Vision
ICLP	Proceedings of the International Conference on Logic Programming
ICML	Proceedings of the International Conference on Machine Learning
ICPR	Proceedings of the International Conference on Pattern Recognition
ICRA	Proceedings of the IEEE International Conference on Robotics and Automation
ICSLP	Proceedings of the International Conference on Speech and Language Processing
IJAR	International Journal of Approximate Reasoning
IJCAI	Proceedings of the International Joint Conference on Artificial Intelligence
IJCNN	Proceedings of the International Joint Conference on Neural Networks
IJCV	International Journal of Computer Vision
ILP	Proceedings of the International Workshop on Inductive Logic Programming
ISMIS	Proceedings of the International Symposium on Methodologies for Intelligent Systems
ISRR	Proceedings of the International Symposium on Robotics Research
JACM	Journal of the Association for Computing Machinery
JAIR	Journal of Artificial Intelligence Research
JAR	Journal of Automated Reasoning
JASA	Journal of the American Statistical Association
JMLR	Journal of Machine Learning Research
JSL	Journal of Symbolic Logic
KDD	Proceedings of the International Conference on Knowledge Discovery and Data Mining
KR	Proceedings of the International Conference on Principles of Knowledge Representation and Reasoning
LICS	Proceedings of the IEEE Symposium on Logic in Computer Science
NIPS	Advances in Neural Information Processing Systems
PAMI	IEEE Transactions on Pattern Analysis and Machine Intelligence
PNAS	Proceedings of the National Academy of Sciences of the United States of America
PODS	Proceedings of the ACM International Symposium on Principles of Database Systems
SIGIR	Proceedings of the Special Interest Group on Information Retrieval
SIGMOD	Proceedings of the ACM SIGMOD International Conference on Management of Data
SODA	Proceedings of the Annual ACM-SIAM Symposium on Discrete Algorithms
STOC	Proceedings of the Annual ACM Symposium on Theory of Computing
TARK	Proceedings of the Conference on Theoretical Aspects of Reasoning about Knowledge
UAI	Proceedings of the Conference on Uncertainty in Artificial Intelligence

- Aarup**, M., Arentoft, M. M., Parrod, Y., Stader, J., and Stokes, I. (1994). OPTIMUM-AIV: A knowledge-based planning and scheduling system for spacecraft AIV. In Fox, M. and Zweber, M. (Eds.), *Knowledge Based Scheduling*. Morgan Kaufmann.
- Abney**, S. (2007). *Semisupervised Learning for Computational Linguistics*. CRC Press.
- Abramson**, B. and Yung, M. (1989). Divide and conquer under global constraints: A solution to the N-queens problem. *J. Parallel and Distributed Computing*, 6(3), 649–662.
- Achlioptas**, D. (2009). Random satisfiability. In Biere, A., Heule, M., van Maaren, H., and Walsh, T. (Eds.), *Handbook of Satisfiability*. IOS Press.
- Achlioptas**, D., Beame, P., and Molloy, M. (2004). Exponential bounds for DPLL below the satisfiability threshold. In *SODA-04*.
- Achlioptas**, D., Naor, A., and Peres, Y. (2007). On the maximum satisfiability of random formulas. *JACM*, 54(2).
- Achlioptas**, D. and Peres, Y. (2004). The threshold for random k -SAT is $2k \log 2 - o(k)$. *J. American Mathematical Society*, 17(4), 947–973.
- Ackley**, D. H. and Littman, M. L. (1991). Interactions between learning and evolution. In Langton, C., Taylor, C., Farmer, J. D., and Ramussen, S. (Eds.), *Artificial Life II*, pp. 487–509. Addison-Wesley.
- Adelson-Velsky**, G. M., Arlazarov, V. L., Bitman, A. R., Zhivotovsky, A. A., and Uskov, A. V. (1970). Programming a computer to play chess. *Russian Mathematical Surveys*, 25, 221–262.
- Adida**, B. and Birbeck, M. (2008). RDFa primer. Tech. rep., W3C.
- Agerbeck**, C. and Hansen, M. O. (2008). A multi-agent approach to solving *NP*-complete problems. Master's thesis, Technical Univ. of Denmark.
- Aggarwal**, G., Goel, A., and Motwani, R. (2006). Truthful auctions for pricing search keywords. In *EC-06*, pp. 1–7.
- Agichtein**, E. and Gravano, L. (2003). Querying text databases for efficient information extraction. In *Proc. IEEE Conference on Data Engineering*.
- Agmon**, S. (1954). The relaxation method for linear inequalities. *Canadian Journal of Mathematics*, 6(3), 382–392.
- Agre**, P. E. and Chapman, D. (1987). Pengi: an implementation of a theory of activity. In *IJCAI-87*, pp. 268–272.
- Aho**, A. V., Hopcroft, J., and Ullman, J. D. (1974). *The Design and Analysis of Computer Algorithms*. Addison-Wesley.
- Aizerman**, M., Braverman, E., and Rozonoer, L. (1964). Theoretical foundations of the potential function method in pattern recognition learning. *Automation and Remote Control*, 25, 821–837.
- Al-Chang**, M., Bresina, J., Charest, L., Chase, A., Hsu, J., Jonsson, A., Kanefsky, B., Morris, P., Rajan, K., Yglesias, J., Chafin, B., Dias, W., and Mal dague, P. (2004). MAPGEN: Mixed-Initiative planning and scheduling for the Mars Exploration Rover mission. *IEEE Intelligent Systems*, 19(1), 8–12.
- Albus**, J. S. (1975). A new approach to manipulator control: The cerebellar model articulation controller (CMAC). *J. Dynamic Systems, Measurement, and Control*, 97, 270–277.
- Aldous**, D. and Vazirani, U. (1994). “Go with the winners” algorithms. In *FOCS-94*, pp. 492–501.
- Alekhnovich**, M., Hirsch, E. A., and Itsykson, D. (2005). Exponential lower bounds for the running time of DPLL algorithms on satisfiable formulas. *JAR*, 35(1–3), 51–72.
- Allais**, M. (1953). Le comportement de l'homme rationnel devant la risque: critique des postulats et axiomes de l'école Américaine. *Econometrica*, 21, 503–546.
- Allen**, J. F. (1983). Maintaining knowledge about temporal intervals. *CACM*, 26(11), 832–843.
- Allen**, J. F. (1984). Towards a general theory of action and time. *AII*, 23, 123–154.
- Allen**, J. F. (1991). Time and time again: The many ways to represent time. *Int. J. Intelligent Systems*, 6, 341–355.
- Allen**, J. F., Hendler, J., and Tate, A. (Eds.). (1990). *Readings in Planning*. Morgan Kaufmann.
- Allis**, L. (1988). A knowledge-based approach to connect four. The game is solved: White wins. Master's thesis, Vrije Univ., Amsterdam.
- Almuallim**, H. and Dietterich, T. (1991). Learning with many irrelevant features. In *AAAI-91*, Vol. 2, pp. 547–552.
- ALPAC** (1966). Language and machines: Computers in translation and linguistics. Tech. rep. 1416, The Automatic Language Processing Advisory Committee of the National Academy of Sciences.
- Alterman**, R. (1988). Adaptive planning. *Cognitive Science*, 12, 393–422.
- Amarel**, S. (1967). An approach to heuristic problem-solving and theorem proving in the propositional calculus. In Hart, J. and Takasu, S. (Eds.), *Systems and Computer Science*. University of Toronto Press.
- Amarel**, S. (1968). On representations of problems of reasoning about actions. In Michie, D. (Ed.), *Machine Intelligence 3*, Vol. 3, pp. 131–171. Elsevier/North-Holland.
- Amir**, E. and Russell, S. J. (2003). Logical filtering. In *IJCAI-03*.
- Amit**, D., Gutfreund, H., and Sompolinsky, H. (1985). Spin-glass models of neural networks. *Physical Review A*, 32, 1007–1018.
- Andersen**, S. K., Olesen, K. G., Jensen, F. V., and Jensen, F. (1989). HUGIN—A shell for building Bayesian belief universes for expert systems. In *IJCAI-89*, Vol. 2, pp. 1080–1085.
- Anderson**, J. R. (1980). *Cognitive Psychology and Its Implications*. W. H. Freeman.
- Anderson**, J. R. (1983). *The Architecture of Cognition*. Harvard University Press.
- Andoni**, A. and Indyk, P. (2006). Near-optimal hashing algorithms for approximate nearest neighbor in high dimensions. In *FOCS-06*.
- Andre**, D. and Russell, S. J. (2002). State abstraction for programmable reinforcement learning agents. In *AAAI-02*, pp. 119–125.
- Anthony**, M. and Bartlett, P. (1999). *Neural Network Learning: Theoretical Foundations*. Cambridge University Press.
- Aoki**, M. (1965). Optimal control of partially observable Markov systems. *J. Franklin Institute*, 280(5), 367–386.
- Appel**, K. and Haken, W. (1977). Every planar map is four colorable: Part I: Discharging. *Illinois J. Math.*, 21, 429–490.
- Appelt**, D. (1999). Introduction to information extraction. *CACM*, 12(3), 161–172.
- Apt**, K. R. (1999). The essence of constraint propagation. *Theoretical Computer Science*, 221(1–2), 179–210.
- Apt**, K. R. (2003). *Principles of Constraint Programming*. Cambridge University Press.
- Apté**, C., Damerau, F., and Weiss, S. (1994). Automated learning of decision rules for text categorization. *ACM Transactions on Information Systems*, 12, 233–251.
- Arbuthnot**, J. (1692). *Of the Laws of Chance*. Motte, London. Translation into English, with additions, of Huygens (1657).
- Archibald**, C., Altman, A., and Shoham, Y. (2009). Analysis of a winning computational billiards player. In *IJCAI-09*.
- Ariely**, D. (2009). *Predictably Irrational* (Revised edition). Harper.
- Arkin**, R. (1998). *Behavior-Based Robotics*. MIT Press.
- Armando**, A., Carboni, R., Compagna, L., Cuel lar, J., and Tobarra, L. (2008). Formal analysis of SAML 2.0 web browser single sign-on: Breaking the SAML-based single sign-on for google apps. In *FMSE '08: Proc. 6th ACM workshop on Formal methods in security engineering*, pp. 1–10.
- Arnould**, A. (1662). *La logique, ou l'art de penser*. Chez Charles Savreux, au pied de la Tour de Notre Dame, Paris.
- Arora**, S. (1998). Polynomial time approximation schemes for Euclidean traveling salesman and other geometric problems. *JACM*, 45(5), 753–782.
- Arunachalam**, R. and Sadeh, N. M. (2005). The supply chain trading agent competition. *Electronic Commerce Research and Applications*, Spring, 66–84.
- Ashby**, W. R. (1940). Adaptiveness and equilibrium. *J. Mental Science*, 86, 478–483.
- Ashby**, W. R. (1948). Design for a brain. *Electronic Engineering, December*, 379–383.
- Ashby**, W. R. (1952). *Design for a Brain*. Wiley.
- Asimov**, I. (1942). Runaround. *Astounding Science Fiction*, March.
- Asimov**, I. (1950). *I, Robot*. Doubleday.
- Astrom**, K. J. (1965). Optimal control of Markov decision processes with incomplete state estimation. *J. Math. Anal. Applic.*, 10, 174–205.
- Audi**, R. (Ed.). (1999). *The Cambridge Dictionary of Philosophy*. Cambridge University Press.
- Axelrod**, R. (1985). *The Evolution of Cooperation*. Basic Books.
- Baader**, F., Calvanese, D., McGuinness, D., Nardi, D., and Patel-Schneider, P. (2007). *The Description Logic Handbook* (2nd edition). Cambridge University Press.
- Baader**, F. and Snyder, W. (2001). Unification theory. In Robinson, J. and Voronkov, A. (Eds.), *Handbook of Automated Reasoning*, pp. 447–533. Elsevier.
- Bacchus**, F. (1990). *Representing and Reasoning with Probabilistic Knowledge*. MIT Press.
- Bacchus**, F. and Grove, A. (1995). Graphical models for preference and utility. In *UAI-95*, pp. 3–10.
- Bacchus**, F. and Grove, A. (1996). Utility independence in a qualitative decision theory. In *KR-96*, pp. 542–552.

- Bacchus**, F., Grove, A., Halpern, J. Y., and Koller, D. (1992). From statistics to beliefs. In *AAAI-92*, pp. 602–608.
- Bacchus**, F. and van Beek, P. (1998). On the conversion between non-binary and binary constraint satisfaction problems. In *AAAI-98*, pp. 311–318.
- Bacchus**, F. and van Run, P. (1995). Dynamic variable ordering in CSPs. In *CP-95*, pp. 258–275.
- Bachmann**, P. G. H. (1894). *Die analytische Zahlentheorie*. B. G. Teubner, Leipzig.
- Backus**, J. W. (1996). Transcript of question and answer session. In Wexelblat, R. L. (Ed.), *History of Programming Languages*, p. 162. Academic Press.
- Bagnell**, J. A. and Schneider, J. (2001). Autonomous helicopter control using reinforcement learning policy search methods. In *ICRA-01*.
- Baker**, J. (1975). The Dragon system—An overview. *IEEE Transactions on Acoustics; Speech; and Signal Processing*, 23, 24–29.
- Baker**, J. (1979). Trainable grammars for speech recognition. In *Speech Communication Papers for the 97th Meeting of the Acoustical Society of America*, pp. 547–550.
- Baldi**, P., Chauvin, Y., Hunkapiller, T., and McClure, M. (1994). Hidden Markov models of biological primary sequence information. *PNAS*, 91(3), 1059–1063.
- Baldwin**, J. M. (1896). A new factor in evolution. *American Naturalist*, 30, 441–451. Continued on pages 536–553.
- Ballard**, B. W. (1983). The *-minimax search procedure for trees containing chance nodes. *AIJ*, 21(3), 327–350.
- Baluja**, S. (1997). Genetic algorithms and explicit search statistics. In Mozer, M. C., Jordan, M. I., and Petsche, T. (Eds.), *NIPS 9*, pp. 319–325. MIT Press.
- Bancilhon**, F., Maier, D., Sagiv, Y., and Ullman, J. D. (1986). Magic sets and other strange ways to implement logic programs. In *PODS-86*, pp. 1–16.
- Banko**, M. and Brill, E. (2001). Scaling to very very large corpora for natural language disambiguation. In *ACL-01*, pp. 26–33.
- Banko**, M., Brill, E., Dumais, S. T., and Lin, J. (2002). Askmsr: Question answering using the worldwide web. In *Proc. AAAI Spring Symposium on Mining Answers from Texts and Knowledge Bases*, pp. 7–9.
- Banko**, M., Cafarella, M. J., Soderland, S., Broadhead, M., and Etzioni, O. (2007). Open information extraction from the web. In *IJCAI-07*.
- Banko**, M. and Etzioni, O. (2008). The tradeoffs between open and traditional relation extraction. In *ACL-08*, pp. 28–36.
- Bar-Hillel**, Y. (1954). Indexical expressions. *Mind*, 63, 359–379.
- Bar-Hillel**, Y. (1960). The present status of automatic translation of languages. In Alt, F. L. (Ed.), *Advances in Computers*, Vol. 1, pp. 91–163. Academic Press.
- Bar-Shalom**, Y. (Ed.). (1992). *Multitarget-multisensor tracking: Advanced applications*. Artech House.
- Bar-Shalom**, Y. and Fortmann, T. E. (1988). *Tracking and Data Association*. Academic Press.
- Bartak**, R. (2001). Theory and practice of constraint propagation. In *Proc. Third Workshop on Constraint Programming for Decision and Control (CPDC-01)*, pp. 7–14.
- Barto**, A. G., Bradtko, S. J., and Singh, S. P. (1995). Learning to act using real-time dynamic programming. *AIJ*, 73(1), 81–138.
- Barto**, A. G., Sutton, R. S., and Anderson, C. W. (1983). Neuron-like adaptive elements that can solve difficult learning control problems. *IEEE Transactions on Systems, Man and Cybernetics*, 13, 834–846.
- Barto**, A. G., Sutton, R. S., and Brouwer, P. S. (1981). Associative search network: A reinforcement learning associative memory. *Biological Cybernetics*, 40(3), 201–211.
- Barwise**, J. and Etchemendy, J. (1993). *The Language of First-Order Logic: Including the Macintosh Program Tarski's World 4.0* (Third Revised and Expanded edition). Center for the Study of Language and Information (CSLI).
- Barwise**, J. and Etchemendy, J. (2002). *Language, Proof and Logic*. CSLI (Univ. of Chicago Press).
- Baum**, E., Boneh, D., and Garrett, C. (1995). On genetic algorithms. In *COLT-95*, pp. 230–239.
- Baum**, E. and Haussler, D. (1989). What size net gives valid generalization? *Neural Computation*, 1(1), 151–160.
- Baum**, E. and Smith, W. D. (1997). A Bayesian approach to relevance in game playing. *AIJ*, 97(1–2), 195–242.
- Baum**, E. and Wilczek, F. (1988). Supervised learning of probability distributions by neural networks. In Anderson, D. Z. (Ed.), *Neural Information Processing Systems*, pp. 52–61. American Institute of Physics.
- Baum**, L. E. and Petrie, T. (1966). Statistical inference for probabilistic functions of finite state Markov chains. *Annals of Mathematical Statistics*, 41.
- Baxter**, J. and Bartlett, P. (2000). Reinforcement learning in POMDP's via direct gradient ascent. In *ICML-00*, pp. 41–48.
- Bayardo**, R. J. and Miranker, D. P. (1994). An optimal backtrack algorithm for tree-structured constraint satisfaction problems. *AIJ*, 71(1), 159–181.
- Bayardo**, R. J. and Schrag, R. C. (1997). Using CSP look-back techniques to solve real-world SAT instances. In *AAAI-97*, pp. 203–208.
- Bayes**, T. (1763). An essay towards solving a problem in the doctrine of chances. *Philosophical Transactions of the Royal Society of London*, 53, 370–418.
- Beal**, D. F. (1980). An analysis of minimax. In Clarke, M. R. B. (Ed.), *Advances in Computer Chess 2*, pp. 103–109. Edinburgh University Press.
- Beal**, J. and Winston, P. H. (2009). The new frontier of human-level artificial intelligence. *IEEE Intelligent Systems*, 24(4), 21–23.
- Beckert**, B. and Posegga, J. (1995). Leantap: Lean, tableau-based deduction. *JAR*, 15(3), 339–358.
- Beeri**, C., Fagin, R., Maier, D., and Yannakakis, M. (1983). On the desirability of acyclic database schemes. *JACM*, 30(3), 479–513.
- Bekey**, G. (2008). *Robotics: State Of The Art And Future Challenges*. Imperial College Press.
- Bell**, C. and Tate, A. (1985). Using temporal constraints to restrict search in a planner. In *Proc. Third Alvey IKBS SIG Workshop*.
- Bell**, J. L. and Machover, M. (1977). *A Course in Mathematical Logic*. Elsevier/North-Holland.
- Bellman**, R. E. (1952). On the theory of dynamic programming. *PNAS*, 38, 716–719.
- Bellman**, R. E. (1961). *Adaptive Control Processes: A Guided Tour*. Princeton University Press.
- Bellman**, R. E. (1965). On the application of dynamic programming to the determination of optimal play in chess and checkers. *PNAS*, 53, 244–246.
- Bellman**, R. E. (1978). *An Introduction to Artificial Intelligence: Can Computers Think?* Boyd & Fraser Publishing Company.
- Bellman**, R. E. (1984). *Eye of the Hurricane*. World Scientific.
- Bellman**, R. E. and Dreyfus, S. E. (1962). *Applied Dynamic Programming*. Princeton University Press.
- Bellman**, R. E. (1957). *Dynamic Programming*. Princeton University Press.
- Belongie**, S., Malik, J., and Puzicha, J. (2002). Shape matching and object recognition using shape contexts. *PAMI*, 24(4), 509–522.
- Ben-Tal**, A. and Nemirovski, A. (2001). *Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications*. SIAM (Society for Industrial and Applied Mathematics).
- Bengio**, Y. and LeCun, Y. (2007). Scaling learning algorithms towards AI. In Bottou, L., Chapelle, O., DeCoste, D., and Weston, J. (Eds.), *Large-Scale Kernel Machines*. MIT Press.
- Bentham**, J. (1823). *Principles of Morals and Legislation*. Oxford University Press, Oxford, UK. Original work published in 1789.
- Berger**, J. O. (1985). *Statistical Decision Theory and Bayesian Analysis*. Springer Verlag.
- Berkson**, J. (1944). Application of the logistic function to bio-assay. *JASA*, 39, 357–365.
- Berlekamp**, E. R., Conway, J. H., and Guy, R. K. (1982). *Winning Ways, For Your Mathematical Plays*. Academic Press.
- Berlekamp**, E. R. and Wolfe, D. (1994). *Mathematical Go: Chilling Gets the Last Point*. A.K. Peters.
- Berleur**, J. and Brunnstein, K. (2001). *Ethics of Computing: Codes, Spaces for Discussion and Law*. Chapman and Hall.
- Berliner**, H. J. (1979). The B* tree search algorithm: A best-first proof procedure. *AIJ*, 12(1), 23–40.
- Berliner**, H. J. (1980a). Backgammon computer program beats world champion. *AIJ*, 14, 205–220.
- Berliner**, H. J. (1980b). Computer backgammon. *Scientific American*, 249(6), 64–72.
- Bernardo**, J. M. and Smith, A. F. M. (1994). *Bayesian Theory*. Wiley.
- Berners-Lee**, T., Hendler, J., and Lassila, O. (2001). The semantic web. *Scientific American*, 284(5), 34–43.
- Bernoulli**, D. (1738). Specimen theoriae novae de mensura sortis. *Proc. St. Petersburg Imperial Academy of Sciences*, 5, 175–192.
- Bernstein**, A. and Roberts, M. (1958). Computer vs. chess player. *Scientific American*, 198(6), 96–105.
- Bernstein**, P. L. (1996). *Against the Odds: The Remarkable Story of Risk*. Wiley.
- Berrou**, C., Glavieux, A., and Thitimajshima, P. (1993). Near Shannon limit error control-correcting coding and decoding: Turbo-codes. 1. In *Proc. IEEE International Conference on Communications*, pp. 1064–1070.
- Berry**, D. A. and Fristedt, B. (1985). *Bandit Problems: Sequential Allocation of Experiments*. Chapman and Hall.

- Bertele**, U. and Brioschi, F. (1972). *Nonserial dynamic programming*. Academic Press.
- Bertoli**, P., Cimatti, A., and Roveri, M. (2001a). Heuristic search + symbolic model checking = efficient conformant planning. In *IJCAI-01*, pp. 467–472.
- Bertoli**, P., Cimatti, A., Roveri, M., and Traverso, P. (2001b). Planning in nondeterministic domains under partial observability via symbolic model checking. In *IJCAI-01*, pp. 473–478.
- Bertot**, Y., Casteran, P., Huet, G., and Paulin-Mohring, C. (2004). *Interactive Theorem Proving and Program Development*. Springer.
- Bertsekas**, D. (1987). *Dynamic Programming: Deterministic and Stochastic Models*. Prentice-Hall.
- Bertsekas**, D. and Tsitsiklis, J. N. (1996). *Neurodynamic programming*. Athena Scientific.
- Bertsekas**, D. and Tsitsiklis, J. N. (2008). *Introduction to Probability* (2nd edition). Athena Scientific.
- Bertsekas**, D. and Shreve, S. E. (2007). *Stochastic Optimal Control: The Discrete-Time Case*. Athena Scientific.
- Bessière**, C. (2006). Constraint propagation. In Rossi, F., van Beek, P., and Walsh, T. (Eds.), *Handbook of Constraint Programming*. Elsevier.
- Bhar**, R. and Hamori, S. (2004). *Hidden Markov Models: Applications to Financial Economics*. Springer.
- Bibel**, W. (1993). *Deduction: Automated Logic*. Academic Press.
- Biere**, A., Heule, M., van Maaren, H., and Walsh, T. (Eds.). (2009). *Handbook of Satisfiability*. IOS Press.
- Billings**, D., Burch, N., Davidson, A., Holte, R., Schaeffer, J., Schauenberg, T., and Szafrań, D. (2003). Approximating game-theoretic optimal strategies for full-scale poker. In *IJCAI-03*.
- Binder**, J., Koller, D., Russell, S. J., and Kanazawa, K. (1997a). Adaptive probabilistic networks with hidden variables. *Machine Learning*, 29, 213–244.
- Binder**, J., Murphy, K., and Russell, S. J. (1997b). Space-efficient inference in dynamic probabilistic networks. In *IJCAI-97*, pp. 1292–1296.
- Binford**, T. O. (1971). Visual perception by computer. Invited paper presented at the IEEE Systems Science and Cybernetics Conference, Miami.
- Binmore**, K. (1982). *Essays on Foundations of Game Theory*. Pitman.
- Bishop**, C. M. (1995). *Neural Networks for Pattern Recognition*. Oxford University Press.
- Bishop**, C. M. (2007). *Pattern Recognition and Machine Learning*. Springer-Verlag.
- Bisson**, T. (1990). They're made out of meat. *Omni Magazine*.
- Bistarelli**, S., Montanari, U., and Rossi, F. (1997). Semiring-based constraint satisfaction and optimization. *JACM*, 44(2), 201–236.
- Bitner**, J. R. and Reingold, E. M. (1975). Backtrack programming techniques. *CACM*, 18(11), 651–656.
- Bizer**, C., Auer, S., Kobilarov, G., Lehmann, J., and Cyganiak, R. (2007). DBpedia – querying wikipedia like a database. In *Developers Track Presentation at the 16th International Conference on World Wide Web*.
- Blazewicz**, J., Ecker, K., Pesch, E., Schmidt, G., and Weglarz, J. (2007). *Handbook on Scheduling: Models and Methods for Advanced Planning* (*International Handbooks on Information Systems*). Springer-Verlag New York, Inc.
- Blei**, D. M., Ng, A. Y., and Jordan, M. I. (2001). Latent Dirichlet Allocation. In *Neural Information Processing Systems*, Vol. 14.
- Blinder**, A. S. (1983). Issues in the coordination of monetary and fiscal policies. In *Monetary Policy Issues in the 1980s*. Federal Reserve Bank, Kansas City, Missouri.
- Bliss**, C. I. (1934). The method of probits. *Science*, 79(2037), 38–39.
- Block**, H. D., Knight, B., and Rosenblatt, F. (1962). Analysis of a four-layer series-coupled perceptron. *Rev. Modern Physics*, 34(1), 275–282.
- Blum**, A. L. and Furst, M. (1995). Fast planning through planning graph analysis. In *IJCAI-95*, pp. 1636–1642.
- Blum**, A. L. and Furst, M. (1997). Fast planning through planning graph analysis. *AIJ*, 90(1–2), 281–300.
- Blum**, A. L. (1996). On-line algorithms in machine learning. In *Proc. Workshop on On-Line Algorithms, Dagstuhl*, pp. 306–325.
- Blum**, A. L. and Mitchell, T. M. (1998). Combining labeled and unlabeled data with co-training. In *COLT-98*, pp. 92–100.
- Blumer**, A., Ehrenfeucht, A., Haussler, D., and Warmuth, M. (1989). Learnability and the Vapnik-Chervonenkis dimension. *JACM*, 36(4), 929–965.
- Bobrow**, D. G. (1967). Natural language input for a computer problem solving system. In Minsky, M. L. (Ed.), *Semantic Information Processing*, pp. 133–215. MIT Press.
- Bobrow**, D. G., Kaplan, R., Kay, M., Norman, D. A., Thompson, H., and Winograd, T. (1977). GUS, a frame driven dialog system. *AIJ*, 8, 155–173.
- Boden**, M. A. (1977). *Artificial Intelligence and Natural Man*. Basic Books.
- Boden**, M. A. (Ed.). (1990). *The Philosophy of Artificial Intelligence*. Oxford University Press.
- Bolognesi**, A. and Ciancarini, P. (2003). Computer programming of kriegspiel endings: The case of KR vs. k. In *Advances in Computer Games 10*.
- Bonet**, B. (2002). An epsilon-optimal grid-based algorithm for partially observable Markov decision processes. In *ICML-02*, pp. 51–58.
- Bonet**, B. and Geffner, H. (1999). Planning as heuristic search: New results. In *ECP-99*, pp. 360–372.
- Bonet**, B. and Geffner, H. (2000). Planning with incomplete information as heuristic search in belief space. In *ICAPS-00*, pp. 52–61.
- Bonet**, B. and Geffner, H. (2005). An algorithm better than AO*? In *AAAI-05*.
- Boole**, G. (1847). *The Mathematical Analysis of Logic: Being an Essay towards a Calculus of Deductive Reasoning*. Macmillan, Barclay, and Macmillan, Cambridge.
- Booth**, T. L. (1969). Probabilistic representation of formal languages. In *IEEE Conference Record of the 1969 Tenth Annual Symposium on Switching and Automata Theory*, pp. 74–81.
- Borel**, E. (1921). La théorie du jeu et les équations intégrales à noyau symétrique. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, 173, 1304–1308.
- Borenstein**, J., Everett, B., and Feng, L. (1996). *Navigating Mobile Robots: Systems and Techniques*. A. K. Peters, Ltd.
- Borenstein**, J. and Koren, Y. (1991). The vector field histogram—Fast obstacle avoidance for mobile robots. *IEEE Transactions on Robotics and Automation*, 7(3), 278–288.
- Borgida**, A., Brachman, R. J., McGuinness, D., and Alperin Resnick, L. (1989). CLASSIC: A structural data model for objects. *SIGMOD Record*, 18(2), 58–67.
- Boroditsky**, L. (2003). Linguistic relativity. In Nadel, L. (Ed.), *Encyclopedia of Cognitive Science*, pp. 917–921. Macmillan.
- Bošer**, B., Guyon, I., and Vapnik, V. N. (1992). A training algorithm for optimal margin classifiers. In *COLT-92*.
- Bosse**, M., Newman, P., Leonard, J., Soika, M., Feiten, W., and Teller, S. (2004). Simultaneous localization and map building in large-scale cyclic environments using the atlas framework. *Int. J. Robotics Research*, 23(12), 1113–1139.
- Bourzutschky**, M. (2006). 7-man endgames with pawns. *CCRL Discussion Board*, kirill-kryukov.com/chess/discussion-board/viewtopic.php?t=805.
- Boutilier**, C. and Brafman, R. I. (2001). Partial-order planning with concurrent interacting actions. *JAIR*, 14, 105–136.
- Boutilier**, C., Dearden, R., and Goldszmidt, M. (2000). Stochastic dynamic programming with factored representations. *AIJ*, 121, 49–107.
- Boutilier**, C., Reiter, R., and Price, B. (2001). Symbolic dynamic programming for first-order MDPs. In *IJCAI-01*, pp. 467–472.
- Boutilier**, C., Friedman, N., Goldszmidt, M., and Koller, D. (1996). Context-specific independence in Bayesian networks. In *UAI-96*, pp. 115–123.
- Bouzy**, B. and Cazenave, T. (2001). Computer go: An AI oriented survey. *AIJ*, 132(1), 39–103.
- Bowerman**, M. and Levinson, S. (2001). *Language acquisition and conceptual development*. Cambridge University Press.
- Bowling**, M., Johanson, M., Burch, N., and Szafrań, D. (2008). Strategy evaluation in extensive games with importance sampling. In *ICML-08*.
- Box**, G. E. P. (1957). Evolutionary operation: A method of increasing industrial productivity. *Applied Statistics*, 6, 81–101.
- Box**, G. E. P., Jenkins, G., and Reinsel, G. (1994). *Time Series Analysis: Forecasting and Control* (3rd edition). Prentice Hall.
- Boyan**, J. A. (2002). Technical update: Least-squares temporal difference learning. *Machine Learning*, 49(2–3), 233–246.
- Boyan**, J. A. and Moore, A. W. (1998). Learning evaluation functions for global optimization and Boolean satisfiability. In *AAAI-98*.
- Boyd**, S. and Vandenberghe, L. (2004). *Convex Optimization*. Cambridge University Press.
- Boyan**, X., Friedman, N., and Koller, D. (1999). Discovering the hidden structure of complex dynamic systems. In *UAI-99*.
- Boyer**, R. S. and Moore, J. S. (1979). *A Computational Logic*. Academic Press.
- Boyer**, R. S. and Moore, J. S. (1984). Proof checking the RSA public key encryption algorithm. *American Mathematical Monthly*, 91(3), 181–189.

- Brachman, R. J.** (1979). On the epistemological status of semantic networks. In Findler, N. V. (Ed.), *Associative Networks: Representation and Use of Knowledge by Computers*, pp. 3–50. Academic Press.
- Brachman, R. J., Fikes, R. E., and Levesque, H. J.** (1983). Krypton: A functional approach to knowledge representation. *Computer*, 16(10), 67–73.
- Brachman, R. J. and Levesque, H. J.** (Eds.). (1985). *Readings in Knowledge Representation*. Morgan Kaufmann.
- Bradtko, S. J. and Barto, A. G.** (1996). Linear least-squares algorithms for temporal difference learning. *Machine Learning*, 22, 33–57.
- Brafman, O. and Brafman, R.** (2009). *Sway: The Irresistible Pull of Irrational Behavior*. Broadway Business.
- Brafman, R. I. and Domshlak, C.** (2008). From one to many: Planning for loosely coupled multi-agent systems. In *ICAPS-08*, pp. 28–35.
- Brafman, R. I. and Tennenholz, M.** (2000). A near optimal polynomial time algorithm for learning in certain classes of stochastic games. *AII*, 121, 31–47.
- Braitenberg, V.** (1984). *Vehicles: Experiments in Synthetic Psychology*. MIT Press.
- Bransford, J. and Johnson, M.** (1973). Consideration of some problems in comprehension. In Chase, W. G. (Ed.), *Visual Information Processing*. Academic Press.
- Brants, T., Popat, A. C., Xu, P., Och, F. J., and Dean, J.** (2007). Large language models in machine translation. In *EMNLP-CoNLL-2007: Proc. 2007 Joint Conference on Empirical Methods in Natural Language Processing and Computational Natural Language Learning*, pp. 858–867.
- Bratko, I.** (1986). *Prolog Programming for Artificial Intelligence* (1st edition). Addison-Wesley.
- Bratko, I.** (2001). *Prolog Programming for Artificial Intelligence* (Third edition). Addison-Wesley.
- Bratman, M. E.** (1987). *Intention, Plans, and Practical Reason*. Harvard University Press.
- Bratman, M. E.** (1992). Planning and the stability of intention. *Minds and Machines*, 2(1), 1–16.
- Breese, J. S.** (1992). Construction of belief and decision networks. *Computational Intelligence*, 8(4), 624–647.
- Breese, J. S. and Heckerman, D.** (1996). Decision-theoretic troubleshooting: A framework for repair and experiment. In *UAI-96*, pp. 124–132.
- Breiman, L.** (1996). Bagging predictors. *Machine Learning*, 24(2), 123–140.
- Breiman, L., Friedman, J., Olshen, R. A., and Stone, C. J.** (1984). *Classification and Regression Trees*. Wadsworth International Group.
- Brelaz, D.** (1979). New methods to color the vertices of a graph. *CACM*, 22(4), 251–256.
- Brent, R. P.** (1973). *Algorithms for minimization without derivatives*. Prentice-Hall.
- Bresnan, J.** (1982). *The Mental Representation of Grammatical Relations*. MIT Press.
- Brewka, G., Dix, J., and Konolige, K.** (1997). *Nonmonotonic Reasoning: An Overview*. CSLI Publications.
- Brickley, D. and Guha, R. V.** (2004). RDF vocabulary description language 1.0: RDF schema. Tech. rep., W3C.
- Bridle, J. S.** (1990). Probabilistic interpretation of feedforward classification network outputs, with relationships to statistical pattern recognition. In Fogelman Soulié, F. and Héault, J. (Eds.), *Neurocomputing: Algorithms, Architectures and Applications*. Springer-Verlag.
- Briggs, R.** (1985). Knowledge representation in Sanskrit and artificial intelligence. *AI Mag*, 6(1), 32–39.
- Brin, D.** (1998). *The Transparent Society*. Perseus.
- Brin, S.** (1999). Extracting patterns and relations from the world wide web. Technical report 1999-65, Stanford InfoLab.
- Brin, S. and Page, L.** (1998). The anatomy of a large-scale hypertextual web search engine. In *Proc. Seventh World Wide Web Conference*.
- Bringsjord, S.** (2008). If I were judge. In Epstein, R., Roberts, G., and Beber, G. (Eds.), *Parsing the Turing Test*. Springer.
- Broadbent, D. E.** (1958). *Perception and Communication*. Pergamon.
- Brooks, R. A.** (1986). A robust layered control system for a mobile robot. *IEEE Journal of Robotics and Automation*, 2, 14–23.
- Brooks, R. A.** (1989). Engineering approach to building complete, intelligent beings. *Proc. SPIE—the International Society for Optical Engineering*, 1002, 618–625.
- Brooks, R. A.** (1991). Intelligence without representation. *AII*, 47(1–3), 139–159.
- Brooks, R. A. and Lozano-Perez, T.** (1985). A subdivision algorithm in configuration space for find-path with rotation. *IEEE Transactions on Systems, Man and Cybernetics*, 15(2), 224–233.
- Brown, C., Finkelstein, L., and Purdom, P.** (1988). Backtrack searching in the presence of symmetry. In Mora, T. (Ed.), *Applied Algebra, Algebraic Algorithms and Error-Correcting Codes*, pp. 99–110. Springer-Verlag.
- Brown, K. C.** (1974). A note on the apparent bias of net revenue estimates. *J. Finance*, 29, 1215–1216.
- Brown, P. F., Cocke, J., Della Pietra, S. A., Della Pietra, V. J., Jelinek, F., Mercer, R. L., and Roossin, P.** (1988). A statistical approach to language translation. In *COLING-88*, pp. 71–76.
- Brown, P. F., Della Pietra, S. A., Della Pietra, V. J., and Mercer, R. L.** (1993). The mathematics of statistical machine translation: Parameter estimation. *Computational Linguistics*, 19(2), 263–311.
- Brownston, L., Farrell, R., Kant, E., and Martin, N.** (1985). *Programming expert systems in OPS5: An introduction to rule-based programming*. Addison-Wesley.
- Bruce, V., Georgeson, M., and Green, P.** (2003). *Visual Perception: Physiology, Psychology and Ecology*. Psychology Press.
- Bruner, J. S., Goodnow, J. J., and Austin, G. A.** (1957). *A Study of Thinking*. Wiley.
- Bryant, B. D. and Miikkulainen, R.** (2007). Acquiring visibly intelligent behavior with example-guided neuroevolution. In *AAAI-07*.
- Bryce, D. and Kambhampati, S.** (2007). A tutorial on planning graph-based reachability heuristics. *AI Mag*, Spring, 47–83.
- Bryce, D., Kambhampati, S., and Smith, D. E.** (2006). Planning graph heuristics for belief space search. *JAIR*, 26, 35–99.
- Bryson, A. E. and Ho, Y.-C.** (1969). *Applied Optimal Control*. Blaisdell.
- Buchanan, B. G. and Mitchell, T. M.** (1978). Model-directed learning of production rules. In Waterman, D. A. and Hayes-Roth, F. (Eds.), *Pattern-Directed Inference Systems*, pp. 297–312. Academic Press.
- Buchanan, B. G., Mitchell, T. M., Smith, R. G., and Johnson, C. R.** (1978). Models of learning systems. In *Encyclopedia of Computer Science and Technology*, Vol. 11. Dekker.
- Buchanan, B. G. and Shortliffe, E. H.** (Eds.). (1984). *Rule-Based Expert Systems: The MYCIN Experiments of the Stanford Heuristic Programming Project*. Addison-Wesley.
- Buchanan, B. G., Sutherland, G. L., and Feigenbaum, E. A.** (1969). Heuristic DENDRAL: A program for generating explanatory hypotheses in organic chemistry. In Meltzer, B., Michie, D., and Swann, M. (Eds.), *Machine Intelligence 4*, pp. 209–254. Edinburgh University Press.
- Buehler, M., Iagnemma, K., and Singh, S.** (Eds.). (2006). *The 2005 DARPA Grand Challenge: The Great Robot Race*. Springer-Verlag.
- Bunt, H. C.** (1985). The formal representation of (quasi-) continuous concepts. In Hobbs, J. R. and Moore, R. C. (Eds.), *Formal Theories of the Commonsense World*, chap. 2, pp. 37–70. Ablex.
- Burgard, W., Cremers, A. B., Fox, D., Hähnel, D., Lakemeyer, G., Schulz, D., Steiner, W., and Thrun, S.** (1999). Experiences with an interactive museum tour-guide robot. *AII*, 114(1–2), 3–55.
- Buro, M.** (1995). ProbCut: An effective selective extension of the alpha-beta algorithm. *J. International Computer Chess Association*, 18(2), 71–76.
- Buro, M.** (2002). Improving heuristic mini-max search by supervised learning. *AII*, 134(1–2), 85–99.
- Burstein, J., Leacock, C., and Swartz, R.** (2001). Automated evaluation of essays and short answers. In *Fifth International Computer Assisted Assessment (CAA) Conference*.
- Burton, R.** (2009). *On Being Certain: Believing You Are Right Even When You're Not*. St. Martin's Griffin.
- Buss, D. M.** (2005). *Handbook of evolutionary psychology*. Wiley.
- Butler, S.** (1863). Darwin among the machines. *The Press (Christchurch, New Zealand)*, June 13.
- Bylander, T.** (1992). Complexity results for serial decomposability. In *AAAI-92*, pp. 729–734.
- Bylander, T.** (1994). The computational complexity of propositional STRIPS planning. *AII*, 69, 165–204.
- Byrd, R. H., Lu, P., Nocedal, J., and Zhu, C.** (1995). A limited memory algorithm for bound constrained optimization. *SIAM Journal on Scientific and Statistical Computing*, 16(5), 1190–1208.
- Cabeza, R. and Nyberg, L.** (2001). Imaging cognition II: An empirical review of 275 PET and fMRI studies. *J. Cognitive Neuroscience*, 12, 1–47.
- Cafarella, M. J., Halevy, A., Zhang, Y., Wang, D. Z., and Wu, E.** (2008). Webtables: Exploring the power of tables on the web. In *VLDB-2008*.
- Calvanese, D., Lenzerini, M., and Nardi, D.** (1999). Unifying class-based representation formalisms. *JAIR*, 11, 199–240.
- Campbell, M. S., Hoane, A. J., and Hsu, F.-H.** (2002). Deep Blue. *AII*, 134(1–2), 57–83.

- Canny**, J. and Reif, J. (1987). New lower bound techniques for robot motion planning problems. In *FOCS-87*, pp. 39–48.
- Canny**, J. (1986). A computational approach to edge detection. *PAMI*, 8, 679–698.
- Canny**, J. (1988). *The Complexity of Robot Motion Planning*. MIT Press.
- Capen**, E., Clapp, R., and Campbell, W. (1971). Competitive bidding in high-risk situations. *J. Petroleum Technology*, 23, 641–653.
- Caprara**, A., Fischetti, M., and Toth, P. (1995). A heuristic method for the set covering problem. *Operations Research*, 47, 730–743.
- Carbonell**, J. G. (1983). Derivational analogy and its role in problem solving. In *AAAI-83*, pp. 64–69.
- Carbonell**, J. G., Knoblock, C. A., and Minton, S. (1989). PRODIGY: An integrated architecture for planning and learning. Technical report CMU-CS-89-189, Computer Science Department, Carnegie Mellon University.
- Carbonell**, J. R. and Collins, A. M. (1973). Natural semantics in artificial intelligence. In *IJCAI-73*, pp. 344–351.
- Cardano**, G. (1663). *Liber de ludo aleae*. Lyons.
- Carnap**, R. (1928). *Der logische Aufbau der Welt*. Weltkreis-verlag. Translated into English as (Carnap, 1967).
- Carnap**, R. (1948). On the application of inductive logic. *Philosophy and Phenomenological Research*, 8, 133–148.
- Carnap**, R. (1950). *Logical Foundations of Probability*. University of Chicago Press.
- Carroll**, S. (2007). *The Making of the Fittest: DNA and the Ultimate Forensic Record of Evolution*. Norton.
- Casati**, R. and Varzi, A. (1999). *Parts and places: the structures of spatial representation*. MIT Press.
- Cassandra**, A. R., Kaelbling, L. P., and Littman, M. L. (1994). Acting optimally in partially observable stochastic domains. In *AAAI-94*, pp. 1023–1028.
- Cassandras**, C. G. and Lygeros, J. (2006). *Stochastic Hybrid Systems*. CRC Press.
- Castro**, R., Coates, M., Liang, G., Nowak, R., and Yu, B. (2004). Network tomography: Recent developments. *Statistical Science*, 19(3), 499–517.
- Cesa-Bianchi**, N. and Lugosi, G. (2006). *Prediction, learning, and Games*. Cambridge University Press.
- Cesta**, A., Cortellessa, G., Denis, M., Donati, A., Fratini, S., Oddi, A., Pollicella, N., Rabenau, E., and Schulster, J. (2007). MEXAR2: AI solves mission planner problems. *IEEE Intelligent Systems*, 22(4), 12–19.
- Chakrabarti**, P. P., Ghose, S., Acharya, A., and de Sarkar, S. C. (1989). Heuristic search in restricted memory. *AII*, 4(2), 197–222.
- Chandra**, A. K. and Harel, D. (1980). Computable queries for relational data bases. *J. Computer and System Sciences*, 21(2), 156–178.
- Chang**, C.-L. and Lee, R. C.-T. (1973). *Symbolic Logic and Mechanical Theorem Proving*. Academic Press.
- Chapman**, D. (1987). Planning for conjunctive goals. *AII*, 32(3), 333–377.
- Charniak**, E. (1993). *Statistical Language Learning*. MIT Press.
- Charniak**, E. (1996). Tree-bank grammars. In *AAAI-96*, pp. 1031–1036.
- Charniak**, E. (1997). Statistical parsing with a context-free grammar and word statistics. In *AAAI-97*, pp. 598–603.
- Charniak**, E. and Goldman, R. (1992). A Bayesian model of plan recognition. *AII*, 64(1), 53–79.
- Charniak**, E. and McDermott, D. (1985). *Introduction to Artificial Intelligence*. Addison-Wesley.
- Charniak**, E., Riesbeck, C., McDermott, D., and Meehan, J. (1987). *Artificial Intelligence Programming* (2nd edition). Lawrence Erlbaum Associates.
- Charniak**, E. (1991). Bayesian networks without tears. *AIMag*, 12(4), 50–63.
- Charniak**, E. and Johnson, M. (2005). Coarse-to-fine n-best parsing and maxent discriminative reranking. In *ACL-05*.
- Chater**, N. and Oaksford, M. (Eds.). (2008). *The probabilistic mind: Prospects for Bayesian cognitive science*. Oxford University Press.
- Chatfield**, C. (1989). *The Analysis of Time Series: An Introduction* (4th edition). Chapman and Hall.
- Cheeseman**, P. (1985). In defense of probability. In *IJCAI-85*, pp. 1002–1009.
- Cheeseman**, P. (1988). An inquiry into computer understanding. *Computational Intelligence*, 4(1), 58–66.
- Cheeseman**, P., Kanefsky, B., and Taylor, W. (1991). Where the really hard problems are. In *IJCAI-91*, pp. 331–337.
- Cheeseman**, P., Self, M., Kelly, J., and Stutz, J. (1988). Bayesian classification. In *AAAI-88*, Vol. 2, pp. 607–611.
- Cheeseman**, P. and Stutz, J. (1996). Bayesian classification (AutoClass): Theory and results. In Fayad, U., Piateski-Shapiro, G., Smyth, P., and Uthurusamy, R. (Eds.), *Advances in Knowledge Discovery and Data Mining*. AAAI Press/MIT Press.
- Chen**, S. F. and Goodman, J. (1996). An empirical study of smoothing techniques for language modeling. In *ACL-96*, pp. 310–318.
- Cheng**, J. and Druzdzel, M. J. (2000). AIS-BN: An adaptive importance sampling algorithm for evidential reasoning in large Bayesian networks. *JAIR*, 13, 155–188.
- Cheng**, J., Greiner, R., Kelly, J., Bell, D. A., and Liu, W. (2002). Learning Bayesian networks from data: An information-theory based approach. *AII*, 137, 43–90.
- Chklovski**, T. and Gil, Y. (2005). Improving the design of intelligent acquisition interfaces for collecting world knowledge from web contributors. In *Proc. Third International Conference on Knowledge Capture (K-CAP)*.
- Chomsky**, N. (1956). Three models for the description of language. *IRE Transactions on Information Theory*, 2(3), 113–124.
- Chomsky**, N. (1957). *Syntactic Structures*. Mouton.
- Choset**, H. (1996). *Sensor Based Motion Planning: The Hierarchical Generalized Voronoi Graph*. Ph.D. thesis, California Institute of Technology.
- Choset**, H., Lynch, K., Hutchinson, S., Kantor, G., Burgard, W., Kavraki, L., and Thrun, S. (2004). *Principles of Robotic Motion: Theory, Algorithms, and Implementation*. MIT Press.
- Chung**, K. L. (1979). *Elementary Probability Theory with Stochastic Processes* (3rd edition). Springer-Verlag.
- Church**, A. (1936). A note on the Entscheidungsproblem. *JSL*, 1, 40–41 and 101–102.
- Church**, A. (1956). *Introduction to Mathematical Logic*. Princeton University Press.
- Church**, K. and Patil, R. (1982). Coping with syntactic ambiguity or how to put the block in the box on the table. *Computational Linguistics*, 8(3–4), 139–149.
- Church**, K. (2004). Speech and language processing: Can we use the past to predict the future. In *Proc. Conference on Text, Speech, and Dialogue*.
- Church**, K. and Gale, W. A. (1991). A comparison of the enhanced Good–Turing and deleted estimation methods for estimating probabilities of English bigrams. *Computer Speech and Language*, 5, 19–54.
- Churchland**, P. M. and Churchland, P. S. (1982). Functionalism, qualia, and intentionality. In Biro, J. I. and Shaham, R. W. (Eds.), *Mind, Brain and Function: Essays in the Philosophy of Mind*, pp. 121–145. University of Oklahoma Press.
- Churchland**, P. S. (1986). *Neurophilosophy: Toward a Unified Science of the Mind–Brain*. MIT Press.
- Ciancarini**, P. and Wooldridge, M. (2001). *Agent-Oriented Software Engineering*. Springer-Verlag.
- Cimatti**, A., Roveri, M., and Traverso, P. (1998). Automatic OBDD-based generation of universal plans in non-deterministic domains. In *AAAI-98*, pp. 875–881.
- Clark**, A. (1998). *Being There: Putting Brain, Body, and World Together Again*. MIT Press.
- Clark**, A. (2008). *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*. Oxford University Press.
- Clark**, K. L. (1978). Negation as failure. In Gallaire, H. and Minker, J. (Eds.), *Logic and Data Bases*, pp. 293–322. Plenum.
- Clark**, P. and Niblett, T. (1989). The CN2 induction algorithm. *Machine Learning*, 3, 261–283.
- Clark**, S. and Curran, J. R. (2004). Parsing the WSJ using CCG and log-linear models. In *ACL-04*, pp. 104–111.
- Clarke**, A. C. (1968a). *2001: A Space Odyssey*. Signet.
- Clarke**, A. C. (1968b). The world of 2001. *Vogue*.
- Clarke**, E. and Grumberg, O. (1987). Research on automatic verification of finite-state concurrent systems. *Annual Review of Computer Science*, 2, 269–290.
- Clarke**, M. R. B. (Ed.). (1977). *Advances in Computer Chess 1*. Edinburgh University Press.
- Clearwater**, S. H. (Ed.). (1996). *Market-Based Control*. World Scientific.
- Clocksin**, W. F. and Mellish, C. S. (2003). *Programming in Prolog* (5th edition). Springer-Verlag.
- Clocksin**, W. F. (2003). *Clause and Effect: Prolog Programming for the Working Programmer*. Springer.
- Coarfa**, C., Demopoulos, D., Aguirre, A., Subramanian, D., and Yardi, M. (2003). Random 3-SAT: The plot thickens. *Constraints*, 8(3), 243–261.
- Coates**, A., Abbeel, P., and Ng, A. Y. (2009). Apprenticeship learning for helicopter control. *JACM*, 52(7), 97–105.
- Cobham**, A. (1964). The intrinsic computational difficulty of functions. In *Proc. 1964 International Congress for Logic, Methodology, and Philosophy of Science*, pp. 24–30.

- Cohen, P. R.** (1995). *Empirical methods for artificial intelligence*. MIT Press.
- Cohen, P. R.** and **Levesque, H. J.** (1990). Intention is choice with commitment. *AIJ*, 42(2–3), 213–261.
- Cohen, P. R.**, **Morgan, J.**, and **Pollack, M. E.** (1990). *Intentions in Communication*. MIT Press.
- Cohen, W. W.** and **Page, C. D.** (1995). Learnability in inductive logic programming: Methods and results. *New Generation Computing*, 13(3–4), 369–409.
- Cohn, A. G.**, **Bennett, B.**, **Gooday, J. M.**, and **Gotts, N.** (1997). RCC: A calculus for region based qualitative spatial reasoning. *Geoinformatica*, 1, 275–316.
- Collin, Z.**, **Dechter, R.**, and **Katz, S.** (1999). Self-stabilizing distributed constraint satisfaction. *Chicago Journal of Theoretical Computer Science*, 1999(115).
- Collins, F. S.**, **Morgan, M.**, and **Patrinos, A.** (2003). The human genome project: Lessons from large-scale biology. *Science*, 300(5617), 286–290.
- Collins, M.** (1999). *Head-driven Statistical Models for Natural Language Processing*. Ph.D. thesis, University of Pennsylvania.
- Collins, M.** and **Duffy, K.** (2002). New ranking algorithms for parsing and tagging: Kernels over discrete structures, and the voted perceptron. In *ACL-02*.
- Colmerauer, A.** and **Roussel, P.** (1993). The birth of Prolog. *SIGPLAN Notices*, 28(3), 37–52.
- Colmerauer, A.** (1975). Les grammaires de métamorphose. Tech. rep., Groupe d'Intelligence Artificielle, Université de Marseille-Luminy.
- Colmerauer, A.**, **Kanoui, H.**, **Pasero, R.**, and **Roussel, P.** (1973). Un système de communication homme-machine en Français. Rapport, Groupe d'Intelligence Artificielle, Université d'Aix-Marseille II.
- Condon, J. H.** and **Thompson, K.** (1982). Belle chess hardware. In Clarke, M. R. B. (Ed.), *Advances in Computer Chess 3*, pp. 45–54. Pergamon.
- Congdon, C. B.**, **Huber, M.**, **Kortenkamp, D.**, **Bidlack, C.**, **Cohen, C.**, **Huffman, S.**, **Koss, F.**, **Raschke, U.**, and **Weymouth, T.** (1992). CARMEL versus Flakey: A comparison of two robots. Tech. rep. Papers from the AAAI Robot Competition, RC-92-01, American Association for Artificial Intelligence.
- Conlisk, J.** (1989). Three variants on the Allais example. *American Economic Review*, 79(3), 392–407.
- Connell, J.** (1989). *A Colony Architecture for an Artificial Creature*. Ph.D. thesis, Artificial Intelligence Laboratory, MIT. Also available as AI Technical Report 1151.
- Consortium, T. G. O.** (2008). The gene ontology project in 2008. *Nucleic Acids Research*, 36.
- Cook, S. A.** (1971). The complexity of theorem-proving procedures. In *STOC-71*, pp. 151–158.
- Cook, S. A.** and **Mitchell, D.** (1997). Finding hard instances of the satisfiability problem: A survey. In Du, D., Gu, J., and Pardalos, P. (Eds.), *Satisfiability problems: Theory and applications*. American Mathematical Society.
- Cooper, G.** (1990). The computational complexity of probabilistic inference using Bayesian belief networks. *AIJ*, 42, 393–405.
- Cooper, G.** and **Herskovits, E.** (1992). A Bayesian method for the induction of probabilistic networks from data. *Machine Learning*, 9, 309–347.
- Copeland, J.** (1993). *Artificial Intelligence: A Philosophical Introduction*. Blackwell.
- Copernicus** (1543). *De Revolutionibus Orbium Coelestium*. Apud Ioh. Petreium, Nuremberg.
- Cormen, T. H.**, **Leiserson, C. E.**, and **Rivest, R.** (1990). *Introduction to Algorithms*. MIT Press.
- Cortes, C.** and **Vapnik, V. N.** (1995). Support vector networks. *Machine Learning*, 20, 273–297.
- Cournot, A.** (Ed.). (1838). *Recherches sur les principes mathématiques de la théorie des richesses*. L. Hachette, Paris.
- Cover, T.** and **Thomas, J.** (2006). *Elements of Information Theory* (2nd edition). Wiley.
- Cowan, J. D.** and **Sharp, D. H.** (1988a). Neural nets. *Quarterly Reviews of Biophysics*, 21, 365–427.
- Cowan, J. D.** and **Sharp, D. H.** (1988b). Neural nets and artificial intelligence. *Daedalus*, 117, 85–121.
- Cowell, R.**, **Dawid, A. P.**, **Lauritzen, S.**, and **Spiegelhalter, D. J.** (2002). *Probabilistic Networks and Expert Systems*. Springer.
- Cox, I.** (1993). A review of statistical data association techniques for motion correspondence. *IJCV*, 10, 53–66.
- Cox, I.** and **Hingorani, S. L.** (1994). An efficient implementation and evaluation of Reid's multiple hypothesis tracking algorithm for visual tracking. In *ICPR-94*, Vol. 1, pp. 437–442.
- Cox, I.** and **Wilfong, G. T.** (Eds.). (1990). *Autonomous Robot Vehicles*. Springer Verlag.
- Cox, R. T.** (1946). Probability, frequency, and reasonable expectation. *American Journal of Physics*, 14(1), 1–13.
- Craig, J.** (1989). *Introduction to Robotics: Mechanics and Control* (2nd edition). Addison-Wesley Publishing Inc.
- Craik, K. J.** (1943). *The Nature of Explanation*. Cambridge University Press.
- Craswell, N.**, **Zaragoza, H.**, and **Robertson, S. E.** (2005). Microsoft cambridge at trec-14: Enterprise track. In *Proc. Fourteenth Text REtrieval Conference*.
- Crauser, A.**, **Mehlhorn, K.**, **Meyer, U.**, and **Sanders, P.** (1998). A parallelization of Dijkstra's shortest path algorithm. In *Proc. 23rd International Symposium on Mathematical Foundations of Computer Science*, pp. 722–731.
- Craven, M.**, **DiPasquo, D.**, **Freitag, D.**, **McCallum, A.**, **Mitchell, T. M.**, **Nigam, K.**, and **Slattery, S.** (2000). Learning to construct knowledge bases from the World Wide Web. *AIJ*, 118(1/2), 69–113.
- Crawford, J. M.** and **Auton, L. D.** (1993). Experimental results on the crossover point in satisfiability problems. In *AAAI-93*, pp. 21–27.
- Cristianini, N.** and **Hahn, M.** (2007). *Introduction to Computational Genomics: A Case Studies Approach*. Cambridge University Press.
- Cristianini, N.** and **Schölkopf, B.** (2002). Support vector machines and kernel methods: The new generation of learning machines. *AI Mag*, 23(3), 31–41.
- Cristianini, N.** and **Shawe-Taylor, J.** (2000). *An introduction to support vector machines and other kernel-based learning methods*. Cambridge University Press.
- Crockett, L.** (1994). *The Turing Test and the Frame Problem: AI's Mistaken Understanding of Intelligence*. Ablex.
- Croft, B.**, **Metzler, D.**, and **Strohman, T.** (2009). *Search Engines: Information retrieval in Practice*. Addison Wesley.
- Cross, S. E.** and **Walker, E.** (1994). DART: Applying knowledge based planning and scheduling to crisis action planning. In Zweben, M. and Fox, M. S. (Eds.), *Intelligent Scheduling*, pp. 711–729. Morgan Kaufmann.
- Cruse, D. A.** (1986). *Lexical Semantics*. Cambridge University Press.
- Culberson, J.** and **Schaeffer, J.** (1996). Searching with pattern databases. In *Advances in Artificial Intelligence (Lecture Notes in Artificial Intelligence 1081)*, pp. 402–416. Springer-Verlag.
- Culberson, J.** and **Schaeffer, J.** (1998). Pattern databases. *Computational Intelligence*, 14(4), 318–334.
- Cullingford, R. E.** (1981). Integrating knowledge sources for computer “understanding” tasks. *IEEE Transactions on Systems, Man and Cybernetics (SMC)*, 11.
- Cummins, D.** and **Allen, C.** (1998). *The Evolution of Mind*. Oxford University Press.
- Cushing, W.**, **Kambhampati, S.**, **Mausam, and Weld, D. S.** (2007). When is temporal planning really temporal? In *IJCAI-07*.
- Cybenko, G.** (1988). Continuous valued neural networks with two hidden layers are sufficient. Technical report, Department of Computer Science, Tufts University.
- Cybenko, G.** (1989). Approximation by superpositions of a sigmoidal function. *Mathematics of Controls, Signals, and Systems*, 2, 303–314.
- Daganzo, C.** (1979). *Multinomial probit: The theory and its application to demand forecasting*. Academic Press.
- Dagum, P.** and **Luby, M.** (1993). Approximating probabilistic inference in Bayesian belief networks is NP-hard. *AIJ*, 60(1), 141–153.
- Dalal, N.** and **Triggs, B.** (2005). Histograms of oriented gradients for human detection. In *CVPR*, pp. 886–893.
- Dantzig, G. B.** (1949). Programming of interdependent activities: II. Mathematical model. *Econometrica*, 17, 200–211.
- Darwiche, A.** (2001). Recursive conditioning. *AIJ*, 126, 5–41.
- Darwiche, A.** and **Ginsberg, M. L.** (1992). A symbolic generalization of probability theory. In *AAAI-92*, pp. 622–627.
- Darwiche, A.** (2009). *Modeling and reasoning with Bayesian networks*. Cambridge University Press.
- Darwin, C.** (1859). *On The Origin of Species by Means of Natural Selection*. J. Murray, London.
- Darwin, C.** (1871). *Descent of Man*. J. Murray.
- Dasgupta, P.**, **Chakrabarti, P. P.**, and **de Sarkar, S. C.** (1994). Agent searching in a tree and the optimality of iterative deepening. *AIJ*, 71, 195–208.
- Davidson, D.** (1980). *Essays on Actions and Events*. Oxford University Press.
- Davies, T. R.** (1985). Analogy. Informal note IN-CSLI-85-4, Center for the Study of Language and Information (CSLI).
- Davies, T. R.** and **Russell, S. J.** (1987). A logical approach to reasoning by analogy. In *IJCAI-87*, Vol. 1, pp. 264–270.
- Davis, E.** (1986). *Representing and Acquiring Geographic Knowledge*. Pitman and Morgan Kaufmann.
- Davis, E.** (1990). *Representations of Commonsense Knowledge*. Morgan Kaufmann.

- Davis, E.** (2005). Knowledge and communication: A first-order theory. *AIJ*, 166, 81–140.
- Davis, E.** (2006). The expressivity of quantifying over regions. *J. Logic and Computation*, 16, 891–916.
- Davis, E.** (2007). Physical reasoning. In van Harmelen, F., Lifschitz, V., and Porter, B. (Eds.), *The Handbook of Knowledge Representation*, pp. 597–620. Elsevier.
- Davis, E.** (2008). Pouring liquids: A study in commonsense physical reasoning. *AIJ*, 172(1540–1578).
- Davis, E.** and Morgenstern, L. (2004). Introduction: Progress in formal commonsense reasoning. *AIJ*, 153, 1–12.
- Davis, E.** and Morgenstern, L. (2005). A first-order theory of communication and multi-agent plans. *J. Logic and Computation*, 15(5), 701–749.
- Davis, K. H.**, Biddulph, R., and Balashek, S. (1952). Automatic recognition of spoken digits. *J. Acoustical Society of America*, 24(6), 637–642.
- Davis, M.** (1957). A computer program for Presburger's algorithm. In *Proving Theorems (as Done by Man, Logician, or Machine)*, pp. 215–233. Proc. Summer Institute for Symbolic Logic. Second edition; publication date is 1960.
- Davis, M.**, Logemann, G., and Loveland, D. (1962). A machine program for theorem-proving. *CACM*, 5, 394–397.
- Davis, M.** and Putnam, H. (1960). A computing procedure for quantification theory. *JACM*, 7(3), 201–215.
- Davis, R.** and Lenat, D. B. (1982). *Knowledge-Based Systems in Artificial Intelligence*. McGraw-Hill.
- Dayan, P.** (1992). The convergence of TD(λ) for general λ . *Machine Learning*, 8(3–4), 341–362.
- Dayan, P.** and Abbott, L. F. (2001). *Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems*. MIT Press.
- Dayan, P.** and Niv, Y. (2008). Reinforcement learning and the brain: The good, the bad and the ugly. *Current Opinion in Neurobiology*, 18(2), 185–196.
- de Dombal, F. T.**, Leaper, D. J., Horrocks, J. C., and Staniland, J. R. (1974). Human and computer-aided diagnosis of abdominal pain: Further report with emphasis on performance of clinicians. *British Medical Journal*, 1, 376–380.
- de Dombal, F. T.**, Staniland, J. R., and Clamp, S. E. (1981). Geographical variation in disease presentation. *Medical Decision Making*, 1, 59–69.
- de Finetti, B.** (1937). Le prévision: ses lois logiques, ses sources subjectives. *Ann. Inst. Poincaré*, 7, 1–68.
- de Finetti, B.** (1993). On the subjective meaning of probability. In Monari, P. and Cocchi, D. (Eds.), *Probabilità e Induzione*, pp. 291–321. Clueb.
- de Freitas, J. F. G.**, Niranjani, M., and Gee, A. H. (2000). Sequential Monte Carlo methods to train neural network models. *Neural Computation*, 12(4), 933–953.
- de Kleer, J.** (1975). Qualitative and quantitative knowledge in classical mechanics. Tech. rep. AI-TR-352, MIT Artificial Intelligence Laboratory.
- de Kleer, J.** (1989). A comparison of ATMS and CSP techniques. In *IJCAI-89*, Vol. 1, pp. 290–296.
- de Kleer, J.** and Brown, J. S. (1985). A qualitative physics based on confluences. In Hobbs, J. R. and Moore, R. C. (Eds.), *Formal Theories of the Commonsense World*, chap. 4, pp. 109–183. Ablex.
- de Marcken, C.** (1996). *Unsupervised Language Acquisition*. Ph.D. thesis, MIT.
- De Morgan, A.** (1864). On the syllogism, No. IV, and on the logic of relations. *Transaction of the Cambridge Philosophical Society*, X, 331–358.
- De Raedt, L.** (1992). *Interactive Theory Revision: An Inductive Logic Programming Approach*. Academic Press.
- de Salvo Braz, R.**, Amir, E., and Roth, D. (2007). Lifted first-order probabilistic inference. In Getoor, L. and Taskar, B. (Eds.), *Introduction to Statistical Relational Learning*. MIT Press.
- Deacon, T. W.** (1997). *The symbolic species: The co-evolution of language and the brain*. W. W. Norton.
- Deale, M.**, Yvanovich, M., Schmitzus, D., Kautz, D., Carpenter, M., Zweber, M., Davis, G., and Daun, B. (1994). The space shuttle ground processing scheduling system. In Zweber, M. and Fox, M. (Eds.), *Intelligent Scheduling*, pp. 423–449. Morgan Kaufmann.
- Dean, T.**, Basye, K., Chekaluk, R., and Hyun, S. (1990). Coping with uncertainty in a control system for navigation and exploration. In *AAAI-90*, Vol. 2, pp. 1010–1015.
- Dean, T.** and Boddy, M. (1988). An analysis of time-dependent planning. In *AAAI-88*, pp. 49–54.
- Dean, T.**, Kirby, R. J., and Miller, D. (1990). Hierarchical planning involving deadlines, travel time, and resources. *Computational Intelligence*, 6(1), 381–398.
- Dean, T.**, Kaelbling, L. P., Kirman, J., and Nicholson, A. (1993). Planning with deadlines in stochastic domains. In *AAAI-93*, pp. 574–579.
- Dean, T.** and Kanazawa, K. (1989a). A model for projection and action. In *IJCAI-89*, pp. 985–990.
- Dean, T.** and Kanazawa, K. (1989b). A model for reasoning about persistence and causation. *Computational Intelligence*, 5(3), 142–150.
- Dean, T.**, Kanazawa, K., and Shewchuk, J. (1990). Prediction, observation and estimation in planning and control. In *5th IEEE International Symposium on Intelligent Control*, Vol. 2, pp. 645–650.
- Dean, T.** and Wellman, M. P. (1991). *Planning and Control*. Morgan Kaufmann.
- Dearden, R.**, Friedman, N., and Andre, D. (1999). Model-based Bayesian exploration. In *UAI-99*.
- Dearden, R.**, Friedman, N., and Russell, S. J. (1998). Bayesian q-learning. In *AAAI-98*.
- Debevec, P.**, Taylor, C., and Malik, J. (1996). Modeling and rendering architecture from photographs: A hybrid geometry- and image-based approach. In *Proc. 23rd Annual Conference on Computer Graphics (SIGGRAPH)*, pp. 11–20.
- Debreu, G.** (1960). Topological methods in cardinal utility theory. In Arrow, K. J., Karlin, S., and Suppes, P. (Eds.), *Mathematical Methods in the Social Sciences*, 1959. Stanford University Press.
- Dechter, R.** (1990a). Enhancement schemes for constraint processing: Backjumping, learning and cutset decomposition. *AIJ*, 41, 273–312.
- Dechter, R.** (1990b). On the expressiveness of networks with hidden variables. In *AAAI-90*, pp. 379–385.
- Dechter, R.** (1992). Constraint networks. In Shapiro, S. (Ed.), *Encyclopedia of Artificial Intelligence* (2nd edition), pp. 276–285. Wiley and Sons.
- Dechter, R.** (1999). Bucket elimination: A unifying framework for reasoning. *AIJ*, 113, 41–85.
- Dechter, R.** and Pearl, J. (1985). Generalized best-first search strategies and the optimality of A^* . *JACM*, 32(3), 505–536.
- Dechter, R.** and Pearl, J. (1987). Network-based heuristics for constraint-satisfaction problems. *AIJ*, 34(1), 1–38.
- Dechter, R.** and Pearl, J. (1989). Tree clustering for constraint networks. *AIJ*, 38(3), 353–366.
- Dechter, R.** (2003). *Constraint Processing*. Morgan Kaufmann.
- Dechter, R.** and Frost, D. (2002). Backjump-based backtracking for constraint satisfaction problems. *AIJ*, 136(2), 147–188.
- Dechter, R.** and Mateescu, R. (2007). AND/OR search spaces for graphical models. *AIJ*, 171(2–3), 73–106.
- DeCoste, D.** and Schölkopf, B. (2002). Training invariant support vector machines. *Machine Learning*, 46(1), 161–190.
- Dedekind, R.** (1888). *Was sind und was sollen die Zahlen*. Braunschweig, Germany.
- Deerwester, S. C.**, Dumais, S. T., Landauer, T. K., Furnas, G. W., and Harshman, R. A. (1990). Indexing by latent semantic analysis. *J. American Society for Information Science*, 41(6), 391–407.
- DeGroot, M. H.** (1970). *Optimal Statistical Decisions*. McGraw-Hill.
- DeGroot, M. H.** and Schervish, M. J. (2001). *Probability and Statistics* (3rd edition). Addison Wesley.
- DeJong, G.** (1981). Generalizations based on explanations. In *IJCAI-81*, pp. 67–69.
- DeJong, G.** (1982). An overview of the FRUMP system. In Lehnert, W. and Ringle, M. (Eds.), *Strategies for Natural Language Processing*, pp. 149–176. Lawrence Erlbaum.
- DeJong, G.** and Mooney, R. (1986). Explanation-based learning: An alternative view. *Machine Learning*, 1, 145–176.
- Del Moral, P.**, Doucet, A., and Jasra, A. (2006). Sequential Monte Carlo samplers. *J. Royal Statistical Society, Series B*, 68(3), 411–436.
- Del Moral, P.** (2004). *Feynman–Kac Formulae, Genealogical and Interacting Particle Systems with Applications*. Springer-Verlag.
- Delgrande, J.** and Schaub, T. (2003). On the relation between Reiter's default logic and its (major) variants. In *Seventh European Conference on Symbolic and Quantitative Approaches to Reasoning with Uncertainty*, pp. 452–463.
- Dempster, A. P.** (1968). A generalization of Bayesian inference. *J. Royal Statistical Society, Series B*, 205–247.
- Dempster, A. P.**, Laird, N., and Rubin, D. (1977). Maximum likelihood from incomplete data via the EM algorithm. *J. Royal Statistical Society, Series B*, 1–38.
- Deng, X.** and Papadimitriou, C. H. (1990). Exploring an unknown graph. In *FOCS-90*, pp. 355–361.
- Denis, F.** (2001). Learning regular languages from simple positive examples. *Machine Learning*, 44(1/2), 37–66.
- Dennett, D. C.** (1984). Cognitive wheels: the frame problem of AI. In Hookway, C. (Ed.), *Minds, Machines, and Evolution: Philosophical Studies*, pp. 129–151. Cambridge University Press.
- Dennett, D. C.** (1991). *Consciousness Explained*. Penguin Press.

- Denney, E., Fischer, B., and Schumann, J.** (2006). An empirical evaluation of automated theorem provers in software certification. *Int. J. AI Tools*, 15(1), 81–107.
- Descartes, R.** (1637). Discourse on method. In Cottingham, J., Stoothoff, R., and Murdoch, D. (Eds.), *The Philosophical Writings of Descartes*, Vol. I. Cambridge University Press, Cambridge, UK.
- Descartes, R.** (1641). Meditations on first philosophy. In Cottingham, J., Stoothoff, R., and Murdoch, D. (Eds.), *The Philosophical Writings of Descartes*, Vol. II. Cambridge University Press, Cambridge, UK.
- Descomte, Y. and Latombe, J.-C.** (1985). Making compromises among antagonist constraints in a planner. *AIJ*, 27, 183–217.
- Detwarsasiti, A. and Shachter, R. D.** (2005). Influence diagrams for team decision analysis. *Decision Analysis*, 2(4), 207–228.
- Devroye, L.** (1987). *A course in density estimation*. Birkhauser.
- Dickmanns, E. D. and Zapp, A.** (1987). Autonomous high speed road vehicle guidance by computer vision. In *Automatic Control—World Congress, 1987: Selected Papers from the 10th Triennial World Congress of the International Federation of Automatic Control*, pp. 221–226.
- Dietterich, T.** (1990). Machine learning. *Annual Review of Computer Science*, 4, 255–306.
- Dietterich, T.** (2000). Hierarchical reinforcement learning with the MAXQ value function decomposition. *JAIR*, 13, 227–303.
- Dijkstra, E. W.** (1959). A note on two problems in connexion with graphs. *Numerische Mathematik*, 1, 269–271.
- Dijkstra, E. W.** (1984). The threats to computing science. In *ACM South Central Regional Conference*.
- Dillenburg, J. F. and Nelson, P. C.** (1994). Perimeter search. *AIJ*, 65(1), 165–178.
- Dinh, H., Russell, A., and Su, Y.** (2007). On the value of good advice: The complexity of A* with accurate heuristics. In *AAAI-07*.
- Dissanayake, G., Newman, P., Clark, S., Durrant-Whyte, H., and Csorba, M.** (2001). A solution to the simultaneous localisation and map building (SLAM) problem. *IEEE Transactions on Robotics and Automation*, 17(3), 229–241.
- Do, M. B. and Kambhampati, S.** (2001). Sapa: A domain-independent heuristic metric temporal planner. In *ECP-01*.
- Do, M. B. and Kambhampati, S.** (2003). Planning as constraint satisfaction: solving the planning graph by compiling it into CSP. *AIJ*, 132(2), 151–182.
- Doctorow, C.** (2001). Metacrap: Putting the torch to seven straw-men of the meta-utopia. www.we11.com/~doctorow/metacrap.htm.
- Domingos, P. and Pazzani, M.** (1997). On the optimality of the simple Bayesian classifier under zero-one loss. *Machine Learning*, 29, 103–30.
- Domingos, P. and Richardson, M.** (2004). Markov logic: A unifying framework for statistical relational learning. In *Proc. ICML-04 Workshop on Statistical Relational Learning*.
- Donninger, C. and Lorenz, U.** (2004). The chess monster hydra. In *Proc. 14th International Conference on Field-Programmable Logic and Applications*, pp. 927–932.
- Doorenbos, R.** (1994). Combining left and right unlinking for matching a large number of learned rules. In *AAAI-94*.
- Doran, J. and Michie, D.** (1966). Experiments with the graph traverser program. *Proc. Royal Society of London*, 294, Series A, 235–259.
- Dorf, R. C. and Bishop, R. H.** (2004). *Modern Control Systems* (10th edition). Prentice-Hall.
- Doucet, A.** (1997). *Monte Carlo methods for Bayesian estimation of hidden Markov models: Application to radiation signals*. Ph.D. thesis, Université de Paris-Sud.
- Doucet, A., de Freitas, N., and Gordon, N.** (2001). *Sequential Monte Carlo Methods in Practice*. Springer-Verlag.
- Doucet, A., de Freitas, N., Murphy, K., and Russell, S. J.** (2000). Rao-blackwellised particle filtering for dynamic bayesian networks. In *UAI-00*.
- Dowling, W. F. and Gallier, J. H.** (1984). Linear-time algorithms for testing the satisfiability of propositional Horn formulas. *J. Logic Programming*, 1, 267–284.
- Dowty, D., Wall, R., and Peters, S.** (1991). *Introduction to Montague Semantics*. D. Reidel.
- Doyle, J.** (1979). A truth maintenance system. *AIJ*, 12(3), 231–272.
- Doyle, J.** (1983). What is rational psychology? Toward a modern mental philosophy. *AI Mag*, 4(3), 50–53.
- Doyle, J. and Patil, R.** (1991). Two theses of knowledge representation: Language restrictions, taxonomic classification, and the utility of representation services. *AIJ*, 48(3), 261–297.
- Drabble, B.** (1990). Mission scheduling for spacecraft: Diaries of T-SCHED. In *Expert Planning Systems*, pp. 76–81. Institute of Electrical Engineers.
- Dredze, M., Crammer, K., and Pereira, F.** (2008). Confidence-weighted linear classification. In *ICML-08*, pp. 264–271.
- Dreyfus, H. L.** (1972). *What Computers Can't Do: A Critique of Artificial Reason*. Harper and Row.
- Dreyfus, H. L.** (1992). *What Computers Still Can't Do: A Critique of Artificial Reason*. MIT Press.
- Dreyfus, H. L. and Dreyfus, S. E.** (1986). *Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer*. Blackwell.
- Dreyfus, S. E.** (1969). An appraisal of some shortest-paths algorithms. *Operations Research*, 17, 395–412.
- Dubois, D. and Prade, H.** (1994). A survey of belief revision and updating rules in various uncertainty models. *Int. J. Intelligent Systems*, 9(1), 61–100.
- Duda, R. O., Gaschnig, J., and Hart, P. E.** (1979). Model design in the Prospector consultant system for mineral exploration. In Michie, D. (Ed.), *Expert Systems in the Microelectronic Age*, pp. 153–167. Edinburgh University Press.
- Duda, R. O. and Hart, P. E.** (1973). *Pattern classification and scene analysis*. Wiley.
- Duda, R. O., Hart, P. E., and Stork, D. G.** (2001). *Pattern Classification* (2nd edition). Wiley.
- Dudek, G. and Jenkin, M.** (2000). *Computational Principles of Mobile Robotics*. Cambridge University Press.
- Duffy, D.** (1991). *Principles of Automated Theorem Proving*. John Wiley & Sons.
- Dunn, H. L.** (1946). Record linkage". *Am. J. Public Health*, 36(12), 1412–1416.
- Durfee, E. H. and Lesser, V. R.** (1989). Negotiating task decomposition and allocation using partial global planning. In Huhns, M. and Gasser, L. (Eds.), *Distributed AI*, Vol. 2. Morgan Kaufmann.
- Durme, B. V. and Pasca, M.** (2008). Finding cars, goddesses and enzymes: Parametrizable acquisition of labeled instances for open-domain information extraction. In *AAAI-08*, pp. 1243–1248.
- Dyer, M.** (1983). *In-Depth Understanding*. MIT Press.
- Dyson, G.** (1998). *Darwin among the machines : the evolution of global intelligence*. Perseus Books.
- Duzeroski, S., Muggleton, S. H., and Russell, S. J.** (1992). PAC-learnability of determinate logic programs. In *COLT-92*, pp. 128–135.
- Earley, J.** (1970). An efficient context-free parsing algorithm. *CACM*, 13(2), 94–102.
- Edelkamp, S.** (2009). Scaling search with symbolic pattern databases. In *Model Checking and Artificial Intelligence (MOCHART)*, pp. 49–65.
- Edmonds, J.** (1965). Paths, trees, and flowers. *Canadian Journal of Mathematics*, 17, 449–467.
- Edwards, P. (Ed.)** (1967). *The Encyclopedia of Philosophy*. Macmillan.
- Een, N. and Sörensson, N.** (2003). An extensible SAT-solver. In Giunchiglia, E. and Tacchella, A. (Eds.), *Theory and Applications of Satisfiability Testing: 6th International Conference (SAT 2003)*. Springer-Verlag.
- Eiter, T., Leone, N., Mateis, C., Pfeifer, G., and Scarcello, F.** (1998). The KR system dlv: Progress report, comparisons and benchmarks. In *KR-98*, pp. 406–417.
- Elio, R. (Ed.)** (2002). *Common Sense, Reasoning, and Rationality*. Oxford University Press.
- Elkan, C.** (1993). The paradoxical success of fuzzy logic. In *AAAI-93*, pp. 698–703.
- Elkan, C.** (1997). Boosting and naive Bayesian learning. Tech. rep., Department of Computer Science and Engineering, University of California, San Diego.
- Ellsberg, D.** (1962). *Risk, Ambiguity, and Decision*. Ph.D. thesis, Harvard University.
- Elman, J., Bates, E., Johnson, M., Karmiloff-Smith, A., Parisi, D., and Plunkett, K.** (1997). *Rethinking Innateness*. MIT Press.
- Empson, W.** (1953). *Seven Types of Ambiguity*. New Directions.
- Enderton, H. B.** (1972). *A Mathematical Introduction to Logic*. Academic Press.
- Epstein, R., Roberts, G., and Beber, G. (Eds.)** (2008). *Parsing the Turing Test*. Springer.
- Erdmann, M. A. and Mason, M.** (1988). An exploration of sensorless manipulation. *IEEE Journal of Robotics and Automation*, 4(4), 369–379.
- Ernst, H. A.** (1961). *MH-1, a Computer-Operated Mechanical Hand*. Ph.D. thesis, Massachusetts Institute of Technology.
- Ernst, M., Millstein, T., and Weld, D. S.** (1997). Automatic SAT-compilation of planning problems. In *IJCAI-97*, pp. 1169–1176.
- Erol, K., Hendler, J., and Nau, D. S.** (1994). HTN planning: Complexity and expressivity. In *AAAI-94*, pp. 1123–1128.

- Erol, K., Hendler, J., and Nau, D. S.** (1996). Complexity results for HTN planning. *AIJ*, 18(1), 69–93.
- Etzioni, A.** (2004). *From Empire to Community: A New Approach to International Relation*. Palgrave Macmillan.
- Etzioni, O.** (1989). Tractable decision-analytic control. In *Proc. First International Conference on Knowledge Representation and Reasoning*, pp. 114–125.
- Etzioni, O., Banko, M., Soderland, S., and Weld, D. S.** (2008). Open information extraction from the web. *CACM*, 51(12).
- Etzioni, O., Hanks, S., Weld, D. S., Draper, D., Lesh, N., and Williamson, M.** (1992). An approach to planning with incomplete information. In *KR-92*.
- Etzioni, O. and Weld, D. S.** (1994). A softbot-based interface to the Internet. *CACM*, 37(7), 72–76.
- Etzioni, O., Banko, M., and Cafarella, M. J.** (2006). Machine reading. In *AAAI-06*.
- Etzioni, O., Cafarella, M. J., Downey, D., Popescu, A.-M., Shaked, T., Soderland, S., Weld, D. S., and Yates, A.** (2005). Unsupervised named-entity extraction from the web: An experimental study. *AIJ*, 165(1), 91–134.
- Evans, T. G.** (1968). A program for the solution of a class of geometric-analogy intelligence-test questions. In Minsky, M. L. (Ed.), *Semantic Information Processing*, pp. 271–353. MIT Press.
- Fagin, R., Halpern, J. Y., Moses, Y., and Vardi, M. Y.** (1995). *Reasoning about Knowledge*. MIT Press.
- Fahlman, S. E.** (1974). A planning system for robot construction tasks. *AIJ*, 5(1), 1–49.
- Faugeras, O.** (1993). *Three-Dimensional Computer Vision: A Geometric Viewpoint*. MIT Press.
- Faugeras, O., Luong, Q.-T., and Papadopoulou, T.** (2001). *The Geometry of Multiple Images*. MIT Press.
- Fearing, R. S. and Hollerbach, J. M.** (1985). Basic solid mechanics for tactile sensing. *Int. J. Robotics Research*, 4(3), 40–54.
- Featherstone, R.** (1987). *Robot Dynamics Algorithms*. Kluwer Academic Publishers.
- Feigenbaum, E. A.** (1961). The simulation of verbal learning behavior. *Proc. Western Joint Computer Conference*, 19, 121–131.
- Feigenbaum, E. A., Buchanan, B. G., and Ledberg, J.** (1971). On generality and problem solving: A case study using the DENDRAL program. In Meltzer, B. and Michie, D. (Eds.), *Machine Intelligence* 6, pp. 165–190. Edinburgh University Press.
- Feldman, J. and Sproull, R. F.** (1977). Decision theory and artificial intelligence II: The hungry monkey. Technical report, Computer Science Department, University of Rochester.
- Feldman, J. and Yakimovsky, Y.** (1974). Decision theory and artificial intelligence I: Semantics-based region analyzer. *AIJ*, 5(4), 349–371.
- Fellbaum, C.** (2001). *Wordnet: An Electronic Lexical Database*. MIT Press.
- Fellegi, I. and Sunter, A.** (1969). A theory for record linkage". *JASA*, 64, 1183–1210.
- Felner, A., Korf, R. E., and Hanan, S.** (2004). Additive pattern database heuristics. *JAIR*, 22, 279–318.
- Felner, A., Korf, R. E., Meshulam, R., and Holte, R.** (2007). Compressed pattern databases. *JAIR*, 30, 213–247.
- Felzenszwalb, P. and Huttenlocher, D.** (2000). Efficient matching of pictorial structures. In *CVPR*.
- Felzenszwalb, P. and McAllester, D. A.** (2007). The generalized A* architecture. *JAIR*.
- Ferguson, T.** (1992). Mate with knight and bishop in kriegspiel. *Theoretical Computer Science*, 96(2), 389–403.
- Ferguson, T.** (1995). Mate with the two bishops in kriegspiel. www.math.ucla.edu/~tom/papers.
- Ferguson, T.** (1973). Bayesian analysis of some nonparametric problems. *Annals of Statistics*, 1(2), 209–230.
- Ferraris, P. and Giunchiglia, E.** (2000). Planning as satisifiability in nondeterministic domains. In *AAAI-00*, pp. 748–753.
- Ferriss, T.** (2007). *The 4-Hour Workweek*. Crown.
- Fikes, R. E., Hart, P. E., and Nilsson, N. J.** (1972). Learning and executing generalized robot plans. *AIJ*, 3(4), 251–288.
- Fikes, R. E. and Nilsson, N. J.** (1971). STRIPS: A new approach to the application of theorem proving to problem solving. *AIJ*, 2(3–4), 189–208.
- Fikes, R. E. and Nilsson, N. J.** (1993). STRIPS, a retrospective. *AIJ*, 59(1–2), 227–232.
- Fine, S., Singer, Y., and Tishby, N.** (1998). The hierarchical hidden markov model: Analysis and applications. *Machine Learning*, 32(41–62).
- Finney, D. J.** (1947). *Probit analysis: A statistical treatment of the sigmoid response curve*. Cambridge University Press.
- Firth, J.** (1957). *Papers in Linguistics*. Oxford University Press.
- Fisher, R. A.** (1922). On the mathematical foundations of theoretical statistics. *Philosophical Transactions of the Royal Society of London, Series A* 222, 309–368.
- Fix, E. and Hodges, J. L.** (1951). Discriminatory analysis—Nonparametric discrimination: Consistency properties. Tech. rep. 21-49-004, USAF School of Aviation Medicine.
- Floreano, D., Zufferey, J. C., Srinivasan, M. V., and Ellington, C.** (2009). *Flying Insects and Robots*. Springer.
- Fogel, D. B.** (2000). *Evolutionary Computation: Toward a New Philosophy of Machine Intelligence*. IEEE Press.
- Fogel, L. J., Owens, A. J., and Walsh, M. J.** (1966). *Artificial Intelligence through Simulated Evolution*. Wiley.
- Foo, N.** (2001). Why engineering models do not have a frame problem. In *Discrete event modeling and simulation technologies: a tapestry of systems and AI-based theories and methodologies*. Springer.
- Forbes, J.** (2002). *Learning Optimal Control for Autonomous Vehicles*. Ph.D. thesis, University of California.
- Forbus, K. D.** (1985). Qualitative process theory. In Bobrow, D. (Ed.), *Qualitative Reasoning About Physical Systems*, pp. 85–186. MIT Press.
- Forbus, K. D. and de Kleer, J.** (1993). *Building Problem Solvers*. MIT Press.
- Ford, K. M. and Hayes, P. J.** (1995). Turing Test considered harmful. In *IJCAI-95*, pp. 972–977.
- Forestier, J.-P. and Varaiya, P.** (1978). Multilayer control of large Markov chains. *IEEE Transactions on Automatic Control*, 23(2), 298–304.
- Forgy, C.** (1981). OPS5 user's manual. Technical report CMU-CS-81-135, Computer Science Department, Carnegie-Mellon University.
- Forgy, C.** (1982). A fast algorithm for the many patterns/many objects match problem. *AIJ*, 19(1), 17–37.
- Forsyth, D. and Ponce, J.** (2002). *Computer Vision: A Modern Approach*. Prentice Hall.
- Fourier, J.** (1827). Analyse des travaux de l'Académie Royale des Sciences, pendant l'année 1824; partie mathématique. *Histoire de l'Académie Royale des Sciences de France*, 7, xvii–lv.
- Fox, C. and Tversky, A.** (1995). Ambiguity aversion and comparative ignorance. *Quarterly Journal of Economics*, 110(3), 585–603.
- Fox, D., Burgard, W., Dellaert, F., and Thrun, S.** (1999). Monte carlo localization: Efficient position estimation for mobile robots. In *AAAI-99*.
- Fox, M. S.** (1990). Constraint-guided scheduling: A short history of research at CMU. *Computers in Industry*, 14(1–3), 79–88.
- Fox, M. S., Allen, B., and Strohm, G.** (1982). Job shop scheduling: An investigation in constraint-directed reasoning. In *AAAI-82*, pp. 155–158.
- Fox, M. S. and Long, D.** (1998). The automatic inference of state invariants in TIM. *JAIR*, 9, 367–421.
- Franco, J. and Paull, M.** (1983). Probabilistic analysis of the Davis Putnam procedure for solving the satisfiability problem. *Discrete Applied Mathematics*, 5, 77–87.
- Frank, I., Basin, D. A., and Matsubara, H.** (1998). Finding optimal strategies for imperfect information games. In *AAAI-98*, pp. 500–507.
- Frank, R. H. and Cook, P. J.** (1996). *The Winner-Take-All Society*. Penguin.
- Franz, A.** (1996). *Automatic Ambiguity resolution in Natural Language Processing: An Empirical Approach*. Springer.
- Franz, A. and Brants, T.** (2006). All our n-gram are belong to you. Blog posting.
- Frege, G.** (1879). *Begriffsschrift, eine der arithmetischen nachgebildete Formelsprache des reinen Denkens*. Halle, Berlin. English translation appears in van Heijenoort (1967).
- Freitag, D. and McCallum, A.** (2000). Information extraction with hmm structures learned by stochastic optimization. In *AAAI-00*.
- Freuder, E. C.** (1978). Synthesizing constraint expressions. *CACM*, 21(11), 958–966.
- Freuder, E. C.** (1982). A sufficient condition for backtrack-free search. *JACM*, 29(1), 24–32.
- Freuder, E. C.** (1985). A sufficient condition for backtrack-bounded search. *JACM*, 32(4), 755–761.
- Freuder, E. C. and Mackworth, A. K.** (Eds.). (1994). *Constraint-based reasoning*. MIT Press.
- Freund, Y. and Schapire, R. E.** (1996). Experiments with a new boosting algorithm. In *ICML-96*.
- Freund, Y. and Schapire, R. E.** (1999). Large margin classification using the perceptron algorithm. *Machine Learning*, 37(3), 277–296.
- Friedberg, R. M.** (1958). A learning machine: Part I. *IBM Journal of Research and Development*, 2, 2–13.
- Friedberg, R. M., Dunham, B., and North, T.** (1959). A learning machine: Part II. *IBM Journal of Research and Development*, 3(3), 282–287.

- Friedgut**, E. (1999). Necessary and sufficient conditions for sharp thresholds of graph properties, and the k-SAT problem. *J. American Mathematical Society*, 12, 1017–1054.
- Friedman**, G. J. (1959). Digital simulation of an evolutionary process. *General Systems Yearbook*, 4, 171–184.
- Friedman**, J., Hastie, T., and Tibshirani, R. (2000). Additive logistic regression: A statistical view of boosting. *Annals of Statistics*, 28(2), 337–374.
- Friedman**, N. (1998). The Bayesian structural EM algorithm. In *UAI-98*.
- Friedman**, N. and Goldszmidt, M. (1996). Learning Bayesian networks with local structure. In *UAI-96*, pp. 252–262.
- Friedman**, N. and Koller, D. (2003). Being Bayesian about Bayesian network structure: A Bayesian approach to structure discovery in Bayesian networks. *Machine Learning*, 50, 95–125.
- Friedman**, N., Murphy, K., and Russell, S. J. (1998). Learning the structure of dynamic probabilistic networks. In *UAI-98*.
- Friedman**, N. (2004). Inferring cellular networks using probabilistic graphical models. *Science*, 303(5659), 799–805.
- Fruhwirth**, T. and Abdennadher, S. (2003). *Essentials of constraint programming*. Cambridge University Press.
- Fuchs**, J. J., Gasquet, A., Olalanty, B., and Currie, K. W. (1990). PlanERS-1: An expert planning system for generating spacecraft mission plans. In *First International Conference on Expert Planning Systems*, pp. 70–75. Institute of Electrical Engineers.
- Fudenberg**, D. and Tirole, J. (1991). *Game theory*. MIT Press.
- Fukunaga**, A. S., Rabideau, G., Chien, S., and Yan, D. (1997). ASPEN: A framework for automated planning and scheduling of spacecraft control and operations. In *Proc. International Symposium on AI, Robotics and Automation in Space*, pp. 181–187.
- Fung**, R. and Chang, K. C. (1989). Weighting and integrating evidence for stochastic simulation in Bayesian networks. In *UAI-98*, pp. 209–220.
- Gaddum**, J. H. (1933). Reports on biological standard III: Methods of biological assay depending on a quantal response. Special report series of the medical research council 183, Medical Research Council.
- Gaifman**, H. (1964). Concerning measures in first order calculi. *Israel Journal of Mathematics*, 2, 1–18.
- Gallaire**, H. and Minker, J. (Eds.). (1978). *Logic and Databases*. Plenum.
- Gallier**, J. H. (1986). *Logic for Computer Science: Foundations of Automatic Theorem Proving*. Harper and Row.
- Gamba**, A., Gamberini, L., Palmieri, G., and Sanna, R. (1961). Further experiments with PAPA. *Nuovo Cimento Supplemento*, 20(2), 221–231.
- Garding**, J. (1992). Shape from texture for smooth curved surfaces in perspective projection. *J. Mathematical Imaging and Vision*, 2(4), 327–350.
- Gardner**, M. (1968). *Logic Machines, Diagrams and Boolean Algebra*. Dover.
- Garey**, M. R. and Johnson, D. S. (1979). *Computers and Intractability*. W. H. Freeman.
- Gaschnig**, J. (1977). A general backtrack algorithm that eliminates most redundant tests. In *IJCAI-77*, p. 457.
- Gaschnig**, J. (1979). Performance measurement and analysis of certain search algorithms. Technical report CMU-CS-79-124, Computer Science Department, Carnegie-Mellon University.
- Gasser**, R. (1995). *Efficiently harnessing computational resources for exhaustive search*. Ph.D. thesis, ETH Zürich.
- Gasser**, R. (1998). Solving nine men's morris. In Nowakowski, R. (Ed.), *Games of No Chance*. Cambridge University Press.
- Gat**, E. (1998). Three-layered architectures. In Kortenkamp, D., Bonasso, R. P., and Murphy, R. (Eds.), *AI-based Mobile Robots: Case Studies of Successful Robot Systems*, pp. 195–210. MIT Press.
- Gauss**, C. F. (1809). *Theoria Motus Corporum Coelestium in Sectionibus Conicis Solem Ambientium*. Sumtibus F. Perthes et I. H. Besser, Hamburg.
- Gauss**, C. F. (1829). Beiträge zur theorie der algebraischen gleichungen. Collected in *Werke*, Vol. 3, pages 71–102. K. Gesellschaft Wissenschaft, Göttingen, Germany, 1876.
- Gawande**, A. (2002). *Complications: A Surgeon's Notes on an Imperfect Science*. Metropolitan Books.
- Geiger**, D., Verma, T., and Pearl, J. (1990). Identifying independence in Bayesian networks. *Networks*, 20(5), 507–534.
- Geisel**, T. (1955). *On Beyond Zebra*. Random House.
- Gelb**, A. (1974). *Applied Optimal Estimation*. MIT Press.
- Gelernter**, H. (1959). Realization of a geometry-theorem proving machine. In *Proc. an International Conference on Information Processing*, pp. 273–282. UNESCO House.
- Gelfond**, M. and Lifschitz, V. (1988). Compiling circumscriptive theories into logic programs. In *Non-Monotonic Reasoning: 2nd International Workshop Proceedings*, pp. 74–99.
- Gelfond**, M. (2008). Answer sets. In van Harmelen, F., Lifschitz, V., and Porter, B. (Eds.), *Handbook of Knowledge Representation*, pp. 285–316. Elsevier.
- Gelly**, S. and Silver, D. (2008). Achieving master level play in 9 x 9 computer go. In *AAAI-08*, pp. 1537–1540.
- Gelman**, A., Carlin, J. B., Stern, H. S., and Rubin, D. (1995). *Bayesian Data Analysis*. Chapman & Hall.
- Geman**, S. and Geman, D. (1984). Stochastic relaxation, Gibbs distributions, and Bayesian restoration of images. *PAMI*, 6(6), 721–741.
- Genesereth**, M. R. (1984). The use of design descriptions in automated diagnosis. *AIJ*, 24(1–3), 411–436.
- Genesereth**, M. R. and Nilsson, N. J. (1987). *Logical Foundations of Artificial Intelligence*. Morgan Kaufmann.
- Genesereth**, M. R. and Nourbakhsh, I. (1993). Time-saving tips for problem solving with incomplete information. In *AAAI-93*, pp. 724–730.
- Genesereth**, M. R. and Smith, D. E. (1981). Meta-level architecture. Memo HPP-81-6, Computer Science Department, Stanford University.
- Gent**, I., Petrie, K., and Puget, J.-F. (2006). Symmetry in constraint programming. In Rossi, F., van Beek, P., and Walsh, T. (Eds.), *Handbook of Constraint Programming*. Elsevier.
- Gentner**, D. (1983). Structure mapping: A theoretical framework for analogy. *Cognitive Science*, 7, 155–170.
- Gentner**, D. and Goldin-Meadow, S. (Eds.). (2003). *Language in mind: Advances in the study of language and thought*. MIT Press.
- Gerevini**, A. and Long, D. (2005). Plan constraints and preferences in PDDL3. Tech. rep., Dept. of Electronics for Automation, University of Brescia, Italy.
- Gerevini**, A. and Serina, I. (2002). LPG: A planner based on planning graphs with action costs. In *ICAPS-02*, pp. 281–290.
- Gerevini**, A. and Serina, I. (2003). Planning as propositional CSP: from walksat to local search for action graphs. *Constraints*, 8, 389–413.
- Gershwin**, G. (1937). Let's call the whole thing off. Song.
- Getoor**, L. and Taskar, B. (Eds.). (2007). *Introduction to Statistical Relational Learning*. MIT Press.
- Ghahramani**, Z. and Jordan, M. I. (1997). Factorial hidden Markov models. *Machine Learning*, 29, 245–274.
- Ghahramani**, Z. (1998). Learning dynamic bayesian networks. In *Adaptive Processing of Sequences and Data Structures*, pp. 168–197.
- Ghahramani**, Z. (2005). Tutorial on nonparametric Bayesian methods. Tutorial presentation at the UAI Conference.
- Ghallab**, M., Howe, A., Knoblock, C. A., and McDermott, D. (1998). PDDL—The planning domain definition language. Tech. rep. DCS TR-1165, Yale Center for Computational Vision and Control.
- Ghallab**, M. and Laruelle, H. (1994). Representation and control in IxTeT, a temporal planner. In *AIPS-94*, pp. 61–67.
- Ghallab**, M., Nau, D. S., and Traverso, P. (2004). *Automated Planning: Theory and practice*. Morgan Kaufmann.
- Gibbs**, R. W. (2006). Metaphor interpretation as embodied simulation. *Mind*, 21(3), 434–458.
- Gibson**, J. J. (1950). *The Perception of the Visual World*. Houghton Mifflin.
- Gibson**, J. J. (1979). *The Ecological Approach to Visual Perception*. Houghton Mifflin.
- Gilks**, W. R., Richardson, S., and Spiegelhalter, D. J. (Eds.). (1996). *Markov chain Monte Carlo in practice*. Chapman and Hall.
- Gilks**, W. R., Thomas, A., and Spiegelhalter, D. J. (1994). A language and program for complex Bayesian modelling. *The Statistician*, 43, 169–178.
- Gilmore**, P. C. (1960). A proof method for quantification theory: Its justification and realization. *IBM Journal of Research and Development*, 4, 28–35.
- Ginsberg**, M. L. (1993). *Essentials of Artificial Intelligence*. Morgan Kaufmann.
- Ginsberg**, M. L. (1999). GIB: Steps toward an expert-level bridge-playing program. In *IJCAI-99*, pp. 584–589.
- Ginsberg**, M. L., Frank, M., Halpin, M. P., and Torrance, M. C. (1990). Search lessons learned from crossword puzzles. In *AAAI-90*, Vol. 1, pp. 210–215.
- Ginsberg**, M. L. (2001). GIB: Imperfect information in a computationally challenging game. *JAIR*, 14, 303–358.
- Gionis**, A., Indyk, P., and Motwani, R. (1999). Similarity search in high dimensions via hashing. In *Proc. 25th Very Large Database (VLDB) Conference*.

- Gittins, J. C.** (1989). *Multi-Armed Bandit Allocation Indices*. Wiley.
- Glanc, A.** (1978). On the etymology of the word "robot". *SIGART Newsletter*, 67, 12.
- Glover, F.** and **Laguna, M.** (Eds.). (1997). *Tabu search*. Kluwer.
- Gödel, K.** (1930). *Über die Vollständigkeit des Logikkalküls*. Ph.D. thesis, University of Vienna.
- Gödel, K.** (1931). Über formal unentscheidbare Sätze der Principia mathematica und verwandter Systeme I. *Monatshefte für Mathematik und Physik*, 38, 173–198.
- Goebel, J.**, Volk, K., Walker, H., and Gerbault, F. (1989). Automatic classification of spectra from the infrared astronomical satellite (IRAS). *Astronomy and Astrophysics*, 222, L5–L8.
- Goertzel, B.** and **Pennachin, C.** (2007). *Artificial General Intelligence*. Springer.
- Gold, B.** and **Morgan, N.** (2000). *Speech and Audio Signal Processing*. Wiley.
- Gold, E. M.** (1967). Language identification in the limit. *Information and Control*, 10, 447–474.
- Goldberg, A. V.**, Kaplan, H., and Werneck, R. F. (2006). Reach for a*: Efficient point-to-point shortest path algorithms. In *Workshop on algorithm engineering and experiments*, pp. 129–143.
- Goldman, R.** and Boddy, M. (1996). Expressive planning and explicit knowledge. In *AIPS-96*, pp. 110–117.
- Goldszmidt, M.** and **Pearl, J.** (1996). Qualitative probabilities for default reasoning, belief revision, and causal modeling. *AIJ*, 84(1–2), 57–112.
- Golomb, S.** and Baumert, L. (1965). Backtrack programming. *JACM*, 14, 516–524.
- Golub, G.**, Heath, M., and Wahba, G. (1979). Generalized cross-validation as a method for choosing a good ridge parameter. *Technometrics*, 21(2).
- Gomes, C.**, Selman, B., Crato, N., and Kautz, H. (2000). Heavy-tailed phenomena in satisfiability and constraint processing. *JAR*, 24, 67–100.
- Gomes, C.**, Kautz, H., Sabharwal, A., and Selman, B. (2008). Satisfiability solvers. In van Harmelen, F., Lifschitz, V., and Porter, B. (Eds.), *Handbook of Knowledge Representation*. Elsevier.
- Gomes, C.** and Selman, B. (2001). Algorithm portfolios. *AIJ*, 126, 43–62.
- Gomes, C.**, Selman, B., and Kautz, H. (1998). Boosting combinatorial search through randomization. In *AAAI-98*, pp. 431–437.
- Gonthier, G.** (2008). Formal proof—The four-color theorem. *Notices of the AMS*, 55(11), 1382–1393.
- Good, I. J.** (1961). A causal calculus. *British Journal of the Philosophy of Science*, 11, 305–318.
- Good, I. J.** (1965). Speculations concerning the first ultraintelligent machine. In Alt, F. L. and Rubinooff, M. (Eds.), *Advances in Computers*, Vol. 6, pp. 31–88. Academic Press.
- Good, I. J.** (1983). *Good Thinking: The Foundations of Probability and Its Applications*. University of Minnesota Press.
- Goodman, D.** and Keene, R. (1997). *Man versus Machine: Kasparov versus Deep Blue*. H3 Publications.
- Goodman, J.** (2001). A bit of progress in language modeling. Tech. rep. MSR-TR-2001-72, Microsoft Research.
- Goodman, J.** and Heckerman, D. (2004). Fighting spam with statistics. *Significance, the Magazine of the Royal Statistical Society*, 1, 69–72.
- Goodman, N.** (1954). *Fact, Fiction and Forecast*. University of London Press.
- Goodman, N.** (1977). *The Structure of Appearance* (3rd edition). D. Reidel.
- Gopnik, A.** and Glymour, C. (2002). Causal maps and bayes nets: A cognitive and computational account of theory-formation. In Carothers, P., Stich, S., and Siegal, M. (Eds.), *The Cognitive Basis of Science*. Cambridge University Press.
- Gordon, D. M.** (2000). *Ants at Work*. Norton.
- Gordon, D. M.** (2007). Control without hierarchy. *Nature*, 446(8), 143.
- Gordon, M. J.**, Milner, A. J., and Wadsworth, C. P. (1979). *Edinburgh LCF*. Springer-Verlag.
- Gordon, N.** (1994). *Bayesian methods for tracking*. Ph.D. thesis, Imperial College.
- Gordon, N.**, Salmon, D. J., and Smith, A. F. M. (1993). Novel approach to nonlinear/non-Gaussian Bayesian state estimation. *IEE Proceedings F (Radar and Signal Processing)*, 140(2), 107–113.
- Gorry, G. A.** (1968). Strategies for computer-aided diagnosis. *Mathematical Biosciences*, 2(3–4), 293–318.
- Gorry, G. A.**, Kassirer, J. P., Essig, A., and Schwartz, W. B. (1973). Decision analysis as the basis for computer-aided management of acute renal failure. *American Journal of Medicine*, 55, 473–484.
- Gottlob, G.**, Leone, N., and Scarcello, F. (1999a). A comparison of structural CSP decomposition methods. In *IJCAI-99*, pp. 394–399.
- Gottlob, G.**, Leone, N., and Scarcello, F. (1999b). Hypertree decompositions and tractable queries. In *PÓDS-99*, pp. 21–32.
- Graham, S. L.**, Harrison, M. A., and Ruzzo, W. L. (1980). An improved context-free recognizer. *ACM Transactions on Programming Languages and Systems*, 2(3), 415–462.
- Grama, A.** and Kumar, V. (1995). A survey of parallel search algorithms for discrete optimization problems. *ORSA Journal of Computing*, 7(4), 365–385.
- Grassmann, H.** (1861). *Lehrbuch der Arithmetik*. Th. Chr. Fr. Enslin, Berlin.
- Grayson, C. J.** (1960). Decisions under uncertainty: Drilling decisions by oil and gas operators. Tech. rep., Division of Research, Harvard Business School.
- Green, B.**, Wolf, A., Chomsky, C., and Laugherly, K. (1961). BASEBALL: An automatic question answerer. In *Proc. Western Joint Computer Conference*, pp. 219–224.
- Green, C.** (1969a). Application of theorem proving to problem solving. In *IJCAI-69*, pp. 219–239.
- Green, C.** (1969b). Theorem-proving by resolution as a basis for question-answering systems. In Meltzer, B., Michie, D., and Swann, M. (Eds.), *Machine Intelligence 4*, pp. 183–205. Edinburgh University Press.
- Green, C.** and Raphael, B. (1968). The use of theorem-proving techniques in question-answering systems. In *Proc. 23rd ACM National Conference*.
- Greenblatt, R. D.**, Eastlake, D. E., and Crocker, S. D. (1967). The Greenblatt chess program. In *Proc. Fall Joint Computer Conference*, pp. 801–810.
- Greiner, R.** (1989). Towards a formal analysis of EBL. In *ICML-89*, pp. 450–453.
- Grinstead, C.** and Snell, J. (1997). *Introduction to Probability*. AMS.
- Grove, W.** and Meehl, P. (1996). Comparative efficiency of informal (subjective, impressionistic) and formal (mechanical, algorithmic) prediction procedures: The clinical statistical controversy. *Psychology, Public Policy, and Law*, 2, 293–323.
- Gruber, T.** (2004). Interview of Tom Gruber. *AIS SIGSEMIS Bulletin*, 1(3).
- Gu, J.** (1989). *Parallel Algorithms and Architectures for Very Fast AI Search*. Ph.D. thesis, University of Utah.
- Guard, J.**, Oglesby, F., Bennett, J., and Settle, L. (1969). Semi-automated mathematics. *JACM*, 16, 49–62.
- Guestrin, C.**, Koller, D., Gearhart, C., and Kanodia, N. (2003a). Generalizing plans to new environments in relational MDPs. In *IJCAI-03*.
- Guestrin, C.**, Koller, D., Parr, R., and Venkataraman, S. (2003b). Efficient solution algorithms for factored MDPs. *JAIR*, 19, 399–468.
- Guestrin, C.**, Lagoudakis, M. G., and Parr, R. (2002). Coordinated reinforcement learning. In *ICML-02*, pp. 227–234.
- Guibas, L. J.**, Knuth, D. E., and Sharir, M. (1992). Randomized incremental construction of Delaunay and Voronoi diagrams. *Algorithmica*, 7, 381–413. See also *17th Int. Coll. on Automata, Languages and Programming*, 1990, pp. 414–431.
- Gumperz, J.** and Levinson, S. (1996). *Rethinking Linguistic Relativity*. Cambridge University Press.
- Guyon, I.** and Elisseeff, A. (2003). An introduction to variable and feature selection. *JMLR*, pp. 1157–1182.
- Hacking, I.** (1975). *The Emergence of Probability*. Cambridge University Press.
- Haghghi, A.** and Klein, D. (2006). Prototype-driven grammar induction. In *COLING-06*.
- Hald, A.** (1990). *A History of Probability and Statistics and Their Applications before 1750*. Wiley.
- Halevy, A.** (2007). Dataspaces: A new paradigm for data integration. In *Brazilian Symposium on Databases*.
- Halevy, A.**, Norvig, P., and Pereira, F. (2009). The unreasonable effectiveness of data. *IEEE Intelligent Systems, March/April*, 8–12.
- Halpern, J. Y.** (1990). An analysis of first-order logics of probability. *AIJ*, 46(3), 311–350.
- Halpern, J. Y.** (1999). Technical addendum, Cox's theorem revisited. *JAIR*, 11, 429–435.
- Halpern, J. Y.** and Weissman, V. (2008). Using first-order logic to reason about policies. *ACM Transactions on Information and System Security*, 11(4).
- Hamming, R. W.** (1991). *The Art of Probability for Scientists and Engineers*. Addison-Wesley.
- Hammond, K.** (1989). *Case-Based Planning: Viewing Planning as a Memory Task*. Academic Press.
- Hamscher, W.**, Console, L., and Kleer, J. D. (1992). *Readings in Model-based Diagnosis*. Morgan Kaufmann.
- Han, X.** and Boyden, E. (2007). Multiple-color optical activation, silencing, and desynchronization of neural activity, with single-spike temporal resolution. *PLoS One*, e299.
- Hand, D.**, Mannila, H., and Smyth, P. (2001). *Principles of Data Mining*. MIT Press.

- Handschin, J. E.** and Mayne, D. Q. (1969). Monte Carlo techniques to estimate the conditional expectation in multi-stage nonlinear filtering. *Int. J. Control.*, 9(5), 547–559.
- Hansen, E.** (1998). Solving POMDPs by searching in policy space. In *UAI-98*, pp. 211–219.
- Hansen, E.** and Zilberman, S. (2001). LAO*: a heuristic search algorithm that finds solutions with loops. *AIJ*, 129(1–2), 35–62.
- Hansen, P.** and Jaumard, B. (1990). Algorithms for the maximum satisfiability problem. *Computing*, 44(4), 279–303.
- Hanski, I.** and Cambefort, Y. (Eds.). (1991). *Dung Beetle Ecology*. Princeton University Press.
- Hansson, O.** and Mayer, A. (1989). Heuristic search as evidential reasoning. In *UAI-5*.
- Hansson, O.**, Mayer, A., and Yung, M. (1992). Criticizing solutions to relaxed models yields powerful admissible heuristics. *Information Sciences*, 63(3), 207–227.
- Haralick, R. M.** and Elliot, G. L. (1980). Increasing tree search efficiency for constraint satisfaction problems. *AIJ*, 14(3), 263–313.
- Hardin, G.** (1968). The tragedy of the commons. *Science*, 162, 1243–1248.
- Hardy, G. H.** (1940). *A Mathematician's Apology*. Cambridge University Press.
- Harman, G. H.** (1983). *Change in View: Principles of Reasoning*. MIT Press.
- Harris, Z.** (1954). Distributional structure. *Word*, 10(2/3).
- Harrison, J. R.** and March, J. G. (1984). Decision making and postdecision surprises. *Administrative Science Quarterly*, 29, 26–42.
- Harsanyi, J.** (1967). Games with incomplete information played by Bayesian players. *Management Science*, 14, 159–182.
- Hart, P. E.**, Nilsson, N. J., and Raphael, B. (1968). A formal basis for the heuristic determination of minimum cost paths. *IEEE Transactions on Systems Science and Cybernetics*, SSC-4(2), 100–107.
- Hart, P. E.**, Nilsson, N. J., and Raphael, B. (1972). Correction to “A formal basis for the heuristic determination of minimum cost paths”. *SIGART Newsletter*, 37, 28–29.
- Hart, T. P.** and Edwards, D. J. (1961). The tree prune (TP) algorithm. Artificial intelligence project memo 30, Massachusetts Institute of Technology.
- Hartley, H.** (1958). Maximum likelihood estimation from incomplete data. *Biometrika*, 45, 174–194.
- Hartley, R.** and Zisserman, A. (2000). *Multiple view geometry in computer vision*. Cambridge University Press.
- Haslum, P.**, Botea, A., Helmert, M., Bonet, B., and Koenig, S. (2007). Domain-independent construction of pattern database heuristics for cost-optimal planning. In *AAAI-07*, pp. 1007–1012.
- Haslum, P.** and Geffner, H. (2001). Heuristic planning with time and resources. In *Proc. IJCAI-01 Workshop on Planning with Resources*.
- Haslum, P.** (2006). Improving heuristics through relaxed search – An analysis of TP4 and HSP*a in the 2004 planning competition. *JAIR*, 25, 233–267.
- Haslum, P.**, Bonet, B., and Geffner, H. (2005). New admissible heuristics for domain-independent planning. In *AAAI-05*.
- Hastie, T.** and Tibshirani, R. (1996). Discriminant adaptive nearest neighbor classification and regression. In Touretzky, D. S., Mozer, M. C., and Hasselmo, M. E. (Eds.), *NIPS 8*, pp. 409–15. MIT Press.
- Hastie, T.**, Tibshirani, R., and Friedman, J. (2001). *The Elements of Statistical Learning: Data Mining, Inference and Prediction* (2nd edition). Springer-Verlag.
- Hastie, T.**, Tibshirani, R., and Friedman, J. (2009). *The Elements of Statistical Learning: Data Mining, Inference and Prediction* (2nd edition). Springer-Verlag.
- Haugeland, J.** (Ed.). (1985). *Artificial Intelligence: The Very Idea*. MIT Press.
- Hauk, T.** (2004). *Search in Trees with Chance Nodes*. Ph.D. thesis, Univ. of Alberta.
- Hausler, D.** (1989). Learning conjunctive concepts in structural domains. *Machine Learning*, 4(1), 7–40.
- Havelund, K.**, Lowry, M., Park, S., Pecheur, C., Penix, J., Visser, W., and White, J. L. (2000). Formal analysis of the remote agent before and after flight. In *Proc. 5th NASA Langley Formal Methods Workshop*.
- Havenstein, H.** (2005). Spring comes to AI winter. *Computer World*.
- Hawkins, J.** and Blakeslee, S. (2004). *On Intelligence*. Henry Holt and Co.
- Hayes, P. J.** (1978). The naive physics manifesto. In Michie, D. (Ed.), *Expert Systems in the Microelectronic Age*. Edinburgh University Press.
- Hayes, P. J.** (1979). The logic of frames. In Metzing, D. (Ed.), *Frame Conceptions and Text Understanding*, pp. 46–61. de Gruyter.
- Hayes, P. J.** (1985a). Naive physics I: Ontology for liquids. In Hobbs, J. R. and Moore, R. C. (Eds.), *Formal Theories of the Commonsense World*, chap. 3, pp. 71–107. Ablex.
- Hayes, P. J.** (1985b). The second naive physics manifesto. In Hobbs, J. R. and Moore, R. C. (Eds.), *Formal Theories of the Commonsense World*, chap. 1, pp. 1–36. Ablex.
- Haykin, S.** (2008). *Neural Networks: A Comprehensive Foundation*. Prentice Hall.
- Hays, J.** and Efros, A. A. (2007). Scene completion Using millions of photographs. *ACM Transactions on Graphics (SIGGRAPH)*, 26(3).
- Hearst, M. A.** (1992). Automatic acquisition of hyponyms from large text corpora. In *COLING-92*.
- Hearst, M. A.** (2009). *Search User Interfaces*. Cambridge University Press.
- Hebb, D. O.** (1949). *The Organization of Behavior*. Wiley.
- Heckerman, D.** (1986). Probabilistic interpretation for MYCIN’s certainty factors. In Kanal, L. N. and Lemmer, J. F. (Eds.), *UAI 2*, pp. 167–196. Elsevier/North-Holland.
- Heckerman, D.** (1991). *Probabilistic Similarity Networks*. MIT Press.
- Heckerman, D.** (1998). A tutorial on learning with Bayesian networks. In Jordan, M. I. (Ed.), *Learning in graphical models*. Kluwer.
- Heckerman, D.**, Geiger, D., and Chickering, D. M. (1994). Learning Bayesian networks: The combination of knowledge and statistical data. Technical report MSR-TR-94-09, Microsoft Research.
- Heidegger, M.** (1927). *Being and Time*. SCM Press.
- Heinz, E. A.** (2000). *Scalable search in computer chess*. Vieweg.
- Held, M.** and Karp, R. M. (1970). The traveling salesman problem and minimum spanning trees. *Operations Research*, 18, 1138–1162.
- Helmert, M.** (2001). On the complexity of planning in transportation domains. In *ECP-01*.
- Helmert, M.** (2003). Complexity results for standard benchmark domains in planning. *AIJ*, 143(2), 219–262.
- Helmert, M.** (2006). The fast downward planning system. *JAIR*, 26, 191–246.
- Helmert, M.** and Richter, S. (2004). Fast downward – Making use of causal dependencies in the problem representation. In *Proc. International Planning Competition at ICAPS*, pp. 41–43.
- Helmert, M.** and Röger, G. (2008). How good is almost perfect? In *AAAI-08*.
- Hendler, J.**, Carbonell, J. G., Lenat, D. B., Mizoguchi, R., and Rosenbloom, P. S. (1995). VERY large knowledge bases – Architecture vs engineering. In *IJCAI-95*, pp. 2033–2036.
- Henrion, M.** (1988). Propagation of uncertainty in Bayesian networks by probabilistic logic sampling. In Lemmer, J. F. and Kanal, L. N. (Eds.), *UAI 2*, pp. 149–163. Elsevier/North-Holland.
- Henzinger, T. A.** and Sastry, S. (Eds.). (1998). *Hybrid systems: Computation and control*. Springer-Verlag.
- Herbrand, J.** (1930). *Recherches sur la Théorie de la Démonstration*. Ph.D. thesis, University of Paris.
- Hewitt, C.** (1969). PLANNER: a language for proving theorems in robots. In *IJCAI-69*, pp. 295–301.
- Hierholzer, C.** (1873). Über die Möglichkeit, einen Linienzug ohne Wiederholung und ohne Unterbrechung zu umfahren. *Mathematische Annalen*, 6, 30–32.
- Hilgard, E. R.** and Bower, G. H. (1975). *Theories of Learning* (4th edition). Prentice-Hall.
- Hintikka, J.** (1962). *Knowledge and Belief*. Cornell University Press.
- Hinton, G. E.** and Anderson, J. A. (1981). *Parallel Models of Associative Memory*. Lawrence Erlbaum Associates.
- Hinton, G. E.** and Nowlan, S. J. (1987). How learning can guide evolution. *Complex Systems*, 1(3), 495–502.
- Hinton, G. E.**, Osindero, S., and Teh, Y. W. (2006). A fast learning algorithm for deep belief nets. *Neural Computation*, 18, 1527–1554.
- Hinton, G. E.** and Sejnowski, T. (1983). Optimal perceptual inference. In *CVPR*, pp. 448–453.
- Hinton, G. E.** and Sejnowski, T. (1986). Learning and relearning in Boltzmann machines. In Rumelhart, D. E. and McClelland, J. L. (Eds.), *Parallel Distributed Processing*, chap. 7, pp. 282–317. MIT Press.
- Hirsh, H.** (1987). Explanation-based generalization in a logic programming environment. In *IJCAI-87*.
- Hobbs, J. R.** (1990). *Literature and Cognition*. CSLI Press.
- Hobbs, J. R.**, Appelt, D., Bear, J., Israel, D., Kameyama, M., Stickel, M. E., and Tyson, M. (1997). FASTUS: A cascaded finite-state transducer for extracting information from natural-language text. In Roche, E. and Schabes, Y. (Eds.), *Finite-State Devices for Natural Language Processing*, pp. 383–406. MIT Press.

- Hobbs, J. R.** and Moore, R. C. (Eds.). (1985). *Formal Theories of the Commonsense World*. Ablex.
- Hobbs, J. R.**, Stickel, M. E., Appelt, D., and Martin, P. (1993). Interpretation as abduction. *AIJ*, 63(1–2), 99–142.
- Hoffmann, J.** (2001). FF: The fast-forward planning system. *AIMag*, 22(3), 57–62.
- Hoffmann, J.** and Brafman, R. I. (2006). Conformant planning via heuristic forward search: A new approach. *AIJ*, 170(6–7), 507–541.
- Hoffmann, J.** and Brafman, R. I. (2005). Contingent planning via heuristic forward search with implicit belief states. In *ICAPS-05*.
- Hoffmann, J.** (2005). Where “ignoring delete lists” works: Local search topology in planning benchmarks. *JAIR*, 24, 685–758.
- Hoffmann, J.** and Nebel, B. (2001). The FF planning system: Fast plan generation through heuristic search. *JAIR*, 14, 253–302.
- Hoffmann, J.**, Sabharwal, A., and Domshlak, C. (2006). Friends or foes? An AI planning perspective on abstraction and search. In *ICAPS-06*, pp. 294–303.
- Hogan, N.** (1985). Impedance control: An approach to manipulation. Parts I, II, and III. *J. Dynamic Systems, Measurement, and Control*, 107(3), 1–24.
- Hoiem, D.**, Efros, A. A., and Hebert, M. (2008). Putting objects in perspective. *IJCV*, 80(1).
- Holland, J. H.** (1975). *Adaption in Natural and Artificial Systems*. University of Michigan Press.
- Holland, J. H.** (1995). *Hidden Order: How Adaptation Builds Complexity*. Addison-Wesley.
- Holte, R.** and Hernadvolgyi, I. (2001). Steps towards the automatic creation of search heuristics. Tech. rep. TR04-02, CS Dept., Univ. of Alberta.
- Holzmann, G. J.** (1997). The Spin model checker. *IEEE Transactions on Software Engineering*, 23(5), 279–295.
- Hood, A.** (1824). Case 4th—28 July 1824 (Mr. Hood’s cases of injuries of the brain). *Phrenological Journal and Miscellany*, 2, 82–94.
- Hooker, J.** (1995). Testing heuristics: We have it all wrong. *J. Heuristics*, 1, 33–42.
- Hoos, H.** and Tsang, E. (2006). Local search methods. In Rossi, F., van Beek, P., and Walsh, T. (Eds.), *Handbook of Constraint Processing*, pp. 135–168. Elsevier.
- Hope, J.** (1994). *The Authorship of Shakespeare’s Plays*. Cambridge University Press.
- Hopfield, J. J.** (1982). Neurons with graded response have collective computational properties like those of two-state neurons. *PNAS*, 79, 2554–2558.
- Horn, A.** (1951). On sentences which are true of direct unions of algebras. *JSL*, 16, 14–21.
- Horn, B. K. P.** (1970). Shape from shading: A method for obtaining the shape of a smooth opaque object from one view. Technical report 232, MIT Artificial Intelligence Laboratory.
- Horn, B. K. P.** (1986). *Robot Vision*. MIT Press.
- Horn, B. K. P.** and Brooks, M. J. (1989). *Shape from Shading*. MIT Press.
- Horn, B. V.** (2003). Constructing a logic of plausible inference: A guide to cox’s theorem. *IJAR*, 34, 3–24.
- Horning, J. J.** (1969). *A study of grammatical inference*. Ph.D. thesis, Stanford University.
- Horowitz, E.** and Sahni, S. (1978). *Fundamentals of Computer Algorithms*. Computer Science Press.
- Horswill, I.** (2000). Functional programming of behavior-based systems. *Autonomous Robots*, 9, 83–93.
- Horvitz, E. J.** (1987). Problem-solving design: Reasoning about computational value, trade-offs, and resources. In *Proc. Second Annual NASA Research Forum*, pp. 26–43.
- Horvitz, E. J.** (1989). Rational metareasoning and compilation for optimizing decisions under bounded resources. In *Proc. Computational Intelligence 89*. Association for Computing Machinery.
- Horvitz, E. J.** and Barry, M. (1995). Display of information for time-critical decision making. In *UAI-95*, pp. 296–305.
- Horvitz, E. J.**, Breese, J. S., Heckerman, D., and Hovel, D. (1998). The Lumiere project: Bayesian user modeling for inferring the goals and needs of software users. In *UAI-98*, pp. 256–265.
- Horvitz, E. J.**, Breese, J. S., and Henrion, M. (1988). Decision theory in expert systems and artificial intelligence. *IJAR*, 2, 247–302.
- Horvitz, E. J.** and Breese, J. S. (1996). Ideal partition of resources for metareasoning. In *AAAI-96*, pp. 1229–1234.
- Horvitz, E. J.** and Heckerman, D. (1986). The inconsistent use of measures of certainty in artificial intelligence research. In Kanal, L. N. and Lemmer, J. F. (Eds.), *UAI 2*, pp. 137–151. Elsevier/North-Holland.
- Horvitz, E. J.**, Heckerman, D., and Langlotz, C. P. (1986). A framework for comparing alternative formalisms for plausible reasoning. In *AAAI-86*, Vol. 1, pp. 210–214.
- Howard, R. A.** (1960). *Dynamic Programming and Markov Processes*. MIT Press.
- Howard, R. A.** (1966). Information value theory. *IEEE Transactions on Systems Science and Cybernetics*, SSC-2, 22–26.
- Howard, R. A.** (1977). Risk preference. In Howard, R. A. and Matheson, J. E. (Eds.), *Readings in Decision Analysis*, pp. 429–465. Decision Analysis Group, SRI International.
- Howard, R. A.** (1989). Microrisks for medical decision analysis. *Int. J. Technology Assessment in Health Care*, 5, 357–370.
- Howard, R. A.** and Matheson, J. E. (1984). Influence diagrams. In Howard, R. A. and Matheson, J. E. (Eds.), *Readings on the Principles and Applications of Decision Analysis*, pp. 721–762. Strategic Decisions Group.
- Howe, D.** (1987). The computational behaviour of girard’s paradox. In *LICS-87*, pp. 205–214.
- Hsu, F.-H.** (2004). *Behind Deep Blue: Building the Computer that Defeated the World Chess Champion*. Princeton University Press.
- Hsu, F.-H.**, Anantharaman, T. S., Campbell, M. S., and Nowatzky, A. (1990). A grandmaster chess machine. *Scientific American*, 263(4), 44–50.
- Hu, J.** and Wellman, M. P. (1998). Multiagent reinforcement learning: Theoretical framework and an algorithm. In *ICML-98*, pp. 242–250.
- Hu, J.** and Wellman, M. P. (2003). Nash q-learning for general-sum stochastic games. *JMLR*, 4, 1039–1069.
- Huang, T.**, Koller, D., Malik, J., Ogasawara, G., Rao, B., Russell, S. J., and Weber, J. (1994). Automatic symbolic traffic scene analysis using belief networks. In *AAAI-94*, pp. 966–972.
- Huang, T.** and Russell, S. J. (1998). Object identification: A Bayesian analysis with application to traffic surveillance. *AII*, 103, 1–17.
- Huang, X. D.**, Aceri, A., and Hon, H. (2001). *Spoken Language Processing*. Prentice Hall.
- Hubel, D. H.** (1988). *Eye, Brain, and Vision*. W. H. Freeman.
- Huddleston, R. D.** and Pullum, G. K. (2002). *The Cambridge Grammar of the English Language*. Cambridge University Press.
- Huffman, D. A.** (1971). Impossible objects as non-sense sentences. In Meltzer, B. and Michie, D. (Eds.), *Machine Intelligence 6*, pp. 295–324. Edinburgh University Press.
- Hughes, B. D.** (1995). *Random Walks and Random Environments, Vol. 1: Random Walks*. Oxford University Press.
- Hughes, G. E.** and Cresswell, M. J. (1996). *A New Introduction to Modal Logic*. Routledge.
- Huhns, M. N.** and Singh, M. P. (Eds.). (1998). *Readings in Agents*. Morgan Kaufmann.
- Hume, D.** (1739). *A Treatise of Human Nature* (2nd edition). Republished by Oxford University Press, 1978, Oxford, UK.
- Humphrys, M.** (2008). How my program passed the turing test. In Epstein, R., Roberts, G., and Beber, G. (Eds.), *Parsing the Turing Test*. Springer.
- Hunsberger, L.** and Grosz, B. J. (2000). A combinatorial auction for collaborative planning. In *Int. Conference on Multi-Agent Systems (ICMAS-2000)*.
- Hunt, W.** and Brock, B. (1992). A formal HDL and its use in the FM9001 verification. *Philosophical Transactions of the Royal Society of London*, 339.
- Hunter, L.** and States, D. J. (1992). Bayesian classification of protein structure. *IEEE Expert*, 7(4), 67–75.
- Hurst, M.** (2000). *The Interpretation of Text in Tables*. Ph.D. thesis, Edinburgh.
- Hurwicz, L.** (1973). The design of mechanisms for resource allocation. *American Economic Review Papers and Proceedings*, 63(1), 1–30.
- Husmeier, D.** (2003). Sensitivity and specificity of inferring genetic regulatory interactions from microarray experiments with dynamic bayesian networks. *Bioinformatics*, 19(17), 2271–2282.
- Huth, M.** and Ryan, M. (2004). *Logic in computer science: modelling and reasoning about systems* (2nd edition). Cambridge University Press.
- Huttenlocher, D.** and Ullman, S. (1990). Recognizing solid objects by alignment with an image. *IJCV*, 5(2), 195–212.
- Hyggen, C.** (1657). De ratioinibus in ludo aleae. In van Schooten, F. (Ed.), *Exercitionum Mathematicorum*. Elsevier, Amsterdam. Translated into English by John Arbuthnot (1692).
- Huyn, N.**, Dechter, R., and Pearl, J. (1980). Probabilistic analysis of the complexity of A*. *AII*, 15(3), 241–254.
- Hwa, R.** (1998). An empirical evaluation of probabilistic lexicalized tree insertion grammars. In *ACL-98*, pp. 557–563.
- Hwang, C. H.** and Schubert, L. K. (1993). EL: A formal, yet natural, comprehensive knowledge representation. In *AAAI-93*, pp. 676–682.
- Ingerman, P. Z.** (1967). Panini–Backus form suggested. *CACM*, 10(3), 137.
- Inoue, K.** (2001). Inverse entailment for full clausal theories. In *LICS-2001 Workshop on Logic and Learning*.

- Intille, S.** and Bobick, A. (1999). A framework for recognizing multi-agent action from visual evidence. In *AAAI-99*, pp. 518–525.
- Isard, M.** and Blake, A. (1996). Contour tracking by stochastic propagation of conditional density. In *ECCV*, pp. 343–356.
- Iwama, K.** and Tamaki, S. (2004). Improved upper bounds for 3-SAT. In *SODA-04*.
- Jaakkola, T.** and Jordan, M. I. (1996). Computing upper and lower bounds on likelihoods in intractable networks. In *UAI-96*, pp. 340–348. Morgan Kaufmann.
- Jaakkola, T.**, Singh, S. P., and Jordan, M. I. (1995). Reinforcement learning algorithm for partially observable Markov decision problems. In *NIPS* 7, pp. 345–352.
- Jackson, F.** (1982). Epiphenomenal qualia. *Philosophical Quarterly*, 32, 127–136.
- Jaffar, J.** and Lassez, J.-L. (1987). Constraint logic programming. In *Proc. Fourteenth ACM Conference on Principles of Programming Languages*, pp. 111–119. Association for Computing Machinery.
- Jaffar, J.**, Michaylov, S., Stuckey, P. J., and Yap, R. H. C. (1992). The CLP(R) language and system. *ACM Transactions on Programming Languages and Systems*, 14(3), 339–395.
- Jaynes, E. T.** (2003). *Probability Theory: The Logic of Science*. Cambridge Univ. Press.
- Jefferson, G.** (1949). The mind of mechanical man: The Lister Oration delivered at the Royal College of Surgeons in England. *British Medical Journal*, 1(25), 1105–1121.
- Jeffrey, R. C.** (1983). *The Logic of Decision* (2nd edition). University of Chicago Press.
- Jeffreys, H.** (1948). *Theory of Probability*. Oxford.
- Jelinek, F.** (1976). Continuous speech recognition by statistical methods. *Proc. IEEE*, 64(4), 532–556.
- Jelinek, F.** (1997). *Statistical Methods for Speech Recognition*. MIT Press.
- Jelinek, F.** and Mercer, R. L. (1980). Interpolated estimation of Markov source parameters from sparse data. In *Proc. Workshop on Pattern Recognition in Practice*, pp. 381–397.
- Jennings, H. S.** (1906). *Behavior of the Lower Organisms*. Columbia University Press.
- Jenniskens, P.**, Betlem, H., Betlem, J., and Barifaijo, E. (1994). The Mbale meteorite shower. *Meteoritics*, 29(2), 246–254.
- Jensen, F. V.** (2001). *Bayesian Networks and Decision Graphs*. Springer-Verlag.
- Jensen, F. V.** (2007). *Bayesian Networks and Decision Graphs*. Springer-Verlag.
- Jevons, W. S.** (1874). *The Principles of Science*. Routledge/Thoemmes Press, London.
- Ji, S.**, Parr, R., Li, H., Liao, X., and Carin, L. (2007). Point-based policy iteration. In *AAAI-07*.
- Jimenez, P.** and Torras, C. (2000). An efficient algorithm for searching implicit AND/OR graphs with cycles. *AII*, 124(1), 1–30.
- Joachims, T.** (2001). A statistical learning model of text classification with support vector machines. In *SIGIR-01*, pp. 128–136.
- Johnson, W. W.** and Story, W. E. (1879). Notes on the “15” puzzle. *American Journal of Mathematics*, 2, 397–404.
- Johnston, M. D.** and Adorf, H.-M. (1992). Scheduling with neural networks: The case of the Hubble space telescope. *Computers and Operations Research*, 19(3–4), 209–240.
- Jones, N. D.**, Gomard, C. K., and Sestoft, P. (1993). *Partial Evaluation and Automatic Program Generation*. Prentice-Hall.
- Jones, R.**, Laird, J., and Nielsen, P. E. (1998). Automated intelligent pilots for combat flight simulation. In *AAAI-98*, pp. 1047–54.
- Jones, R.**, McCallum, A., Nigam, K., and Riloff, E. (1999). Bootstrapping for text learning tasks. In *Proc. IJCAI-99 Workshop on Text Mining: Foundations, Techniques, and Applications*, pp. 52–63.
- Jones, T.** (2007). *Artificial Intelligence: A Systems Approach*. Infinity Science Press.
- Jonsson, A.**, Morris, P., Muscettola, N., Rajan, K., and Smith, B. (2000). Planning in interplanetary space: Theory and practice. In *AIPS-00*, pp. 177–186.
- Jordan, M. I.** (1995). Why the logistic function? a tutorial discussion on probabilities and neural networks. Computational cognitive science technical report 9503, Massachusetts Institute of Technology.
- Jordan, M. I.** (2005). Dirichlet processes, Chinese restaurant processes and all that. Tutorial presentation at the NIPS Conference.
- Jordan, M. I.**, Ghahramani, Z., Jaakkola, T., and Saul, L. K. (1998). An introduction to variational methods for graphical models. In Jordan, M. I. (Ed.), *Learning in Graphical Models*. Kluwer.
- Jouannaud, J.-P.** and Kirchner, C. (1991). Solving equations in abstract algebras: A rule-based survey of unification. In Lassez, J.-L. and Plotkin, G. (Eds.), *Computational Logic*, pp. 257–321. MIT Press.
- Judd, J. S.** (1990). *Neural Network Design and the Complexity of Learning*. MIT Press.
- Juels, A.** and Wattenberg, M. (1996). Stochastic hillclimbing as a baseline method for evaluating genetic algorithms. In Touretzky, D. S., Mozer, M. C., and Hasselmo, M. E. (Eds.), *NIPS* 8, pp. 430–6. MIT Press.
- Junker, U.** (2003). The logic of ilog (j)configurator: Combining constraint programming with a description logic. In *Proc. IJCAI-03 Configuration Workshop*, pp. 13–20.
- Jurafsky, D.** and Martin, J. H. (2000). *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition*. Prentice-Hall.
- Jurafsky, D.** and Martin, J. H. (2008). *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition* (2nd edition). Prentice-Hall.
- Kadane, J. B.** and Simon, H. A. (1977). Optimal strategies for a class of constrained sequential problems. *Annals of Statistics*, 5, 237–255.
- Kadane, J. B.** and Larkey, P. D. (1982). Subjective probability and the theory of games. *Management Science*, 28(2), 113–120.
- Kaelbling, L. P.**, Littman, M. L., and Cassandra, A. R. (1998). Planning and acting in partially observable stochastic domains. *AII*, 101, 99–134.
- Kaelbling, L. P.**, Littman, M. L., and Moore, A. W. (1996). Reinforcement learning: A survey. *JAIR*, 4, 237–285.
- Kaelbling, L. P.** and Rosenschein, S. J. (1990). Action and planning in embedded agents. *Robotics and Autonomous Systems*, 6(1–2), 35–48.
- Kager, R.** (1999). *Optimality Theory*. Cambridge University Press.
- Kahn, H.** and Marshall, A. W. (1953). Methods of reducing sample size in Monte Carlo computations. *Operations Research*, 1(5), 263–278.
- Kahneman, D.**, Slovic, P., and Tversky, A. (Eds.). (1982). *Judgment under Uncertainty: Heuristics and Biases*. Cambridge University Press.
- Kahneman, D.** and Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, pp. 263–291.
- Kaindl, H.** and Khorsand, A. (1994). Memory-bounded bidirectional search. In *AAAI-94*, pp. 1359–1364.
- Kalman, R.** (1960). A new approach to linear filtering and prediction problems. *J. Basic Engineering*, 82, 35–46.
- Kambhampati, S.** (1994). Exploiting causal structure to control retrieval and refitting during plan reuse. *Computational Intelligence*, 10, 213–244.
- Kambhampati, S.**, Mali, A. D., and Srivastava, B. (1998). Hybrid planning for partially hierarchical domains. In *AAAI-98*, pp. 882–888.
- Kanal, L. N.** and Kumar, V. (1988). *Search in Artificial Intelligence*. Springer-Verlag.
- Kanazawa, K.**, Koller, D., and Russell, S. J. (1995). Stochastic simulation algorithms for dynamic probabilistic networks. In *UAI-95*, pp. 346–351.
- Kantorovich, L. V.** (1939). Mathematical methods of organizing and planning production. Published in translation in *Management Science*, 6(4), 366–422, July 1960.
- Kaplan, D.** and Montague, R. (1960). A paradox regained. *Notre Dame Journal of Formal Logic*, 1(3), 79–90.
- Karmarkar, N.** (1984). A new polynomial-time algorithm for linear programming. *Combinatorica*, 4, 373–395.
- Karp, R. M.** (1972). Reducibility among combinatorial problems. In Miller, R. E. and Thatcher, J. W. (Eds.), *Complexity of Computer Computations*, pp. 85–103. Plenum.
- Kartam, N. A.** and Levitt, R. E. (1990). A constraint-based approach to construction planning of multi-story buildings. In *Expert Planning Systems*, pp. 245–250. Institute of Electrical Engineers.
- Kasami, T.** (1965). An efficient recognition and syntax analysis algorithm for context-free languages. Tech. rep. AFCLR-65-758, Air Force Cambridge Research Laboratory.
- Kasparov, G.** (1997). IBM owes me a rematch. *Time*, 149(21), 66–67.
- Kaufmann, M.**, Manolios, P., and Moore, J. S. (2000). *Computer-Aided Reasoning: An Approach*. Kluwer.
- Kautz, H.** (2006). Deconstructing planning as satisfiability. In *AAAI-06*.
- Kautz, H.**, McAllester, D. A., and Selman, B. (1996). Encoding plans in propositional logic. In *KR-96*, pp. 374–384.
- Kautz, H.** and Selman, B. (1992). Planning as satisfiability. In *ECAI-92*, pp. 359–363.

- Kautz, H.** and Selman, B. (1998). BLACKBOX: A new approach to the application of theorem proving to problem solving. Working Notes of the AIPS-98 Workshop on Planning as Combinatorial Search.
- Kavraki, L.**, Svestka, P., Latombe, J.-C., and Overmars, M. (1996). Probabilistic roadmaps for path planning in high-dimensional configuration spaces. *IEEE Transactions on Robotics and Automation*, 12(4), 566–580.
- Kay, M.**, Gawron, J. M., and Norvig, P. (1994). *Verbmobil: A Translation System for Face-To-Face Dialog*. CSLI Press.
- Kearns, M.** (1990). *The Computational Complexity of Machine Learning*. MIT Press.
- Kearns, M.**, Mansour, Y., and Ng, A. Y. (2000). Approximate planning in large POMDPs via reusable trajectories. In Solla, S. A., Leen, T. K., and Müller, K.-R. (Eds.), *NIPS 12*. MIT Press.
- Kearns, M.** and Singh, S. P. (1998). Near-optimal reinforcement learning in polynomial time. In *ICML-98*, pp. 260–268.
- Kearns, M.** and Vazirani, U. (1994). *An Introduction to Computational Learning Theory*. MIT Press.
- Kearns, M.** and Mansour, Y. (1998). A fast, bottom-up decision tree pruning algorithm with near-optimal generalization. In *ICML-98*, pp. 269–277.
- Kebeasy, R. M.**, Hussein, A. I., and Dahy, S. A. (1998). Discrimination between natural earthquakes and nuclear explosions using the Aswan Seismic Network. *Annali di Geofisica*, 41(2), 127–140.
- Keeney, R. L.** (1974). Multiplicative utility functions. *Operations Research*, 22, 22–34.
- Keeney, R. L.** and Raiffa, H. (1976). *Decisions with Multiple Objectives: Preferences and Value Trade-offs*. Wiley.
- Kemp, M.** (Ed.) (1989). *Leonardo on Painting: An Anthology of Writings*. Yale University Press.
- Kephart, J. O.** and Chess, D. M. (2003). The vision of autonomic computing. *IEEE Computer*, 36(1), 41–50.
- Kersting, K.**, Raedt, L. D., and Kramer, S. (2000). Interpreting bayesian logic programs. In *Proc. AAAI-2000 Workshop on Learning Statistical Models from Relational Data*.
- Kessler, B.**, Nunberg, G., and Schütze, H. (1997). Automatic detection of text genre. *CoRR, cmp-lg/9707002*.
- Keynes, J. M.** (1921). *A Treatise on Probability*. Macmillan.
- Khare, R.** (2006). Microformats: The next (small) thing on the semantic web. *IEEE Internet Computing*, 10(1), 68–75.
- Khatib, O.** (1986). Real-time obstacle avoidance for robot manipulator and mobile robots. *Int. J. Robotics Research*, 5(1), 90–98.
- Khmelev, D. V.** and Tweedie, F. J. (2001). Using Markov chains for identification of writer. *Literary and Linguistic Computing*, 16(3), 299–307.
- Kietz, J.-U.** and Duzeroski, S. (1994). Inductive logic programming and learnability. *SIGART Bulletin*, 5(1), 22–32.
- Kilgarriff, A.** and Grefenstette, G. (2006). Introduction to the special issue on the web as corpus. *Computational Linguistics*, 29(3), 333–347.
- Kim, J. H.** (1983). A computational model for combined causal and diagnostic reasoning in inference systems. In *IJCAI-83*, pp. 190–193.
- Kim, J.-H.**, Lee, C.-H., Lee, K.-H., and Kuppuswamy, N. (2007). Evolving personality of a genetic robot in ubiquitous environment. In *The 16th IEEE International Symposium on Robot and Human-interactive Communication*, pp. 848–853.
- King, R. D.**, Rowland, J., Oliver, S. G., and Young, M. (2009). The automation of science. *Science*, 324(5923), 85–89.
- Kirk, D. E.** (2004). *Optimal Control Theory: An Introduction*. Dover.
- Kirkpatrick, S.**, Gelatt, C. D., and Vecchi, M. P. (1983). Optimization by simulated annealing. *Science*, 220, 671–680.
- Kister, J.**, Stein, P., Ulam, S., Walden, W., and Wells, M. (1957). Experiments in chess. *JACM*, 4, 174–177.
- Kisynski, J.** and Poole, D. (2009). Lifted aggregation in directed first-order probabilistic models. In *IJCAI-09*.
- Kitano, H.**, Asada, M., Kuniyoshi, Y., Noda, I., and Osawa, E. (1997a). RoboCup: The robot world cup initiative. In *Proc. First International Conference on Autonomous Agents*, pp. 340–347.
- Kitano, H.**, Asada, M., Kuniyoshi, Y., Noda, I., Osawa, E., and Matsubara, H. (1997b). RoboCup: A challenge problem for AI. *AIMag*, 18(1), 73–85.
- Kjaerulff, U.** (1992). A computational scheme for reasoning in dynamic probabilistic networks. In *UAI-92*, pp. 121–129.
- Klein, D.** and Manning, C. (2001). Parsing with treebank grammars: Empirical bounds, theoretical models, and the structure of the Penn treebank. In *ACL-01*.
- Klein, D.** and Manning, C. (2003). A* parsing: Fast exact Viterbi parse selection. In *HLT-NAACL-03*, pp. 119–126.
- Klein, D.**, Smarr, J., Nguyen, H., and Manning, C. (2003). Named entity recognition with character-level models. In *Conference on Natural Language Learning (CoNLL)*.
- Kleinberg, J. M.** (1999). Authoritative sources in a hyperlinked environment. *JACM*, 46(5), 604–632.
- Klempner, P.** (2002). What really matters in auction design. *J. Economic Perspectives*, 16(1).
- Kneser, R.** and Ney, H. (1995). Improved backoff for M-gram language modeling. In *ICASSP-95*, pp. 181–184.
- Knight, K.** (1999). A statistical MT tutorial workbook. Prepared in connection with the Johns Hopkins University summer workshop.
- Knuth, D. E.** (1964). Representing numbers using only one 4. *Mathematics Magazine*, 37(Nov/Dec), 308–310.
- Knuth, D. E.** (1968). Semantics for context-free languages. *Mathematical Systems Theory*, 2(2), 127–145.
- Knuth, D. E.** (1973). *The Art of Computer Programming* (second edition), Vol. 2: Fundamental Algorithms. Addison-Wesley.
- Knuth, D. E.** (1975). An analysis of alpha–beta pruning. *AII*, 6(4), 293–326.
- Knuth, D. E.** and Bendix, P. B. (1970). Simple word problems in universal algebras. In Leech, J. (Ed.), *Computational Problems in Abstract Algebra*, pp. 263–267. Pergamon.
- Kocsis, L.** and Szepesvari, C. (2006). Bandit-based Monte-Carlo planning. In *ECML-06*.
- Koditschek, D.** (1987). Exact robot navigation by means of potential functions: some topological considerations. In *ICRA-87*, Vol. 1, pp. 1–6.
- Koehler, J.**, Nebel, B., Hoffmann, J., and Dimopoulos, Y. (1997). Extending planning graphs to an ADL subset. In *ECP-97*, pp. 273–285.
- Koehn, P.** (2009). *Statistical Machine Translation*. Cambridge University Press.
- Koenderink, J. J.** (1990). *Solid Shape*. MIT Press.
- Koenig, S.** (1991). Optimal probabilistic and decision-theoretic planning using Markovian decision theory. Master's report, Computer Science Division, University of California.
- Koenig, S.** (2000). Exploring unknown environments with real-time search or reinforcement learning. In Solla, S. A., Leen, T. K., and Müller, K.-R. (Eds.), *NIPS 12*. MIT Press.
- Koenig, S.** (2001). Agent-centered search. *AIMag*, 22(4), 109–131.
- Koller, D.**, Megiddo, N., and von Stengel, B. (1996). Efficient computation of equilibria for extensive two-person games. *Games and Economic Behaviour*, 14(2), 247–259.
- Koller, D.** and Pfeffer, A. (1997). Representations and solutions for game-theoretic problems. *AII*, 94(1–2), 167–215.
- Koller, D.** and Pfeffer, A. (1998). Probabilistic frame-based systems. In *AAAI-98*, pp. 580–587.
- Koller, D.** and Friedman, N. (2009). *Probabilistic Graphical Models: Principles and Techniques*. MIT Press.
- Koller, D.** and Milch, B. (2003). Multi-agent influence diagrams for representing and solving games. *Games and Economic Behavior*, 45, 181–221.
- Koller, D.** and Parr, R. (2000). Policy iteration for factored MDPs. In *UAI-00*, pp. 326–334.
- Koller, D.** and Sahami, M. (1997). Hierarchically classifying documents using very few words. In *ICML-97*, pp. 170–178.
- Kolmogorov, A. N.** (1941). Interpolation und extrapolation von stationären zufälligen folgen. *Bulletin of the Academy of Sciences of the USSR, Ser. Math.* 5, 3–14.
- Kolmogorov, A. N.** (1950). *Foundations of the Theory of Probability*. Chelsea.
- Kolmogorov, A. N.** (1963). On tables of random numbers. *Sankhya, the Indian Journal of Statistics, Series A* 25.
- Kolmogorov, A. N.** (1965). Three approaches to the quantitative definition of information. *Problems in Information Transmission*, 1(1), 1–7.
- Kolodner, J.** (1983). Reconstructive memory: A computer model. *Cognitive Science*, 7, 281–328.
- Kolodner, J.** (1993). *Case-Based Reasoning*. Morgan Kaufmann.
- Kondrak, G.** and van Beek, P. (1997). A theoretical evaluation of selected backtracking algorithms. *AII*, 89, 365–387.
- Konolige, K.** (1997). COLBERT: A language for reactive control in Saphira. In *Künstliche Intelligenz: Advances in Artificial Intelligence*, LNAI, pp. 31–52.
- Konolige, K.** (2004). Large-scale map-making. In *AAAI-04*, pp. 457–463.

- Konolige, K.** (1982). A first order formalization of knowledge and action for a multi-agent planning system. In Hayes, J. E., Michie, D., and Pao, Y.-H. (Eds.), *Machine Intelligence 10*. Ellis Horwood.
- Konolige, K.** (1994). Easy to be hard: Difficult problems for greedy algorithms. In *KR-94*, pp. 374–378.
- Koo, T., Carreras, X., and Collins, M.** (2008). Simple semi-supervised dependency parsing. In *ACL-08*.
- Koopmans, T. C.** (1972). Representation of preference orderings over time. In McGuire, C. B. and Radner, R. (Eds.), *Decision and Organization*. Elsevier/North-Holland.
- Korb, K. B.** and Nicholson, A. (2003). *Bayesian Artificial Intelligence*. Chapman and Hall.
- Korb, K. B., Nicholson, A., and Jitnah, N.** (1999). Bayesian poker. In *UAI-99*.
- Korf, R. E.** (1985a). Depth-first iterative-deepening: an optimal admissible tree search. *AIJ*, 27(1), 97–109.
- Korf, R. E.** (1985b). Iterative-deepening A*: An optimal admissible tree search. In *IJCAI-85*, pp. 1034–1036.
- Korf, R. E.** (1987). Planning as search: A quantitative approach. *AIJ*, 33(1), 65–88.
- Korf, R. E.** (1990). Real-time heuristic search. *AIJ*, 42(3), 189–212.
- Korf, R. E.** (1993). Linear-space best-first search. *AIJ*, 62(1), 41–78.
- Korf, R. E.** (1995). Space-efficient search algorithms. *ACM Computing Surveys*, 27(3), 337–339.
- Korf, R. E. and Chickering, D. M.** (1996). Best-first minimax search. *AIJ*, 84(1–2), 299–337.
- Korf, R. E. and Felner, A.** (2002). Disjoint pattern database heuristics. *AIJ*, 134(1–2), 9–22.
- Korf, R. E., Reid, M., and Edelkamp, S.** (2001). Time complexity of iterative-deepening-A*. *AIJ*, 129, 199–218.
- Korf, R. E. and Zhang, W.** (2000). Divide-and-conquer frontier search applied to optimal sequence alignment. In *American Association for Artificial Intelligence*, pp. 910–916.
- Korf, R. E.** (2008). Linear-time disk-based implicit graph search. *JACM*, 55(6).
- Korf, R. E. and Schulte, P.** (2005). Large-scale parallel breadth-first search. In *AAAI-05*, pp. 1380–1385.
- Kotok, A.** (1962). A chess playing program for the IBM 7090. AI project memo 41, MIT Computation Center.
- Koutsoupias, E. and Papadimitriou, C. H.** (1992). On the greedy algorithm for satisfiability. *Information Processing Letters*, 43(1), 53–55.
- Kowalski, R.** (1974). Predicate logic as a programming language. In *Proc. IFIP Congress*, pp. 569–574.
- Kowalski, R.** (1979). *Logic for Problem Solving*. Elsevier/North-Holland.
- Kowalski, R.** (1988). The early years of logic programming. *CACM*, 31, 38–43.
- Kowalski, R. and Sergot, M.** (1986). A logic-based calculus of events. *New Generation Computing*, 4(1), 67–95.
- Koza, J. R.** (1992). *Genetic Programming: On the Programming of Computers by Means of Natural Selection*. MIT Press.
- Koza, J. R.** (1994). *Genetic Programming II: Automatic discovery of reusable programs*. MIT Press.
- Koza, J. R., Bennett, F. H., Andre, D., and Keane, M. A.** (1999). *Genetic Programming III: Darwinian invention and problem solving*. Morgan Kaufmann.
- Kraus, S., Ephrati, E., and Lehmann, D.** (1991). Negotiation in a non-cooperative environment. *AIJ*, 3(4), 255–281.
- Krause, A. and Guestrin, C.** (2009). Optimal value of information in graphical models. *JAIR*, 35, 557–591.
- Krause, A., McMahan, B., Guestrin, C., and Gupta, A.** (2008). Robust submodular observation selection. *JMLR*, 9, 2761–2801.
- Kripke, S. A.** (1963). Semantical considerations on modal logic. *Acta Philosophica Fennica*, 16, 83–94.
- Krogh, A., Brown, M., Mian, I. S., Sjolander, K., and Haussler, D.** (1994). Hidden Markov models in computational biology: Applications to protein modeling. *J. Molecular Biology*, 235, 1501–1531.
- Kübler, S., McDonald, R., and Nivre, J.** (2009). *Dependency Parsing*. Morgan Claypool.
- Kuhn, H. W.** (1953). Extensive games and the problem of information. In Kuhn, H. W. and Tucker, A. W. (Eds.), *Contributions to the Theory of Games II*. Princeton University Press.
- Kuhn, H. W.** (1955). The Hungarian method for the assignment problem. *Naval Research Logistics Quarterly*, 2, 83–97.
- Kuipers, B. J.** (1985). Qualitative simulation. In Bobrow, D. (Ed.), *Qualitative Reasoning About Physical Systems*, pp. 169–203. MIT Press.
- Kuipers, B. J. and Levitt, T. S.** (1988). Navigation and mapping in large-scale space. *AIMag*, 9(2), 25–43.
- Kuipers, B. J.** (2001). Qualitative simulation. In Meyers, R. A. (Ed.), *Encyclopedias of Physical Science and Technology*. Academic Press.
- Kumar, P. R. and Varaiya, P.** (1986). *Stochastic Systems: Estimation, Identification, and Adaptive Control*. Prentice-Hall.
- Kumar, V.** (1992). Algorithms for constraint satisfaction problems: A survey. *AIMag*, 13(1), 32–44.
- Kumar, V. and Kanal, L. N.** (1983). A general branch and bound formulation for understanding and synthesizing and/or tree search procedures. *AIJ*, 21, 179–198.
- Kumar, V. and Kanal, L. N.** (1988). The CDP: A unifying formulation for heuristic search, dynamic programming, and branch-and-bound. In Kanal, L. N. and Kumar, V. (Eds.), *Search in Artificial Intelligence*, chap. 1, pp. 1–27. Springer-Verlag.
- Kumar, V., Nau, D. S., and Kanal, L. N.** (1988). A general branch-and-bound formulation for AND/OR graph and game tree search. In Kanal, L. N. and Kumar, V. (Eds.), *Search in Artificial Intelligence*, chap. 3, pp. 91–130. Springer-Verlag.
- Kurien, J., Nayak, P., and Smith, D. E.** (2002). Fragment-based conformant planning. In *AIPS-02*.
- Kurzweil, R.** (1990). *The Age of Intelligent Machines*. MIT Press.
- Kurzweil, R.** (2005). *The Singularity is Near*. Viking.
- Kwok, C., Etzioni, O., and Weld, D. S.** (2001). Scaling question answering to the web. In *Proc. 10th International Conference on the World Wide Web*.
- Kyburg, H. E. and Teng, C.-M.** (2006). Nonmonotonic logic and statistical inference. *Computational Intelligence*, 22(1), 26–51.
- Kyburg, H. E.** (1977). Randomness and the right reference class. *J. Philosophy*, 74(9), 501–521.
- Kyburg, H. E.** (1983). The reference class. *Philosophy of Science*, 50, 374–397.
- La Mettrie, J. O.** (1748). *L'homme machine*. E. Luzac, Leyde, France.
- La Mura, P. and Shoham, Y.** (1999). Expected utility networks. In *UAI-99*, pp. 366–373.
- Laborie, P.** (2003). Algorithms for propagating resource constraints in AI planning and scheduling. *AIJ*, 143(2), 151–188.
- Ladkin, P.** (1986a). Primitives and units for time specification. In *AAAI-86*, Vol. 1, pp. 354–359.
- Ladkin, P.** (1986b). Time representation: a taxonomy of interval relations. In *AAAI-86*, Vol. 1, pp. 360–366.
- Lafferty, J., McCallum, A., and Pereira, F.** (2001). Conditional random fields: Probabilistic models for segmenting and labeling sequence data. In *ICML-01*.
- Lafferty, J. and Zhai, C.** (2001). Probabilistic relevance models based on document and query generation. In *Proc. Workshop on Language Modeling and Information Retrieval*.
- Lagoudakis, M. G. and Parr, R.** (2003). Least-squares policy iteration. *JMLR*, 4, 1107–1149.
- Laird, J., Newell, A., and Rosenbloom, P. S.** (1987). SOAR: An architecture for general intelligence. *AIJ*, 33(1), 1–64.
- Laird, J., Rosenbloom, P. S., and Newell, A.** (1986). Chunking in Soar: The anatomy of a general learning mechanism. *Machine Learning*, 1, 11–46.
- Laird, J.** (2008). Extending the Soar cognitive architecture. In *Artificial General Intelligence Conference*.
- Lakoff, G.** (1987). *Women, Fire, and Dangerous Things: What Categories Reveal About the Mind*. University of Chicago Press.
- Lakoff, G. and Johnson, M.** (1980). *Metaphors We Live By*. University of Chicago Press.
- Lakoff, G. and Johnson, M.** (1999). *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. Basic Books.
- Lam, J. and Greenspan, M.** (2008). Eye-in-hand visual servoing for accurate shooting in pool robotics. In *5th Canadian Conference on Computer and Robot Vision*.
- Lamarck, J. B.** (1809). *Philosophie zoologique*. Chez Dentu et L'Auteur, Paris.
- Landhuis, E.** (2004). Lifelong debunker takes on arbiter of neutral choices: Magician-turned-mathematician uncovers bias in a flip of a coin. *Stanford Report*.
- Langdon, W. and Poli, R.** (2002). *Foundations of Genetic Programming*. Springer.
- Langley, P., Simon, H. A., Bradshaw, G. L., and Zytkow, J. M.** (1987). *Scientific Discovery: Computational Explorations of the Creative Processes*. MIT Press.
- Langton, C. (Ed.).** (1995). *Artificial Life*. MIT Press.
- Laplace, P.** (1816). *Essai philosophique sur les probabilités* (3rd edition). Courcier Imprimeur, Paris.

- Laptev, I.** and Perez, P. (2007). Retrieving actions in movies. In *ICCV*, pp. 1–8.
- Lari, K.** and Young, S. J. (1990). The estimation of stochastic context-free grammars using the inside-outside algorithm. *Computer Speech and Language*, 4, 35–56.
- Larrañaga, P.**, Kuijpers, C., Murga, R., Inza, I., and Dizdarevic, S. (1999). Genetic algorithms for the travelling salesman problem: A review of representations and operators. *Artificial Intelligence Review*, 13, 129–170.
- Larson, S. C.** (1931). The shrinkage of the coefficient of multiple correlation. *J. Educational Psychology*, 22, 45–55.
- Laskey, K. B.** (2008). MEBN: A language for first-order bayesian knowledge bases. *AII*, 172, 140–178.
- Latombe, J.-C.** (1991). *Robot Motion Planning*. Kluwer.
- Lauritzen, S.** (1995). The EM algorithm for graphical association models with missing data. *Computational Statistics and Data Analysis*, 19, 191–201.
- Lauritzen, S.** (1996). *Graphical models*. Oxford University Press.
- Lauritzen, S.**, Dawid, A. P., Larsen, B., and Leimer, H. (1990). Independence properties of directed Markov fields. *Networks*, 20(5), 491–505.
- Lauritzen, S.** and Spiegelhalter, D. J. (1988). Local computations with probabilities on graphical structures and their application to expert systems. *J. Royal Statistical Society, B* 50(2), 157–224.
- Lauritzen, S.** and Wermuth, N. (1989). Graphical models for associations between variables, some of which are qualitative and some quantitative. *Annals of Statistics*, 17, 31–57.
- LaValle, S.** (2006). *Planning Algorithms*. Cambridge University Press.
- Lavrauc, N.** and Duzeroski, S. (1994). *Inductive Logic Programming: Techniques and Applications*. Ellis Horwood.
- Lawler, E. L.**, Lenstra, J. K., Kan, A., and Shmoys, D. B. (1992). *The Travelling Salesman Problem*. Wiley Interscience.
- Lawler, E. L.**, Lenstra, J. K., Kan, A., and Shmoys, D. B. (1993). Sequencing and scheduling: Algorithms and complexity. In Graves, S. C., Zipkin, P. H., and Kan, A. H. G. R. (Eds.), *Logistics of Production and Inventory: Handbooks in Operations Research and Management Science, Volume 4*, pp. 445–522. North-Holland.
- Lawler, E. L.** and Wood, D. E. (1966). Branch-and-bound methods: A survey. *Operations Research*, 14(4), 699–719.
- Lazanas, A.** and Latombe, J.-C. (1992). Landmark-based robot navigation. In *AAAI-92*, pp. 816–822.
- LeCun, Y.**, Jackel, L., Boser, B., and Denker, J. (1989). Handwritten digit recognition: Applications of neural network chips and automatic learning. *IEEE Communications Magazine*, 27(11), 41–46.
- LeCun, Y.**, Jackel, L., Bottou, L., Brunot, A., Cortes, C., Denker, J., Drucker, H., Guyon, I., Muller, U., Sackinger, E., Simard, P., and Vapnik, V. N. (1995). Comparison of learning algorithms for handwritten digit recognition. In *Int. Conference on Artificial Neural Networks*, pp. 53–60.
- Leech, G.**, Rayson, P., and Wilson, A. (2001). *Word Frequencies in Written and Spoken English: Based on the British National Corpus*. Longman.
- Legendre, A. M.** (1805). *Nouvelles méthodes pour la détermination des orbites des comètes*.
- Lehrer, J.** (2009). *How We Decide*. Houghton Mifflin.
- Lenat, D. B.** (1983). EURISKO: A program that learns new heuristics and domain concepts: The nature of heuristics, III: Program design and results. *AII*, 21(1–2), 61–98.
- Lenat, D. B.** and Brown, J. S. (1984). Why AM and EURISKO appear to work. *AII*, 23(3), 269–294.
- Lenat, D. B.** and Guha, R. V. (1990). *Building Large Knowledge-Based Systems: Representation and Inference in the CYC Project*. Addison-Wesley.
- Leonard, H. S.** and Goodman, N. (1940). The calculus of individuals and its uses. *JSL*, 5(2), 45–55.
- Leonard, J.** and Durrant-Whyte, H. (1992). *Directed sonar sensing for mobile robot navigation*. Kluwer.
- Leśniewski, S.** (1916). Podstawy ogólnej teorii mnogości. Moscow.
- Lettvin, J. Y.**, Maturana, H. R., McCulloch, W. S., and Pitts, W. (1959). What the frog's eye tells the frog's brain. *Proc. IRE*, 47(11), 1940–1951.
- Letz, R.**, Schumann, J., Bayerl, S., and Bibel, W. (1992). SETHEO: A high-performance theorem prover. *JAR*, 8(2), 183–212.
- Levesque, H. J.** and Brachman, R. J. (1987). Expressiveness and tractability in knowledge representation and reasoning. *Computational Intelligence*, 3(2), 78–93.
- Levin, D. A.**, Peres, Y., and Wilmer, E. L. (2008). *Markov Chains and Mixing Times*. American Mathematical Society.
- Levitt, G. M.** (2000). *The Turk, Chess Automaton*. McFarland and Company.
- Levy, D.** (Ed.). (1988a). *Computer Chess Compendium*. Springer-Verlag.
- Levy, D.** (Ed.). (1988b). *Computer Games*. Springer-Verlag.
- Levy, D.** (1989). The million pound bridge program. In Levy, D. and Beal, D. (Eds.), *Heuristic Programming in Artificial Intelligence*. Ellis Horwood.
- Levy, D.** (2007). *Love and Sex with Robots*. Harper.
- Lewis, D. D.** (1998). Naive Bayes at forty: The independence assumption in information retrieval. In *ECML-98*, pp. 4–15.
- Lewis, D. K.** (1966). An argument for the identity theory. *J. Philosophy*, 63(1), 17–25.
- Lewis, D. K.** (1980). Mad pain and Martian pain. In Block, N. (Ed.), *Readings in Philosophy of Psychology*, Vol. 1, pp. 216–222. Harvard University Press.
- Leyton-Brown, K.** and Shoham, Y. (2008). *Essentials of Game Theory: A Concise, Multidisciplinary Introduction*. Morgan Claypool.
- Li, C. M.** and Anbulagan (1997). Heuristics based on unit propagation for satisfiability problems. In *IJCAI-97*, pp. 366–371.
- Li, M.** and Vitanyi, P. M. B. (1993). *An Introduction to Kolmogorov Complexity and Its Applications*. Springer-Verlag.
- Liberatore, P.** (1997). The complexity of the language A. *Electronic Transactions on Artificial Intelligence*, 1, 13–38.
- Lifschitz, V.** (2001). Answer set programming and plan generation. *AII*, 138(1–2), 39–54.
- Lighthill, J.** (1973). Artificial intelligence: A general survey. In Lighthill, J., Sutherland, N. S., Needham, R. M., Longuet-Higgins, H. C., and Michie, D. (Eds.), *Artificial Intelligence: A Paper Symposium*. Science Research Council of Great Britain.
- Lin, S.** (1965). Computer solutions of the travelling salesman problem. *Bell Systems Technical Journal*, 44(10), 2245–2269.
- Lin, S.** and Kernighan, B. W. (1973). An effective heuristic algorithm for the travelling-salesman problem. *Operations Research*, 21(2), 498–516.
- Lindley, D. V.** (1956). On a measure of the information provided by an experiment. *Annals of Mathematical Statistics*, 27(4), 986–1005.
- Lindsay, R. K.**, Buchanan, B. G., Feigenbaum, E. A., and Lederman, J. (1980). *Applications of Artificial Intelligence for Organic Chemistry: The DENRAL Project*. McGraw-Hill.
- Littman, M. L.** (1994). Markov games as a framework for multi-agent reinforcement learning. In *ICML-94*, pp. 157–163.
- Littman, M. L.**, Keim, G. A., and Shazeer, N. M. (1999). Solving crosswords with PROVERB. In *AAAI-99*, pp. 914–915.
- Liu, J. S.** and Chen, R. (1998). Sequential Monte Carlo methods for dynamic systems. *JASA*, 93, 1022–1031.
- Livescu, K.**, Glass, J., and Bilmes, J. (2003). Hidden feature modeling for speech recognition using dynamic Bayesian networks. In *EUROSPEECH-2003*, pp. 2529–2532.
- Livnat, A.** and Pippenger, N. (2006). An optimal brain can be composed of conflicting agents. *PNAS*, 103(9), 3198–3202.
- Locke, J.** (1690). *An Essay Concerning Human Understanding*. William Tegg.
- Lodge, D.** (1984). *Small World*. Penguin Books.
- Loftus, E.** and Palmer, J. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. *J. Verbal Learning and Verbal Behavior*, 13, 585–589.
- Lohn, J. D.**, Kraus, W. F., and Colombano, S. P. (2001). Evolutionary optimization of yagi-uda antennas. In *Proc. Fourth International Conference on Evolvable Systems*, pp. 236–243.
- Longley, N.** and Sankaran, S. (2005). The NHL's overtime-loss rule: Empirically analyzing the unintended effects. *Atlantic Economic Journal*.
- Longuet-Higgins, H. C.** (1981). A computer algorithm for reconstructing a scene from two projections. *Nature*, 293, 133–135.
- Loo, B. T.**, Condie, T., Garofalakis, M., Gay, D. E., Hellerstein, J. M., Maniatis, P., Ramakrishnan, R., Roscoe, T., and Stoica, I. (2006). Declarative networking: Language, execution and optimization. In *SIGMOD-06*.
- Love, N.**, Hinrichs, T., and Genesereth, M. R. (2006). General game playing: Game description language specification. Tech. rep. LG-2006-01, Stanford University Computer Science Dept.
- Lovejoy, W. S.** (1991). A survey of algorithmic methods for partially observed Markov decision processes. *Annals of Operations Research*, 28(1–4), 47–66.
- Loveland, D.** (1970). A linear format for resolution. In *Proc. IRIA Symposium on Automatic Demonstration*, pp. 147–162.

- Lowe**, D. (1987). Three-dimensional object recognition from single two-dimensional images. *AIJ*, 31, 355–395.
- Lowe**, D. (1999). Object recognition using local scale invariant feature. In *ICCV*.
- Lowe**, D. (2004). Distinctive image features from scale-invariant keypoints. *IJCV*, 60(2), 91–110.
- Löwenheim**, L. (1915). Über möglichkeiten im Relativkalkül. *Mathematische Annalen*, 76, 447–470.
- Lowerre**, B. T. (1976). *The HARPY Speech Recognition System*. Ph.D. thesis, Computer Science Department, Carnegie-Mellon University.
- Lowerre**, B. T. and Reddy, R. (1980). The HARPY speech recognition system. In Lea, W. A. (Ed.), *Trends in Speech Recognition*, chap. 15. Prentice-Hall.
- Lowry**, M. (2008). Intelligent software engineering tools for NASA's crew exploration vehicle. In *Proc. ISMIS*.
- Loyd**, S. (1959). *Mathematical Puzzles of Sam Loyd: Selected and Edited by Martin Gardner*. Dover.
- Lozano-Perez**, T. (1983). Spatial planning: A configuration space approach. *IEEE Transactions on Computers*, C-32(2), 108–120.
- Lozano-Perez**, T., Mason, M., and Taylor, R. (1984). Automatic synthesis of fine-motion strategies for robots. *Int. J. Robotics Research*, 3(1), 3–24.
- Lu**, F. and Milios, E. (1997). Globally consistent range scan alignment for environment mapping. *Autonomous Robots*, 4, 333–349.
- Luby**, M., Sinclair, A., and Zuckerman, D. (1993). Optimal speedup of Las Vegas algorithms. *Information Processing Letters*, 47, 173–180.
- Lucas**, J. R. (1961). Minds, machines, and Gödel. *Philosophy*, 36.
- Lucas**, J. R. (1976). This Gödel is killing me: A rejoinder. *Philosophia*, 6(1), 145–148.
- Lucas**, P. (1996). Knowledge acquisition for decision-theoretic expert systems. *AISB Quarterly*, 94, 23–33.
- Lucas**, P., van der Gaag, L., and Abu-Hanna, A. (2004). Bayesian networks in biomedicine and health-care. *Artificial Intelligence in Medicine*.
- Luce**, D. R. and Raiffa, H. (1957). *Games and Decisions*. Wiley.
- Ludlow**, P., Nagasawa, Y., and Stoljar, D. (2004). *There's Something About Mary*. MIT Press.
- Luger**, G. F. (Ed.) (1995). *Computation and intelligence: Collected readings*. AAAI Press.
- Lyman**, P. and Varian, H. R. (2003). How much information? www.sims.berkeley.edu/how-much-info-2003.
- Machina**, M. (2005). Choice under uncertainty. In *Encyclopedia of Cognitive Science*, pp. 505–514. Wiley.
- MacKay**, D. J. C. (1992). A practical Bayesian framework for back-propagation networks. *Neural Computation*, 4(3), 448–472.
- MacKay**, D. J. C. (2002). *Information Theory, Inference and Learning Algorithms*. Cambridge University Press.
- MacKenzie**, D. (2004). *Mechanizing Proof*. MIT Press.
- Mackworth**, A. K. (1977). Consistency in networks of relations. *AIJ*, 8(1), 99–118.
- Mackworth**, A. K. (1992). Constraint satisfaction. In Shapiro, S. (Ed.), *Encyclopedia of Artificial Intelligence* (second edition), Vol. 1, pp. 285–293. Wiley.
- Mahanti**, A. and Daniels, C. J. (1993). A SIMD approach to parallel heuristic search. *AIJ*, 60(2), 243–282.
- Mailath**, G. and Samuelson, L. (2006). *Repeated Games and Reputations: Long-Run Relationships*. Oxford University Press.
- Majercik**, S. M. and Littman, M. L. (2003). Contingent planning under uncertainty via stochastic satisfiability. *AIJ*, pp. 119–162.
- Malik**, J. and Perona, P. (1990). Preattentive texture discrimination with early vision mechanisms. *J. Opt. Soc. Am. A*, 7(5), 923–932.
- Malik**, J. and Rosenholtz, R. (1994). Recovering surface curvature and orientation from texture distortion: A least squares algorithm and sensitivity analysis. In *ECCV*, pp. 353–364.
- Malik**, J. and Rosenholtz, R. (1997). Computing local surface orientation and shape from texture for curved surfaces. *IJCV*, 23(2), 149–168.
- Maneva**, E., Mossel, E., and Wainwright, M. J. (2007). A new look at survey propagation and its generalizations. *JACM*, 54(4).
- Manna**, Z. and Waldinger, R. (1971). Toward automatic program synthesis. *CACM*, 14(3), 151–165.
- Manna**, Z. and Waldinger, R. (1985). *The Logical Basis for Computer Programming: Volume 1: Deductive Reasoning*. Addison-Wesley.
- Manning**, C. and Schütze, H. (1999). *Foundations of Statistical Natural Language Processing*. MIT Press.
- Manning**, C., Raghavan, P., and Schütze, H. (2008). *Introduction to Information Retrieval*. Cambridge University Press.
- Mannion**, M. (2002). Using first-order logic for product line model validation. In *Software Product Lines: Second International Conference*. Springer.
- Manzini**, G. (1995). BIDA*: An improved perimeter search algorithm. *AIJ*, 72(2), 347–360.
- Marbach**, P. and Tsitsiklis, J. N. (1998). Simulation-based optimization of Markov reward processes. Technical report LIDS-P-2411, Laboratory for Information and Decision Systems, Massachusetts Institute of Technology.
- Marcus**, G. (2009). *Kluge: The Haphazard Evolution of the Human Mind*. Mariner Books.
- Marcus**, M. P., Santorini, B., and Marcinkiewicz, M. A. (1993). Building a large annotated corpus of english: The penn treebank. *Computational Linguistics*, 19(2), 313–330.
- Markov**, A. A. (1913). An example of statistical investigation in the text of "Eugene Onegin" illustrating coupling of "tests" in chains. *Proc. Academy of Sciences of St. Petersburg*, 7.
- Maron**, M. E. (1961). Automatic indexing: An experimental inquiry. *JACM*, 8(3), 404–417.
- Maron**, M. E. and Kuhns, J.-L. (1960). On relevance, probabilistic indexing and information retrieval. *CACM*, 7, 219–244.
- Marr**, D. (1982). *Vision: A Computational Investigation into the Human Representation and Processing of Visual Information*. W. H. Freeman.
- Marriott**, K. and Stuckey, P. J. (1998). *Programming with Constraints: An Introduction*. MIT Press.
- Marsland**, A. T. and Schaeffer, J. (Eds.) (1990). *Computers, Chess, and Cognition*. Springer-Verlag.
- Marsland**, S. (2009). *Machine Learning: An Algorithmic Perspective*. CRC Press.
- Martelli**, A. and Montanari, U. (1973). Additive AND/OR graphs. In *IJCAI-73*, pp. 1–11.
- Martelli**, A. and Montanari, U. (1978). Optimizing decision trees through heuristically guided search. *CACM*, 21, 1025–1039.
- Martelli**, A. (1977). On the complexity of admissible search algorithms. *AIJ*, 8(1), 1–13.
- Martelli**, B., Pasula, H., Russell, S. J., and Peres, Y. (2002). Decayed MCMC filtering. In *UAI-02*, pp. 319–326.
- Martelli**, B., Russell, S. J., Latham, D., and Guestrin, C. (2005). Concurrent hierarchical reinforcement learning. In *IJCAI-05*.
- Martelli**, B., Russell, S. J., and Wolfe, J. (2007). Angelic semantics for high-level actions. In *ICAPS-07*.
- Martelli**, B., Russell, S. J., and Wolfe, J. (2008). Angelic hierarchical planning: Optimal and online algorithms. In *ICAPS-08*.
- Martin**, D., Fowlkes, C., and Malik, J. (2004). Learning to detect natural image boundaries using local brightness, color, and texture cues. *PAMI*, 26(5), 530–549.
- Martin**, J. H. (1990). *A Computational Model of Metaphor Interpretation*. Academic Press.
- Mason**, M. (1993). Kicking the sensing habit. *AIMag*, 14(1), 58–59.
- Mason**, M. (2001). *Mechanics of Robotic Manipulation*. MIT Press.
- Mason**, M. and Salisbury, J. (1985). *Robot hands and the mechanics of manipulation*. MIT Press.
- Mataric**, M. J. (1997). Reinforcement learning in the multi-robot domain. *Autonomous Robots*, 4(1), 73–83.
- Mates**, B. (1953). *Stoic Logic*. University of California Press.
- Matuszek**, C., Cabral, J., Witbrock, M., and DeOliveira, J. (2006). An introduction to the syntax and semantics of cyc. In *Proc. AAAI Spring Symposium on Formalizing and Compiling Background Knowledge and Its Applications to Knowledge Representation and Question Answering*.
- Maxwell**, J. and Kaplan, R. (1993). The interface between phrasal and functional constraints. *Computational Linguistics*, 19(4), 571–590.
- McAllester**, D. A. (1980). An outlook on truth maintenance. *Ai memo 551*, MIT AI Laboratory.
- McAllester**, D. A. (1988). Conspiracy numbers for min-max search. *AIJ*, 35(3), 287–310.
- McAllester**, D. A. (1998). What is the most pressing issue facing AI and the AAAI today? Candidate statement, election for Councilor of the American Association for Artificial Intelligence.
- McAllester**, D. A. and Rosenblitt, D. (1991). Systematic nonlinear planning. In *AAAI-91*, Vol. 2, pp. 634–639.
- McCallum**, A. (2003). Efficiently inducing features of conditional random fields. In *UAI-03*.
- McCarthy**, J. (1958). Programs with common sense. In *Proc. Symposium on Mechanisation of Thought Processes*, Vol. 1, pp. 77–84.
- McCarthy**, J. (1963). Situations, actions, and causal laws. Memo 2, Stanford University Artificial Intelligence Project.

- McCarthy, J.** (1968). Programs with common sense. In Minsky, M. L. (Ed.), *Semantic Information Processing*, pp. 403–418. MIT Press.
- McCarthy, J.** (1980). Circumscription: A form of non-monotonic reasoning. *AIJ*, 13(1–2), 27–39.
- McCarthy, J.** (2007). From here to human-level AI. *AIJ*, 171(18), 1174–1182.
- McCarthy, J.** and Hayes, P. J. (1969). Some philosophical problems from the standpoint of artificial intelligence. In Meltzer, B., Michie, D., and Swann, M. (Eds.), *Machine Intelligence 4*, pp. 463–502. Edinburgh University Press.
- McCarthy, J.**, Minsky, M. L., Rochester, N., and Shannon, C. E. (1955). Proposal for the Dartmouth summer research project on artificial intelligence. Tech. rep., Dartmouth College.
- McCawley, J. D.** (1988). *The Syntactic Phenomena of English*, Vol. 2 volumes. University of Chicago Press.
- McCorduck, P.** (2004). *Machines who think: a personal inquiry into the history and prospects of artificial intelligence* (Revised edition). A K Peters.
- McCulloch, W. S.** and Pitts, W. (1943). A logical calculus of the ideas immanent in nervous activity. *Bulletin of Mathematical Biophysics*, 5, 115–137.
- McCune, W.** (1992). Automated discovery of new axiomatizations of the left group and right group calculi. *JAR*, 9(1), 1–24.
- McCune, W.** (1997). Solution of the Robbins problem. *JAR*, 19(3), 263–276.
- McDermott, D.** (1976). Artificial intelligence meets natural stupidity. *SIGART Newsletter*, 57, 4–9.
- McDermott, D.** (1978a). Planning and acting. *Cognitive Science*, 2(2), 71–109.
- McDermott, D.** (1978b). Tarskian semantics, or, no notation without denotation! *Cognitive Science*, 2(3).
- McDermott, D.** (1985). Reasoning about plans. In Hobbs, J. and Moore, R. (Eds.), *Formal theories of the commonsense world*. Intellect Books.
- McDermott, D.** (1987). A critique of pure reason. *Computational Intelligence*, 3(3), 151–237.
- McDermott, D.** (1996). A heuristic estimator for means-ends analysis in planning. In *ICAPS-96*, pp. 142–149.
- McDermott, D.** and Doyle, J. (1980). Non-monotonic logic: i. *AIJ*, 13(1–2), 41–72.
- McDermott, J.** (1982). R1: A rule-based configurer of computer systems. *AIJ*, 19(1), 39–88.
- McEliece, R. J.**, MacKay, D. J. C., and Cheng, J.-F. (1998). Turbo decoding as an instance of Pearl's "belief propagation" algorithm. *IEEE Journal on Selected Areas in Communications*, 16(2), 140–152.
- McGregor, J. J.** (1979). Relational consistency algorithms and their application in finding subgraph and graph isomorphisms. *Information Sciences*, 19(3), 229–250.
- McIlraith, S.** and Zeng, H. (2001). Semantic web services. *IEEE Intelligent Systems*, 16(2), 46–53.
- McLachlan, G. J.** and Krishnan, T. (1997). *The EM Algorithm and Extensions*. Wiley.
- McMillan, K. L.** (1993). *Symbolic Model Checking*. Kluwer.
- Mehl, P.** (1955). *Clinical vs. Statistical Prediction*. University of Minnesota Press.
- Mendel, G.** (1866). Versuche über pflanzenhybriden. *Verhandlungen des Naturforschenden Vereins, Abhandlungen, Brünn*, 4, 3–47. Translated into English by C. T. Druery, published by Bateson (1902).
- Merer, J.** (1909). Functions of positive and negative type and their connection with the theory of integral equations. *Philos. Trans. Roy. Soc. London*, A, 209, 415–446.
- Merleau-Ponty, M.** (1945). *Phenomenology of Perception*. Routledge.
- Metropolis, N.**, Rosenbluth, A., Rosenbluth, M., Teller, A., and Teller, E. (1953). Equations of state calculations by fast computing machines. *J. Chemical Physics*, 21, 1087–1091.
- Metzinger, T.** (2009). *The Ego Tunnel: The Science of the Mind and the Myth of the Self*. Basic Books.
- Mézard, M.** and Nadal, J.-P. (1989). Learning in feedforward layered networks: The tiling algorithm. *J. Physics*, 22, 2191–2204.
- Michalski, R. S.** (1969). On the quasi-minimal solution of the general covering problem. In *Proc. First International Symposium on Information Processing*, pp. 125–128.
- Michalski, R. S.**, Mozetic, I., Hong, J., and Lavrauc, N. (1986). The multi-purpose incremental learning system AQ15 and its testing application to three medical domains. In *AAAI-86*, pp. 1041–1045.
- Michie, D.** (1966). Game-playing and game-learning automata. In Fox, L. (Ed.), *Advances in Programming and Non-Numerical Computation*, pp. 183–200. Pergamon.
- Michie, D.** (1972). Machine intelligence at Edinburgh. *Management Informatics*, 2(1), 7–12.
- Michie, D.** (1974). Machine intelligence at Edinburgh. In *On Intelligence*, pp. 143–155. Edinburgh University Press.
- Michie, D.** and Chambers, R. A. (1968). BOXES: An experiment in adaptive control. In Dale, E. and Michie, D. (Eds.), *Machine Intelligence 2*, pp. 125–133. Elsevier/North-Holland.
- Michie, D.**, Spiegelhalter, D. J., and Taylor, C. (Eds.). (1994). *Machine Learning, Neural and Statistical Classification*. Ellis Horwood.
- Milch, B.**, Marthi, B., Sontag, D., Russell, S. J., Ong, D., and Kolobov, A. (2005). BLOG: Probabilistic models with unknown objects. In *IJCAI-05*.
- Milch, B.**, Zettlemoyer, L. S., Kersting, K., Haimes, M., and Kaelbling, L. P. (2008). Lifted probabilistic inference with counting formulas. In *AAAI-08*, pp. 1062–1068.
- Milgrom, P.** (1997). Putting auction theory to work: The simultaneous ascending auction. Tech. rep. Technical Report 98-0002, Stanford University Department of Economics.
- Mill, J. S.** (1843). *A System of Logic, Ratiocinative and Inductive: Being a Connected View of the Principles of Evidence, and Methods of Scientific Investigation*. J. W. Parker, London.
- Mill, J. S.** (1863). *Utilitarianism*. Parker, Son and Bourn, London.
- Miller, A. C.**, Merkhofer, M. M., Howard, R. A., Matheson, J. E., and Rice, T. R. (1976). Development of automated aids for decision analysis. Technical report, SRI International.
- Minker, J.** (2001). *Logic-Based Artificial Intelligence*. Kluwer.
- Minsky, M. L.** (1975). A framework for representing knowledge. In Winston, P. H. (Ed.), *The Psychology of Computer Vision*, pp. 211–277. McGraw-Hill. Originally an MIT AI Laboratory memo; the 1975 version is abridged, but is the most widely cited.
- Minsky, M. L.** (1986). *The society of mind*. Simon and Schuster.
- Minsky, M. L.** (2007). *The Emotion Machine: Commonsense Thinking, Artificial Intelligence, and the Future of the Human Mind*. Simon and Schuster.
- Minsky, M. L.** and Papert, S. (1969). *Perceptrons: An Introduction to Computational Geometry* (first edition). MIT Press.
- Minsky, M. L.** and Papert, S. (1988). *Perceptrons: An Introduction to Computational Geometry* (Expanded edition). MIT Press.
- Minsky, M. L.**, Singh, P., and Sloman, A. (2004). The st. thomas common sense symposium: Designing architectures for human-level intelligence. *AIMag*, 25(2), 113–124.
- Minton, S.** (1984). Constraint-based generalization: Learning game-playing plans from single examples. In *AAAI-84*, pp. 251–254.
- Minton, S.** (1988). Quantitative results concerning the utility of explanation-based learning. In *AAAI-88*, pp. 564–569.
- Minton, S.**, Johnston, M. D., Philips, A. B., and Laird, P. (1992). Minimizing conflicts: A heuristic repair method for constraint satisfaction and scheduling problems. *AIJ*, 58(1–3), 161–205.
- Misak, C.** (2004). *The Cambridge Companion to Peirce*. Cambridge University Press.
- Mitchell, M.** (1996). *An Introduction to Genetic Algorithms*. MIT Press.
- Mitchell, M.**, Holland, J. H., and Forrest, S. (1996). When will a genetic algorithm outperform hill climbing? In Cowan, J., Tesauro, G., and Alspector, J. (Eds.), *NIPS 6*. MIT Press.
- Mitchell, T. M.** (1977). Version spaces: A candidate elimination approach to rule learning. In *IJCAI-77*, pp. 305–310.
- Mitchell, T. M.** (1982). Generalization as search. *AIJ*, 18(2), 203–226.
- Mitchell, T. M.** (1990). Becoming increasingly reactive (mobile robots). In *AAAI-90*, Vol. 2, pp. 1051–1058.
- Mitchell, T. M.** (1997). *Machine Learning*. McGraw-Hill.
- Mitchell, T. M.**, Keller, R., and Kedar-Cabelli, S. (1986). Explanation-based generalization: A unifying view. *Machine Learning*, 1, 47–80.
- Mitchell, T. M.**, Utgoff, P. E., and Banerji, R. (1983). Learning by experimentation: Acquiring and refining problem-solving heuristics. In Michalski, R. S., Carbonell, J. G., and Mitchell, T. M. (Eds.), *Machine Learning: An Artificial Intelligence Approach*, pp. 163–190. Morgan Kaufmann.
- Mitchell, T. M.** (2005). Reading the web: A breakthrough goal for AI. *AIMag*, 26(3), 12–16.
- Mitchell, T. M.** (2007). Learning, information extraction and the web. In *ECML/PKDD*, p. 1.
- Mitchell, T. M.**, Shinkareva, S. V., Carlson, A., Chang, K.-M., Malave, V. L., Mason, R. A., and Just, M. A. (2008). Predicting human brain activity associated with the meanings of nouns. *Science*, 320, 1191–1195.
- Mohr, R.** and Henderson, T. C. (1986). Arc and path consistency revisited. *AIJ*, 28(2), 225–233.

- Mohri**, M., Pereira, F., and Riley, M. (2002). Weighted finite-state transducers in speech recognition. *Computer Speech and Language*, 16(1), 69–88.
- Montague**, P. R., Dayan, P., Person, C., and Sejnowski, T. (1995). Bee foraging in uncertain environments using predictive Hebbian learning. *Nature*, 377, 725–728.
- Montague**, R. (1970). English as a formal language. In *Linguaggi nella Società e nella Tecnica*, pp. 189–224. Edizioni di Comunità.
- Montague**, R. (1973). The proper treatment of quantification in ordinary English. In Hintikka, K. J., Moravcsik, J. M. E., and Suppes, P. (Eds.), *Approaches to Natural Language*. D. Reidel.
- Montanari**, U. (1974). Networks of constraints: Fundamental properties and applications to picture processing. *Information Sciences*, 7(2), 95–132.
- Montemerlo**, M. and Thrun, S. (2004). Large-scale robotic 3-D mapping of urban structures. In *Proc. International Symposium on Experimental Robotics*. Springer Tracts in Advanced Robotics (STAR).
- Montemerlo**, M., Thrun, S., Koller, D., and Wegbreit, B. (2002). FastSLAM: A factored solution to the simultaneous localization and mapping problem. In *AAAI-02*.
- Mooney**, R. (1999). Learning for semantic interpretation: Scaling up without dumbing down. In *Proc. 1st Workshop on Learning Language in Logic*, pp. 7–15.
- Moore**, A. and Wong, W.-K. (2003). Optimal reinsertion: A new search operator for accelerated and more accurate Bayesian network structure learning. In *ICML-03*.
- Moore**, A. W. and Atkeson, C. G. (1993). Prioritized sweeping—Reinforcement learning with less data and less time. *Machine Learning*, 13, 103–130.
- Moore**, A. W. and Lee, M. S. (1997). Cached sufficient statistics for efficient machine learning with large datasets. *JAIR*, 8, 67–91.
- Moore**, E. F. (1959). The shortest path through a maze. In *Proc. an International Symposium on the Theory of Switching, Part II*, pp. 285–292. Harvard University Press.
- Moore**, R. C. (1980). Reasoning about knowledge and action. Artificial intelligence center technical note 191, SRI International.
- Moore**, R. C. (1985). A formal theory of knowledge edge and action. In Hobbs, J. R. and Moore, R. C. (Eds.), *Formal Theories of the Commonsense World*, pp. 319–358. Ablex.
- Moore**, R. C. (2005). Association-based bilingual word alignment. In *Proc. ACL-05 Workshop on Building and Using Parallel Texts*, pp. 1–8.
- Moravec**, H. P. (1983). The stanford cart and the cmu rover. *Proc. IEEE*, 71(7), 872–884.
- Moravec**, H. P. and Elfes, A. (1985). High resolution maps from wide angle sonar. In *ICRA-85*, pp. 116–121.
- Moravec**, H. P. (1988). *Mind Children: The Future of Robot and Human Intelligence*. Harvard University Press.
- Moravec**, H. P. (2000). *Robot: Mere Machine to Transcendent Mind*. Oxford University Press.
- Morgenstern**, L. (1998). Inheritance comes of age: Applying nonmonotonic techniques to problems in industry. *AIJ*, 103, 237–271.
- Morjaria**, M. A., Rink, F. J., Smith, W. D., Klempner, G., Burns, C., and Stein, J. (1995). Elicitation of probabilities for belief networks: Combining qualitative and quantitative information. In *UAI-95*, pp. 141–148.
- Morrison**, P. and Morrison, E. (Eds.). (1961). *Charles Babbage and His Calculating Engines: Selected Writings by Charles Babbage and Others*. Dover.
- Moskewicz**, M. W., Madigan, C. F., Zhao, Y., Zhang, L., and Malik, S. (2001). Chaff: Engineering an efficient SAT solver. In *Proc. 38th Design Automation Conference (DAC 2001)*, pp. 530–535.
- Mosteller**, F. and Wallace, D. L. (1964). *Inference and Disputed Authorship: The Federalist*. Addison-Wesley.
- Mostow**, J. and Priedtis, A. E. (1989). Discovering admissible heuristics by abstracting and optimizing: A transformational approach. In *IJCAI-89*, Vol. 1, pp. 701–707.
- Motzkin**, T. S. and Schoenberg, I. J. (1954). The relaxation method for linear inequalities. *Canadian Journal of Mathematics*, 6(3), 393–404.
- Moutarlier**, P. and Chatila, R. (1989). Stochastic multisensory data fusion for mobile robot location and environment modeling. In *ISRR-89*.
- Mueller**, E. T. (2006). *Commonsense Reasoning*. Morgan Kaufmann.
- Muggleton**, S. H. (1991). Inductive logic programming. *New Generation Computing*, 8, 295–318.
- Muggleton**, S. H. (1992). *Inductive Logic Programming*. Academic Press.
- Muggleton**, S. H. (1995). Inverse entailment and Progol. *New Generation Computing*, 13(3–4), 245–286.
- Muggleton**, S. H. (2000). Learning stochastic logic programs. Proc. AAAI 2000 Workshop on Learning Statistical Models from Relational Data.
- Muggleton**, S. H. and Buntine, W. (1988). Machine invention of first-order predicates by inverting resolution. In *ICML-88*, pp. 339–352.
- Muggleton**, S. H. and De Raedt, L. (1994). Inductive logic programming: Theory and methods. *J. Logic Programming*, 19/20, 629–679.
- Muggleton**, S. H. and Feng, C. (1990). Efficient induction of logic programs. In *Proc. Workshop on Algorithmic Learning Theory*, pp. 368–381.
- Müller**, M. (2002). Computer Go. *AIJ*, 134(1–2), 145–179.
- Müller**, M. (2003). Conditional combinatorial games, and their application to analyzing capturing races in go. *Information Sciences*, 154(3–4), 189–202.
- Mumford**, D. and Shah, J. (1989). Optimal approximations by piece-wise smooth functions and associated variational problems. *Commun. Pure Appl. Math.*, 42, 577–685.
- Murphy**, K., Weiss, Y., and Jordan, M. I. (1999). Loopy belief propagation for approximate inference: An empirical study. In *UAI-99*, pp. 467–475.
- Murphy**, K. (2001). The Bayes net toolbox for MATLAB. *Computing Science and Statistics*, 33.
- Murphy**, K. (2002). *Dynamic Bayesian Networks: Representation, Inference and Learning*. Ph.D. thesis, UC Berkeley.
- Murphy**, K. and Mian, I. S. (1999). Modelling gene expression data using Bayesian networks. people.cs.ubc.ca/~murphyk/Papers/ismb99.pdf.
- Murphy**, K. and Russell, S. J. (2001). Rao-blackwellised particle filtering for dynamic Bayesian networks. In Doucet, A., de Freitas, N., and Gordon, N. J. (Eds.), *Sequential Monte Carlo Methods in Practice*. Springer-Verlag.
- Murphy**, K. and Weiss, Y. (2001). The factored frontier algorithm for approximate inference in DBNs. In *UAI-01*, pp. 378–385.
- Murphy**, R. (2000). *Introduction to AI Robotics*. MIT Press.
- Murray-Rust**, P., Rzepa, H. S., Williamson, J., and Willighagen, E. L. (2003). Chemical markup, XML and the world-wide web. 4. CML schema. *J. Chem. Inf. Comput. Sci.*, 43, 752–772.
- Murthy**, C. and Russell, J. R. (1990). A constructive proof of Higman's lemma. In *LICS-90*, pp. 257–269.
- Muscettola**, N. (2002). Computing the envelope for stepwise-constant resource allocations. In *CP-02*, pp. 139–154.
- Muscettola**, N., Nayak, P., Pell, B., and Williams, B. (1998). Remote agent: To boldly go where no AI system has gone before. *AIJ*, 103, 5–48.
- Muslea**, I. (1999). Extraction patterns for information extraction tasks: A survey. In *Proc. AAAI-99 Workshop on Machine Learning for Information Extraction*.
- Myerson**, R. (1981). Optimal auction design. *Mathematics of Operations Research*, 6, 58–73.
- Myerson**, R. (1986). Multistage games with communication. *Econometrica*, 54, 323–358.
- Myerson**, R. (1991). *Game Theory: Analysis of Conflict*. Harvard University Press.
- Nagel**, T. (1974). What is it like to be a bat? *Philosophical Review*, 83, 435–450.
- Nalwa**, V. S. (1993). *A Guided Tour of Computer Vision*. Addison-Wesley.
- Nash**, J. (1950). Equilibrium points in N-person games. *PNAS*, 36, 48–49.
- Nau**, D. S. (1980). Pathology on game trees: A summary of results. In *AAAI-80*, pp. 102–104.
- Nau**, D. S. (1983). Pathology on game trees revisited, and an alternative to minimaxing. *AIJ*, 21(1–2), 221–244.
- Nau**, D. S., Kumar, V., and Kanal, L. N. (1984). General branch and bound, and its relation to A* and AO*. *AIJ*, 23, 29–58.
- Nayak**, P. and Williams, B. (1997). Fast context switching in real-time propositional reasoning. In *AAAI-97*, pp. 50–56.
- Neal**, R. (1996). *Bayesian Learning for Neural Networks*. Springer-Verlag.
- Nebel**, B. (2000). On the compilability and expressive power of propositional planning formalisms. *JAIR*, 12, 271–315.
- Nefan**, A., Liang, L., Pi, X., Liu, X., and Murphy, K. (2002). Dynamic bayesian networks for audio-visual speech recognition. *EURASIP, Journal of Applied Signal Processing*, 11, 1–15.
- Nesterov**, Y. and Nemirovski, A. (1994). *Interior-Point Polynomial Methods in Convex Programming*. SIAM (Society for Industrial and Applied Mathematics).
- Netto**, E. (1901). *Lehrbuch der Combinatorik*. B. G. Teubner.
- Nevill-Manning**, C. G. and Witten, I. H. (1997). Identifying hierarchical structures in sequences: A linear-time algorithm. *JAIR*, 7, 67–82.

- Newell**, A. (1982). The knowledge level. *AIJ*, 18(1), 82–127.
- Newell**, A. (1990). *Unified Theories of Cognition*. Harvard University Press.
- Newell**, A. and Ernst, G. (1965). The search for generality. In *Proc. IFIP Congress*, Vol. 1, pp. 17–24.
- Newell**, A., Shaw, J. C., and Simon, H. A. (1957). Empirical explorations with the logic theory machine. *Proc. Western Joint Computer Conference*, 15, 218–239. Reprinted in Feigenbaum and Feldman (1963).
- Newell**, A., Shaw, J. C., and Simon, H. A. (1958). Chess playing programs and the problem of complexity. *IBM Journal of Research and Development*, 4(2), 320–335.
- Newell**, A. and Simon, H. A. (1961). GPS, a program that simulates human thought. In Billing, H. (Ed.), *Lernende Automaten*, pp. 109–124. R. Oldenbourg.
- Newell**, A. and Simon, H. A. (1972). *Human Problem Solving*. Prentice-Hall.
- Newell**, A. and Simon, H. A. (1976). Computer science as empirical inquiry: Symbols and search. *CACM*, 19, 113–126.
- Newton**, I. (1664–1671). Methodus fluxionum et serierum infinitarum. Unpublished notes.
- Ng**, A. Y. (2004). Feature selection, l_1 vs. l_2 regularization, and rotational invariance. In *ICML-04*.
- Ng**, A. Y., Harada, D., and Russell, S. J. (1999). Policy invariance under reward transformations: Theory and application to reward shaping. In *ICML-99*.
- Ng**, A. Y. and Jordan, M. I. (2000). PEGASUS: A policy search method for large MDPs and POMDPs. In *UAI-00*, pp. 406–415.
- Ng**, A. Y., Kim, H. J., Jordan, M. I., and Sastry, S. (2004). Autonomous helicopter flight via reinforcement learning. In *NIPS 16*.
- Nguyen**, X. and Kambhampati, S. (2001). Reviving partial order planning. In *IJCAI-01*, pp. 459–466.
- Nguyen**, X., Kambhampati, S., and Nigenda, R. S. (2001). Planning graph as the basis for deriving heuristics for plan synthesis by state space and CSP search. Tech. rep., Computer Science and Engineering Department, Arizona State University.
- Nicholson**, A. and Brady, J. M. (1992). The data association problem when monitoring robot vehicles using dynamic belief networks. In *ECAI-92*, pp. 689–693.
- Niemelä**, I., Simons, P., and Syrjänen, T. (2000). Smodels: A system for answer set programming. In *Proc. 8th International Workshop on Non-Monotonic Reasoning*.
- Nigam**, K., McCallum, A., Thrun, S., and Mitchell, T. M. (2000). Text classification from labeled and unlabeled documents using EM. *Machine Learning*, 39(2–3), 103–134.
- Niles**, I. and Pease, A. (2001). Towards a standard upper ontology. In *FOIS '01: Proc. international conference on Formal Ontology in Information Systems*, pp. 2–9.
- Nilsson**, D. and Lauritzen, S. (2000). Evaluating influence diagrams using LIMIDs. In *UAI-00*, pp. 436–445.
- Nilsson**, N. J. (1965). *Learning Machines: Foundations of Trainable Pattern-Classifying Systems*. McGraw-Hill. Republished in 1990.
- Nilsson**, N. J. (1971). *Problem-Solving Methods in Artificial Intelligence*. McGraw-Hill.
- Nilsson**, N. J. (1984). Shakey the robot. Technical note 323, SRI International.
- Nilsson**, N. J. (1986). Probabilistic logic. *AIJ*, 28(1), 71–87.
- Nilsson**, N. J. (1991). Logic and artificial intelligence. *AIJ*, 47(1–3), 31–56.
- Nilsson**, N. J. (1995). Eye on the prize. *AIMag*, 16(2), 9–17.
- Nilsson**, N. J. (1998). *Artificial Intelligence: A New Synthesis*. Morgan Kaufmann.
- Nilsson**, N. J. (2005). Human-level artificial intelligence? be serious! *AIMag*, 26(4), 68–75.
- Nilsson**, N. J. (2009). *The Quest for Artificial Intelligence: A History of Ideas and Achievements*. Cambridge University Press.
- Nisan**, N., Roughgarden, T., Tardos, E., and Vazirani, V. (Eds.). (2007). *Algorithmic Game Theory*. Cambridge University Press.
- Noe**, A. (2009). *Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness*. Hill and Wang.
- Norvig**, P. (1988). Multiple simultaneous interpretations of ambiguous sentences. In *COGSCI-88*.
- Norvig**, P. (1992). *Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp*. Morgan Kaufmann.
- Norvig**, P. (2009). Natural language corpus data. In Segaran, T. and Hammerbacher, J. (Eds.), *Beautiful Data*. O'Reilly.
- Nowick**, S. M., Dean, M. E., Dill, D. L., and Horowitz, M. (1993). The design of a high-performance cache controller: A case study in asynchronous synthesis. *Integration: The VLSI Journal*, 15(3), 241–262.
- Numberg**, G. (1979). The non-uniqueness of semantic solutions: Polysemy. *Language and Philosophy*, 3(2), 143–184.
- Nussbaum**, M. C. (1978). *Aristotle's De Motu Animalium*. Princeton University Press.
- Oaksford**, M. and Chater, N. (Eds.). (1998). *Rational models of cognition*. Oxford University Press.
- Och**, F. J. and Ney, H. (2003). A systematic comparison of various statistical alignment model. *Computational Linguistics*, 29(1), 19–51.
- Och**, F. J. and Ney, H. (2004). The alignment template approach to statistical machine translation. *Computational Linguistics*, 30, 417–449.
- Ogawa**, S., Lee, T.-M., Kay, A. R., and Tank, D. W. (1990). Brain magnetic resonance imaging with contrast dependent on blood oxygenation. *PNAS*, 87, 9868–9872.
- Oh**, S., Russell, S. J., and Sastry, S. (2009). Markov chain Monte Carlo data association for multi-target tracking. *IEEE Transactions on Automatic Control*, 54(3), 481–497.
- Olesen**, K. G. (1993). Causal probabilistic networks with both discrete and continuous variables. *PAMI*, 15(3), 275–279.
- Oliver**, N., Garg, A., and Horvitz, E. J. (2004). Layered representations for learning and inferring office activity from multiple sensory channels. *Computer Vision and Image Understanding*, 96, 163–180.
- Oliver**, R. M. and Smith, J. Q. (Eds.). (1990). *Influence Diagrams, Belief Nets and Decision Analysis*. Wiley.
- Omohundro**, S. (2008). The basic AI drives. In *AGI-08 Workshop on the Sociocultural, Ethical and Futurological Implications of Artificial Intelligence*. Wiley.
- O'Reilly**, U.-M. and Oppacher, F. (1994). Program search with a hierarchical variable length representation: Genetic programming, simulated annealing and hill climbing. In *Proc. Third Conference on Parallel Problem Solving from Nature*, pp. 397–406.
- Ormanet**, D. and Sen, S. (2002). Kernel-based reinforcement learning. *Machine Learning*, 49(2–3), 161–178.
- Osborne**, M. J. (2004). *An Introduction to Game Theory*. Oxford University Press.
- Osborne**, M. J. and Rubinstein, A. (1994). *A Course in Game Theory*. MIT Press.
- Osherson**, D. N., Stob, M., and Weinstein, S. (1986). *Systems That Learn: An Introduction to Learning Theory for Cognitive and Computer Scientists*. MIT Press.
- Padgham**, L. and Winikoff, M. (2004). *Developing Intelligent Agent Systems: A Practical Guide*. Wiley.
- Page**, C. D. and Srinivasan, A. (2002). ILP: A short look back and a longer look forward. Submitted to *Journal of Machine Learning Research*.
- Palacios**, H. and Geffner, H. (2007). From conformant into classical planning: Efficient translations that may be complete too. In *ICAPS-07*.
- Palay**, A. J. (1985). *Searching with Probabilities*. Pitman.
- Palmer**, D. A. and Hearst, M. A. (1994). Adaptive sentence boundary disambiguation. In *Proc. Conference on Applied Natural Language Processing*, pp. 78–83.
- Palmer**, S. (1999). *Vision Science: Photons to Phenomenology*. MIT Press.
- Papadimitriou**, C. H. (1994). *Computational Complexity*. Addison Wesley.
- Papadimitriou**, C. H., Tamaki, H., Raghavan, P., and Vempala, S. (1998). Latent semantic indexing: A probabilistic analysis. In *PODS-98*, pp. 159–168.
- Papadimitriou**, C. H. and Tsitsiklis, J. N. (1987). The complexity of Markov decision processes. *Mathematics of Operations Research*, 12(3), 441–450.
- Papadimitriou**, C. H. and Yannakakis, M. (1991). Shortest paths without a map. *Theoretical Computer Science*, 84(1), 127–150.
- Papavassiliou**, V. and Russell, S. J. (1999). Convergence of reinforcement learning with general function approximators. In *IJCAI-99*, pp. 748–757.
- Parekh**, R. and Honavar, V. (2001). DFA learning from simple examples. *Machine Learning*, 44, 9–35.
- Parisi**, G. (1988). *Statistical field theory*. Addison-Wesley.
- Parisi**, M. M. G. and Zecchina, R. (2002). Analytic and algorithmic solution of random satisfiability problems. *Science*, 297, 812–815.
- Parker**, A., Nau, D. S., and Subrahmanian, V. S. (2005). Game-tree search with combinatorially large belief states. In *IJCAI-05*, pp. 254–259.
- Parker**, D. B. (1985). Learning logic. Technical report TR-47, Center for Computational Research in Economics and Management Science, Massachusetts Institute of Technology.
- Parker**, L. E. (1996). On the design of behavior-based multi-robot teams. *J. Advanced Robotics*, 10(6).
- Parr**, R. and Russell, S. J. (1998). Reinforcement learning with hierarchies of machines. In Jordan, M. I., Kearns, M., and Solla, S. A. (Eds.), *NIPS 10*. MIT Press.

- Parzen, E.** (1962). On estimation of a probability density function and mode. *Annals of Mathematical Statistics*, 33, 1065–1076.
- Pasca, M.** and Harabagiu, S. M. (2001). High performance question/answering. In *SIGIR-01*, pp. 366–374.
- Pasca, M.**, Lin, D., Bigham, J., Lifchits, A., and Jain, A. (2006). Organizing and searching the world wide web of facts—Step one: The one-million fact extraction challenge. In *AAAI-06*.
- Paskin, M.** (2001). Grammatical bigrams. In *NIPS*.
- Pasula, H.**, Martha, B., Milch, B., Russell, S. J., and Shpitser, I. (2003). Identity uncertainty and citation matching. In *NIPS 15*. MIT Press.
- Pasula, H.** and Russell, S. J. (2001). Approximate inference for first-order probabilistic languages. In *IJCAI-01*.
- Pasula, H.**, Russell, S. J., Ostland, M., and Ritov, Y. (1999). Tracking many objects with many sensors. In *IJCAI-99*.
- Patashnik, O.** (1980). Cubic: 4x4x4 tic-tac-toe. *Mathematics Magazine*, 53(4), 202–216.
- Patrick, B. G.**, Almulla, M., and Newborn, M. (1992). An upper bound on the time complexity of iterative-deepening-A*. *AIJ*, 5(2–4), 265–278.
- Paul, R. P.** (1981). *Robot Manipulators: Mathematics, Programming, and Control*. MIT Press.
- Pauls, A.** and Klein, D. (2009). K-best A* parsing. In *ACL-09*.
- Peano, G.** (1889). *Arithmetices principia, nova methodo exposita*. Fratres Bocca, Turin.
- Pearce, J.**, Tambe, M., and Maheswaran, R. (2008). Solving multiagent networks using distributed constraint optimization. *AIMag*, 29(3), 47–62.
- Pearl, J.** (1982a). Reverend Bayes on inference engines: A distributed hierarchical approach. In *AAAI-82*, pp. 133–136.
- Pearl, J.** (1982b). The solution for the branching factor of the alpha-beta pruning algorithm and its optimality. *CACM*, 25(8), 559–564.
- Pearl, J.** (1984). *Heuristics: Intelligent Search Strategies for Computer Problem Solving*. Addison-Wesley.
- Pearl, J.** (1986). Fusion, propagation, and structuring in belief networks. *AIJ*, 29, 241–288.
- Pearl, J.** (1987). Evidential reasoning using stochastic simulation of causal models. *AIJ*, 32, 247–257.
- Pearl, J.** (1988). *Probabilistic Reasoning in Intelligent Systems: Networks of Plausible Inference*. Morgan Kaufmann.
- Pearl, J.** (2000). *Causality: Models, Reasoning, and Inference*. Cambridge University Press.
- Pearl, J.** and Verma, T. (1991). A theory of inferred causation. In *KR-91*, pp. 441–452.
- Pearson, J.** and Jeavons, P. (1997). A survey of tractable constraint satisfaction problems. Technical report CSD-TR-97-15, Royal Holloway College, U. of London.
- Pease, A.** and Niles, I. (2002). IEEE standard upper ontology: A progress report. *Knowledge Engineering Review*, 17(1), 65–70.
- Pednault, E. P. D.** (1986). Formulating multiagent, dynamic-world problems in the classical planning framework. In *Reasoning about Actions and Plans: Proc. 1986 Workshop*, pp. 47–82.
- Peirce, C. S.** (1870). Description of a notation for the logic of relatives, resulting from an amplification of the conceptions of Boole's calculus of logic. *Memoirs of the American Academy of Arts and Sciences*, 9, 317–378.
- Peirce, C. S.** (1883). A theory of probable inference. Note B. The logic of relatives. In *Studies in Logic by Members of the Johns Hopkins University*, pp. 187–203, Boston.
- Peirce, C. S.** (1902). Logic as semiotic: The theory of signs. Unpublished manuscript; reprinted in (Buchler 1955).
- Peirce, C. S.** (1909). Existential graphs. Unpublished manuscript; reprinted in (Buchler 1955).
- Pelikan, M.**, Goldberg, D. E., and Cantu-Paz, E. (1999). BOA: The Bayesian optimization algorithm. In *GECCO-99: Proc. Genetic and Evolutionary Computation Conference*, pp. 525–532.
- Pemberton, J. C.** and Korf, R. E. (1992). Incremental planning on graphs with cycles. In *AIPS-92*, pp. 525–532.
- Penberthy, J. S.** and Weld, D. S. (1992). UCPOP: A sound, complete, partial order planner for ADL. In *KR-92*, pp. 103–114.
- Peng, J.** and Williams, R. J. (1993). Efficient learning and planning within the Dyna framework. *Adaptive Behavior*, 2, 437–454.
- Penrose, R.** (1989). *The Emperor's New Mind*. Oxford University Press.
- Penrose, R.** (1994). *Shadows of the Mind*. Oxford University Press.
- Peot, M.** and Smith, D. E. (1992). Conditional nonlinear planning. In *ICAPS-92*, pp. 189–197.
- Pereira, F.** and Shieber, S. (1987). *Prolog and Natural-Language Analysis*. Center for the Study of Language and Information (CSLI).
- Pereira, F.** and Warren, D. H. D. (1980). Definite clause grammars for language analysis: A survey of the formalism and a comparison with augmented transition networks. *AIJ*, 13, 231–278.
- Pereira, F.** and Wright, R. N. (1991). Finite-state approximation of phrase structure grammars. In *ACL-91*, pp. 246–255.
- Perlis, A.** (1982). Epigrams in programming. *SIGPLAN Notices*, 17(9), 7–13.
- Perrin, B. E.**, Ralaivola, L., and Mazurie, A. (2003). Gene networks inference using dynamic Bayesian networks. *Bioinformatics*, 19, II 138–II 148.
- Peterson, C.** and Anderson, J. R. (1987). A mean field theory learning algorithm for neural networks. *Complex Systems*, 1(5), 995–1019.
- Petrić, M.** and Zilberman, S. (2009). Bilinear programming approach for multiagent planning. *JAIR*, 35, 235–274.
- Petrov, S.** and Klein, D. (2007a). Discriminative log-linear grammars with latent variables. In *NIPS*.
- Petrov, S.** and Klein, D. (2007b). Improved inference for unlexicalized parsing. In *ACL-07*.
- Petrov, S.** and Klein, D. (2007c). Learning and inference for hierarchically split pcfgs. In *AAAI-07*.
- Pfeffer, A.**, Koller, D., Milch, B., and Takusagawa, K. T. (1999). SPOOK: A system for probabilistic object-oriented knowledge representation. In *UAI-99*.
- Pfeffer, A.** (2000). *Probabilistic Reasoning for Complex Systems*. Ph.D. thesis, Stanford University.
- Pfeffer, A.** (2007). The design and implementation of IBAL: A general-purpose probabilistic language. In Getoor, L. and Taskar, B. (Eds.), *Introduction to Statistical Relational Learning*. MIT Press.
- Pfeifer, R.**, Bongard, J., Brooks, R. A., and Iwasa, S. (2006). *How the Body Shapes the Way We Think: A New View of Intelligence*. Bradford.
- Pineau, J.**, Gordon, G., and Thrun, S. (2003). Point-based value iteration: An anytime algorithm for POMDPs. In *IJCAI-03*.
- Pinedo, M.** (2008). *Scheduling: Theory, Algorithms, and Systems*. Springer Verlag.
- Pinkas, G.** and Dechter, R. (1995). Improving connectionist energy minimization. *JAIR*, 3, 223–248.
- Pinker, S.** (1995). Language acquisition. In Gleitman, L. R., Liberman, M., and Osherson, D. N. (Eds.), *An Invitation to Cognitive Science* (second edition), Vol. 1. MIT Press.
- Pinker, S.** (2003). *The Blank Slate: The Modern Denial of Human Nature*. Penguin.
- Pinto, D.**, McCallum, A., Wei, X., and Croft, W. B. (2003). Table extraction using conditional random fields. In *SIGIR-03*.
- Pipatsrisawat, K.** and Darwiche, A. (2007). RSat 2.0: SAT solver description. Tech. rep. D-153, Automated Reasoning Group, Computer Science Department, University of California, Los Angeles.
- Plaat, A.**, Schaeffer, J., Pijs, W., and de Bruin, A. (1996). Best-first fixed-depth minimax algorithms. *AIJ*, 87(1–2), 255–293.
- Place, U. T.** (1956). Is consciousness a brain process? *British Journal of Psychology*, 47, 44–50.
- Platt, J.** (1999). Fast training of support vector machines using sequential minimal optimization. In *Advances in Kernel Methods: Support Vector Learning*, pp. 185–208. MIT Press.
- Plotkin, G.** (1971). *Automatic Methods of Inductive Inference*. Ph.D. thesis, Edinburgh University.
- Plotkin, G.** (1972). Building-in equational theories. In Meltzer, B. and Michie, D. (Eds.), *Machine Intelligence 7*, pp. 73–90. Edinburgh University Press.
- Pohl, I.** (1971). Bi-directional search. In Meltzer, B. and Michie, D. (Eds.), *Machine Intelligence 6*, pp. 127–140. Edinburgh University Press.
- Pohl, I.** (1973). The avoidance of (relative) catastrophe, heuristic competence, genuine dynamic weighting and computational issues in heuristic problem solving. In *IJCAI-73*, pp. 20–23.
- Pohl, I.** (1977). Practical and theoretical considerations in heuristic search algorithms. In Elcock, E. W. and Michie, D. (Eds.), *Machine Intelligence 8*, pp. 55–72. Ellis Horwood.
- Poli, R.**, Langdon, W., and McPhee, N. (2008). *A Field Guide to Genetic Programming*. Lulu.com.
- Pomerleau, D. A.** (1993). *Neural Network Perception for Mobile Robot Guidance*. Kluwer.
- Ponte, J.** and Croft, W. B. (1998). A language modeling approach to information retrieval. In *SIGIR-98*, pp. 275–281.
- Pool, D.** (1993). Probabilistic Horn abduction and Bayesian networks. *AIJ*, 64, 81–129.
- Pool, D.** (2003). First-order probabilistic inference. In *IJCAI-03*, pp. 985–991.
- Pool, D.**, Mackworth, A. K., and Goebel, R. (1998). *Computational intelligence: A logical approach*. Oxford University Press.

- Popper, K. R.** (1959). *The Logic of Scientific Discovery*. Basic Books.
- Popper, K. R.** (1962). *Conjectures and Refutations: The Growth of Scientific Knowledge*. Basic Books.
- Portner, P.** and Partee, B. H. (2002). *Formal Semantics: The Essential Readings*. Wiley-Blackwell.
- Post, E. L.** (1921). Introduction to a general theory of elementary propositions. *American Journal of Mathematics*, 43, 163–185.
- Poundstone, W.** (1993). *Prisoner's Dilemma*. Anchor.
- Pourret, O., Náim, P., and Marcot, B.** (2008). *Bayesian Networks: A practical guide to applications*. Wiley.
- Prades, J. L. P., Loomes, G., and Brey, R.** (2008). Trying to estimate a monetary value for the QALY. Tech. rep. WP Econ 08.09, Univ. Pablo Olavide.
- Pradhan, M., Provan, G. M., Middleton, B., and Henrion, M.** (1994). Knowledge engineering for large belief networks. In *UAI-94*, pp. 484–490.
- Prawitz, D.** (1960). An improved proof procedure. *Theoria*, 26, 102–139.
- Press, W. H., Teukolsky, S. A., Vetterling, W. T., and Flannery, B. P.** (2007). *Numerical Recipes: The Art of Scientific Computing* (third edition). Cambridge University Press.
- Preston, J.** and Bishop, M. (2002). *Views into the Chinese Room: New Essays on Searle and Artificial Intelligence*. Oxford University Press.
- Prieditis, A. E.** (1993). Machine discovery of effective admissible heuristics. *Machine Learning*, 12(1–3), 117–141.
- Prinz, D. G.** (1952). Robot chess. *Research*, 5, 261–266.
- Prosser, P.** (1993). Hybrid algorithms for constraint satisfaction problems. *Computational Intelligence*, 9, 268–299.
- Pullum, G. K.** (1991). *The Great Eskimo Vocabulary Hoax (and Other Irreverent Essays on the Study of Language)*. University of Chicago Press.
- Pullum, G. K.** (1996). Learnability, hyperlearning, and the poverty of the stimulus. In *22nd Annual Meeting of the Berkeley Linguistics Society*.
- Puterman, M. L.** (1994). *Markov Decision Processes: Discrete Stochastic Dynamic Programming*. Wiley.
- Puterman, M. L.** and Shin, M. C. (1978). Modified policy iteration algorithms for discounted Markov decision problems. *Management Science*, 24(11), 1127–1137.
- Putnam, H.** (1960). Minds and machines. In Hook, S. (Ed.), *Dimensions of Mind*, pp. 138–164. Macmillan.
- Putnam, H.** (1963). ‘Degree of confirmation’ and inductive logic. In Schilpp, P. A. (Ed.), *The Philosophy of Rudolf Carnap*, pp. 270–292. Open Court.
- Putnam, H.** (1967). The nature of mental states. In Capitan, W. H. and Merrill, D. D. (Eds.), *Art, Mind, and Religion*, pp. 37–48. University of Pittsburgh Press.
- Putnam, H.** (1975). The meaning of “meaning”. In Gunderson, K. (Ed.), *Language, Mind and Knowledge: Minnesota Studies in the Philosophy of Science*. University of Minnesota Press.
- Pylyshyn, Z. W.** (1974). Minds, machines and phenomenology: Some reflections on Dreyfus’ ‘What Computers Can’t Do’. *Int. J. Cognitive Psychology*, 3(1), 57–77.
- Pylyshyn, Z. W.** (1984). *Computation and Cognition: Toward a Foundation for Cognitive Science*. MIT Press.
- Quillian, M. R.** (1961). A design for an understanding machine. Paper presented at a colloquium: Semantic Problems in Natural Language, King’s College, Cambridge, England.
- Quine, W. V.** (1953). Two dogmas of empiricism. In *From a Logical Point of View*, pp. 20–46. Harper and Row.
- Quine, W. V.** (1960). *Word and Object*. MIT Press.
- Quine, W. V.** (1982). *Methods of Logic* (fourth edition). Harvard University Press.
- Quinlan, J. R.** (1979). Discovering rules from large collections of examples: A case study. In Michie, D. (Ed.), *Expert Systems in the Microelectronic Age*. Edinburgh University Press.
- Quinlan, J. R.** (1986). Induction of decision trees. *Machine Learning*, 1, 81–106.
- Quinlan, J. R.** (1990). Learning logical definitions from relations. *Machine Learning*, 5(3), 239–266.
- Quinlan, J. R.** (1993). *C4.5: Programs for machine learning*. Morgan Kaufmann.
- Quinlan, J. R.** and Cameron-Jones, R. M. (1993). FOIL: A midterm report. In *ICML-93*, pp. 3–20.
- Quirk, R., Greenbaum, S., Leech, G., and Svartvik, J.** (1985). *A Comprehensive Grammar of the English Language*. Longman.
- Rabani, Y., Rabinovich, Y., and Sinclair, A.** (1998). A computational view of population genetics. *Random Structures and Algorithms*, 12(4), 313–334.
- Rabiner, L. R.** and Juang, B.-H. (1993). *Fundamentals of Speech Recognition*. Prentice-Hall.
- Ralphs, T. K., Ladanyi, L., and Saltzman, M. J.** (2004). A library hierarchy for implementing scalable parallel search algorithms. *J. Supercomputing*, 28(2), 215–234.
- Ramanan, D., Forsyth, D., and Zisserman, A.** (2007). Tracking people by learning their appearance. *IEEE Pattern Analysis and Machine Intelligence*.
- Ramsey, F. P.** (1931). Truth and probability. In Braithwaite, R. B. (Ed.), *The Foundations of Mathematics and Other Logical Essays*. Harcourt Brace Jovanovich.
- Ranzato, M., Poultney, C., Chopra, S., and LeCun, Y.** (2007). Efficient learning of sparse representations with an energy-based model. In *NIPS 19*, pp. 1137–1144.
- Raphson, J.** (1690). *Analysis aequationum universalis*. Apud Abelem Swalle, London.
- Rashevsky, N.** (1936). Physico-mathematical aspects of excitation and conduction in nerves. In *Cold Springs Harbor Symposia on Quantitative Biology. IV: Excitation Phenomena*, pp. 90–97.
- Rashevsky, N.** (1938). *Mathematical Biophysics: Physico-Mathematical Foundations of Biology*. University of Chicago Press.
- Rasmussen, C. E.** and Williams, C. K. I. (2006). *Gaussian Processes for Machine Learning*. MIT Press.
- Rassenti, S., Smith, V., and Bulfin, R.** (1982). A combinatorial auction mechanism for airport time slot allocation. *Bell Journal of Economics*, 13, 402–417.
- Ratner, D.** and Warmuth, M. (1986). Finding a shortest solution for the $n \times n$ extension of the 15-puzzle is intractable. In *AAAI-86*, Vol. 1, pp. 168–172.
- Rauch, H. E., Tung, F., and Striebel, C. T.** (1965). Maximum likelihood estimates of linear dynamic systems. *AIAA Journal*, 3(8), 1445–1450.
- Rayward-Smith, V., Osman, I., Reeves, C., and Smith, G. (Eds.).** (1996). *Modern Heuristic Search Methods*. Wiley.
- Rechenberg, I.** (1965). Cybernetic solution path of an experimental problem. Library translation 1122, Royal Aircraft Establishment.
- Reeson, C. G., Huang, K.-C., Bayer, K. M., and Choueiry, B. Y.** (2007). An interactive constraint-based approach to sudoku. In *AAAI-07*, pp. 1976–1977.
- Regin, J.** (1994). A filtering algorithm for constraints of difference in CSPs. In *AAAI-94*, pp. 362–367.
- Reichenbach, H.** (1949). *The Theory of Probability: An Inquiry into the Logical and Mathematical Foundations of the Calculus of Probability* (second edition). University of California Press.
- Reid, D. B.** (1979). An algorithm for tracking multiple targets. *IEEE Trans. Automatic Control*, 24(6), 843–854.
- Reif, J.** (1979). Complexity of the mover’s problem and generalizations. In *FOCS-79*, pp. 421–427. IEEE.
- Reiter, R.** (1980). A logic for default reasoning. *AI*, 13(1–2), 81–132.
- Reiter, R.** (1991). The frame problem in the situation calculus: A simple solution (sometimes) and a completeness result for goal regression. In Lifschitz, V. (Ed.), *Artificial Intelligence and Mathematical Theory of Computation: Papers in Honor of John McCarthy*, pp. 359–380. Academic Press.
- Reiter, R.** (2001). *Knowledge in Action: Logical Foundations for Specifying and Implementing Dynamical Systems*. MIT Press.
- Renner, G.** and Ekart, A. (2003). Genetic algorithms in computer aided design. *Computer Aided Design*, 35(8), 709–726.
- Rényi, A.** (1970). *Probability Theory*. Elsevier/North-Holland.
- Reynolds, C. W.** (1987). Flocks, herds, and schools: A distributed behavioral model. *Computer Graphics*, 21, 25–34. SIGGRAPH ’87 Conference Proceedings.
- Riazanov, A.** and Voronkov, A. (2002). The design and implementation of VAMPIRE. *AI Communications*, 15(2–3), 91–110.
- Rich, E.** and Knight, K. (1991). *Artificial Intelligence* (second edition). McGraw-Hill.
- Richards, M.** and Amir, E. (2007). Opponent modeling in Scrabble. In *IJCAI-07*.
- Richardson, M., Bilmes, J., and Diorio, C.** (2000). Hidden-articulator Markov models: Performance improvements and robustness to noise. In *ICASSP-00*.
- Richter, S.** and Westphal, M. (2008). The LAMA planner. In *Proc. International Planning Competition at ICAPS*.
- Ridley, M.** (2004). *Evolution*. Oxford Reader.
- Rieger, C.** (1976). An organization of knowledge for problem solving and language comprehension. *AIJ*, 7, 89–127.

- Riley, J.** and Samuelson, W. (1981). Optimal auctions. *American Economic Review*, 71, 381–392.
- Riloff, E.** (1993). Automatically constructing a dictionary for information extraction tasks. In *AAAI-93*, pp. 811–816.
- Rintanen, J.** (1999). Improvements to the evaluation of quantified Boolean formulae. In *IJCAI-99*, pp. 1192–1197.
- Rintanen, J.** (2007). Asymptotically optimal encodings of conformant planning in QBF. In *AAAI-07*, pp. 1045–1050.
- Ripley, B. D.** (1996). *Pattern Recognition and Neural Networks*. Cambridge University Press.
- Rissanen, J.** (1984). Universal coding, information, prediction, and estimation. *IEEE Transactions on Information Theory*, IT-30(4), 629–636.
- Rissanen, J.** (2007). *Information and Complexity in Statistical Modeling*. Springer.
- Ritchie, G. D.** and Hanna, F. K. (1984). AM: A case study in AI methodology. *AIJ*, 23(3), 249–268.
- Rivest, R.** (1987). Learning decision lists. *Machine Learning*, 2(3), 229–246.
- Roberts, L. G.** (1963). Machine perception of three-dimensional solids. Technical report 315, MIT Lincoln Laboratory.
- Robertson, N.** and Seymour, P. D. (1986). Graph minors. II. Algorithmic aspects of tree-width. *J. Algorithms*, 7(3), 309–322.
- Robertson, S. E.** (1977). The probability ranking principle in IR. *J. Documentation*, 33, 294–304.
- Robertson, S. E.** and Sparck Jones, K. (1976). Relevance weighting of search terms. *J. American Society for Information Science*, 27, 129–146.
- Robinson, A.** and Voronkov, A. (2001). *Handbook of Automated Reasoning*. Elsevier.
- Robinson, J. A.** (1965). A machine-oriented logic based on the resolution principle. *JACM*, 12, 23–41.
- Roche, E.** and Schabes, Y. (1997). *Finite-State Language Processing (Language, Speech and Communication)*. Bradford Books.
- Rock, I.** (1984). *Perception*. W. H. Freeman.
- Rosenblatt, F.** (1957). The perceptron: A perceiving and recognizing automaton. Report 85-460-1, Project PARA, Cornell Aeronautical Laboratory.
- Rosenblatt, F.** (1960). On the convergence of reinforcement procedures in simple perceptrons. Report VG-1196-G-4, Cornell Aeronautical Laboratory.
- Rosenblatt, F.** (1962). *Principles of Neurodynamics: Perceptrons and the Theory of Brain Mechanisms*. Spartan.
- Rosenblatt, M.** (1956). Remarks on some nonparametric estimates of a density function. *Annals of Mathematical Statistics*, 27, 832–837.
- Rosenblueth, A.**, Wiener, N., and Bigelow, J. (1943). Behavior, purpose, and teleology. *Philosophy of Science*, 10, 18–24.
- Rosenschein, J. S.** and Zlotkin, G. (1994). *Rules of Encounter*. MIT Press.
- Rosenschein, S. J.** (1985). Formal theories of knowledge in AI and robotics. *New Generation Computing*, 3(4), 345–357.
- Ross, P. E.** (2004). Psyching out computer chess players. *IEEE Spectrum*, 41(2), 14–15.
- Ross, S. M.** (1988). *A First Course in Probability* (third edition). Macmillan.
- Rossi, F.**, van Beek, P., and Walsh, T. (2006). *Handbook of Constraint Processing*. Elsevier.
- Roussel, P.** (1975). Prolog: Manual de référence et d'utilisation. Tech. rep., Groupe d'Intelligence Artificielle, Université d'Aix-Marseille.
- Rouveiro, C.** and Puget, J.-F. (1989). A simple and general solution for inverting resolution. In *Proc. European Working Session on Learning*, pp. 201–210.
- Rowat, P. F.** (1979). *Representing the Spatial Experience and Solving Spatial problems in a Simulated Robot Environment*. Ph.D. thesis, University of British Columbia.
- Roweis, S. T.** and Ghahramani, Z. (1999). A unifying review of Linear Gaussian Models. *Neural Computation*, 11(2), 305–345.
- Rowley, H.**, Baluja, S., and Kanade, T. (1996). Neural network-based face detection. In *CVPR*, pp. 203–208.
- Roy, N.**, Gordon, G., and Thrun, S. (2005). Finding approximate POMDP solutions through belief compression. *JAIR*, 23, 1–40.
- Rubin, D.** (1988). Using the SIR algorithm to simulate posterior distributions. In Bernardo, J. M., de Groot, M. H., Lindley, D. V., and Smith, A. F. M. (Eds.), *Bayesian Statistics 3*, pp. 395–402. Oxford University Press.
- Rumelhart, D. E.**, Hinton, G. E., and Williams, R. J. (1986a). Learning internal representations by error propagation. In Rumelhart, D. E. and McClelland, J. L. (Eds.), *Parallel Distributed Processing*, Vol. 1, chap. 8, pp. 318–362. MIT Press.
- Rumelhart, D. E.**, Hinton, G. E., and Williams, R. J. (1986b). Learning representations by back-propagating errors. *Nature*, 323, 533–536.
- Rumelhart, D. E.** and McClelland, J. L. (Eds.). (1986). *Parallel Distributed Processing*. MIT Press.
- Rummery, G. A.** and Niranjan, M. (1994). Online Q-learning using connectionist systems. Tech. rep. CUED/F-INFENG/TR 166, Cambridge University Engineering Department.
- Ruspini, E. H.**, Lowrance, J. D., and Strat, T. M. (1992). Understanding evidential reasoning. *IJAR*, 6(3), 401–424.
- Russell, J. G. B.** (1990). Is screening for abdominal aortic aneurysm worthwhile? *Clinical Radiology*, 41, 182–184.
- Russell, S. J.** (1985). The compleat guide to MRS. Report STAN-CS-85-1080, Computer Science Department, Stanford University.
- Russell, S. J.** (1986). A quantitative analysis of analogy by similarity. In *AAAI-86*, pp. 284–288.
- Russell, S. J.** (1988). Tree-structured bias. In *AAAI-88*, Vol. 2, pp. 641–645.
- Russell, S. J.** (1992). Efficient memory-bounded search methods. In *ECAI-92*, pp. 1–5.
- Russell, S. J.** (1998). Learning agents for uncertain environments (extended abstract). In *COLT-98*, pp. 101–103.
- Russell, S. J.**, Binder, J., Koller, D., and Kanazawa, K. (1995). Local learning in probabilistic networks with hidden variables. In *IJCAI-95*, pp. 1146–52.
- Russell, S. J.** and Grosof, B. (1987). A declarative approach to bias in concept learning. In *AAAI-87*.
- Russell, S. J.** and Norvig, P. (2003). *Artificial Intelligence: A Modern Approach* (2nd edition). Prentice-Hall.
- Russell, S. J.** and Subramanian, D. (1995). Provably bounded-optimal agents. *JAIR*, 3, 575–609.
- Russell, S. J.**, Subramanian, D., and Parr, R. (1993). Provably bounded optimal agents. In *IJCAI-93*, pp. 338–345.
- Russell, S. J.** and Wefald, E. H. (1989). On optimal game-tree search using rational meta-reasoning. In *IJCAI-89*, pp. 334–340.
- Russell, S. J.** and Wefald, E. H. (1991). *Do the Right Thing: Studies in Limited Rationality*. MIT Press.
- Russell, S. J.** and Wolfe, J. (2005). Efficient belief-state AND-OR search, with applications to Kriegspiel. In *IJCAI-05*, pp. 278–285.
- Russell, S. J.** and Zimdars, A. (2003). Q-decomposition of reinforcement learning agents. In *ICML-03*.
- Rustagi, J. S.** (1976). *Variational Methods in Statistics*. Academic Press.
- Sabin, D.** and Freuder, E. C. (1994). Contradicting conventional wisdom in constraint satisfaction. In *ECAI-94*, pp. 125–129.
- Sacerdoti, E. D.** (1974). Planning in a hierarchy of abstraction spaces. *AIJ*, 5(2), 115–135.
- Sacerdoti, E. D.** (1975). The nonlinear nature of plans. In *IJCAI-75*, pp. 206–214.
- Sacerdoti, E. D.** (1977). *A Structure for Plans and Behavior*. Elsevier/North-Holland.
- Sadri, F.** and Kowalski, R. (1995). Variants of the event calculus. In *ICLP-95*, pp. 67–81.
- Sahami, M.**, Dumais, S. T., Heckerman, D., and Horvitz, E. J. (1998). A Bayesian approach to filtering junk E-mail. In *Learning for Text Categorization: Papers from the 1998 Workshop*.
- Sahami, M.**, Hearst, M. A., and Saund, E. (1996). Applying the multiple cause mixture model to text categorization. In *ICML-96*, pp. 435–443.
- Sahin, N. T.**, Pinker, S., Cash, S. S., Schomer, D., and Halgren, E. (2009). Sequential processing of lexical, grammatical, and phonological information within Broca's area. *Science*, 326(5291), 445–449.
- Sakuta, M.** and Iida, H. (2002). AND/OR-tree search for solving problems with uncertainty: A case study using screen-shogi problems. *IPSJ Journal*, 43(01).
- Salomaa, A.** (1969). Probabilistic and weighted grammars. *Information and Control*, 15, 529–544.
- Salton, G.**, Wong, A., and Yang, C. S. (1975). A vector space model for automatic indexing. *CACM*, 18(11), 613–620.
- Samuel, A. L.** (1959). Some studies in machine learning using the game of checkers. *IBM Journal of Research and Development*, 3(3), 210–229.
- Samuel, A. L.** (1967). Some studies in machine learning using the game of checkers II—Recent progress. *IBM Journal of Research and Development*, 11(6), 601–617.
- Samuelsson, C.** and Rayner, M. (1991). Quantitative evaluation of explanation-based learning as an optimization tool for a large-scale natural language system. In *IJCAI-91*, pp. 609–615.
- Sarawagi, S.** (2007). Information extraction. *Foundations and Trends in Databases*, 1(3), 261–377.
- Satia, J. K.** and Lave, R. E. (1973). Markovian decision processes with probabilistic observation of states. *Management Science*, 20(1), 1–13.
- Sato, T.** and Kameya, Y. (1997). PRISM: A symbolic-statistical modeling language. In *IJCAI-97*, pp. 1330–1335.

- Saul, L. K., Jaakkola, T., and Jordan, M. I.** (1996). Mean field theory for sigmoid belief networks. *JAIR*, 4, 61–76.
- Savage, L. J.** (1954). *The Foundations of Statistics*. Wiley.
- Sayre, K.** (1993). Three more flaws in the computational model. Paper presented at the APA (Central Division) Annual Conference, Chicago, Illinois.
- Schaeffer, J.** (2008). *One Jump Ahead: Computer Perfection at Checkers*. Springer-Verlag.
- Schaeffer, J., Burch, N., Björnsson, Y., Kishimoto, A., Müller, M., Lake, R., Lu, P., and Sutphen, S.** (2007). Checkers is solved. *Science*, 317, 1518–1522.
- Schank, R. C. and Abelson, R. P.** (1977). *Scripts, Plans, Goals, and Understanding*. Lawrence Erlbaum Associates.
- Schank, R. C. and Riesbeck, C.** (1981). *Inside Computer Understanding: Five Programs Plus Miniatures*. Lawrence Erlbaum Associates.
- Schapire, R. E. and Singer, Y.** (2000). Boostexter: A boosting-based system for text categorization. *Machine Learning*, 39(2/3), 135–168.
- Schapire, R. E.** (1990). The strength of weak learnability. *Machine Learning*, 5(2), 197–227.
- Schapire, R. E.** (2003). The boosting approach to machine learning: An overview. In Denison, D. D., Hansen, M. H., Holmes, C., Mallick, B., and Yu, B. (Eds.), *Nonlinear Estimation and Classification*. Springer.
- Schmid, C. and Mohr, R.** (1996). Combining grey-value invariants with local constraints for object recognition. In *CVPR*.
- Schmolze, J. G. and Lipkis, T. A.** (1983). Classification in the KL-ONE representation system. In *IJCAI-83*, pp. 330–332.
- Schölkopf, B. and Smola, A. J.** (2002). *Learning with Kernels*. MIT Press.
- Schöning, T.** (1999). A probabilistic algorithm for k-SAT and constraint satisfaction problems. In *FOCS-99*, pp. 410–414.
- Schoppers, M. J.** (1987). Universal plans for reactive robots in unpredictable environments. In *IJCAI-87*, pp. 1039–1046.
- Schoppers, M. J.** (1989). In defense of reaction plans as caches. *AIMag*, 10(4), 51–60.
- Schröder, E.** (1877). *Der Operationskreis des Logikkalküls*. B. G. Teubner, Leipzig.
- Schultz, W., Dayan, P., and Montague, P. R.** (1997). A neural substrate of prediction and reward. *Science*, 275, 1593.
- Schulz, D., Burgard, W., Fox, D., and Cremers, A. B.** (2003). People tracking with mobile robots using sample-based joint probabilistic data association filters. *Int. J. Robotics Research*, 22(2), 99–116.
- Schulz, S.** (2004). System Description: E 0.81. In *Proc. International Joint Conference on Automated Reasoning*, Vol. 3097 of *LNAI*, pp. 223–228.
- Schütze, H.** (1995). *Ambiguity in Language Learning: Computational and Cognitive Models*. Ph.D. thesis, Stanford University. Also published by CSLI Press, 1997.
- Schwartz, J. T., Scharir, M., and Hopcroft, J.** (1987). *Planning, Geometry and Complexity of Robot Motion*. Ablex Publishing Corporation.
- Schwartz, S. P. (Ed.)** (1977). *Naming, Necessity, and Natural Kinds*. Cornell University Press.
- Scott, D. and Krauss, P.** (1966). Assigning probabilities to logical formulas. In Hintikka, J. and Suppes, P. (Eds.), *Aspects of Inductive Logic*. North-Holland.
- Searle, J. R.** (1980). Minds, brains, and programs. *BBS*, 3, 417–457.
- Searle, J. R.** (1984). *Minds, Brains and Science*. Harvard University Press.
- Searle, J. R.** (1990). Is the brain's mind a computer program? *Scientific American*, 262, 26–31.
- Searle, J. R.** (1992). *The Rediscovery of the Mind*. MIT Press.
- Sebastiani, F.** (2002). Machine learning in automated text categorization. *ACM Computing Surveys*, 34(1), 1–47.
- Segaran, T.** (2007). *Programming Collective Intelligence: Building Smart Web 2.0 Applications*. O'Reilly.
- Selman, B., Kautz, H., and Cohen, B.** (1996). Local search strategies for satisfiability testing. In *DIMACS Series in Discrete Mathematics and Theoretical Computer Science*, Volume 26, pp. 521–532. American Mathematical Society.
- Selman, B. and Levesque, H. J.** (1993). The complexity of path-based defeasible inheritance. *AIJ*, 62(2), 303–339.
- Selman, B., Levesque, H. J., and Mitchell, D.** (1992). A new method for solving hard satisfiability problems. In *AAAI-92*, pp. 440–446.
- Sha, F. and Pereira, F.** (2003). Shallow parsing with conditional random fields. Technical report CIS TR MS-CIS-02-35, Univ. of Penn.
- Shachter, R. D.** (1986). Evaluating influence diagrams. *Operations Research*, 34, 871–882.
- Shachter, R. D.** (1998). Bayes-ball: The rational pastime (for determining irrelevance and requisite information in belief networks and influence diagrams). In *UAI-98*, pp. 480–487.
- Shachter, R. D., D'Ambrosio, B., and Del Favero, B. A.** (1990). Symbolic probabilistic inference in belief networks. In *AAAI-90*, pp. 126–131.
- Shachter, R. D. and Kenley, C. R.** (1989). Gaussian influence diagrams. *Management Science*, 35(5), 527–550.
- Shachter, R. D. and Peot, M.** (1989). Simulation approaches to general probabilistic inference on belief networks. In *UAI-98*.
- Shachter, R. D. and Heckerman, D.** (1987). Think-backward for knowledge acquisition. *AIMag*, 3(Fall).
- Shaffer, G.** (1976). *A Mathematical Theory of Evidence*. Princeton University Press.
- Shahookar, K. and Mazumder, P.** (1991). VLSI cell placement techniques. *Computing Surveys*, 23(2), 143–220.
- Shanahan, M.** (1997). *Solving the Frame Problem*. MIT Press.
- Shanahan, M.** (1999). The event calculus explained. In Wooldridge, M. J. and Veloso, M. (Eds.), *Artificial Intelligence Today*, pp. 409–430. Springer-Verlag.
- Shankar, N.** (1986). *Proof-Checking Metamathematics*. Ph.D. thesis, Computer Science Department, University of Texas at Austin.
- Shannon, C. E. and Weaver, W.** (1949). *The Mathematical Theory of Communication*. University of Illinois Press.
- Shannon, C. E.** (1948). A mathematical theory of communication. *Bell Systems Technical Journal*, 27, 379–423, 623–656.
- Shannon, C. E.** (1950). Programming a computer for playing chess. *Philosophical Magazine*, 41(4), 256–275.
- Sharparau, D., Pistore, M., and Traverso, P.** (2008). Fusing procedural and declarative planning goals for nondeterministic domains. In *AAAI-08*.
- Shapiro, E.** (1981). An algorithm that infers theories from facts. In *IJCAI-81*, p. 1064.
- Shapiro, S. C. (Ed.)** (1992). *Encyclopedia of Artificial Intelligence* (second edition). Wiley.
- Shapley, S.** (1953). Stochastic games. In *PNAS*, Vol. 39, pp. 1095–1100.
- Shatkay, H. and Kaelbling, L. P.** (1997). Learning topological maps with weak local odometric information. In *IJCAI-97*.
- Shelley, M.** (1818). *Frankenstein: Or, the Modern Prometheus*. Pickering and Chatto.
- Sheppard, B.** (2002). World-championship-caliber scrabble. *AIJ*, 134(1–2), 241–275.
- Shi, J. and Malik, J.** (2000). Normalized cuts and image segmentation. *PAMI*, 22(8), 888–905.
- Shieber, S.** (1994). Lessons from a restricted Turing Test. *CACM*, 37, 70–78.
- Shieber, S. (Ed.)** (2004). *The Turing Test*. MIT Press.
- Shoham, Y.** (1993). Agent-oriented programming. *AIJ*, 60(1), 51–92.
- Shoham, Y.** (1994). *Artificial Intelligence Techniques in Prolog*. Morgan Kaufmann.
- Shoham, Y. and Leyton-Brown, K.** (2009). *Multagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations*. Cambridge Univ. Press.
- Shoham, Y., Powers, R., and Grenager, T.** (2004). If multi-agent learning is the answer, what is the question? In *Proc. AAAI Fall Symposium on Artificial Multi-Agent Learning*.
- Shortliffe, E. H.** (1976). *Computer-Based Medical Consultations: MYCIN*. Elsevier/North-Holland.
- Sietsma, J. and Dow, R. J. F.** (1988). Neural net pruning—Why and how. In *IEEE International Conference on Neural Networks*, pp. 325–333.
- Siklossy, L. and Dreissi, J.** (1973). An efficient robot planner which generates its own procedures. In *IJCAI-73*, pp. 423–430.
- Silverstein, C., Henzinger, M., Marais, H., and Moricz, M.** (1998). Analysis of a very large altavista query log. Tech. rep. 1998-014, Digital Systems Research Center.
- Simmons, R. and Koenig, S.** (1995). Probabilistic robot navigation in partially observable environments. In *IJCAI-95*, pp. 1080–1087. IJCAI, Inc.
- Simon, D.** (2006). *Optimal State Estimation: Kalman, H Infinity, and Nonlinear Approaches*. Wiley.
- Simon, H. A.** (1947). *Administrative behavior*. Macmillan.
- Simon, H. A.** (1957). *Models of Man: Social and Rational*. John Wiley.
- Simon, H. A.** (1963). Experiments with a heuristic compiler. *JACM*, 10, 493–506.
- Simon, H. A.** (1981). *The Sciences of the Artificial* (second edition). MIT Press.

- Simon, H. A.** (1982). *Models of Bounded Rationality, Volume 1*. The MIT Press.
- Simon, H. A.** and Newell, A. (1958). Heuristic problem solving: The next advance in operations research. *Operations Research*, 6, 1–10.
- Simon, H. A.** and Newell, A. (1961). Computer simulation of human thinking and problem solving. *Datamation, June/July*, 35–37.
- Simon, J. C.** and Dubois, O. (1989). Number of solutions to satisfiability instances—Applications to knowledge bases. *AII*, 3, 53–65.
- Simonis, H.** (2005). Sudoku as a constraint problem. In *CP Workshop on Modeling and Reformulating Constraint Satisfaction Problems*, pp. 13–27.
- Singer, P. W.** (2009). *Wired for War*. Penguin Press.
- Singh, P.**, Lin, T., Mueller, E. T., Lim, G., Perkins, T., and Zhu, W. L. (2002). Open mind common sense: Knowledge acquisition from the general public. In *Proc. First International Conference on Ontologies, Databases, and Applications of Semantics for Large Scale Information Systems*.
- Singhal, A.**, Buckley, C., and Mitra, M. (1996). Pivot document length normalization. In *SIGIR-96*, pp. 21–29.
- Sittler, R. W.** (1964). An optimal data association problem in surveillance theory. *IEEE Transactions on Military Electronics*, 8(2), 125–139.
- Skinner, B. F.** (1953). *Science and Human Behavior*. Macmillan.
- Skolem, T.** (1920). Logisch-kombinatorische Untersuchungen über die Erfüllbarkeit oder Beweisbarkeit mathematischer Sätze nebst einem Theoreme über die dichten Mengen. *Videnskapselskapets skrifter, I. Matematisk-naturvidenskabelig klasse*, 4.
- Skolem, T.** (1928). Über die mathematische Logik. *Norsk matematisk tidsskrift*, 10, 125–142.
- Slagle, J. R.** (1963). A heuristic program that solves symbolic integration problems in freshman calculus. *JACM*, 10(4).
- Slate, D. J.** and Atkin, L. R. (1977). CHESS 4.5—Northwestern University chess program. In Frey, P. W. (Ed.), *Chees Skill in Man and Machine*, pp. 82–118. Springer-Verlag.
- Slater, E.** (1950). Statistics for the chess computer and the factor of mobility. In *Symposium on Information Theory*, pp. 150–152. Ministry of Supply.
- Sleator, D.** and Temperley, D. (1993). Parsing English with a link grammar. In *Third Annual Workshop on Parsing technologies*.
- Slocum, J.** and Sonneveld, D. (2006). *The 15 Puzzle*. Slocum Puzzle Foundation.
- Sloman, A.** (1978). *The Computer Revolution in Philosophy*. Harvester Press.
- Smallwood, R. D.** and Sondik, E. J. (1973). The optimal control of partially observable Markov processes over a finite horizon. *Operations Research*, 21, 1071–1088.
- Smart, J. J. C.** (1959). Sensations and brain processes. *Philosophical Review*, 68, 141–156.
- Smith, B.** (2004). Ontology. In Floridi, L. (Ed.), *The Blackwell Guide to the Philosophy of Computing and Information*, pp. 155–166. Wiley-Blackwell.
- Smith, D. E.**, Genesereth, M. R., and Ginsberg, M. L. (1986). Controlling recursive inference. *AII*, 30(3), 343–389.
- Smith, D. A.** and Eisner, J. (2008). Dependency parsing by belief propagation. In *EMNLP*, pp. 145–156.
- Smith, D. E.** and Weld, D. S. (1998). Conformant Graphplan. In *AAAI-98*, pp. 889–896.
- Smith, J. Q.** (1988). *Decision Analysis*. Chapman and Hall.
- Smith, J. E.** and Winkler, R. L. (2006). The optimizer's curse: Skepticism and postdecision surprise in decision analysis. *Management Science*, 52(3), 311–322.
- Smith, J. M.** (1982). *Evolution and the Theory of Games*. Cambridge University Press.
- Smith, J. M.** and Szathmáry, E. (1999). *The Origins of Life: From the Birth of Life to the Origin of Language*. Oxford University Press.
- Smith, M. K.**, Welty, C., and McGuinness, D. (2004). OWL web ontology language guide. Tech. rep., W3C.
- Smith, R. C.** and Cheeseman, P. (1986). On the representation and estimation of spatial uncertainty. *Int. J. Robotics Research*, 5(4), 56–68.
- Smith, S. J. J.**, Nau, D. S., and Throop, T. A. (1998). Success in spades: Using AI planning techniques to win the world championship of computer bridge. In *AAI-98*, pp. 1079–1086.
- Smolensky, P.** (1988). On the proper treatment of connectionism. *BBS*, 2, 1–74.
- Smullyan, R. M.** (1995). *First-Order Logic*. Dover.
- Smyth, P.**, Heckerman, D., and Jordan, M. I. (1997). Probabilistic independence networks for hidden Markov probability models. *Neural Computation*, 9(2), 227–269.
- Snell, M. B.** (2008). Do you have free will? John Searle reflects on various philosophical questions in light of new research on the brain. *California Alumni Magazine, March/April*.
- Soderland, S.** and Weld, D. S. (1991). Evaluating nonlinear planning. Technical report TR-91-02-03, University of Washington Department of Computer Science and Engineering.
- Solomonoff, R. J.** (1964). A formal theory of inductive inference. *Information and Control*, 7, 1–22, 224–254.
- Solomonoff, R. J.** (2009). Algorithmic probability—theory and applications. In Emmert-Streib, F. and Dehmer, M. (Eds.), *Information Theory and Statistical Learning*. Springer.
- Sondik, E. J.** (1971). *The Optimal Control of Partially Observable Markov Decision Processes*. Ph.D. thesis, Stanford University.
- Sosic, R.** and Gu, J. (1994). Efficient local search with conflict minimization: A case study of the n-queens problem. *IEEE Transactions on Knowledge and Data Engineering*, 6(5), 661–668.
- Sowa, J.** (1999). *Knowledge Representation: Logical, Philosophical, and Computational Foundations*. Blackwell.
- Spaan, M. T. J.** and Vlassis, N. (2005). Perseus: Randomized point-based value iteration for POMDPs. *JAIR*, 24, 195–220.
- Spiegelhalter, D. J.**, Dawid, A. P., Lauritzen, S., and Cowell, R. (1993). Bayesian analysis in expert systems. *Statistical Science*, 8, 219–282.
- Spielberg, S.** (2001). AI. Movie.
- Spirites, P.**, Glymour, C., and Scheines, R. (1993). *Causation, prediction, and search*. Springer-Verlag.
- Srinivasan, A.**, Muggerton, S. H., King, R. D., and Sternberg, M. J. E. (1994). Mutagenesis: ILP experiments in a non-determinate biological domain. In *ILP-94*, Vol. 237, pp. 217–232.
- Srivastava, M.** and Bickford, M. (1990). Formal verification of a pipelined microprocessor. *IEEE Software*, 7(5), 52–64.
- Staab, S.** (2004). *Handbook on Ontologies*. Springer.
- Stallman, R. M.** and Sussman, G. J. (1977). Forward reasoning and dependency-directed backtracking in a system for computer-aided circuit analysis. *AII*, 9(2), 135–196.
- Stanfill, C.** and Waltz, D. (1986). Toward memory-based reasoning. *CACM*, 29(12), 1213–1228.
- Stefik, M.** (1995). *Introduction to Knowledge Systems*. Morgan Kaufmann.
- Stein, L. A.** (2002). *Interactive Programming in Java (pre-publication draft)*. Morgan Kaufmann.
- Stephenson, T.**, Bourlard, H., Bengio, S., and Morris, A. (2000). Automatic speech recognition using dynamic bayesian networks with both acoustic and articulatory features. In *IISLP-00*, pp. 951–954.
- Stergiou, K.** and Walsh, T. (1999). The difference all-difference makes. In *IJCAI-99*, pp. 414–419.
- Stickel, M. E.** (1992). A prolog technology theorem prover: a new exposition and implementation in prolog. *Theoretical Computer Science*, 104, 109–128.
- Stiller, L.** (1992). KQNKR. *J. International Computer Chess Association*, 15(1), 16–18.
- Stiller, L.** (1996). Multilinear algebra and chess endgames. In Nowakowski, R. J. (Ed.), *Games of No Chance, MSRI, 29, 1996*. Mathematical Sciences Research Institute.
- Stockman, G.** (1979). A minimax algorithm better than alpha-beta? *AII*, 12(2), 179–196.
- Stoffel, K.**, Taylor, M., and Hendler, J. (1997). Efficient management of very large ontologies. In *Proc. AAAI-97*, pp. 442–447.
- Stolcke, A.** and Omohundro, S. (1994). Inducing probabilistic grammars by Bayesian model merging. In *Proc. Second International Colloquium on Grammatical Inference and Applications (ICGI-94)*, pp. 106–118.
- Stone, M.** (1974). Cross-validatory choice and assessment of statistical predictions. *J. Royal Statistical Society*, 36(111–133).
- Stone, P.** (2000). *Layered Learning in Multi-Agent Systems: A Winning Approach to Robotic Soccer*. MIT Press.
- Stone, P.** (2003). Multiagent competitions and research: Lessons from RoboCup and TAC. In Lima, P. U. and Rojas, P. (Eds.), *RoboCup-2002: Robot Soccer World Cup VI*, pp. 224–237. Springer Verlag.
- Stone, P.**, Kaminka, G., and Rosenschein, J. S. (2009). Leading a best-response teammate in an ad hoc team. In *AAMAS Workshop in Agent Mediated Electronic Commerce*.
- Stork, D. G.** (2004). Optics and realism in renaissance art. *Scientific American*, pp. 77–83.
- Strachey, C.** (1952). Logical or non-mathematical programmes. In *Proc. 1952 ACM national meeting (Toronto)*, pp. 46–49.
- Stratonovich, R. L.** (1959). Optimum nonlinear systems which bring about a separation of a signal with constant parameters from noise. *Radiotekhnika*, 2(6), 892–901.
- Stratonovich, R. L.** (1965). On value of information. *Izvestiya of USSR Academy of Sciences, Technical Cybernetics*, 5, 3–12.
- Subramanian, D.** and Feldman, R. (1990). The utility of EBL in recursive domain theories. In *AAAI-90*, Vol. 2, pp. 942–949.

- Subramanian, D.** and Wang, E. (1994). Constraint-based kinematic synthesis. In *Proc. International Conference on Qualitative Reasoning*, pp. 228–239.
- Sussman, G. J.** (1975). *A Computer Model of Skill Acquisition*. Elsevier/North-Holland.
- Sutcliffe, G.** and Suttner, C. (1998). The TPTP Problem Library: CNF Release v1.2.1. *JAR*, 21(2), 177–203.
- Sutcliffe, G.**, Schulz, S., Claessen, K., and Gelder, A. V. (2006). Using the TPTP language for writing derivations and finite interpretations. In *Proc. International Joint Conference on Automated Reasoning*, pp. 67–81.
- Sutherland, I.** (1963). Sketchpad: A man-machine graphical communication system. In *Proc. Spring Joint Computer Conference*, pp. 329–346.
- Sutton, C.** and McCallum, A. (2007). An introduction to conditional random fields for relational learning. In Getoor, L. and Taskar, B. (Eds.), *Introduction to Statistical Relational Learning*. MIT Press.
- Sutton, R. S.** (1988). Learning to predict by the methods of temporal differences. *Machine Learning*, 3, 9–44.
- Sutton, R. S.**, McAllester, D. A., Singh, S. P., and Mansour, Y. (2000). Policy gradient methods for reinforcement learning with function approximation. In Solla, S. A., Leen, T. K., and Müller, K.-R. (Eds.), *NIPS 12*, pp. 1057–1063. MIT Press.
- Sutton, R. S.** (1990). Integrated architectures for learning, planning, and reacting based on approximating dynamic programming. In *ICML-90*, pp. 216–224.
- Sutton, R. S.** and Barto, A. G. (1998). *Reinforcement Learning: An Introduction*. MIT Press.
- Swore, K.** and Burges, C. (2009). A machine learning approach for improved bm25 retrieval. In *Proc. Conference on Information Knowledge Management*.
- Swade, D.** (2000). *Difference Engine: Charles Babbage And The Quest To Build The First Computer*. Diane Publishing Co.
- Swerling, P.** (1959). First order error propagation in a stagewise smoothing procedure for satellite observations. *J. Astronautical Sciences*, 6, 46–52.
- Swift, T.** and Warren, D. S. (1994). Analysis of SLG-WAM evaluation of definite programs. In *Logic Programming. Proc. 1994 International Symposium on Logic programming*, pp. 219–235.
- Syrjänen, T.** (2000). Lparse 1.0 user's manual. [saturn.tcs.hut.fi/Software/smodes](http://saturn.tcs.hut.fi/Software/smodels).
- Tadepalli, P.** (1993). Learning from queries and examples with tree-structured bias. In *ICML-93*, pp. 322–329.
- Tadepalli, P.**, Givan, R., and Driessens, K. (2004). Relational reinforcement learning: An overview. In *ICML-04*.
- Tait, P. G.** (1880). Note on the theory of the “15 puzzle”. *Proc. Royal Society of Edinburgh*, 10, 664–665.
- Tamaki, H.** and Sato, T. (1986). OLD resolution with tabulation. In *ICLP-86*, pp. 84–98.
- Tarjan, R. E.** (1983). *Data Structures and Network Algorithms*. CBMS-NSF Regional Conference Series in Applied Mathematics. SIAM (Society for Industrial and Applied Mathematics).
- Tarski, A.** (1935). Die Wahrheitsbegriff in den formalisierten Sprachen. *Studia Philosophica*, 1, 261–405.
- Tarski, A.** (1941). *Introduction to Logic and to the Methodology of Deductive Sciences*. Dover.
- Tarski, A.** (1956). *Logic, Semantics, Metamathematics: Papers from 1923 to 1938*. Oxford University Press.
- Tash, J. K.** and Russell, S. J. (1994). Control strategies for a stochastic planner. In *AAAI-94*, pp. 1079–1085.
- Taskar, B.**, Abbeel, P., and Koller, D. (2002). Discriminative probabilistic models for relational data. In *UAI-02*.
- Tate, A.** (1975a). Interacting goals and their use. In *IJCAI-75*, pp. 215–218.
- Tate, A.** (1975b). *Using Goal Structure to Direct Search in a Problem Solver*. Ph.D. thesis, University of Edinburgh.
- Tate, A.** (1977). Generating project networks. In *IJCAI-77*, pp. 888–893.
- Tate, A.** and Whiter, A. M. (1984). Planning with multiple resource constraints and an application to a naval planning problem. In *Proc. First Conference on AI Applications*, pp. 410–416.
- Tatman, J. A.** and Shachter, R. D. (1990). Dynamic programming and influence diagrams. *IEEE Transactions on Systems, Man and Cybernetics*, 20(2), 365–379.
- Tattersall, C.** (1911). *A Thousand End-Games: A Collection of Chess Positions That Can Be Won or Drawn by the Best Play*. British Chess Magazine.
- Taylor, G.**, Stensrud, B., Eitelman, S., and Dunham, C. (2007). Towards automating airspace management. In *Proc. Computational Intelligence for Security and Defense Applications (CISDA) Conference*, pp. 1–5.
- Tenenbaum, J.**, Griffiths, T., and Niyogi, S. (2007). Intuitive theories as grammars for causal inference. In Gopnik, A. and Schulz, L. (Eds.), *Causal learning: Psychology, Philosophy, and Computation*. Oxford University Press.
- Tesauro, G.** (1992). Practical issues in temporal difference learning. *Machine Learning*, 8(3–4), 257–277.
- Tesauro, G.** (1995). Temporal difference learning and TD-Gammon. *CACM*, 38(3), 58–68.
- Tesauro, G.** and Sejnowski, T. (1989). A parallel network that learns to play backgammon. *AIJ*, 39(3), 357–390.
- Teyssier, M.** and Koller, D. (2005). Ordering-based search: A simple and effective algorithm for learning Bayesian networks. In *UAI-05*, pp. 584–590.
- Thaler, R.** (1992). *The Winner's Curse: Paradoxes and Anomalies of Economic Life*. Princeton University Press.
- Thaler, R.** and Sunstein, C. (2009). *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Penguin.
- Theocharous, G.**, Murphy, K., and Kaelbling, L. P. (2004). Representing hierarchical POMDPs as DBNs for multi-scale robot localization. In *ICRA-04*.
- Thiele, T.** (1880). Om anvendelse af mindste kvadraters metode i nogle tilfælde, hvor en komplikation af visse slags uensartede tilfældige fejltilfælde giver fejlene en ‘systematisk’ karakter. *Vidensk. Selsk. Skr. 5. Rk., naturvid. og mat. Afd.*, 12, 381–408.
- Thielscher, M.** (1999). From situation calculus to fluent calculus: State update axioms as a solution to the inferential frame problem. *AIJ*, 111(1–2), 277–299.
- Thompson, K.** (1986). Retrograde analysis of certain endgames. *J. International Computer Chess Association, May*, 131–139.
- Thompson, K.** (1996). 6-piece endgames. *J. International Computer Chess Association*, 19(4), 215–226.
- Thrun, S.**, Burgard, W., and Fox, D. (2005). *Probabilistic Robotics*. MIT Press.
- Thrun, S.**, Fox, D., and Burgard, W. (1998). A probabilistic approach to concurrent mapping and localization for mobile robots. *Machine Learning*, 31, 29–53.
- Thrun, S.** (2006). Stanley, the robot that won the DARPA Grand Challenge. *J. Field Robotics*, 23(9), 661–692.
- Tikhonov, A. N.** (1963). Solution of incorrectly formulated problems and the regularization method. *Soviet Math. Dokl.*, 5, 1035–1038.
- Titterington, D. M.**, Smith, A. F. M., and Makov, U. E. (1985). *Statistical analysis of finite mixture distributions*. Wiley.
- Toffler, A.** (1970). *Future Shock*. Bantam.
- Tomasi, C.** and Kanade, T. (1992). Shape and motion from image streams under orthography: A factorization method. *IJCV*, 9, 137–154.
- Torralba, A.**, Fergus, R., and Weiss, Y. (2008). Small codes and large image databases for recognition. In *CVPR*, pp. 1–8.
- Trucco, E.** and Verri, A. (1998). *Introductory Techniques for 3-D Computer Vision*. Prentice Hall.
- Tsitsiklis, J. N.** and Van Roy, B. (1997). An analysis of temporal-difference learning with function approximation. *IEEE Transactions on Automatic Control*, 42(5), 674–690.
- Tumer, K.** and Wolpert, D. (2000). Collective intelligence and braess’ paradox. In *AAAI-00*, pp. 104–109.
- Turcotte, M.**, Muggleton, S. H., and Sternberg, M. J. E. (2001). Automated discovery of structural signatures of protein fold and function. *J. Molecular Biology*, 306, 591–605.
- Turing, A.** (1936). On computable numbers, with an application to the Entscheidungsproblem. *Proc. London Mathematical Society, 2nd series*, 42, 230–265.
- Turing, A.** (1948). Intelligent machinery. Tech. rep., National Physical Laboratory. reprinted in (Ince, 1992).
- Turing, A.** (1950). Computing machinery and intelligence. *Mind*, 59, 433–460.
- Turing, A.**, Strachey, C., Bates, M. A., and Bowden, B. V. (1953). Digital computers applied to games. In Bowden, B. V. (Ed.), *Faster than Thought*, pp. 286–310. Pitman.
- Tversky, A.** and Kahneman, D. (1982). Causal schemata in judgements under uncertainty. In Kahneman, D., Slovic, P., and Tversky, A. (Eds.), *Judgement Under Uncertainty: Heuristics and Biases*. Cambridge University Press.
- Ullman, J. D.** (1985). Implementation of logical query languages for databases. *ACM Transactions on Database Systems*, 10(3), 289–321.
- Ullman, S.** (1979). *The Interpretation of Visual Motion*. MIT Press.

- Urmson, C.** and Whittaker, W. (2008). Self-driving cars and the Urban Challenge. *IEEE Intelligent Systems*, 23(2), 66–68.
- Valiant, L.** (1984). A theory of the learnable. *CACM*, 27, 1134–1142.
- van Beek, P.** (2006). Backtracking search algorithms. In Rossi, F., van Beek, P., and Walsh, T. (Eds.), *Handbook of Constraint Programming*. Elsevier.
- van Beek, P.** and Chen, X. (1999). CPlan: A constraint programming approach to planning. In *AAAI-99*, pp. 585–590.
- van Beek, P.** and Manchak, D. (1996). The design and experimental analysis of algorithms for temporal reasoning. *JAIR*, 4, 1–18.
- van Benthem, J.** and ter Meulen, A. (1997). *Handbook of Logic and Language*. MIT Press.
- Van Emden, M. H.** and Kowalski, R. (1976). The semantics of predicate logic as a programming language. *JACM*, 23(4), 733–742.
- van Harmelen, F.** and Bundy, A. (1988). Explanation-based generalisation = partial evaluation. *AIJ*, 36(3), 401–412.
- van Harmelen, F.**, Lifschitz, V., and Porter, B. (2007). *The Handbook of Knowledge Representation*. Elsevier.
- van Heijenoort, J.** (Ed.). (1967). *From Frege to Gödel: A Source Book in Mathematical Logic, 1879–1931*. Harvard University Press.
- Van Hentenryck, P.**, Saraswat, V., and Deville, Y. (1998). Design, implementation, and evaluation of the constraint language cc(FD). *J. Logic Programming*, 37(1–3), 139–164.
- van Hoeve, W.-J.** (2001). The alldifferent constraint: a survey. In *6th Annual Workshop of the ERCIM Working Group on Constraints*.
- van Hoeve, W.-J.** and Katriel, I. (2006). Global constraints. In Rossi, F., van Beek, P., and Walsh, T. (Eds.), *Handbook of Constraint Processing*, pp. 169–208. Elsevier.
- van Lambalgen, M.** and Hamm, F. (2005). *The Proper Treatment of Events*. Wiley-Blackwell.
- van Nunen, J. A. E. E.** (1976). A set of successive approximation methods for discounted Markovian decision problems. *Zeitschrift für Operations Research, Serie A*, 20(5), 203–208.
- Van Roy, B.** (1998). *Learning and value function approximation in complex decision processes*. Ph.D. thesis, Laboratory for Information and Decision Systems, MIT.
- Van Roy, P. L.** (1990). Can logic programming execute as fast as imperative programming? Report UCB/CSD 90/600, Computer Science Division, University of California, Berkeley, California.
- Vapnik, V. N.** (1998). *Statistical Learning Theory*. Wiley.
- Vapnik, V. N.** and Chervonenkis, A. Y. (1971). On the uniform convergence of relative frequencies of events to their probabilities. *Theory of Probability and Its Applications*, 16, 264–280.
- Varian, H. R.** (1995). Economic mechanism design for computerized agents. In *USENIX Workshop on Electronic Commerce*, pp. 13–21.
- Vauquois, B.** (1968). A survey of formal grammars and algorithms for recognition and transformation in mechanical translation. In *Proc. IFIP Congress*, pp. 1114–1122.
- Veloso, M.** and Carbonell, J. G. (1993). Derivational analogy in PRODIGY: Automating case acquisition, storage, and utilization. *Machine Learning*, 10, 249–278.
- Vere, S. A.** (1983). Planning in time: Windows and durations for activities and goals. *PAMI*, 5, 246–267.
- Verma, V.**, Gordon, G., Simmons, R., and Thrun, S. (2004). Particle filters for rover fault diagnosis. *IEEE Robotics and Automation Magazine*, June.
- Vinge, V.** (1993). The coming technological singularity: How to survive in the post-human era. In *VISION-21 Symposium*, NASA Lewis Research Center and the Ohio Aerospace Institute.
- Viola, P.** and Jones, M. (2002a). Fast and robust classification using asymmetric adaboost and a detector cascade. In *NIPS 14*.
- Viola, P.** and Jones, M. (2002b). Robust real-time object detection. *ICCV*.
- Visser, U.** and Burkhard, H.-D. (2007). RoboCup 2006: achievements and goals for the future. *AIMag*, 28(2), 115–130.
- Visser, U.**, Ribeiro, F., Ohashi, T., and Dellaert, F. (Eds.). (2008). *RoboCup 2007: Robot Soccer World Cup XI*. Springer.
- Viterbi, A. J.** (1967). Error bounds for convolutional codes and an asymptotically optimum decoding algorithm. *IEEE Transactions on Information Theory*, 13(2), 260–269.
- Vlassis, N.** (2008). *A Concise Introduction to Multi-agent Systems and Distributed Artificial Intelligence*. Morgan and Claypool.
- von Mises, R.** (1928). *Wahrscheinlichkeit, Statistik und Wahrheit*. J. Springer.
- von Neumann, J.** (1928). Zur Theorie der Gesellschaftsspiele. *Mathematische Annalen*, 100(295–320).
- von Neumann, J.** and Morgenstern, O. (1944). *Theory of Games and Economic Behavior* (first edition). Princeton University Press.
- von Winterfeldt, D.** and Edwards, W. (1986). *Decision Analysis and Behavioral Research*. Cambridge University Press.
- Vossen, T.**, Ball, M., Lotem, A., and Nau, D. S. (2001). Applying integer programming to AI planning. *Knowledge Engineering Review*, 16, 85–100.
- Wainwright, M. J.** and Jordan, M. I. (2008). Graphical models, exponential families, and variational inference. *Machine Learning*, 1(1–2), 1–305.
- Waldinger, R.** (1975). Achieving several goals simultaneously. In Elcock, E. W. and Michie, D. (Eds.), *Machine Intelligence* 8, pp. 94–138. Ellis Horwood.
- Wallace, A. R.** (1858). On the tendency of varieties to depart indefinitely from the original type. *Proc. Linnean Society of London*, 3, 53–62.
- Waltz, D.** (1975). Understanding line drawings of scenes with shadows. In Winston, P. H. (Ed.), *The Psychology of Computer Vision*. McGraw-Hill.
- Wang, Y.** and Gelly, S. (2007). Modifications of UCT and sequence-like simulations for Monte-Carlo Go. In *IEEE Symposium on Computational Intelligence and Games*, pp. 175–182.
- Wanner, E.** (1974). *On remembering, forgetting and understanding sentences*. Mouton.
- Warren, D. H. D.** (1974). WARPLAN: A System for Generating Plans. Department of Computational Logic Memo 76, University of Edinburgh.
- Warren, D. H. D.** (1983). An abstract Prolog instruction set. Technical note 309, SRI International.
- Warren, D. H. D.**, Pereira, L. M., and Pereira, F. (1977). PROLOG: The language and its implementation compared with LISP. *SIGPLAN Notices*, 12(8), 109–115.
- Wasserman, L.** (2004). *All of Statistics*. Springer.
- Watkins, C. J.** (1989). *Models of Delayed Reinforcement Learning*. Ph.D. thesis, Psychology Department, Cambridge University.
- Watson, J. D.** and Crick, F. H. C. (1953). A structure for deoxyribose nucleic acid. *Nature*, 171, 737.
- Waugh, K.**, Schnizlein, D., Bowling, M., and Szafron, D. (2009). Abstraction pathologies in extensive games. In *AAMAS-09*.
- Weaver, W.** (1949). Translation. In Locke, W. N. and Booth, D. (Eds.), *Machine translation of languages: fourteen essays*, pp. 15–23. Wiley.
- Webber, B. L.** and Nilsson, N. J. (Eds.). (1981). *Readings in Artificial Intelligence*. Morgan Kaufmann.
- Weibull, J.** (1995). *Evolutionary Game Theory*. MIT Press.
- Weidenbach, C.** (2001). SPASS: Combining superposition, sorts and splitting. In Robinson, A. and Voronkov, A. (Eds.), *Handbook of Automated Reasoning*. MIT Press.
- Weiss, G.** (2000a). *Multiagent systems*. MIT Press.
- Weiss, Y.** (2000b). Correctness of local probability propagation in graphical models with loops. *Neural Computation*, 12(1), 1–41.
- Weiss, Y.** and Freeman, W. (2001). Correctness of belief propagation in Gaussian graphical models of arbitrary topology. *Neural Computation*, 13(10), 2173–2200.
- Weizenbaum, J.** (1976). *Computer Power and Human Reason*. W. H. Freeman.
- Weld, D. S.** (1994). An introduction to least commitment planning. *AIMag*, 15(4), 27–61.
- Weld, D. S.** (1999). Recent advances in AI planning. *AIMag*, 20(2), 93–122.
- Weld, D. S.**, Anderson, C. R., and Smith, D. E. (1998). Extending graphplan to handle uncertainty and sensing actions. In *AAAI-98*, pp. 897–904.
- Weld, D. S.** and de Kleer, J. (1990). *Readings in Qualitative Reasoning about Physical Systems*. Morgan Kaufmann.
- Weld, D. S.** and Etzioni, O. (1994). The first law of robotics: A call to arms. In *AAAI-94*.
- Wellman, M. P.** (1985). Reasoning about preference models. Technical report MIT/LCS/TR-340, Laboratory for Computer Science, MIT.
- Wellman, M. P.** (1988). *Formulation of Tradeoffs in Planning under Uncertainty*. Ph.D. thesis, Massachusetts Institute of Technology.
- Wellman, M. P.** (1990a). Fundamental concepts of qualitative probabilistic networks. *AIJ*, 44(3), 257–303.
- Wellman, M. P.** (1990b). The STRIPS assumption for planning under uncertainty. In *AAAI-90*, pp. 198–203.
- Wellman, M. P.** (1995). The economic approach to artificial intelligence. *ACM Computing Surveys*, 27(3), 360–362.
- Wellman, M. P.**, Breese, J. S., and Goldman, R. (1992). From knowledge bases to decision models. *Knowledge Engineering Review*, 7(1), 35–53.

- Wellman, M. P.** and Doyle, J. (1992). Modular utility representation for decision-theoretic planning. In *ICAPS-92*, pp. 236–242.
- Wellman, M. P.**, Wurman, P., O’Malley, K., Bangera, R., Lin, S., Reeves, D., and Walsh, W. (2001). A trading agent competition. *IEEE Internet Computing*.
- Wells, H. G.** (1898). *The War of the Worlds*. William Heinemann.
- Werbos, P.** (1974). *Beyond Regression: New Tools for Prediction and Analysis in the Behavioral Sciences*. Ph.D. thesis, Harvard University.
- Werbos, P.** (1977). Advanced forecasting methods for global crisis warning and models of intelligence. *General Systems Yearbook*, 22, 25–38.
- Wesley, M. A.** and Lozano-Perez, T. (1979). An algorithm for planning collision-free paths among polyhedral objects. *CACM*, 22(10), 560–570.
- Wexler, Y.** and Meek, C. (2009). MAS: A multiplicative approximation scheme for probabilistic inference. In *NIPS 21*.
- Whitehead, A. N.** (1911). *An Introduction to Mathematics*. Williams and Northgate.
- Whitehead, A. N.** and Russell, B. (1910). *Principia Mathematica*. Cambridge University Press.
- Whorf, B.** (1956). *Language, Thought, and Reality*. MIT Press.
- Widrow, B.** (1962). Generalization and information storage in networks of adaline “neurons”. In *Self-Organizing Systems 1962*, pp. 435–461.
- Widrow, B.** and Hoff, M. E. (1960). Adaptive switching circuits. In *1960 IRE WESCON Convention Record*, pp. 96–104.
- Wiedijk, F.** (2003). Comparing mathematical provers. In *Mathematical Knowledge Management*, pp. 188–202.
- Wiegley, J.**, Goldberg, K., Peshkin, M., and Brokowski, M. (1996). A complete algorithm for designing passive fences to orient parts. In *ICRA-96*.
- Wiener, N.** (1942). The extrapolation, interpolation, and smoothing of stationary time series. Osrd 370, Report to the Services 19, Research Project DIC-6037, MIT.
- Wiener, N.** (1948). *Cybernetics*. Wiley.
- Wilensky, R.** (1978). *Understanding goal-based stories*. Ph.D. thesis, Yale University.
- Wilensky, R.** (1983). *Planning and Understanding*. Addison-Wesley.
- Wilkins, D. E.** (1980). Using patterns and plans in chess. *AII*, 14(2), 165–203.
- Wilkins, D. E.** (1988). *Practical Planning: Extending the AI Planning Paradigm*. Morgan Kaufmann.
- Wilkins, D. E.** (1990). Can AI planners solve practical problems? *Computational Intelligence*, 6(4), 232–246.
- Williams, B.**, Ingham, M., Chung, S., and Elliott, P. (2003). Model-based programming of intelligent embedded systems and robotic space explorers. In *Proc. IEEE: Special Issue on Modeling and Design of Embedded Software*, pp. 212–237.
- Williams, R. J.** (1992). Simple statistical gradient-following algorithms for connectionist reinforcement learning. *Machine Learning*, 8, 229–256.
- Williams, R. J.** and Baird, L. C. I. (1993). Tight performance bounds on greedy policies based on imperfect value functions. Tech. rep. NU-CCS-93-14, College of Computer Science, Northeastern University.
- Wilson, R. A.** and Keil, F. C. (Eds.). (1999). *The MIT Encyclopedia of the Cognitive Sciences*. MIT Press.
- Wilson, R.** (2004). *Four Colors Suffice*. Princeton University Press.
- Winograd, S.** and Cowan, J. D. (1963). *Reliable Computation in the Presence of Noise*. MIT Press.
- Winograd, T.** (1972). Understanding natural language. *Cognitive Psychology*, 3(1), 1–191.
- Winston, P. H.** (1970). Learning structural descriptions from examples. Technical report MAC-TR-76, Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology.
- Winston, P. H.** (1992). *Artificial Intelligence* (Third edition). Addison-Wesley.
- Wintermute, S.**, Xu, J., and Laird, J. (2007). SORTS: A human-level approach to real-time strategy AI. In *Proc. Third Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE-07)*.
- Witten, I. H.** and Bell, T. C. (1991). The zero-frequency problem: Estimating the probabilities of novel events in adaptive text compression. *IEEE Transactions on Information Theory*, 37(4), 1085–1094.
- Witten, I. H.** and Frank, E. (2005). *Data Mining: Practical Machine Learning Tools and Techniques* (2nd edition). Morgan Kaufmann.
- Witten, I. H.**, Moffat, A., and Bell, T. C. (1999). *Managing Gigabytes: Compressing and Indexing Documents and Images* (second edition). Morgan Kaufmann.
- Wittgenstein, L.** (1922). *Tractatus Logico-Philosophicus* (second edition). Routledge and Kegan Paul. Reprinted 1971, edited by D. F. Pears and B. F. McGuinness. This edition of the English translation also contains Wittgenstein’s original German text on facing pages, as well as Bertrand Russell’s introduction to the 1922 edition.
- Wittgenstein, L.** (1953). *Philosophical Investigations*. Macmillan.
- Wojciechowski, W. S.** and Wojcik, A. S. (1983). Automated design of multiple-valued logic circuits by automated theorem proving techniques. *IEEE Transactions on Computers*, C-32(9), 785–798.
- Wolfe, J.** and Russell, S. J. (2007). Exploiting belief state structure in graph search. In *ICAPS Workshop on Planning in Games*.
- Woods, W. A.** (1973). Progress in natural language understanding: An application to lunar geology. In *AFIPS Conference Proceedings*, Vol. 42, pp. 441–450.
- Woods, W. A.** (1975). What’s in a link? Foundations for semantic networks. In Bobrow, D. G. and Collins, A. M. (Eds.), *Representation and Understanding: Studies in Cognitive Science*, pp. 35–82. Academic Press.
- Wooldridge, M.** (2002). *An Introduction to Multi-Agent Systems*. Wiley.
- Wooldridge, M.** and Rao, A. (Eds.). (1999). *Foundations of rational agency*. Kluwer.
- Wos, L.**, Carson, D., and Robinson, G. (1964). The unit preference strategy in theorem proving. In *Proc. Fall Joint Computer Conference*, pp. 615–621.
- Wos, L.**, Carson, D., and Robinson, G. (1965). Efficiency and completeness of the set-of-support strategy in theorem proving. *JACM*, 12, 536–541.
- Wos, L.**, Overbeek, R., Lusk, E., and Boyle, J. (1992). *Automated Reasoning: Introduction and Applications* (second edition). McGraw-Hill.
- Wos, L.** and Robinson, G. (1968). Paramodulation and set of support. In *Proc. IRIA Symposium on Automatic Demonstration*, pp. 276–310.
- Wos, L.**, Robinson, G., Carson, D., and Shalla, L. (1967). The concept of demodulation in theorem proving. *JACM*, 14, 698–704.
- Wos, L.** and Winker, S. (1983). Open questions solved with the assistance of AURA. In *Automated Theorem Proving: After 25 Years: Proc. Special Session of the 89th Annual Meeting of the American Mathematical Society*, pp. 71–88. American Mathematical Society.
- Wos, L.** and Pieper, G. (2003). *Automated Reasoning and the Discovery of Missing and Elegant Proofs*. Rinton Press.
- Wray, R. E.** and Jones, R. M. (2005). An introduction to Soar as an agent architecture. In Sun, R. (Ed.), *Cognition and Multi-agent Interaction: From Cognitive Modeling to Social Simulation*, pp. 53–78. Cambridge University Press.
- Wright, S.** (1921). Correlation and causation. *J. Agricultural Research*, 20, 557–585.
- Wright, S.** (1931). Evolution in Mendelian populations. *Genetics*, 16, 97–159.
- Wright, S.** (1934). The method of path coefficients. *Annals of Mathematical Statistics*, 5, 161–215.
- Wu, D.** (1993). Estimating probability distributions over hypotheses with variable unification. In *IJCAI-93*, pp. 790–795.
- Wu, F.** and Weld, D. S. (2008). Automatically refining the wikipedia infobox ontology. In *17th World Wide Web Conference (WWW2008)*.
- Yang, F.**, Culberson, J., Holte, R., Zahavi, U., and Felner, A. (2008). A general theory of additive state space abstractions. *JAIR*, 32, 631–662.
- Yang, Q.** (1990). Formalizing planning knowledge for hierarchical planning. *Computational Intelligence*, 6, 12–24.
- Yarowsky, D.** (1995). Unsupervised word sense disambiguation rivaling supervised methods. In *ACL-95*, pp. 189–196.
- Yedidia, J.**, Freeman, W., and Weiss, Y. (2005). Constructing free-energy approximations and generalized belief propagation algorithms. *IEEE Transactions on Information Theory*, 51(7), 2282–2312.
- Yip, K. M.-K.** (1991). *KAM: A System for Intelligent Guiding Numerical Experimentation by Computer*. MIT Press.
- Yngve, V.** (1955). A model and an hypothesis for language structure. In Locke, W. N. and Booth, A. D. (Eds.), *Machine Translation of Languages*, pp. 208–226. MIT Press.
- Yob, G.** (1975). Hunt the wumpus! *Creative Computing*, Sep/Oct.
- Yoshikawa, T.** (1990). *Foundations of Robotics: Analysis and Control*. MIT Press.
- Young, H. P.** (2004). *Strategic Learning and Its Limits*. Oxford University Press.
- Younger, D. H.** (1967). Recognition and parsing of context-free languages in time n^3 . *Information and Control*, 10(2), 189–208.

- Yudkowsky, E.** (2008). Artificial intelligence as a positive and negative factor in global risk. In Bostrom, N. and Cirkovic, M. (Eds.), *Global Catastrophic Risk*. Oxford University Press.
- Zadeh, L. A.** (1965). Fuzzy sets. *Information and Control*, 8, 338–353.
- Zadeh, L. A.** (1978). Fuzzy sets as a basis for a theory of possibility. *Fuzzy Sets and Systems*, 1, 3–28.
- Zaritskii, V. S., Svetnik, V. B., and Shimelevich, L. I.** (1975). Monte-Carlo technique in problems of optimal information processing. *Automation and Remote Control*, 36, 2015–22.
- Zelle, J. and Mooney, R.** (1996). Learning to parse database queries using inductive logic programming. In *AAAI-96*, pp. 1050–1055.
- Zermelo, E.** (1913). Über Eine Anwendung der Mengenlehre auf die Theorie des Schachspiels. In *Proc. Fifth International Congress of Mathematicians*, Vol. 2, pp. 501–504.
- Zermelo, E.** (1976). An application of set theory to the theory of chess-playing. *Firbush News*, 6, 37–42. English translation of (Zermelo 1913).
- Zettlemoyer, L. S. and Collins, M.** (2005). Learning to map sentences to logical form: Structured classification with probabilistic categorial grammars. In *UAI-05*.
- Zhang, H. and Stickel, M. E.** (1996). An efficient algorithm for unit-propagation. In *Proc. Fourth International Symposium on Artificial Intelligence and Mathematics*.
- Zhang, L., Pavlovic, V., Cantor, C. R., and Kasif, S.** (2003). Human-mouse gene identification by comparative evidence integration and evolutionary analysis. *Genome Research*, pp. 1–13.
- Zhang, N. L. and Poole, D.** (1994). A simple approach to Bayesian network computations. In *Proc. 10th Canadian Conference on Artificial Intelligence*, pp. 171–178.
- Zhang, N. L., Qi, R., and Poole, D.** (1994). A computational theory of decision networks. *IJAR*, 11, 83–158.
- Zhou, R. and Hansen, E.** (2002). Memory-bounded A* graph search. In *Proc. 15th International Flairs Conference*.
- Zhou, R. and Hansen, E.** (2006). Breadth-first heuristic search. *AIJ*, 170(4–5), 385–408.
- Zhu, D. J. and Latombe, J.-C.** (1991). New heuristic algorithms for efficient hierarchical path planning. *IEEE Transactions on Robotics and Automation*, 7(1), 9–20.
- Zimmermann, H.-J. (Ed.)** (1999). *Practical applications of fuzzy technologies*. Kluwer.
- Zimmermann, H.-J.** (2001). *Fuzzy Set Theory—And Its Applications* (Fourth edition). Kluwer.
- Zinkevich, M., Johanson, M., Bowling, M., and Piccione, C.** (2008). Regret minimization in games with incomplete information. In *NIPS 20*, pp. 1729–1736.
- Zollmann, A., Venugopal, A., Och, F. J., and Ponte, J.** (2008). A systematic comparison of phrase-based, hierarchical and syntax-augmented statistical MT. In *COLING-08*.
- Zweig, G. and Russell, S. J.** (1998). Speech recognition with dynamic Bayesian networks. In *AAAI-98*, pp. 173–180.

This page intentionally left blank

Index

Page numbers in **bold** refer to definitions of terms and algorithms; page numbers in *italics* refer to items in the bibliography.

Symbols

- \wedge (and), 244
 χ^2 (chi squared), 706
 $|$ (cons list cell), 305
 \vdash (derives), 242
 \succ (determination), 784
 \models (entailment), 240
 ϵ -ball, 714
 \exists (there exists), 297
 \forall (for all), 295
 $|$ (given), 485
 \Leftrightarrow (if and only if), 244
 \Rightarrow (implies), 244
 \sim (indifferent), 612
 λ (lambda)-expression, 294
 \neg (not), 244
 \vee (or), 244
 \succ (preferred), 612
 \mapsto (uncertain rule), 548

A

- $A(s)$ (actions in a state), 645
 A^* search, 93–99
AAAI (American Association for AI), 31
Aarup, M., 432, *1064*
Abbeel, P., 556, 857, *1068*, *1090*
Abbott, L. F., 763, 854, *1070*
ABC computer, 14
Abdennadher, S., 230, *1073*
Abelson, R. P., 23, 921, *1088*
Abney, S., 921, *1064*
ABO (Asymptotic Bounded Optimality), 1050
Abramson, B., 110, *1064*
absolute error, **98**
abstraction, **69**, 677
abstraction hierarchy, **432**
ABSTRIPS, 432
Abu-Hanna, A., 505, *1081*
AC-3, **209**
Academy Award, 435
accessibility relations, **451**
accusative case, 899
Acero, A., 922, *1076*
Acharya, A., 112, *1068*
Achlioptas, D., 277, 278, *1064*

- Ackley, D. H., 155, *1064*
acoustic model, **913**
 in disambiguation, 906
ACT, 336
ACT*, 799
acting rationally, 4
action, 34, **67**, 108, 367
 high-level, **406**
 joint, **427**
 monitoring, 423, 424
 primitive, **406**
 rational, 7, 30
action-utility function, **627**, 831
action exclusion axiom, **273**, 428
action monitoring, 423, 424
action schema, **367**
activation function, **728**
active learning, **831**
active sensing, 928
active vision, 1025
actor, **426**
actuator, **34**, 41
 hydraulic, 977
 pneumatic, 977
AD-tree, 826
ADABoost, **751**
adalines, 20
Adams, J., 450
Ada programming language, 14
adaptive control theory, **833**, 854
adaptive dynamic programming, **834**, 834–835, 853, 858
adaptive perception, 985
add-one smoothing, 863
add list, **368**
Adelson-Velsky, G. M., 192, *1064*
Adida, B., 469, *1064*
ADL (Action Description Language), 394
admissible heuristic, **94**, 376
Adorf, H.-M., 432, *1077*
ADP (Adaptive Dynamic Programming), 834
adversarial search, 161
adversarial task, 866
adversary argument, **149**
Advice Taker, 19, 23
AFSM, **1003**
agent, **4**, 34, 59
active, 839
architecture of, 26, 1047
autonomous, 236
components, 1044–1047
decision-theoretic, 483, 610, *664*–666
goal-based, 52–53, 59, 60
greedy, **839**
hybrid, **268**
intelligent, 30, 1036, 1044
knowledge-based, 13, 234–236, 285, 1044
learning, 54–57, 61
logical, 265–274, 314
model-based, **50**, 50–52
online planning, 431
passive, 832
passive ADP, 858
passive learning, 858
problem-solving, **64**, 64–69
rational, **4**, 4–5, 34, 36–38, 59, 60, 636, 1044
reflex, **48**, 48–50, 59, 647, 831
situated, 1025
software agent, **41**
taxi-driving, 56, 1047
utility-based, 53–54, 59, 664
vacuum, 37, 62–63
wumpus, 238, 305
agent function, **35**, 647
agent program, **35**, 46, 59
Agerbeck, C., 228, *1064*
Aggarwal, G., 682, *1064*
aggregation, **403**
Agichtein, E., 885, *1064*
Agmon, S., 761, *1064*
Agre, P. E., 434, *1064*
agreement (in a sentence), **900**
Aguirre, A., 278, *1068*
Aho, A. V., 1059, *1064*
AI, *see* artificial intelligence
aircraft carrier scheduling, 434
airport, driving to, 480
airport siting, 622, 626
AISB (Society for Artificial Intelligence and Simulation of Behaviour), 31
AI Winter, 24, 28
Aizerman, M., 760, *1064*
Al-Chang, M., 28, *1064*

- al-Khowarazmi, 8
 Alberti, L. B., 966
 Albus, J. S., 855, 1064
 Aldiss, B., 1040
 Aldous, D., 154, 1064
 Alekhnovich, M., 277, 1064
 Alexandria, 15
 algorithm, 8
 algorithmic complexity, 759
 Alhazen, 966
 alignment method, 956
 Allais, M., 620, 638, 1064
 Allais paradox, 620
Alldiff constraint, 206
 Allen, B., 432, 1072
 Allen, C., 638, 1069
 Allen, J. F., 396, 431, 448, 470, 1064
 alliance (in multiplayer games), 166
 Allis, L., 194, 1064
 Almanac Game, 640
 Almuallim, H., 799, 1064
 Almulla, M., 111, 1085
 ALPAC., 922, 1064
 Alperin Resnick, L., 457, 471, 1066
 α (normalization constant), 497
 alpha–beta pruning, 167, 199
 alpha–beta search, 167–171, 189, 191
ALPHA-BETA-SEARCH, 170
 Alterman, R., 432, 1064
 Altman, A., 195, 1064
 altruism, 483
 Alvey report, 24
 AM, 800
 Amarel, S., 109, 115, 156, 468, 1064
 ambient illumination, 934
 ambiguity, 287, 465, 861, 904–912, 919
 lexical, 905
 semantic, 905
 syntactic, 905, 920
 ambiguity aversion, 620
 Amir, E., 195, 278, 556, 1064, 1070, 1086
 Amit, D., 761, 1064
 analogical reasoning, 799
ANALOGY, 19, 31
 analysis of algorithms, 1053
 Analytical Engine, 14
 analytical generalization, 799
 Anantharaman, T. S., 192, 1076
 Anbulagan, 277, 1080
 anchoring effect, 621
 anchor text, 463
 AND–OR graph, 257
 And-Elimination, 250
AND-OR-GRAF-SEARCH, 136
 AND–OR tree, 135
AND-SEARCH, 136
 Andersen, S. K., 552, 553, 1064
 Anderson, C. R., 395, 433, 1091
 Anderson, C. W., 855, 1065
 Anderson, J. A., 761, 1075
 Anderson, J. R., 13, 336, 555, 799, 1064, 1085
AND node, 135
 Andoni, A., 760, 1064
 Andre, D., 156, 855, 856, 1064, 1070, 1079
ANGELIC-SEARCH, 414
 angelic semantics, 431
 answer literal, 350
 answer set programming, 359
 antecedent, 244
 Anthony, M., 762, 1064
 anytime algorithm, 1048
 Aoki, M., 686, 1064
 aortic coarctation, 634
 apparent motion, 940
 appearance, 942
 appearance model, 959
 Appel, K., 227, 1064
 Appelt, D., 884, 921, 1064, 1075, 1076
APPEND, 341
 applicable, 67, 368, 375
 apprenticeship learning, 857, 1037
 approximate near-neighbors, 741
 Apt, K. R., 228, 230, 1064
 Apté, C., 884, 1064
 Arbuthnot, J., 504, 1064
 arc consistency, 208
 Archibald, C., 195, 1064
 architecture, 46
 agent, 26, 1047
 cognitive, 336
 for speech recognition, 25
 hybrid, 1003, 1047
 parallel, 112
 pipeline, 1005
 reflective, 1048
 rule-based, 336
 three-layer, 1004
 arc reversal, 559
 Arentoft, M. M., 432, 1064
 argmax, 1059
 argmax, 166
 argument
 from disability, 1021–1022
 from informality, 1024–1025
 Ariely, D., 619, 638, 1064
 Aristotle, 4–7, 10, 59, 60, 275, 313, 468, 469, 471, 758, 966, 1041
 arity, 292, 332
 Arkin, R., 1013, 1064
 Arlazarov, V. L., 192, 1064
 Armando, A., 279, 1064
 Arnould, A., 7, 636, 1064
 Arora, S., 110, 1064
 ARPAbet, 914
 artificial flight, 3
Artificial General Intelligence, 27
 artificial intelligence, 1, 1–1052
 applications of, 28–29
 conferences, 31
 foundations, 5–16, 845
 future of, 1051–1052
 goals of, 1049–1051
 history of, 16–28
 journals, 31
 philosophy of, 1020–1043
 possibility of, 1020–1025
 programming language, 19
 real-time, 1047
 societies, 31
 strong, 1020, 1026–1033, 1040
 subfields, 1
 as universal field, 1
 weak, 1020, 1040
 artificial life, 155
 artificial urea, 1027
 Arunachalam, R., 688, 1064
 Asada, M., 195, 1014, 1078
 asbestos removal, 615
 Ashby, W. R., 15, 1064
 Asimov, I., 1011, 1038, 1064
 ASKMSR, 872, 873, 885
 assertion (logical), 301
 assignment (in a CSP), 203
 associative memory, 762
 assumption, 462
 Astrom, K. J., 156, 686, 1064
 astronomer, 562
 asymptotic analysis, 1054, 1053–1054
 asymptotic bounded optimality, 1050
 Atanasoff, J., 14
 Atkeson, C. G., 854, 1083
 Atkin, L. R., 110, 1089
 atom, 295
 atomic representation, 57, 64
 atomic sentence, 244, 295, 294–295, 299
 attribute, 58
 attribute-based extraction, 874
 auction, 679
 ascending-bid, 679
 Dutch, 692
 English, 679
 first-price, 681
 sealed-bid, 681
 second-price, 681

truth-revealing, **680**
 Vickrey, **681**
 Audi, R., *1042, 1064*
 Auer, S., *439, 469, 1066*
 augmentation, *919*
 augmented finite state machine
 (AFSM), **1003**
 augmented grammar, **897**
 AURA, *356, 360*
 Austin, G. A., *798, 1067*
 Australia, *203, 204, 216*
 authority, **872**
 AUTOCLASS, *826*
 automata, *1035, 1041*
 automated debugging, *800*
 automated taxi, *40, 56, 236, 480, 694,*
 695, 1047
 automobile insurance, *621*
 Auton, L. D., *277, 1069*
 autonomic computing, **60**
 autonomous underwater vehicle (AUV),
 972
 autonomy, **39**
 average reward, **650**
 Axelrod, R., *687, 1064*
 axiom, **235**, *302*
 action exclusion, **273**, *428*
 of Chinese room, *1032*
 decomposability, *614*
 domain-specific, *439*
 effect axiom, **266**
 frame axiom, **267**
 Kolmogorov's, *489*
 of number theory, *303*
 of probability, *489*
 Peano, **303**, *313, 333*
 precondition, *273*
 of probability, *488–490, 1057*
 of set theory, *304*
 successor-state, **267**, *279, 389*
 of utility theory, *613*
 wumpus world, *305*
 axon, *11*

B

*b** (branching factor), *103*
*B** search, *191*
 Baader, F., *359, 471, 1064*
 Babbage, C., *14, 190*
 Bacchus, F., *228, 230, 505, 555, 638,*
 1064, 1065
 bachelor, *441*
 Bachmann, P. G. H., *1059, 1065*
 BACK-PROP-LEARNING, **734**
 back-propagation, *22, 24, 733–736, 761*

backgammon, *177–178, 186, 194, 846,*
 850
 background knowledge, **235**, *349, 777,*
 1024, 1025
 background subtraction, **961**
 backing up (in a search tree), **99**, *165*
 backjumping, **219**, *229*
 backmarking, **229**
 backoff model, **863**
 BACKTRACK, **215**
 backtracking
 chronological, *218*
 dependency-directed, **229**
 dynamic, **229**
 intelligent, *218–220, 262*
 BACKTRACKING-SEARCH, **215**
 backtracking search, *87, 215, 218–220,*
 222, 227
 Backus, J. W., *919, 1065*
 Backus–Naur form (BNF), **1060**
 backward chaining, **257**, *259, 275,*
 337–345, 358
 backward search for planning, *374–376*
 Bacon, F., *6*
 bagging, **760**
 Bagnell, J. A., *852, 1013, 1065*
 bag of words, **866**, *883*
 Baird, L. C. I., *685, 1092*
 Baker, J., *920, 922, 1065*
 Balashek, S., *922, 1070*
 Baldi, P., *604, 1065*
 Baldwin, J. M., *130, 1065*
 Ball, M., *396, 1091*
 Ballard, B. W., *191, 200, 1065*
 Baluja, S., *155, 968, 1065, 1087*
 Bancilhon, F., *358, 1065*
 bandit problem, **840**, *855*
 Banerji, R., *776, 799, 1082*
 bang-bang control, **851**
 Bangera, R., *688, 1092*
 Banko, M., *28, 439, 469, 756, 759, 872,*
 881, 885, 1065, 1072
 Bar-Hillel, Y., *920, 922, 1065*
 Bar-Shalom, Y., *604, 606, 1065*
 Barfaijo, E., *422, 1077*
 Barry, M., *553, 1076*
 Bartak, R., *230, 1065*
 Bartlett, F., *13*
 Bartlett, P., *762, 855, 1064, 1065*
 Barto, A. G., *157, 685, 854, 855, 857,*
 1065, 1067, 1090
 Barwise, J., *280, 314, 1065*
 baseline, **950**
 basic groups, *875*
 Basin, D. A., *191, 1072*
 basis function, **845**
 Basye, K., *1012, 1070*
 Bates, E., *921, 1071*
 Bates, M. A., *14, 192, 1090*
 Batman, *435*
 bats, *435*
 Baum, E., *128, 191, 761, 762, 1065*
 Baum, L. E., *604, 826, 1065*
 Baumert, L., *228, 1074*
 Baxter, J., *855, 1065*
 Bayardo, R. J., *229, 230, 277, 1065*
 Bayer, K. M., *228, 1086*
 Bayerl, S., *359, 1080*
 Bayes' rule, *9, 495, 495–497, 503, 508*
 Bayes, T., *495, 504, 1065*
 Bayes–Nash equilibrium, **678**
 Bayesian, *491*
 Bayesian classifier, *499*
 Bayesian learning, *752, 803, 803–804,*
 825
 Bayesian network, *26, 510, 510–517,*
 551, 565, 827
 dynamic, **590**, *590–599*
 hybrid, **520**, *552*
 inference in, *522–530*
 learning hidden variables in, *824*
 learning in, *813–814*
 multi-entity, *556*
 Bayes Net toolkit, *558*
 Beal, D. F., *191, 1065*
 Beal, J., *27, 1065*
 Beame, P., *277, 1064*
 beam search, *125, 174*
 Bear, J., *884, 1075*
 Beber, G., *30, 1071*
 Beckert, B., *359, 1065*
 beer factory scheduling, *434*
 Beeri, C., *229, 1065*
 beetle, dung, *39, 61, 424, 1004*
 behaviorism, **12**, *15, 60*
 Bekey, G., *1014, 1065*
 belief, *450, 453*
 degree of, **482**, *489*
 desires and, *610–611*
 belief function, **549**
 belief network, *see* Bayesian network
 belief propagation, *555*
 belief revision, **460**
 belief state, **138**, *269, 415, 480*
 in game theory, *675*
 probabalistic, *566, 570*
 wiggly, *271*
 belief update, **460**
 Bell, C., *408, 431, 1065*
 Bell, D. A., *826, 1068*
 Bell, J. L., *314, 1065*
 Bell, T. C., *883, 884, 1092*

- BELLE, 192
 Bell Labs, 922
 Bellman, R. E., 2, 10, 109, 110, 194,
 652, 685, 760, 1065
 Bellman equation, **652**
 Bellman update, **652**
 Belongie, S., 755, 762, 1065
 Ben-Tal, A., 155, 1065
 benchmarking, **1053**
 Bendix, P. B., 359, 1078
 Bengio, S., 604, 1089
 Bengio, Y., 760, 1047, 1065
 BENINQ, 472
 Bennett, B., 473, 1069
 Bennett, F. H., 156, 1079
 Bennett, J., 360, 1074
 Bentham, J., 637, 1065
 Berger, H., 11
 Berger, J. O., 827, 1065
 Berkson, J., 554, 1065
 Berlekamp, E. R., 113, 186, 1065
 Berleur, J., 1034, 1065
 Berliner, H. J., 191, 194, 198, 1065
 Bernardo, J. M., 811, 1065
 Berners-Lee, T., 469, 1065
 Bernoulli, D., 617, 637, 1065
 Bernoulli, J., 9, 504
 Bernoulli, N., 641
 Bernstein, A., 192, 1065
 Bernstein, P. L., 506, 691, 1065
 Berrou, C., 555, 1065
 Berry, C., 14
 Berry, D. A., 855, 1065
 Bertele, U., 553, 1066
 Bertoli, P., 433, 1066
 Bertot, Y., 359, 1066
 Bertsekas, D., 60, 506, 685, 857, 1059,
 1066
 BESM, 192
 Bessière, C., 228, 1066
 best-first search, **92**, 108
 best possible prize, 615
 beta distribution, 592, **811**
 Betlem, H., 422, 1077
 Betlem, J., 422, 1077
 betting game, 490
 Bezzel, M., 109
 BGBLITZ, 194
 Bhar, R., 604, 1066
 Bialik, H. N., 908
 bias, declarative, **787**
 Bibel, W., 359, 360, 1066, 1080
 Bickford, M., 356, 1089
 biconditional, **244**
 Biddulph, R., 922, 1070
 bidirectional search, 90–112
 Bidlack, C., 1013, 1069
 Biere, A., 278, 1066
 Bigelow, J., 15, 1087
 Bigham, J., 885, 1085
 bilingual corpus, **910**
 billiards, 195
 Billings, D., 678, 687, 1066
 Bilmes, J., 604, 1080, 1086
 binary decision diagram, **395**
 binary resolution, **347**
 Binder, J., 604, 605, 826, 1066, 1087
 binding list, **301**
 Binford, T. O., 967, 1066
 Binmore, K., 687, 1066
 binocular stereopsis, **949**, 949–964
 binomial nomenclature, 469
 bioinformatics, 884
 biological naturalism, **1031**
 Birbeck, M., 469, 1064
 Bishop, C. M., 155, 554, 759, 762, 763,
 827, 1066
 Bishop, M., 1042, 1086
 Bishop, R. H., 60, 1071
 Bisson, T., 1042, 1066
 Bistarelli, S., 228, 1066
 Bitman, A. R., 192, 1064
 Bitner, J. R., 228, 1066
 Bizer, C., 439, 469, 1066
 Bjornsson, Y., 194, 1088
 BKG (backgammon program), 194
 BLACKBOX, 395
 Blake, A., 605, 1077
 Blakeslee, S., 1047, 1075
 Blazewicz, J., 432, 1066
 Blei, D. M., 883, 1066
 Blinder, A. S., 691, 1066
 blind search, *see* search, uninformed
 Bliss, C. I., 554, 1066
 Block, H. D., 20, 1066
 blocks world, 20, 23, **370**, 370–371, 472
 BLOG, 556
 bluff, **184**
 Blum, A. L., 395, 752, 761, 885, 1066
 Blumer, A., 759, 1066
 BM25 scoring function, **868**, 884
 BNF (Backus–Naur form), 1060
 BO, **1050**
 Bobick, A., 604, 1077
 Bobrow, D. G., 19, 884, 1066
 Boddy, M., 156, 433, 1048, 1070, 1074
 Boden, M. A., 275, 1042, 1066
 body (of Horn clause), **256**
 boid, **429**, 435
 Bolognesi, A., 192, 1066
 Boltzmann machine, **763**
 Bonaparte, N., 190
 Boneh, D., 128, **1065**
 Bonet, B., 156, 394, 395, 433, 686,
 1066, 1075
 Bongard, J., 1041, 1085
 Boole, G., 7, 8, 276, 1066
 Boolean keyword model, 867
 boosting, **749**, 760
 Booth, J. W., 872
 Booth, T. L., 919, 1066
 bootstrap, 27, 760
 Borel, E., 687, 1066
 Borenstein, J., 1012, 1013, 1066
 Borgida, A., 457, 471, 1066
 Boroditsky, L., 287, 1066
 Boser, B., 760, 762, 1066, 1080
 BOSS, 28, 1007, 1008, 1014
 Bosse, M., 1012, 1066
 Botea, A., 395, 1075
 Bottou, L., 762, 967, 1080
 boundary set, **774**
 bounded optimality (BO), **1050**
 bounded rationality, **1049**
 bounds consistent, **212**
 bounds propagation, **212**
 Bourlard, H., 604, 1089
 Bourzutschky, M., 176, 1066
 Boutilier, C., 434, 553, 686, 1066
 Bouzy, B., 194, 1066
 Bowden, B. V., 14, 192, 1090
 Bower, G. H., 854, 1075
 Bowerman, M., 314, 1066
 Box, G. E. P., 155, 604, 1066
 BOXES, 851
 Boyan, J. A., 154, 854, 1066
 Boyd, S., 155, 1066
 Boyden, E., 11, 1074
 Boyen, X., 605, 1066
 Boyen–Koller algorithm, 605
 Boyer, R. S., 356, 359, 360, 1066
 Boyer–Moore theorem prover, 359, 360
 Boyle, J., 360, 1092
 Brachman, R. J., 457, 471, 473, 1066,
 1067, 1080
 Bradshaw, G. L., 800, 1079
 Bradtko, S. J., 157, 685, 854, 855, 1065,
 1067
 Brady, J. M., 604, 1084
 Brafman, O., 638, 1067
 Brafman, R., 638, 1067
 Brafman, R. I., 433, 434, 855, 1066,
 1067, 1076
 Brahmagupta, 227
 brain, 16
 computational power, 12
 computer vs., 12

- damage, optimal, **737**
 replacement, 1029–1031, 1043
 super, 9
 in a vat, 1028
 brains cause minds, 11
 Braitenberg, V., 1013, **1067**
 branching factor, **80**, 783
 effective, **103**, 111, 169
 Bransford, J., 927, **1067**
 Brants, T., 29, 883, 921, **1067**, 1072
 Bratko, I., 112, 359, 793, **1067**
 Bratman, M. E., 60, 1041, **1067**
 Braverman, E., 760, **1064**
BREADTH-FIRST-SEARCH, **82**
 breadth-first search, **81**, 81–83, 108, 408
 Breese, J. S., 61, 553, 555, 639, 1048,
 1067, **1076**, 1091
 Breiman, L., 758, 760, **1067**
 Brelaz, D., 228, **1067**
 Brent, R. P., 154, **1067**
 Bresina, J., 28, **1064**
 Bresnan, J., 920, **1067**
 Brewka, G., 472, **1067**
 Brey, R., 637, **1086**
 Brickley, D., 469, **1067**
 bridge (card game), 32, **186**, 195
 Bridge Baron, 189
 Bridle, J. S., 761, **1067**
 Briggs, R., 468, **1067**
 brightness, 932
 Brill, E., 28, 756, 759, 872, 885, **1065**
 Brin, D., 881, 885, 1036, **1067**
 Brin, S., 870, 880, 884, **1067**
 Bringsjord, S., 30, **1067**
 Brioschi, F., 553, **1066**
 Britain, 22, 24
 Broadbent, D. E., 13, **1067**
 Broadhead, M., 885, **1065**
 Broca, P., 10
 Brock, B., 360, **1076**
 Brokowski, M., 156, **1092**
 Brooks, M. J., 968, **1076**
 Brooks, R. A., 60, 275, 278, 434, 1003,
 1012, 1013, 1041, **1067**, 1085
 Brouwer, P. S., 854, **1065**
 Brown, C., 230, **1067**
 Brown, J. S., 472, 800, **1070**, 1080
 Brown, K. C., 637, **1067**
 Brown, M., 604, **1079**
 Brown, P. F., 922, **1067**
 Brownston, L., 358, **1067**
 Bruce, V., 968, **1067**
 Brunelleschi, F., 966
 Bruner, J. S., 798, **1067**
 Brunnstein, K., 1034, **1065**
 Brunot, A., 762, 967, **1080**
 Bryant, B. D., 435, **1067**
 Bryce, D., 157, 395, 433, **1067**
 Bryson, A. E., 22, 761, **1067**
 Buchanan, B. G., 22, 23, 61, 468, 557,
 776, 799, **1067**, 1072, 1080
 Buckley, C., 870, **1089**
 Buehler, M., 1014, **1067**
 BUGS, 554, 555
BUILD, 472
 Bulfin, R., 688, **1086**
 bunch, **442**
 Bundy, A., 799, **1091**
 Bunt, H. C., 470, **1067**
 Buntine, W., 800, **1083**
 Burch, N., 194, 678, 687, **1066**, 1088
 Burgard, W., 606, 1012–1014, **1067**,
 1068, **1072**, 1088, 1090
 Burges, C., 884, **1090**
 burglar alarm, 511–513
 Burkhard, H.-D., 1014, **1091**
 Burns, C., 553, **1083**
 Buro, M., 175, 186, **1067**
 Burstein, J., 1022, **1067**
 Burton, R., 638, **1067**
 Buss, D. M., 638, **1067**
 Butler, S., 1042, **1067**
 Bylander, T., 393, 395, **1067**
 Byrd, R. H., 760, **1067**
-
- C**
- c (step cost), 68
 Cabeza, R., 11, **1067**
 Cabral, J., 469, **1081**
 caching, **269**
 Cafarella, M. J., 885, **1065**, 1067, 1072
 Cajal, S., 10
 cake, eating and having, 380
 calculus, 131
 calculus of variations, 155
 Calvanese, D., 471, **1064**, 1067
 Cambefort, Y., 61, **1075**
 Cambridge, 13
 camera
 digital, 930, 943
 for robots, 973
 pinhole, **930**
 stereo, 949, 974
 time of flight, **974**
 video, 929, 963
 Cameron-Jones, R. M., 793, **1086**
 Campbell, M. S., 192, **1067**, 1076
 Campbell, W., 637, **1068**
 candidate elimination, **773**
 can machines think?, **1021**
 Canny, J., 967, 1013, **1068**
 Canny edge detection, 755, 967
 canonical distribution, **518**
 canonical form, **80**
 Cantor, C. R., 553, **1093**
 Cantu-Paz, E., 155, **1085**
 Capek, K., 1011, 1037
 Capen, E., 637, **1068**
 Caprara, A., 395, **1068**
 Carbone, R., 279, **1064**
 Carbonell, J. G., 27, 432, 799, **1068**,
 1075, 1091
 Carbonell, J. R., 799, **1068**
 Cardano, G., 9, 194, 503, **1068**
 card games, 183
 Carin, L., 686, **1077**
 Carlin, J. B., 827, **1073**
 Carlson, A., 288, **1082**
CARMEL, 1013
 Carnap, R., 6, 490, 491, 504, 505, 555,
 1068
 Carnegie Mellon University, 17, 18
 Carpenter, M., 432, **1070**
 Carreras, X., 920, **1079**
 Carroll, S., 155, **1068**
 Carson, D., 359, **1092**
 cart–pole problem, **851**
 Casati, R., 470, **1068**
 cascaded finite-state transducers, **875**
 case-based reasoning, 799
 case agreement, **900**
 case folding, **870**
 case statement (in condition plans), 136
 Cash, S. S., 288, **1087**
 Cassandra, A. R., 686, **1068**, 1077
 Cassandras, C. G., 60, **1068**
 Casteran, P., 359, **1066**
 Castro, R., 553, **1068**
 categorization, 865
 category, **440**, 440–445, 453
 causal network, *see* Bayesian network
 causal probability, **496**
 causal rule, **317**, 517
 causation, 246, 498
 caveman, 778
 Cazenave, T., 194, **1066**
 CCD (charge-coupled device), 930, 969
 cell decomposition, 986, **989**
 exact, **990**
 cell layout, 74
 center (in mechanism design), **679**
 central limit theorem, **1058**
 cerebral cortex, 11
 certainty effect, **620**
 certainty equivalent, **618**
 certainty factor, 23, **548**, 557
 Cesa-Bianchi, N., 761, **1068**

- Cesta, A., 28, 1068
 CGP, 433
 CHAFF, 277
 Chafin, B., 28, 1064
 chain rule (for differentiation), 726
 chain rule (for probabilities), 514
 Chakrabarti, P. P., 112, 157, 1068, 1069
 Chambers, R. A., 851, 854, 1082
 chance node (decision network), 626
 chance node (game tree), 177
 chance of winning, 172
 Chandra, A. K., 358, 1068
 Chang, C.-L., 360, 1068
 Chang, K.-M., 288, 1082
 Chang, K. C., 554, 1073
 channel routing, 74
 Chapman, D., 394, 434, 1064, 1068
 Chapman, N., 109
 characters, 861
 Charest, L., 28, 1064
 charge-coupled device, 930, 969
 Charniak, E., 2, 23, 358, 556, 557, 604,
 920, 921, 1068
 chart parser, 893, 919
 Chase, A., 28, 1064
 chatbot, 1021
 Chater, N., 638, 1068, 1084
 Chatfield, C., 604, 1068
 Chatila, R., 1012, 1083
 Chauvin, Y., 604, 1065
 checkers, 18, 61, 186, 193, 850
 checkmate
 accidental, 182
 guaranteed, 181
 probabilistic, 181
 Cheeseman, P., 9, 26, 229, 277, 557,
 826, 1012, 1068, 1089
 Chekaluk, R., 1012, 1070
 chemistry, 22
 Chen, R., 605, 1080
 Chen, S. F., 883, 1068
 Chen, X., 395, 1091
 Cheng, J., 554, 826, 1068
 Cheng, J.-F., 555, 1082
 Chervonenkis, A. Y., 759, 1091
 chess, 172–173, 185–186
 automaton, 190
 history, 192
 prediction, 21
 Chess, D. M., 60, 1078
 CHESS 4.5, 110
 χ^2 pruning, 706
 Chickering, D. M., 191, 826, 1075, 1079
 Chien, S., 431, 1073
 CHILD-NODE, 79
 CHILL, 902
 chimpanzee, 860
 Chinese room, 1031–1033
 CHINOOK, 186, 193, 194
 Chklovski, T., 439, 1068
 choice point, 340
 Chomsky, C., 920, 1074
 Chomsky, N., 13, 16, 883, 889, 919,
 921, 923, 1068
 Chomsky Normal Form, 893, 919
 Chopra, S., 762, 1086
 Choset, H., 1013, 1014, 1068
 Choueiry, B. Y., 228, 1086
 Christmas, 1026
 chronicles, 470
 chronological backtracking, 218
 cHUGIN, 554
 Chung, K. L., 1059, 1068
 Chung, S., 278, 1092
 chunking, 799
 Church, A., 8, 314, 325, 358, 1068
 Church, K., 883, 894, 920, 923, 1068
 Churchland, P. M., 1042, 1068
 Churchland, P. S., 1030, 1042, 1068
 Ciancarini, P., 60, 192, 1066, 1068
 CIGOL, 800
 Cimatti, A., 396, 433, 1066, 1068
 circuit verification, 312
 circumscription, 459, 468, 471
 prioritized, 459
 city block distance, 103
 Claessen, K., 360, 1090
 clairvoyance, 184
 Clamp, S. E., 505, 1070
 Clapp, R., 637, 1068
 Clark, A., 1025, 1041, 1068
 Clark, K. L., 472, 1068
 Clark, P., 800, 1068
 Clark, S., 920, 1012, 1068, 1071
 Clark completion, 472
 Clarke, A. C., 552, 1034, 1068
 Clarke, E., 395, 1068
 Clarke, M. R. B., 195, 1068
 CLASSIC, 457, 458
 classification (in description logic), 456
 classification (in learning), 696
 class probability, 764
 clause, 253
 Clearwater, S. H., 688, 1068
 CLINT, 800
 Clocksin, W. F., 359, 1068
 closed-world assumption, 299, 344, 417,
 468, 541
 closed class, 890
 closed list, *see* explored set
 CLP, 228, 345
 CLP(R), 359
 clustering, 553, 694, 817, 818
 clustering (in Bayesian networks), 529,
 529–530
 clutter (in data association), 602
 CMAC, 855
 CMU, 922
 CN2, 800
 CNF (Conjunctive Normal Form), 253
 CNLP, 433
 co-NP, 1055
 co-NP-complete, 247, 276, 1055
 Coarfa, C., 278, 1068
 coarticulation, 913, 917
 coastal navigation, 994
 Coates, A., 857, 1068
 Coates, M., 553, 1068
 Cobham, A., 8, 1068
 Cocke, J., 922, 1067
 coercion, 416
 cognitive
 architecture, 336
 cognitive architecture, 336
 cognitive modeling, 3
 cognitive psychology, 13
 cognitive science, 3
 Cohen, B., 277, 1088
 Cohen, C., 1013, 1069
 Cohen, P. R., 25, 30, 434, 1069
 Cohen, W. W., 800, 1069
 Cohn, A. G., 473, 1069
 coin flip, 548, 549, 641
 COLBERT, 1013
 Collin, Z., 230, 1069
 Collins, A. M., 799, 1068
 Collins, F. S., 27, 1069
 Collins, M., 760, 920, 921, 1069, 1079,
 1093
 collusion, 680
 Colmerauer, A., 314, 358, 359, 919,
 1069
 Colombano, S. P., 155, 1080
 color, 935
 color constancy, 935
 combinatorial explosion, 22
 commitment
 epistemological, 289, 290, 313, 482
 ontological, 289, 313, 482, 547
 common sense, 546
 common value, 679
 communication, 286, 429, 888
 commutativity (in search problems), 214
 Compagna, L., 279, 1064
 competitive ratio, 148
 compilation, 342, 1047
 complementary literals, 252
 complete-state formulation, 72

- complete assignment, 203
complete data, 806
completeness
 of inference, 247
 of a proof procedure, 242, 274
 of resolution, 350–353
 of a search algorithm, 80, 108
completing the square, 586
completion (of a data base), 344
complexity, 1053–1055
 sample, 715
 space, 80, 108
 time, 80, 108
complexity analysis, 1054
complex phrases, 876
complex sentence, 244, 295
complex words, 875
compliant motion, 986, 995
component (of mixture distribution), 817
composite decision process, 111
composite object, 442
compositionality, 286
compositional semantics, 901
compression, 846
computability, 8
computational learning theory, 713, 714, 762
computational linguistics, 16
computer, 13–14
 brain vs., 12
computer vision, 3, 12, 20, 228, 929–965
conclusion (of an implication), 244
concurrent action list, 428
condensation, 605
Condie, T., 275, 1080
condition–action rule, 633
conditional distributions, 518
conditional effect, 419
conditional Gaussian, 521
conditional independence, 498, 502, 503, 517–523, 551, 574
conditional plan, 660
conditional probability, 485, 503, 514
conditional probability table (CPT), 512
conditional random field (CRF), 878
conditioning, 492
conditioning case, 512
Condon, J. H., 192, 1069
configuration space, 986, 987
confirmation theory, 6, 505
conflict-directed backjumping, 219, 227
conflict clause learning, 262
conflict set, 219
conformant planning, 415, 417–421, 431, 433, 994
Congdon, C. B., 1013, 1069
conjugate prior, 811
conjunct, 244
conjunction (logic), 244
conjunctive normal form, 253, 253–254, 275, 345–347
conjunct ordering, 333
Conlisk, J., 638, 1069
connected component, 222
Connect Four, 194
connectionism, 24, 727
connective, logical, 16, 244, 274, 295
Connell, J., 1013, 1069
consciousness, 10, 1026, 1029, 1030, 1033, 1033
consequent, 244
conservative approximation, 271, 419
consistency, 105, 456, 769
 arc, 208
 of a CSP assignment, 203
 of a heuristic, 95
 path, 210, 228
consistency condition, 110
CONSISTENT-DET?, 786
consistent estimation, 531
Console, L., 60, 1074
Consortium, T. G. O., 469, 1069
conspiracy number, 191
constant symbol, 292, 294
constraint
 binary, 206
 global, 206, 211
 nonlinear, 205
 preference constraint, 207
 propagation, 208, 214, 217
 resource constraint, 212
 symmetry-breaking, 226
 unary, 206
constraint-based generalization, 799
constraint graph, 203, 223
constraint hypergraph, 206
constraint language, 205
constraint learning, 220, 229
constraint logic programming, 344–345, 359
constraint logic programming (CLP), 228, 345
constraint optimization problem, 207
constraint satisfaction problem (CSP), 20, 202, 202–207
constraint weighting, 222
constructive induction, 791
consumable resource, 402
context, 286
context-free grammar, 889, 918, 919, 1060
context-sensitive grammar, 889
contingencies, 161
contingency planning, 133, 415, 421–422, 431
continuation, 341
continuity (of preferences), 612
continuous domains, 206
contour (in an image), 948, 953–954
contour (of a state space), 97
contraction mapping, 654
contradiction, 250
controller, 59, 997
control theory, 15, 15, 60, 155, 393, 761, 851, 964, 998
 adaptive, 833, 854
 robust, 836
control uncertainty, 996
convention, 429
conversion to normal form, 345–347
convexity, 133
convex optimization, 133, 153
CONVINCE, 552
convolution, 938
Conway, J. H., 113, 1065
Cook, P. J., 1035, 1072
Cook, S. A., 8, 276, 278, 1059, 1069
Cooper, G., 554, 826, 1069
cooperation, 428
coordinate frame, 956
coordination, 426, 430
coordination game, 670
Copeland, J., 470, 1042, 1069
Copernicus., 1035, 1069
CoQ, 227, 359
Cormen, T. H., 1059, 1069
corpus, 861
correlated sampling, 850
Cortellessa, G., 28, 1068
Cortes, C., 760, 762, 967, 1069, 1080
cotraining, 881, 885
count noun, 445
Cournot, A., 687, 1069
Cournot competition, 678
covariance, 1059
covariance matrix, 1058, 1059
Cover, T., 763, 1069
Cowan, J. D., 20, 761, 1069, 1092
Coward, N., 1022
Cowell, R., 639, 826, 1069, 1089
Cox, I., 606, 1012, 1069
Cox, R. T., 490, 504, 505, 1069
CPCS, 519, 552
CPLAN, 395
CPSC, ix

CPT, **512**
 Craig, J., 1013, *1069*
 Craik, K. J., 13, *1069*
 Crammer, K., 761, *1071*
 Craswell, N., 884, *1069*
 Crato, N., 229, *1074*
 Crauser, A., 112, *1069*
 Craven, M., 885, *1069*
 Crawford, J. M., 277, *1069*
 creativity, 16
 Cremers, A. B., 606, 1012, *1067, 1088*
 Cresswell, M. J., 470, *1076*
CRF, 878
 Crick, F. H. C., 130, *1091*
 Cristianini, N., 760, *1069*
 critic (in learning), **55**
 critical path, **403**
 Crocker, S. D., 192, *1074*
 Crockett, L., 279, *1069*
 Croft, B., 884, *1069*
 Croft, W. B., 884, 885, *1085*
 Cross, S. E., 29, *1069*
CROSS-VALIDATION, 710
 cross-validation, **708**, 737, 759, 767
CROSS-VALIDATION-WRAPPER, 710
 crossover, **128**, 153
 crossword puzzle, 44, 231
 Cruse, D. A., 870, *1069*
 cryptarithmetic, **206**
 Csorba, M., 1012, *1071*
 Cuellar, J., 279, *1064*
 Culberson, J., 107, 112, *1069, 1092*
 culling, 128
 Cullingford, R. E., 23, *1069*
 cult of computationalism, 1020
 Cummins, D., 638, *1069*
 cumulative distribution, **564**, 623, 1058
 cumulative learning, 791, 797
 cumulative probability density function, **1058**
 curiosity, 842
 Curran, J. R., 920, *1068*
 current-best-hypothesis, **770**, 798
CURRENT-BEST-LEARNING, 771
 Currie, K. W., 432, *1073*
 curse
 of dimensionality, **739**, 760, 989, 997
 optimizer's, **619**, 637
 winner's, **637**
 Cushing, W., 432, *1069*
 cutoff test, **171**
 cutset
 conditioning, **225**, 227, 554
 cutset, cycle, **225**
 cutset conditioning, **225**, 227, 554
 Cybenko, G., 762, *1069*

CYBERLOVER, 1021
 cybernetics, **15**, 15
CYC, 439, 469, 470
 cyclic solution, **137**
 Cyganiak, R., 439, 469, *1066*
CYK-PARSE, 894
 CYK algorithm, **893**, 919

D

D'Ambrosio, B., 553, *1088*
 d-separation, **517**
 DAG, 511, 552
 Daganzo, C., 554, *1069*
 Dagum, P., 554, *1069*
 Dahy, S. A., 723, 724, *1078*
 Dalal, N., 946, 968, *1069*
DALTON, 800
 Damerau, F., 884, *1064*
 Daniels, C. J., 112, *1081*
 Danish, 907
 Dantzig, G. B., 155, *1069*
DARKTHOUGHT, 192
DARPA, 29, 922
 DARPA Grand Challenge, 1007, 1014
 Dartmouth workshop, 17, 18
 Darwiche, A., 277, 517, 554, 557, 558,
 1069, 1085
 Darwin, C., 130, 1035, *1069*
 Dasgupta, P., 157, *1069*
 data-driven, **258**
 data association, **599**, 982
 database, 299
 database semantics, **300**, 343, 367, 540
 data complexity, **334**
 data compression, **866**
 Datalog, **331**, 357, 358
 data matrix, **721**
 data mining, **26**
 data sparsity, 888
 dative case, 899
 Daun, B., 432, *1070*
 Davidson, A., 678, 687, *1066*
 Davidson, D., 470, *1069*
 Davies, T. R., 784, 799, *1069*
 Davis, E., 469–473, *1069, 1070*
 Davis, G., 432, *1070*
 Davis, K. H., 922, *1070*
 Davis, M., 260, 276, 350, 358, *1070*
 Davis, R., 800, *1070*
 Davis–Putnam algorithm, **260**
 Dawid, A. P., 553, 639, 826, *1069,*
 1080, 1089
 Dayan, P., 763, 854, 855, *1070, 1083,*
 1088
 da Vinci, L., 5, 966

DBN, 566, **590**, 590–599, 603, 604,
 646, 664
DBPEDIA, 439, 469
DCG, 898, 919
 DDN (dynamic decision network), 664,
 685
 Deacon, T. W., 25, *1070*
 dead end, **149**
 Deale, M., 432, *1070*
 Dean, J., 29, 921, *1067*
 Dean, M. E., 279, *1084*
 Dean, T., 431, 557, 604, 686, 1012,
 1013, 1048, *1070*
 Dearden, R., 686, 855, *1066, 1070*
 Debevec, P., 968, *1070*
 Debreu, G., 625, *1070*
 debugging, 308
 Dechter, R., 110, 111, 228–230, 553,
 1069, 1070, 1076, 1085
 decision
 rational, 481, 610, 633
 sequential, 629, **645**
DECISION-LIST-LEARNING, 717
DECISION-TREE-LEARNING, 702
 decision analysis, **633**
 decision boundary, **723**
 decision list, **715**
 decision maker, **633**
 decision network, 510, 610, **626**,
 626–628, 636, 639, 664
 dynamic, **664**, 685
 evaluation of, 628
 decision node, **626**
 decision stump, **750**
 decision theory, 9, 26, **483**, 636
 decision tree, 638, 697, **698**
 expressiveness, 698
 pruning, **705**
 declarative, 286
 declarative bias, **787**
 declarativism, **236**, 275
 decomposability (of lotteries), **613**
DECOMPOSE, 414
 decomposition, **378**
 DeCoste, D., 760, 762, *1070*
 Dedekind, R., 313, *1070*
 deduction, *see* logical inference
 deduction theorem, **249**
 deductive database, **336**, 357, 358
 deductive learning, **694**
 deep belief networks, **1047**
DEEP BLUE, ix, 29, 185, 192
DEEP FRITZ, 193
 Deep Space One, 60, 392, 432
DEEP THOUGHT, 192
 Deerwester, S. C., 883, *1070*

- default logic, 459, 468, 471
 default reasoning, 458–460, 547
 default value, 456
 de Finetti’s theorem, 490
 definite clause, 256, 330–331
 definition (logical), 302
 deformable template, 957
 degree heuristic, 216, 228, 261
 degree of belief, 482, 489
 - interval-valued, 547
 degree of freedom, 975
 degree of truth, 289
 DeGroot, M. H., 506, 827, 1070
 DeJong, G., 799, 884, 1070
 delete list, 368
 Delgrande, J., 471, 1070
 deliberative layer, 1005
 Dellaert, F., 195, 1012, 1072, 1091
 Della Pietra, S. A., 922, 1067
 Della Pietra, V. J., 922, 1067
 delta rule, 846
 Del Favero, B. A., 553, 1088
 Del Moral, P., 605, 1070
 demodulation, 354, 359, 364
 Demopoulos, D., 278, 1068
 De Morgan’s rules, 298
 De Morgan, A., 227, 313
 Dempster, A. P., 557, 604, 826, 1070
 Dempster–Shafer theory, 547, 549, 549–550, 557
 DENDRAL, 22, 23, 468
 dendrite, 11
 Deng, X., 157, 1070
 Denis, F., 921, 1070
 Denis, M., 28, 1068
 Denker, J., 762, 967, 1080
 Dennett, D. C., 1024, 1032, 1033, 1042, 1070
 Denney, E., 360, 1071
 density estimation, 806
 - nonparametric, 814
 DeOliveira, J., 469, 1081
 depth-first search, 85, 85–87, 108, 408
DEPTH-LIMITED-SEARCH, 88
 depth limit, 173
 depth of field, 932
 derivational analogy, 799
 derived sentences, 242
 Descartes, R., 6, 966, 1027, 1041, 1071
 descendant (in Bayesian networks), 517
 Descotte, Y., 432, 1071
 description logic, 454, 456, 456–458, 468, 471
 descriptive theory, 619
 detachment, 547
 detailed balance, 537
 detection failure (in data association), 602
 determination, 784, 799, 801
 - minimal, 787
 deterministic environment, 43
 deterministic node, 518
 Detwarasiti, A., 639, 1071
 Deville, Y., 228, 1091
 DEVISER, 431
 Devroye, L., 827, 1071
 Dewey Decimal system, 440
 de Bruin, A., 191, 1085
 de Dombal, F. T., 505, 1070
 de Finetti, B., 489, 504, 1070
 de Freitas, J. F. G., 605, 1070
 de Freitas, N., 605, 1071
 de Kleer, J., 229, 358, 472, 1070, 1072, 1091
 de Marcken, C., 921, 1070
 De Morgan, A., 1070
 De Raedt, L., 800, 921, 1070, 1083
 de Salvo Braz, R., 556, 1070
 de Sarkar, S. C., 112, 157, 1068, 1069
 Diaconis, P., 620
 diagnosis, 481, 496, 497, 909
 - dental, 481
 - medical, 23, 505, 517, 548, 629, 1036
 diagnostic rule, 317, 517
 dialysis, 616
 diameter (of a graph), 88
 Dias, W., 28, 1064
 Dickmanns, E. D., 1014, 1071
 dictionary, 21
 Dietterich, T., 799, 856, 1064, 1071
 Difference Engine, 14
 differential drive, 976
 differential equation, 997
 - stochastic, 567
 differential GPS, 975
 differentiation, 780
 diffuse albedo, 934
 diffuse reflection, 933
 Digital Equipment Corporation (DEC), 24, 336
 digit recognition, 753–755
 Dijkstra, E. W., 110, 1021, 1071
 Dill, D. L., 279, 1084
 Dillenburg, J. F., 111, 1071
 Dimopoulos, Y., 395, 1078
 Dinh, H., 111, 1071
 Diophantine equations, 227
 Diophantus, 227
 Diorio, C., 604, 1086
 DiPasquo, D., 885, 1069
 Diplomacy, 166
 directed acyclic graph (DAG), 511, 552
 directed arc consistency, 223
 direct utility estimation, 853
 Dirichlet distribution, 811
 Dirichlet process, 827
 disabilities, 1043
 disambiguation, 904–912, 919
 discontinuities, 936
 discount factor, 649, 685, 833
 discovery system, 800
 discrete event, 447
 discretization, 131, 519
 discriminative model, 878
 disjoint sets, 441
 disjunct, 244
 disjunction, 244
 disjunctive constraint, 205
 disjunctive normal form, 283
 disparity, 949
 Dissanayake, G., 1012, 1071
 distant point light source, 934
 distortion, 910
 distribute \vee over \wedge , 254, 347
 distributed constraint satisfaction, 230
 distribution
 - beta, 592, 811
 - conditional, nonparametric, 520
 - cumulative, 564, 623, 1058
 - mixture, 817
 divide-and-conquer, 606
 Dix, J., 472, 1067
 Dizdarevic, S., 158, 1080
 DLV, 472
 DNF (disjunctive normal form), 283
 Do, M. B., 390, 431, 1071
 Doctorow, C., 470, 1071
DOF, 975
 dolphin, 860
 domain, 486
 - continuous, 206
 - element of, 290
 - finite, 205, 344
 - infinite, 205
 - in first-order logic, 290
 - in knowledge representation, 300
 domain closure, 299, 540
 dominance
 - stochastic, 622, 636
 - strict, 622
 dominant strategy, 668, 680
 dominant strategy equilibrium, 668
 dominated plan (in POMDP), 662
 domination (of heuristics), 104
 Domingos, P., 505, 556, 826, 1071
 Domshlak, C., 395, 434, 1067, 1076
 Donati, A., 28, 1068
 Dominger, C., 193, 1071

Doorenbos, R., 358, *1071*
 Doran, J., 110, 111, *1071*
 Dorf, R. C., 60, *1071*
 Doucet, A., 605, *1070, 1071*
 Dow, R. J. F., 762, *1088*
 Dowling, W. F., 277, *1071*
 Downey, D., 885, *1072*
 downward refinement property, **410**
 Dowty, D., 920, *1071*
 Doyle, J., 60, 229, 471, 472, 638, *1071, 1082, 1092*
DPLL, **261**, 277, 494
DPLL-SATISFIABLE?, **261**
 Drabble, B., 432, *1071*
DRAGON, 922
 Draper, D., 433, *1072*
 Drebbel, C., 15
 Dredze, M., 761, *1071*
 Dreussi, J., 432, *1088*
 Dreyfus, H. L., 279, 1024, 1049, *1071*
 Dreyfus, S. E., 109, 110, 685, 1024, *1065, 1071*
 Driessens, K., 857, *1090*
 drilling rights, 629
 drone, **1009**
 dropping conditions, **772**
 Drucker, H., 762, 967, *1080*
 Druzdzel, M. J., 554, *1068*
DT-AGENT, **484**
 dual graph, **206**
 dualism, **6**, 1027, 1041
 Dubois, D., 557, *1071*
 Dubois, O., 277, *1089*
 duck, mechanical, 1011
 Duda, R. O., 505, 557, 763, 825, 827, *1071*
 Dudek, G., 1014, *1071*
 Duffy, D., 360, *1071*
 Duffy, K., 760, *1069*
 Dumais, S. T., 29, 872, 883, 885, *1065, 1070, 1087*
 dung beetle, 39, 61, 424, 1004
 Dunham, B., 21, *1072*
 Dunham, C., 358, *1090*
 Dunn, H. L., 556, *1071*
 DuPont, 24
 duration, **402**
 Dürer, A., 966
 Durfee, E. H., 434, *1071*
 Durme, B. V., 885, *1071*
 Durrant-Whyte, H., 1012, *1071, 1080*
 Dyer, M., 23, *1071*
 dynamical systems, 603
 dynamic backtracking, **229**
 dynamic Bayesian network (DBN), 566, **590**, 590–599, 603, 604, 646,

664
 dynamic decision network, **664**, 685
 dynamic environment, **44**
 dynamic programming, 60, 106, 110, *111, 342, 575, 685*
 adaptive, **834**, 834–835, 853, 858
 nonserial, **553**
 dynamic state, **975**
 dynamic weighting, 111
 Dyson, G., 1042, *1071*
 dystopia, 1052
 Duzeroski, S., 796, 800, *1071, 1078, 1080*

E

E, 359
 \mathcal{E}_0 (English fragment), 890
 Earley, J., 920, *1071*
 early stopping, **706**
 earthquake, 511
 Eastlake, D. E., 192, *1074*
 EBL, 432, **778**, 780–784, 798, 799
 Ecker, K., 432, *1066*
 Eckert, J., 14
 economics, 9–10, 59, 616
 Edelkamp, S., 111, 112, 395, *1071, 1079*
 edge (in an image), **936**
 edge detection, 936–939
 Edinburgh, 800, 1012
 Edmonds, D., 16
 Edmonds, J., 8, *1071*
 Edwards, D. J., 191, *1075*
 Edwards, P., 1042, *1071*
 Edwards, W., 637, *1091*
 EEG, 11
 Een, N., 277, *1071*
 effect, **367**
 missing, **423**
 negative, 398
 effector, **971**
 efficient auction, **680**
 Efros, A. A., 28, 955, 968, *1075, 1076*
 Ehrenfeucht, A., 759, *1066*
 8-puzzle, **70**, 102, 105, 109, 113
 8-queens problem, 71, 109
 Einstein, A., 1
 Eisner, J., 920, *1089*
 Eitelman, S., 358, *1090*
 Eiter, T., 472, *1071*
 Ekart, A., 155, *1086*
 electric motor, **977**
 electronic circuits domain, 309–312
 Elfes, A., 1012, *1083*
ELIMINATION-ASK, **528**
 Elio, R., 638, *1071*

Elisseeff, A., 759, *1074*
ELIZA, 1021, 1035
 Elkan, C., 551, 826, *1071*
 Ellington, C., 1045, *1072*
 Elliot, G. L., 228, *1075*
 Elliott, P., 278, *1092*
 Ellsberg, D., 638, *1071*
 Ellsberg paradox, 620
 Elman, J., 921, *1071*
 EM algorithm, 571, 816–824
 structural, **824**
 embodied cognition, **1026**
 emergent behavior, 430, **1002**
EMNLP, 923
 empirical gradient, **132**, 849
 empirical loss, **712**
 empiricism, **6**, 923
 Empson, W., 921, *1071*
 EMV (expected monetary value), 616
 Enderton, H. B., 314, 358, *1071*
 English, 21, 32
 fragment, 890
ENIAC, 14
 ensemble learning, **748**, 748–752
 entailment, **240**, 274
 inverse, **795**
 entailment constraint, **777**, 789, 798
 entropy, **703**
ENUMERATE-ALL, **525**
ENUMERATION-ASK, **525**
 environment, **34**, 40–46
 artificial, 41
 class, **45**
 competitive, **43**
 continuous, **44**
 cooperative, **43**
 deterministic, **43**
 discrete, **44**
 dynamic, **44**
 game-playing, 197, 858
 generator, **46**
 history, 646
 known, **44**
 multiagent, **42**, 425
 nondeterministic, **43**
 observable, **42**
 one-shot, **43**
 partially observable, **42**
 properties, 42
 semidynamic, **44**
 sequential, **43**
 single-agent, **42**
 static, **44**
 stochastic, **43**
 taxi, 40
 uncertain, **43**

- unknown, 44
unobservable, 42
EPAM (Elementary Perceiver And Memorizer), 758
Ephrati, E., 434, 1079
epiphenomenalism, 1030
episodic environment, 43
epistemological commitment, 289, 290, 313, 482
Epstein, R., 30, 1071
EQP, 360
equality, 353
equality (in logic), 299
equality symbol, 299
equilibrium, 183, 668
equivalence (logical), 249
Erdmann, M. A., 156, 1071
ergodic, 537
Ernst, G., 110, 1084
Ernst, H. A., 1012, 1071
Ernst, M., 395, 1071
Erol, K., 432, 1071, 1072
error (of a hypothesis), 708, 714
error function, 1058
error rate, 708
Essig, A., 505, 1074
Etchemendy, J., 280, 314, 1065
ethics, 1034–1040
Etzioni, A., 1036, 1072
Etzioni, O., 61, 433, 439, 469, 881, 885, 1036, 1050, 1065, 1072, 1079, 1091
Euclid, 8, 966
EURISKO, 800
Europe, 24
European Space Agency, 432
evaluation function, 92, 108, 162, 171–173, 845
linear, 107
Evans, T. G., 19, 31, 1072
event, 446–447, 450
atomic, 506
discrete, 447
exogenous, 423
in probability, 484, 522
liquid, 447
event calculus, 446, 447, 470, 903
Everett, B., 1012, 1066
evidence, 485, 802
reversal, 605
evidence variable, 522
evolution, 130
machine, 21
evolutionary psychology, 621
evolution strategies, 155
exceptions, 438, 456
exclusive or, 246, 766
execution, 66
execution monitoring, 422, 422–434
executive layer, 1004
exhaustive decomposition, 441
existence uncertainty, 541
existential graph, 454
Existential Instantiation, 323
Existential Introduction, 360
expansion (of states), 75
expectation, 1058
expected monetary value, 616
expected utility, 53, 61, 483, 610, 611, 616
expected value (in a game tree), 172, 178
expectiminimax, 178, 191
complexity of, 179
expert system, 468, 633, 636, 800, 1036
commercial, 336
decision-theoretic, 633–636
first, 23
first commercial, 24
HPP (Heuristic Programming Project), 23
logical, 546
medical, 557
Prolog-based, 339
with uncertainty, 26
explaining away, 548
explanation, 462, 781
explanation-based generalization, 187
explanation-based learning (EBL), 432, 778, 780–784, 798, 799
explanatory gap, 1033
exploitation, 839
exploration, 39, 147–154, 831, 839, 855
safe, 149
exploration function, 842, 844
explored set, 77
expressiveness (of a representation scheme), 58
EXTEND-EXAMPLE, 793
extended Kalman filter (EKF), 589, 982
extension (of a concept), 769
extension (of default theory), 460
extensive form, 674
externalities, 683
extrinsic property, 445
eyes, 928, 932, 966
-
- F**
- fact, 256
factor (in variable elimination), 524
factored frontier, 605
factored representation, 58, 64, 202, 367, 486, 664, 694
factoring, 253, 347
Fagin, R., 229, 470, 477, 1065, 1072
Fahlman, S. E., 20, 472, 1072
failure model, 593
false alarm (in data association), 602
false negative, 770
false positive, 770
family tree, 788
Farrell, R., 358, 1067
FAST DIAGONALLY DOWNWARD, 387
FASTDOWNWARD, 395
FASTFORWARD, 379
FASTUS, 874, 875, 884
Faugeras, O., 968, 1072
Fearing, R. S., 1013, 1072
Featherstone, R., 1013, 1072
feature (in speech), 915
feature (of a state), 107, 172
feature extraction, 929
feature selection, 713, 866
feed-forward network, 729
feedback loop, 548
Feigenbaum, E. A., 22, 23, 468, 758, 1067, 1072, 1080
Feiten, W., 1012, 1066
Feldman, J., 639, 1072
Feldman, R., 799, 1089
Fellbaum, C., 921, 1072
Fellegi, I., 556, 1072
Felner, A., 107, 112, 395, 1072, 1079, 1092
Felzenszwalb, P., 156, 959, 1072
Feng, C., 800, 1083
Feng, L., 1012, 1066
Fergus, R., 741, 1090
Ferguson, T., 192, 827, 1072
Fermat, P., 9, 504
Ferraris, P., 433, 1072
Ferriss, T., 1035, 1072
FF, 379, 387, 392, 395
15-puzzle, 109
Fifth Generation project, 24
figure of speech, 905, 906
Fikes, R. E., 60, 156, 314, 367, 393, 432, 434, 471, 799, 1012, 1067, 1072
filtering, 145, 460, 571–573, 603, 659, 823, 856, 978, 1045
assumed-density, 605
Fine, S., 604, 1072
finite-domain, 205, 344
finite-state automata, 874, 889
Finkelstein, L., 230, 1067
Finney, D. J., 554, 1072

Firby, R. J., 431, 1070
 first-order logic, 285, 285–321
 first-order probabilistic logic, 539–546
 Firth, J., 923, 1072
 Fischer, B., 360, 1071
 Fischetti, M., 395, 1068
 Fisher, R. A., 504, 1072
 fitness (in genetic algorithms), 127
 fitness landscape, 155
 Fix, E., 760, 1072
 fixation, 950
FIXED-LAG-SMOOTHING, 580
 fixed-lag smoothing, 576
 fixed point, 258, 331
 Flannery, B. P., 155, 1086
 flaw, 390
 Floreano, D., 1045, 1072
 fluent, 266, 275, 388, 449–450
 fly eyes, 948, 963
FMP, *see* planning, fine-motion
fMRI, 11, 288
 focal plane, 932
FOCUS, 799
 focus of expansion, 948
 Fogel, D. B., 156, 1072
 Fogel, L. J., 156, 1072
FOIL, 793
FOL-BC-ASK, 338
FOL-FC-ASK, 332
 folk psychology, 473
 Foo, N., 279, 1072
FOPC, *see* logic, first-order
 Forbes, J., 855, 1072
FORBIN, 431, 432
 Forbus, K. D., 358, 472, 1072
 force sensor, 975
 Ford, K. M., 30, 1072
 foreshortening, 952
 Forestier, J.-P., 856, 1072
 Forgy, C., 358, 1072
 formulate, search, execute, 66
 Forrest, S., 155, 1082
 Forsyth, D., 960, 968, 1072, 1086
 Fortmann, T. E., 604, 606, 1065
 forward–backward, 575, 822
FORWARD-BACKWARD, 576
 forward chaining, 257, 257–259, 275,
 277, 330–337, 358
 forward checking, 217, 217–218
 forward pruning, 174
 forward search for planning, 373–374
 four-color map problem, 227, 1023
 Fourier, J., 227, 1072
 Fowlkes, C., 941, 967, 1081
 Fox, C., 638, 1072

Fox, D., 606, 1012, 1014, 1067, 1072,
 1088, 1090
 Fox, M. S., 395, 432, 1072
 frame
 in representation, 24, 471
 in speech, 915
 problem
 inferential, 267, 279
 frame problem, 266, 279
 inferential, 447
 representational, 267
 framing effect, 621
 Franco, J., 277, 1072
 Frank, E., 763, 1092
 Frank, I., 191, 1072
 Frank, M., 231, 1073
 Frank, R. H., 1035, 1072
 Frankenstein, 1037
 Franz, A., 883, 921, 1072
 Fratini, S., 28, 1068
FREDDY, 74, 156, 1012
 Fredkin Prize, 192
 Freeman, W., 555, 1091, 1092
 free space, 988
 free will, 6
 Frege, G., 8, 276, 313, 357, 1072
 Freitag, D., 877, 885, 1069, 1072
 frequentism, 491
 Freuder, E. C., 228–230, 1072, 1087
 Freund, Y., 760, 1072
 Friedberg, R. M., 21, 156, 1072
 Friedgut, E., 278, 1073
 Friedman, G. J., 155, 1073
 Friedman, J., 758, 761, 763, 827, 1067,
 1073, 1075
 Friedman, N., 553, 558, 605, 826, 827,
 855, 1066, 1070, 1073, 1078
 Friendly AI, 27, 1039
 Fristedt, B., 855, 1065
 frontier, 75
 Frost, D., 230, 1070
 Fruhwirth, T., 230, 1073
FRUMP, 884
 Fuchs, J. J., 432, 1073
 Fudenberg, D., 688, 1073
 Fukunaga, A. S., 431, 1073
 fully observable, 658
 function, 288
 total, 291
 functional dependency, 784, 799
 functionalism, 60, 1029, 1030, 1041,
 1042
 function approximation, 845, 847
 function symbol, 292, 294
 Fung, R., 554, 1073
 Furnas, G. W., 883, 1070

Furst, M., 395, 1066
 futility pruning, 185
 fuzzy control, 550
 fuzzy logic, 240, 289, 547, 550, 557
 fuzzy set, 550, 557

G

g (path cost), 78
G-set, 774
 Gödel number, 352
 Gabor, Z. Z., 640
 Gaddum, J. H., 554, 1073
 Gaifman, H., 555, 1073
 gain parameter, 998
 gain ratio, 707, 765
 gait, 1001
 Gale, W. A., 883, 1068
 Galileo, G., 1, 56, 796
 Gallaire, H., 358, 1073
 Gallier, J. H., 277, 314, 1071, 1073
 Gamba, A., 761, 1073
 Gamba perceptrons, 761
 Gamberini, L., 761, 1073
 gambling, 9, 613
 game, 9, 161
 of chance, 177–180
 dice, 183
 Go, 186, 194
 of imperfect information, 162
 inspection game, 666
 multiplayer, 165–167
 Othello, 186
 partially observable, 180–184
 of perfect information, 161
 poker, 507
 pursuit–evasion, 196
 repeated, 669, 673
 robot (with humans), 1019
 Scrabble, 187, 195
 zero-sum, 161, 162, 199, 670
 game playing, 161–162, 190
 game programs, 185–187
GAMER, 387
 game show, 616
 game theory, 9, 161, 645, 666, 666–678,
 685
 combinatorial, 186
 game tree, 162
 Gamma function, 828
 Garding, J., 968, 1073
 Gardner, M., 276, 1073
 Garey, M. R., 1059, 1073
 Garg, A., 604, 1084
GARI, 432
 Garofalakis, M., 275, 1080

- Garrett, C., 128, *1065*
Gaschnig's heuristic, 119
Gaschnig, J., 111, 119, 228, 229, 557, *1071, 1073*
Gasquet, A., 432, *1073*
Gasser, R., 112, 194, *1073*
Gat, E., 1013, *1073*
gate (logic), 309
Gauss, C. F., 227, 603, 759, *1073*
Gauss, K. F., 109
Gaussian distribution, **1058**
 multivariate, **584**, 1058
Gaussian error model, **592**
Gaussian filter, **938**
Gaussian process, **827**
Gawande, A., 1036, *1073*
Gawron, J. M., 922, *1078*
Gay, D. E., 275, *1080*
Gearhart, C., 686, *1074*
Gee, A. H., 605, *1070*
Geffner, H., 156, 394, 395, 431, 433, *1066, 1075, 1084*
Geiger, D., 553, 826, *1073, 1075*
Geisel, T., 864, *1073*
Gelatt, C. D., 155, 229, *1078*
Gelb, A., 604, *1073*
Gelder, A. V., 360, *1090*
Gelernter, H., 18, 359, *1073*
Gelfond, M., 359, 472, *1073*
Gelly, S., 194, *1073, 1091*
Gelman, A., 827, *1073*
Geman, D., 554, 967, *1073*
Geman, S., 554, 967, *1073*
generality, 783
generalization, **770, 772**
generalization hierarchy, **776**
generalization loss, **711**
generalized arc consistent, **210**
generalized cylinder, **967**
general ontology, 453
General Problem Solver, 3, 7, 18, 393
generation (of states), **75**
generative capacity, 889
generator, **337**
Genesereth, M. R., 59, 60, 156, 195, 314, 345, 350, 359, 363, 1019, *1073, 1080, 1089*
GENETIC-ALGORITHM, **129**
genetic algorithm, **21**, 126–129, 153, 155–156, 841
genetic programming, **155**
Gent, I., 230, *1073*
Gentner, D., 314, 799, *1073*
Geometry Theorem Prover, 18
Georgeson, M., 968, *1067*
Gerbault, F., 826, *1074*
Gerevini, A., 394, 395, *1073*
Gershwin, G., 917, *1073*
Gestalt school, 966
Getoor, L., 556, *1073*
Ghahramani, Z., 554, 605, 606, 827, *1073, 1077, 1087*
Ghallab, M., 372, 386, 394–396, 431, *1073*
Ghose, S., 112, *1068*
GIB, 187, 195
Gibbs, R. W., 921, *1073*
GIBBS-ASK, **537**
Gibbs sampling, **536**, 538, 554
Gibson, J. J., 967, 968, *1073*
Gil, Y., 439, *1068*
Gilks, W. R., 554, 555, 826, *1073*
Gilmore, P. C., 358, *1073*
Ginsberg, M. L., 187, 195, 229, 231, 359, 363, 557, *1069, 1073, 1089*
Gionis, A., 760, *1073*
Gittins, J. C., 841, 855, *1074*
Gittins index, 841, 855
Giunchiglia, E., 433, *1072*
Givan, R., 857, *1090*
Glanc, A., 1011, *1074*
Glass, J., 604, *1080*
GLAUBER, 800
Glavieux, A., 555, *1065*
GLIE, **840**
global constraint, **206**, 211
Global Positioning System (GPS), **974**
Glover, F., 154, *1074*
Glymour, C., 314, 826, *1074, 1089*
Go (game), 186, 194
goal, **52**, 64, 65, 108, 369
 based agent, 52–53, 59, 60
 formulation of, **65**
 goal-based agent, 52–53, 59
 goal-directed reasoning, **259**
 inferential, **301**
 serializable, **392**
goal clauses, **256**
goal monitoring, 423
goal predicate, **698**
goal test, **67**, 108
God, existence of, 504
Gödel, K., 8, 276, 358, 1022, *1074*
Goebel, J., 826, *1074*
Goebel, R., 2, 59, *1085*
Goel, A., 682, *1064*
Goertzel, B., 27, *1074*
GOFAI, 1024, 1041
gold, 237
Gold, B., 922, *1074*
Gold, E. M., 759, 921, *1074*
Goldbach's conjecture, 800
Goldberg, A. V., 111, *1074*
Goldberg, D. E., 155, *1085*
Goldberg, K., 156, *1092*
Goldin-Meadow, S., 314, *1073*
Goldman, R., 156, 433, 555, 556, 921, 1068, *1074, 1091*
gold standard, **634**
Goldszmidt, M., 553, 557, 686, 826, *1066, 1073, 1074*
GOLEM, 800
Golgi, C., 10
Golomb, S., 228, *1074*
Golub, G., 759, *1074*
Gomard, C. K., 799, *1077*
Gomes, C., 154, 229, 277, *1074*
Gonthier, G., 227, *1074*
Good, I. J., 491, 552, 1037, 1042, *1074*
Good-Turing smoothing, 883
good and evil, 637
Gooday, J. M., 473, *1069*
Goodman, D., 29, *1074*
Goodman, J., 29, 883, *1068, 1074*
Goodman, N., 470, 798, *1074, 1080*
Goodnow, J. J., 798, *1067*
good old-fashioned AI (GOFAI), 1024, 1041
Google, 870, 883, 889, 922
Google Translate, 907
Gopnik, A., 314, *1074*
Gordon, D. M., 429, *1074*
Gordon, G., 605, 686, 1013, *1085, 1087, 1091*
Gordon, M. J., 314, *1074*
Gordon, N., 187, 195, 605, *1071, 1074*
Gorry, G. A., 505, *1074*
Gottlob, G., 230, *1074*
Gotts, N., 473, *1069*
GP-CSP, 390
GPS (General Problem Solver), 3, 7, 18, 393
GPS (Global Positioning System), 974
graceful degradation, 666
gradient, **131**
 empirical, **132**, 849
gradient descent, 125, **719**
 batch, **720**
 stochastic, **720**
Graham, S. L., 920, *1074*
Gramma, A., 112, *1074*
grammar, **860**, 890, 1060
 attribute, **919**
 augmented, **897**
 categorial, 920
 context-free, **889**, 918, 919, 1060
 lexicalized, **897**
 probabilistic, **890**, 888–897, 919

context-sensitive, **889**
 definite clause (DCG), **898**, 919
 dependency, 920
 English, 890–892
 induction of, 921
 lexical-functional (LFG), 920
 phrase structure, 918
 probabilistic, 897
 recursively enumerable, 889
 regular, 889
 grammatical formalism, 889
 Grand Prix, 185
 graph, **67**
 coloring, **227**
 Eulerian, **157**
 GRAPH-SEARCH, **77**
 graphical model, 510, 558
 GRAPHPLAN, 379, **383**, 392, 394–396, 402, 433
 grasping, **1013**
 Grassmann, H., 313, **1074**
 Gravano, L., 885, **1064**
 Grayson, C. J., 617, **1074**
 Greece, 275, 468, 470
 greedy search, 92
 Green, B., 920, **1074**
 Green, C., 19, 314, 356, 358, **1074**
 Green, P., 968, **1067**
 Greenbaum, S., 920, **1086**
 Greenblatt, R. D., 192, **1074**
 Greenspan, M., 195, **1079**
 Grefenstette, G., 27, **1078**
 Greiner, R., 799, 826, **1068**, **1074**
 Grenager, T., 857, **1088**
 grid, rectangular, **77**
 Griffiths, T., 314, **1090**
 Grinstead, C., 506, **1074**
 GRL, 1013
 Grosof, B., 799, **1087**
 Grosz, B. J., 682, 688, **1076**
 grounding, **243**
 ground resolution theorem, **255**, 350
 ground term, **295**, 323
 Grove, A., 505, 638, **1064**, **1065**
 Grove, W., 1022, **1074**
 Gruber, T., 439, 470, **1074**
 grue, 798
 Grumberg, O., 395, **1068**
 GSAT, 277
 Gu, J., 229, 277, **1074**, **1089**
 Guard, J., 360, **1074**
 Guestrin, C., 639, 686, 856, 857, **1074**, **1079**, **1081**
 Guha, R. V., 439, 469, **1067**, **1080**
 Guibas, L. J., 1013, **1074**
 Gumperz, J., 314, **1074**

Gupta, A., 639, **1079**
 GUS, 884
 Gutfreund, H., 761, **1064**
 Guthrie, F., 227
 Guugu Yimithirr, 287
 Guy, R. K., 113, **1065**
 Guyon, I., 759, 760, 762, 967, **1066**, **1074**, **1080**

H

H (entropy), 704
h (heuristic function), 92
 h_{MAP} (MAP hypothesis), 804
 h_{ML} (ML hypothesis), 805
 HACKER, 394
 Hacking, I., 506, **1074**
 Haghghi, A., 896, 920, **1074**
 Hahn, M., 760, **1069**
 Hähnel, D., 1012, **1067**
 Haimes, M., 556, **1082**
 Haken, W., 227, **1064**
 HAL 9000 computer, 552
 Hald, A., 506, **1074**
 Halevy, A., 28, 358, 470, 759, 885, **1067**, **1074**
 Halgren, E., 288, **1087**
 Halpern, J. Y., 314, 470, 477, 505, 555, **1065**, **1072**, **1074**
 Halpin, M. P., 231, **1073**
 halting problem, 325
 ham, 865
 Hamm, F., 470, **1091**
 Hamming, R. W., 506, **1074**
 Hamming distance, **738**
 Hammond, K., 432, **1074**
 Hamori, S., 604, **1066**
 ham sandwich, 906
 Hamscher, W., 60, **1074**
 Han, X., 11, **1074**
 Hanan, S., 395, **1072**
 Hand, D., 763, **1074**
 hand-eye machine, **1012**
 Handschin, J. E., 605, **1075**
 handwritten digit recognition, 753–755
 Hanks, S., 433, **1072**
 Hanna, F. K., 800, **1087**
 Hansard, **911**
 Hansen, E., 112, 156, 422, 433, 686, **1075**, **1093**
 Hansen, M. O., 228, **1064**
 Hansen, P., 277, **1075**
 Hanski, I., 61, **1075**
 Hansson, O., 112, 119, **1075**
 happy graph, 703
 haptics, **1013**
 Harabagiu, S. M., 885, **1085**
 Harada, D., 856, **1084**
 Haralick, R. M., 228, **1075**
 Hardin, G., 688, **1075**
 Hardy, G. H., 1035, **1075**
 Harel, D., 358, **1068**
 Harman, G. H., 1041, **1075**
 HARPY, 154, 922
 Harris, Z., 883, **1075**
 Harrison, J. R., 637, **1075**
 Harrison, M. A., 920, **1074**
 Harsanyi, J., 687, **1075**
 Harshman, R. A., 883, **1070**
 Hart, P. E., 110, 156, 191, 432, 434, 505, 557, 763, 799, 825, 827, **1071**, **1072**, **1075**
 Hart, T. P., 191, **1075**
 Hartley, H., 826, **1075**
 Hartley, R., 968, **1075**
 Harvard, 621
 Haslum, P., 394, 395, 431, **1075**
 Hastie, T., 760, 761, 763, 827, **1073**, **1075**
 Haugeland, J., 2, 30, 1024, 1042, **1075**
 Hauk, T., 191, **1075**
 Haussler, D., 604, 759, 762, 800, **1065**, **1066**, **1075**, **1079**
 Havelund, K., 356, **1075**
 Havenstein, H., 28, **1075**
 Hawkins, J., 1047, **1075**
 Hayes, P. J., 30, 279, 469–472, **1072**, **1075**, **1082**
 Haykin, S., 763, **1075**
 Hays, J., 28, **1075**
 head, **897**
 head (of Horn clause), **256**
 Hearst, M. A., 879, 881, 883, 884, 922, **1075**, **1084**, **1087**
 Heath, M., 759, **1074**
 Heath Robinson, 14
 heavy-tailed distribution, **154**
 Heawood, P., 1023
 Hebb, D. O., 16, 20, 854, **1075**
 Hebbian learning, **16**
 Hebert, M., 955, 968, **1076**
 Heckerman, D., 26, 29, 548, 552, 553, 557, 605, 634, 640, 826, **1067**, **1074–1076**, **1087–1089**
 hedonic calculus, 637
 Heidegger, M., 1041, **1075**
 Heinz, E. A., 192, **1075**
 Held, M., 112, **1075**
 Hellerstein, J. M., 275, **1080**
 Helmert, M., 111, 395, 396, **1075**
 Helmholtz, H., 12
 Hempel, C., 6
 Henderson, T. C., 210, 228, **1082**

- Hendler, J., 27, 396, 432, 469, 1064, 1065, 1071, 1072, 1075, 1089
- Henrion, M., 61, 519, 552, 554, 639, 1075, 1076, 1086
- Henzinger, M., 884, 1088
- Henzinger, T. A., 60, 1075
- Hephaistos, 1011
- Herbrand's theorem, 351, 358
- Herbrand, J., 276, 324, 351, 357, 358, 1075
- Herbrand base, 351
- Herbrand universe, 351, 358
- Hernadvolgyi, I., 112, 1076
- Herskovits, E., 826, 1069
- Hessian, 132
- Heule, M., 278, 1066
- heuristic, 108
- admissible, 94, 376
 - composite, 106
 - degree, 216, 228, 261
 - for planning, 376–379
 - function, 92, 102–107
 - least-constraining-value, 217
 - level sum, 382
 - Manhattan, 103
 - max-level, 382
 - min-conflicts, 220
 - minimum-remaining-values, 216, 228, 333, 405
 - minimum remaining values, 216, 228, 333, 405
 - null move, 185
 - search, 81, 110
 - set-level, 382
 - straight-line, 92
- heuristic path algorithm, 118
- Heuristic Programming Project (HPP), 23
- Hewitt, C., 358, 1075
- hexapod robot, 1001
- hidden Markov model
- factorial, 605
- hidden Markov model (HMM), 25, 566, 578, 578–583, 590, 603, 604, 822–823
- hidden Markov model (HMM) (HMM), 578, 590, 876, 922
- hidden unit, 729
- hidden variable, 522, 816
- HIERARCHICAL-SEARCH, 409
- hierarchical decomposition, 406
- hierarchical lookahead, 415
- hierarchical reinforcement learning, 856, 1046
- hierarchical structure, 1046
- hierarchical task network (HTN), 406, 431
- Hierholzer, C., 157, 1075
- higher-order logic, 289
- high level action, 406
- Hilgard, E. R., 854, 1075
- HILL-CLIMBING, 122
- hill climbing, 122, 153, 158
- first-choice, 124
 - random-restart, 124
 - stochastic, 124
- Hingorani, S. L., 606, 1069
- Hinrichs, T., 195, 1080
- Hintikka, J., 470, 1075
- Hinton, G. E., 155, 761, 763, 1047, 1075, 1087
- Hirsch, E. A., 277, 1064
- Hirsh, H., 799, 1075
- Hitachi, 408
- hit list, 869
- HITS, 871, 872
- HMM, 578, 590, 876, 922
- Ho, Y.-C., 22, 761, 1067
- Hoane, A. J., 192, 1067
- Hobbes, T., 5, 6
- Hobbs, J. R., 473, 884, 921, 1075, 1076
- Hodges, J. L., 760, 1072
- Hoff, M. E., 20, 833, 854, 1092
- Hoffmann, J., 378, 379, 395, 433, 1076, 1078
- Hogan, N., 1013, 1076
- HOG feature, 947
- Hoiem, D., 955, 968, 1076
- holdout cross-validation, 708
- holistic context, 1024
- Holland, J. H., 155, 1076, 1082
- Hollerbach, J. M., 1013, 1072
- holonomic, 976
- Holte, R., 107, 112, 678, 687, 1066, 1072, 1076, 1092
- Holzmann, G. J., 356, 1076
- homeostatic, 15
- homophones, 913
- Homo sapiens*, 1, 860
- Hon, H., 922, 1076
- Honavar, V., 921, 1084
- Hong, J., 799, 1082
- Hood, A., 10, 1076
- Hooker, J., 230, 1076
- Hoos, H., 229, 1076
- Hopcroft, J., 1012, 1059, 1064, 1088
- Hope, J., 886, 1076
- Hopfield, J. J., 762, 1076
- Hopfield network, 762
- Hopkins Beast, 1011
- horizon (in an image), 931
- horizon (in MDPs), 648
- horizon effect, 174
- Horn, A., 276, 1076
- Horn, B. K. P., 968, 1076
- Horn, K. V., 505, 1076
- Horn clause, 256, 791
- Horn form, 275, 276
- Horning, J. J., 1076
- Horowitz, E., 110, 1076
- Horowitz, M., 279, 1084
- Horrocks, J. C., 505, 1070
- horse, 1028
- Horswill, I., 1013, 1076
- Horvitz, E. J., 26, 29, 61, 553, 604, 639, 1048, 1076, 1084, 1087
- Hovel, D., 553, 1076
- Howard, R. A., 626, 637–639, 685, 1076, 1082
- Howe, A., 394, 1073
- Howe, D., 360, 1076
- HSCP, 433
- HSP, 387, 395
- HSPr, 395
- Hsu, F.-H., 192, 1067, 1076
- Hsu, J., 28, 1064
- HTML, 463, 875
- HTN, 406, 431
- HTN planning, 856
- Hu, J., 687, 857, 1076
- Huang, K.-C., 228, 1086
- Huang, T., 556, 604, 1076
- Huang, X. D., 922, 1076
- hub, 872
- Hubble Space Telescope, 206, 221, 432
- Hubel, D. H., 968, 1076
- Huber, M., 1013, 1069
- Hubs and Authorities, 872
- Huddleston, R. D., 920, 1076
- Huet, G., 359, 1066
- Huffman, D. A., 20, 1076
- Huffman, S., 1013, 1069
- Hughes, B. D., 151, 1076
- Hughes, G. E., 470, 1076
- HUGIN, 553, 604
- Huhns, M. N., 61, 1076
- human-level AI, 27, 1034
- human judgment, 546, 557, 619
- humanoid robot, 972
- human performance, 1
- human preference, 649
- Hume, D., 6, 1076
- Humphrys, M., 1021, 1076
- Hungarian algorithm, 601
- Hunkapiller, T., 604, 1065
- Hunsberger, L., 682, 688, 1076
- Hunt, W., 360, 1076

Hunter, L., 826, 1076
 Hurst, M., 885, 1076
 Hurwicz, L., 688, 1076
 Husmeier, D., 605, 1076
 Hussein, A. I., 723, 724, 1078
 Hutchinson, S., 1013, 1014, 1068
 Huth, M., 314, 1076
 Huttenlocher, D., 959, 967, 1072, 1076
 Huygens, C., 504, 687, 1076
 Huyn, N., 111, 1076
 Hwa, R., 920, 1076
 Hwang, C. H., 469, 1076
HYBRID-WUMPUS-AGENT, 270
 hybrid A*, 991
 hybrid architecture, 1003, 1047
HYDRA, 185, 193
 hyperparameter, 811
 hypertree width, 230
 hypothesis, 695
 approximately correct, 714
 consistent, 696
 null, 705
 prior, 803, 810
 hypothesis prior, 803, 810
 hypothesis space, 696, 769
 Hyun, S., 1012, 1070

I

i.i.d. (independent and identically distributed), 708, 803
 Iagnemma, K., 1014, 1067
IBAL, 556
 IBM, 18, 19, 29, 185, 193, 922
 IBM 704 computer, 193
 ice cream, 483
 ID3, 800
IDA* search, 99, 111
 identification in the limit, 759
 identity matrix (**I**), 1056
 identity uncertainty, 541, 876
 idiot Bayes, 499
 IEEE, 469
 ignorance, 547, 549
 practical, 481
 theoretical, 481
 ignore delete lists, 377
 ignore preconditions heuristic, 376
 Iida, H., 192, 1087
 IJCAI (International Joint Conference on AI), 31
ILOG, 359
 ILP, 779, 800
 image, 929
 formation, 929–935, 965
 processing, 965
 segmentation, 941–942

imperfect information, 190, 666
 implementation (of a high-level action), 407
 implementation level, 236
 implication, 244
 implicative normal form, 282, 345
 importance sampling, 532, 554
 incentive, 426
 incentive compatible, 680
 inclusion–exclusion principle, 489
 incompleteness, 342
 theorem, 8, 352, 1022
 inconsistent support, 381
 incremental formulation, 72
 incremental learning, 773, 777
 independence, 494, 494–495, 498, 503
 absolute, 494
 conditional, 498, 502, 503, 517–523, 551, 574
 context-specific, 542, 563
 marginal, 494
 independent subproblems, 222
 index, 869
 indexical, 904
 indexing, 328, 327–329
 India, 16, 227, 468
 indicator variable, 819
 indifference, principle of, 491, 504
 individual (in genetic algorithms), 127
 individuation, 445
 induced width, 229
 induction, 6
 constructive, 791
 mathematical, 8
 inductive learning, 694, 695–697
 inductive logic programming (ILP), 779, 800
 Indyk, P., 760, 1064, 1073
 inference, 208, 235
 probabilistic, 490, 490–494, 510
 inference procedure, 308
 inference rule, 250, 275
 inferential equivalence, 323
 inferential frame problem, 267, 279
 infinite horizon problems, 685
 influence diagram, 552, 610, 626
INFORMATION-GATHERING-AGENT, 632
 information extraction, 873, 873–876, 883
 information gain, 704, 705
 information gathering, 39, 994
 information retrieval (IR), 464, 867, 867–872, 883, 884
 information sets, 675
 information theory, 703–704, 758
 information value, 629, 639
 informed search, 64, 81, 92, 92–102, 108
 influence diagram, 510, 610, 626, 626–628, 636, 639, 664
 Ingerman, P. Z., 919, 1076
 Ingham, M., 278, 1092
 inheritance, 440, 454, 478
 multiple, 455
 initial state, 66, 108, 162, 369
 Inoue, K., 795, 1076
 input resolution, 356
 inside–outside algorithm, 896
 instance (of a schema), 128
 instance-based learning, 737, 737–739, 855
 insufficient reason, principle of, 504
 insurance premium, 618
 intelligence, 1, 34
 intelligent backtracking, 218–220, 262
 intentionality, 1026, 1042
 intentional state, 1028
 intercausal reasoning, 548
 interior-point method, 155
 interleaving, 147
 interleaving (actions), 394
 interleaving (search and action), 136
 interlingua, 908
 internal state, 50
 Internet search, 464
 Internet shopping, 462–467
 interpolation smoothing, 883
 interpretation, 292, 313
 extended, 313
 intended, 292
 pragmatic, 904
 interreflections, 934, 953
 interval, 448
 Intille, S., 604, 1077
 intractability, 21
 intrinsic property, 445
 introspection, 3, 12
 intuition pump, 1032
 inverse (of a matrix), 1056
 inverse entailment, 795
 inverse game theory, 679
 inverse kinematics, 987
 inverse reinforcement learning, 857
 inverse resolution, 794, 794–797, 800
 inverted pendulum, 851
 inverted spectrum, 1033
 Inza, I., 158, 1080
 IPL, 17
 IPP, 387, 395
 IQ test, 19, 31
 IR, 464, 867, 867–872, 883, 884

irrationality, 2, 613
 irreversible, **149**
 IS-A links, 471
 Isard, M., 605, **1077**
 ISBN, 374, 541
 ISIS, 432
 Israel, D., 884, **1075**
 ITEP, 192
 ITEP chess program, 192
 ITERATIVE-DEEPENING-SEARCH, **89**
 iterative deepening search, **88**, 88–90,
 108, 110, 173, 408
 iterative expansion, **111**
 iterative lengthening search, 117
 ITOU, 800
 Itsykson, D., 277, **1064**
 Iwama, K., 277, **1077**
 Iwasawa, S., 1041, **1085**
 IXTET, 395

J

Jaakkola, T., 555, 606, 855, **1077**, 1088
 JACK, 195
 Jackel, L., 762, 967, **1080**
 Jackson, F., 1042, **1077**
 Jacobi, C. G., 606
 Jacquard, J., 14
 Jacquard loom, 14
 Jaffar, J., 359, **1077**
 Jaguar, 431
 Jain, A., 885, **1085**
 James, W., 13
 janitorial science, 37
 Japan, 24
 Jasra, A., 605, **1070**
 Jaumard, B., 277, **1075**
 Jaynes, E. T., 490, 504, 505, **1077**
 Jeavons, P., 230, **1085**
 Jefferson, G., 1026, **1077**
 Jeffrey, R. C., 504, 637, **1077**
 Jeffreys, H., 883, **1077**
 Jelinek, F., 883, 922, 923, **1067**, **1077**
 Jenkin, M., 1014, **1071**
 Jenkins, G., 604, **1066**
 Jennings, H. S., 12, **1077**
 Jenniskens, P., 422, **1077**
 Jensen, F., 552, 553, **1064**
 Jensen, F. V., 552, 553, 558, **1064**, **1077**
 Jevons, W. S., 276, 799, **1077**
 Ji, S., 686, **1077**
 Jimenez, P., 156, 433, **1077**
 Jitnah, N., 687, **1079**
 Joachims, T., 760, 884, **1077**
 job, **402**
 job-shop scheduling problem, 402

Johanson, M., 687, **1066**, **1093**
 Johnson, C. R., 61, **1067**
 Johnson, D. S., 1059, **1073**
 Johnson, M., 920, 921, 927, 1041, **1067**,
 1068, **1071**, **1079**
 Johnson, W. W., 109, **1077**
 Johnston, M. D., 154, 229, 432, **1077**,
 1082

joint action, **427**
 joint probability distribution, **487**
 full, **488**, 503, 510, 513–517

join tree, **529**

Jones, M., 968, **1025**, **1091**
 Jones, N. D., 799, **1077**
 Jones, R., 358, 885, **1077**
 Jones, R. M., 358, **1092**
 Jones, T., 59, **1077**
 Jonsson, A., 28, 60, 431, **1064**, **1077**
 Jordan, M. I., 555, 605, 606, 686, 761,
 827, 850, 852, 855, 857, 883,
 1013, **1066**, **1073**, **1077**, **1083**,
 1084, **1088**, **1089**, **1091**
 Jouannaud, J.-P., 359, **1077**
 Joule, J., 796
 Juang, B.-H., 604, 922, **1086**
 Judd, J. S., 762, **1077**
 Juels, A., 155, **1077**
 Junker, U., 359, **1077**
 Jurafsky, D., 885, 886, 920, 922, **1077**
 Just, M. A., 288, **1082**
 justification (in a JTMS), **461**

K

k-consistency, **211**
 k-DL (decision list), 716
 k-DT (decision tree), 716
 k-d tree, **739**
 k-fold cross-validation, **708**
 Kadane, J. B., 639, 687, **1077**
 Kaelbling, L. P., 278, 556, 605, 686,
 857, 1012, **1068**, **1070**, **1077**,
 1082, **1088**, **1090**
 Kager, R., 921, **1077**
 Kahn, H., 855, **1077**
 Kahneman, D., 2, 517, 620, 638, **1077**,
 1090
 Kaindl, H., 112, **1077**
 Kalman, R., 584, 604, **1077**
 Kalman filter, 566, **584**, 584–591, 603,
 604, 981
 switching, **589**, 608
 Kalman gain matrix, **588**
 Kambhampati, S., 157, 390, 394, 395,
 431–433, **1067**, **1069**, **1071**,
 1077, **1084**
 Kameya, Y., 556, **1087**

Kameyama, M., 884, **1075**
 Kaminka, G., 688, **1089**
 Kan, A., 110, 405, 432, **1080**
 Kanade, T., 951, 968, **1087**, **1090**
 Kanal, L. N., 111, 112, **1077**, **1079**,
 1083
 Kanazawa, K., 604, 605, 686, 826,
 1012, **1066**, **1070**, **1077**, **1087**
 Kanefsky, B., 9, 28, 229, 277, **1064**,
 1068
 Kanodia, N., 686, **1074**
 Kanoui, H., 314, 358, **1069**
 Kant, E., 358, **1067**
 Kantor, G., 1013, 1014, **1068**
 Kantorovich, L. V., 155, **1077**
 Kaplan, D., 471, **1077**
 Kaplan, H., 111, **1074**
 Kaplan, R., 884, 920, **1066**, **1081**
 Karmarkar, N., 155, **1077**
 Karp, R. M., 8, 110, 112, 1059, **1075**,
 1077
 Kartam, N. A., 434, **1077**
 Kasami, T., 920, **1077**
 Kasif, S., 553, **1093**
 Kasparov, G., 29, 192, 193, **1077**
 Kassirer, J. P., 505, **1074**
 Katriel, I., 212, 228, **1091**
 Katz, S., 230, **1069**
 Kaufmann, M., 360, **1077**
 Kautz, D., 432, **1070**
 Kautz, H., 154, 229, 277, 279, 395,
 1074, **1077**, **1078**, **1088**
 Kavraki, L., 1013, 1014, **1068**, **1078**
 Kay, A. R., 11, **1084**
 Kay, M., 884, 907, 922, **1066**, **1078**
 KB, **235**, 274, 315
 KB-AGENT, **236**
 Keane, M. A., 156, **1079**
 Kearns, M., 686, 759, 763, 764, 855,
 1078
 Kebeasy, R. M., 723, 724, **1078**
 Kedar-Cabelli, S., 799, **1082**
 Keene, R., 29, **1074**
 Keeney, R. L., 621, 625, 626, 638, **1078**
 Keil, F. C., 3, 1042, **1092**
 Keim, G. A., 231, **1080**
 Keller, R., 799, **1082**
 Kelly, J., 826, **1068**
 Kemp, M., 966, **1078**
 Kempe, A. B., 1023
 Kenley, C. R., 553, **1088**
 Kephart, J. O., 60, **1078**
 Kepler, J., 966
 kernel, **743**
 kernel function, **747**, 816

polynomial, 747
 kernelization, 748
 kernel machine, 744–748
 kernel trick, 744, 748, 760
 Kernighan, B. W., 110, 1080
 Kersting, K., 556, 1078, 1082
 Kessler, B., 862, 883, 1078
 Keynes, J. M., 504, 1078
 Khare, R., 469, 1078
 Khatib, O., 1013, 1078
 Khmelev, D. V., 886, 1078
 Khorsand, A., 112, 1077
 Kietz, J.-U., 800, 1078
 Kilgariff, A., 27, 1078
 killer move, 170
 Kim, H. J., 852, 857, 1013, 1084
 Kim, J.-H., 1022, 1078
 Kim, J. H., 552, 1078
 Kim, M., 194
 kinematics, 987
 kinematic state, 975
 King, R. D., 797, 1078, 1089
 Kinsey, E., 109
 kinship domain, 301–303
 Kirchner, C., 359, 1077
 Kirk, D. E., 60, 1078
 Kirkpatrick, S., 155, 229, 1078
 Kirman, J., 686, 1070
 Kishimoto, A., 194, 1088
 Kister, J., 192, 1078
 Kisynski, J., 556, 1078
 Kitano, H., 195, 1014, 1078
 Kjaerulff, U., 604, 1078
 KL-ONE, 471
 Kleer, J. D., 60, 1074
 Klein, D., 883, 896, 900, 920, 921,
 1074, 1078, 1085
 Kleinberg, J. M., 884, 1078
 Klemperer, P., 688, 1078
 Klempner, G., 553, 1083
 Kneser, R., 883, 1078
 Knight, B., 20, 1066
 Knight, K., 2, 922, 927, 1078, 1086
 Knoblock, C. A., 394, 432, 1068, 1073
 KNOWITALL, 885
 knowledge
 acquisition, 860
 and action, 7, 453
 background, 235, 349, 777, 1024,
 1025
 base (KB), 235, 274, 315
 commonsense, 19
 diagnostic, 497
 engineering, 307, 307–312, 514
 for decision-theoretic systems, 634
 level, 236, 275

model-based, 497
 prior, 39, 768, 778, 787
 knowledge-based agents, 234
 knowledge-based system, 22–24, 845
 knowledge acquisition, 23, 307, 860
 knowledge compilation, 799
 knowledge map, *see* Bayesian network
 knowledge representation, 2, 16, 19, 24,
 234, 285–290, 437–479
 analogical, 315
 everything, 437
 language, 235, 274, 285
 uncertain, 510–513
 Knuth, D. E., 73, 191, 359, 919, 1013,
 1059, 1074, 1078
 Kobilarov, G., 439, 469, 1066
 Kocsis, L., 194, 1078
 Koditschek, D., 1013, 1078
 Koehler, J., 395, 1078
 Koehn, P., 922, 1078
 Koenderink, J. J., 968, 1078
 Koenig, S., 157, 395, 434, 685, 1012,
 1075, 1078, 1088
 Koller, D., 191, 505, 553, 556, 558, 604,
 605, 639, 677, 686, 687, 826,
 827, 884, 1012, 1065, 1066,
 1073, 1074, 1076–1078, 1083,
 1085, 1087, 1090
 Kolmogorov's axioms, 489
 Kolmogorov, A. N., 504, 604, 759, 1078
 Kolmogorov complexity, 759
 Kolobov, A., 556, 1082
 Kolodner, J., 24, 799, 1078
 Kondrak, G., 229, 230, 1078
 Konolige, K., 229, 434, 472, 1012,
 1013, 1067, 1078, 1079
 Koo, T., 920, 1079
 Koopmans, T. C., 685, 1079
 Korb, K. B., 558, 687, 1079
 Koren, Y., 1013, 1066
 Korf, R. E., 110–112, 157, 191, 394,
 395, 1072, 1079, 1085
 Kortenkamp, D., 1013, 1069
 Koss, F., 1013, 1069
 Kotok, A., 191, 192, 1079
 Koutsoupias, E., 154, 277, 1079
 Kowalski, R., 282, 314, 339, 345, 359,
 470, 472, 1079, 1087, 1091
 Kowalski form, 282, 345
 Koza, J. R., 156, 1079
 Kramer, S., 556, 1078
 Kraus, S., 434, 1079
 Kraus, W. F., 155, 1080
 Krause, A., 639, 1079
 Krauss, P., 555, 1088
 Kriegspiel, 180

Kripke, S. A., 470, 1079
 Krishnan, T., 826, 1082
 Krogh, A., 604, 1079
 KRYPTON, 471
 Ktesibios of Alexandria, 15
 Kübler, S., 920, 1079
 Kuhn, H. W., 601, 606, 687, 1079
 Kuhns, J.-L., 884, 1081
 Kuijpers, C., 158, 1080
 Kuipers, B. J., 472, 473, 1012, 1079
 Kumar, P. R., 60, 1079
 Kumar, V., 111, 112, 230, 1074, 1077,
 1079, 1083
 Kuniyoshi, Y., 195, 1014, 1078
 Kuppuswamy, N., 1022, 1078
 Kurien, J., 157, 1079
 Kurzweil, R., 2, 12, 28, 1038, 1079
 Kwok, C., 885, 1079
 Kyburg, H. E., 505, 1079

L

L-BFGS, 760
 label (in plans), 137, 158
 Laborie, P., 432, 1079
 Ladanyi, L., 112, 1086
 Ladkin, P., 470, 1079
 Lafferty, J., 884, 885, 1079
 Lagoudakis, M. G., 854, 857, 1074,
 1079
 Laguna, M., 154, 1074
 Laird, J., 26, 336, 358, 432, 799, 1047,
 1077, 1079, 1092
 Laird, N., 604, 826, 1070
 Laird, P., 154, 229, 1082
 Lake, R., 194, 1088
 Lakemeyer, G., 1012, 1067
 Lakoff, G., 469, 921, 1041, 1079
 Lam, J., 195, 1079
 LAMA, 387, 395
 Lamarck, J. B., 130, 1079
 Lambert's cosine law, 934
 Lambertian surface, 969
 Landauer, T. K., 883, 1070
 Landhuis, E., 620, 1079
 landmark, 980
 landscape (in state space), 121
 Langdon, W., 156, 1079, 1085
 Langley, P., 800, 1079
 Langlotz, C. P., 26, 1076
 Langton, C., 155, 1079
 language, 860, 888, 890
 abhors synonyms, 870
 formal, 860
 model, 860, 909, 913
 in disambiguation, 906
 natural, 4, 286, 861

- processing, 16, 860
translation, 21, 784, 907–912
understanding, 20, 23
- language generation, **899**
language identification, **862**
- Laplace, P., 9, 491, 504, 546, 883, *1079*
- Laplace smoothing, 863
- Laptev, I., 961, *1080*
- large-scale learning, **712**
- Lari, K., 896, 920, *1080*
- Larkey, P. D., 687, *1077*
- Larrañaga, P., 158, *1080*
- Larsen, B., 553, *1080*
- Larson, G., 778
- Larson, S. C., 759, *1080*
- Laruelle, H., 395, 431, *1073*
- Laskey, K. B., 556, *1080*
- Lassez, J.-L., 359, *1077*
- Lassila, O., 469, *1065*
- latent Dirichlet allocation, 883
- latent semantic indexing, 883
- latent variable, **816**
- Latham, D., 856, *1081*
- Latombe, J.-C., 432, 1012, 1013, *1071*, *1078*, *1080*, *1093*
- lattice theory, 360
- Laugherty, K., 920, *1074*
- Lauritzen, S., 553, 558, 639, 826, *1069*, *1080*, *1084*, *1089*
- LaValle, S., 396, 1013, 1014, *1080*
- Lave, R. E., 686, *1087*
- Lavrauc, N., 796, 799, 800, *1080*, *1082*
- LAWALY, 432
- Lawler, E. L., 110, 111, 405, 432, *1080*
- laws of thought, 4
- layers, **729**
- Lazanas, A., 1013, *1080*
- laziness, **481**
- La Mettrie, J. O., 1035, 1041, *1079*
- La Mura, P., 638, *1079*
- LCF, 314
- Leacock, C., 1022, *1067*
- leaf node, **75**
- leak node, **519**
- Leaper, D. J., 505, *1070*
- leaping to conclusions, 778
- learning, **39**, 44, 59, 236, 243, 693, *1021*, *1025*
active, **831**
apprenticeship, **857**, 1037
assessing performance, 708–709
Bayesian, 752, **803**, 803–804, 825
Bayesian network, 813–814
blocks-world, 20
cart–pole problem, 851
checkers, 18
- computational theory, 713
decision lists, 715–717
decision trees, 697–703
determinations, 785
element, **55**
ensemble, **748**, 748–752
explanation-based, 780–784
game playing, 850–851
grammar, 921
heuristics, 107
hidden Markov model, 822–823
hidden variables, 820
hidden variables, 822
incremental, 773, 777
inductive, **694**, 695–697
knowledge-based, **779**, 788, 798
instance-based, **737**, 737–739, 855
knowledge in, 777–780
linearly separable functions, 731
logical, 768–776
MAP, 804–805
maximum likelihood, 806–810
metalevel, **102**
mixtures of Gaussians, 817–820
naive Bayes, 808–809
neural network, 16, 736–737
new predicates, 790, 796
noise, 705–706
nonparametric, 737
online, **752**, 846
PAC, 714, 759, 784
parameter, **806**, 810–813
passive, **831**
Q, **831**, 843, 844, 848, 973
rate of, **719**, 836
reinforcement, 685, **695**, 830–859, *1025*
inverse, **857**
relational, **857**
relevance-based, 784–787
restaurant problem, 698
statistical, 802–805
temporal difference, 836–838, 853, *854*
top-down, 791–794
to search, 102
unsupervised, **694**, 817–820, 1025
utility functions, 831
weak, **749**
- learning curve, **702**
- least-constraining-value heuristic, **217**
- least commitment, **391**
- leave-one-out cross-validation
(LOOCV), **708**
- LeCun, Y., 760, 762, 967, 1047, *1065*, *1080*, *1086*
- Lederberg, J., 23, 468, *1072*, *1080*
- Lee, C.-H., 1022, *1078*
- Lee, K.-H., 1022, *1078*
- Lee, M. S., 826, *1083*
- Lee, R. C.-T., 360, *1068*
- Lee, T.-M., 11, *1084*
- Leech, G., 920, 921, *1080*, *1086*
- legal reasoning, 32
- Legendre, A. M., 759, *1080*
- Lehmann, D., 434, *1079*
- Lehmann, J., 439, 469, *1066*
- Lehrer, J., 638, *1080*
- Leibniz, G. W., 6, 131, 276, 504, 687
- Leimer, H., 553, *1080*
- Leipzig, 12
- Leiserson, C. E., 1059, *1069*
- Lempel-Ziv-Welch compression (LZW), *867*
- Lenat, D. B., 27, 439, 469, 474, 800, *1070*, *1075*, *1080*
- lens system, 931
- Lenstra, J. K., 110, 405, 432, *1080*
- Lenzerini, M., 471, *1067*
- Leonard, H. S., 470, *1080*
- Leonard, J., 1012, *1066*, *1080*
- Leone, N., 230, 472, *1071*, *1074*
- Lesh, N., 433, *1072*
- Leśniewski, S., 470, *1080*
- Lesser, V. R., 434, *1071*
- Lettvin, J. Y., 963, *1080*
- Letz, R., 359, *1080*
- level (in planning graphs), **379**
- level cost, **382**
- leveled off (planning graph), **381**
- Levesque, H. J., 154, 277, 434, 471, *473*, *1067*, *1069*, *1080*, *1088*
- Levin, D. A., 604, *1080*
- Levinson, S., 314, *1066*, *1074*
- Levitt, G. M., 190, *1080*
- Levitt, R. E., 434, *1077*
- Levitt, T. S., 1012, *1079*
- Levy, D., 195, 1022, *1080*
- Lewis, D. D., 884, *1080*
- Lewis, D. K., 60, 1042, *1080*
- LEX, 776, 799
- lexical category, **888**
- lexicalized grammar, 897
- lexicalized PCFG, **897**, 919, 920
- lexicon, **890**, 920
- Leyton-Brown, K., 230, 435, 688, *1080*, *1088*
- LFG, 920
- Li, C. M., 277, *1080*
- Li, H., 686, *1077*
- Li, M., 759, *1080*
- liability, 1036

- Liang, G., 553, *1068*
 Liang, L., 604, *1083*
 Liao, X., 686, *1077*
 Liberatore, P., 279, *1080*
 Lifchits, A., 885, *1085*
 life insurance, 621
 Lifschitz, V., 472, 473, *1073, 1080, 1091*
 lifting, **326**, 325–329, 367
 in probabilistic inference, 544
 lifting lemma, 350, **353**
 light, 932
 Lighthill, J., 22, *1080*
 Lighthill report, 22, 24
 likelihood, **803**
LIKELIHOOD-WEIGHTING, **534**
 likelihood weighting, **532**, 552, 596
 Lim, G., 439, *1089*
 limited rationality, **5**
 Lin, D., 885, *1085*
 Lin, J., 872, 885, *1065*
 Lin, S., 110, 688, *1080, 1092*
 Lin, T., 439, *1089*
 Lincoln, A., 872
 Lindley, D. V., 639, *1080*
 Lindsay, R. K., 468, *1080*
 linear-chain conditional random field, **878**
 linear algebra, 1055–1057
 linear constraint, **205**
 linear function, **717**
 linear Gaussian, **520**, 553, 584, 809
 linearization, **981**
 linear programming, 133, 153, 155, 206, 673
 linear regression, **718**, 810
 linear resolution, **356**, 795
 linear separability, **723**
 linear separator, 746
 line search, **132**
 linguistics, 15–16
 link, **870**
 link (in a neural network), **728**
 linkage constraints, **986**
 Linnaeus, 469
 LINUS, 796
 Lipkis, T. A., 471, *1088*
 liquid event, **447**
 liquids, 472
 Lisp, **19**, 294
 lists, **305**
 literal (sentence), **244**
 literal, watched, 277
 Littman, M. L., 155, 231, 433, 686, 687, 857, *1064, 1068, 1077, 1080, 1081*
 Liu, J. S., 605, *1080*
 Liu, W., 826, *1068*
 Liu, X., 604, *1083*
 Livescu, K., 604, *1080*
 Livnat, A., 434, *1080*
 lizard toasting, 778
 local beam search, **125**, 126
 local consistency, **208**
 locality, **267**, 547
 locality-sensitive hash (LSH), **740**
 localization, **145**, 581, 979
 Markov, **1012**
 locally structured system, **515**
 locally weighted regression, **742**
 local optimum, 669
 local search, 120–129, 154, 229, 262–263, 275, 277
 location sensors, **974**
 Locke, J., 6, 1042, *1080*
 Lodge, D., 1051, *1080*
 Loebner Prize, 1021
 Loftus, E., 287, *1080*
 Logemann, G., 260, 276, *1070*
 logic, **4**, 7, 240–243
 atoms, 294–295
 default, **459**, 468, 471
 equality in, 299
 first-order, **285**, 285–321
 inference, 322–325
 semantics, 290
 syntax, 290
 fuzzy, 240, 289, 547, 550, 557
 higher-order, **289**
 inductive, 491, **505**
 interpretations, 292–294
 model preference, **459**
 models, 290–292
 nonmonotonic, 251, **458**, 458–460, 471
 notation, 4
 propositional, 235, 243–247, 274, 286
 inference, 247–263
 semantics, 245–246
 syntax, 244–245
 quantifier, 295–298
 resolution, 252–256
 sampling, 554
 temporal, **289**
 terms, 294
 variable in, 340
 logical connective, 16, 244, 274, 295
 logical inference, 242, 322–365
 logical minimization, **442**
 logical omniscience, **453**
 logical piano, 276
 logical positivism, **6**
 logical reasoning, 249–264, 284
 logicism, **4**
 logic programming, 257, 314, 337, 339–345
 constraint, 344–345, 359
 inductive (ILP), **779**, 788–794, 798
 tabled, **343**
 Logic Theorist, 17, 276
 LOGISTELLO, 175, 186
 logistic function, **522**, 760
 logistic regression, **726**
 logit distribution, **522**
 log likelihood, **806**
 Lohn, J. D., 155, *1080*
 London, 14
 Long, D., 394, 395, *1072, 1073*
 long-distance dependencies, 904
 long-term memory, 336
 Longley, N., 692, *1080*
 Longuet-Higgins, H. C., *1080*
 Loo, B. T., 275, *1080*
 LOOCV, **708**
 Look ma, no hands, 18
 lookup table, 736
 Loomes, G., 637, *1086*
 loosely coupled system, **427**
 Lorenz, U., 193, *1071*
 loss function, **710**
 Lotem, A., 396, *1091*
 lottery, **612**, 642
 standard, **615**
 love, 1021
 Love, N., 195, *1080*
 Lovejoy, W. S., 686, *1080*
 Lovelace, A., 14
 Loveland, D., 260, 276, 359, *1070, 1080*
 low-dimensional embedding, **985**
 Lowe, D., 947, 967, 968, *1081*
 Löwenheim, L., 314, *1081*
 Lowerre, B. T., 154, 922, *1081*
 Lowrance, J. D., 557, *1087*
 Lowry, M., 356, 360, *1075, 1081*
 Loyd, S., 109, *1081*
 Lozano-Perez, T., 1012, 1013, *1067, 1081, 1092*
 LPG, 387, 395
 LRTA*, **151**, 157, 415
 LRTA*-AGENT, **152**
 LRTA*-COST, **152**
 LSH (locality-sensitive hash), 740
 LT, 17
 Lu, F., 1012, *1081*
 Lu, P., 194, 760, *1067, 1088*
 Luby, M., 124, 554, *1069, 1081*
 Lucas, J. R., 1023, *1081*
 Lucas, P., 505, 634, *1081*

Luce, D. R., 9, 687, *1081*
 Lucene, 868
 Ludlow, P., 1042, *1081*
 Luger, G. F., 31, *1081*
 Lugosi, G., 761, *1068*
 Lull, R., 5
 Luong, Q.-T., 968, *1072*
 Lusk, E., 360, *1092*
 Lygeros, J., 60, *1068*
 Lyman, P., 759, *1081*
 Lynch, K., 1013, 1014, *1068*
 LZW, 867

M

MA* search, **101**, 101–102, 112
 MACHACK-6, 192
 Machina, M., 638, *1081*
 machine evolution, **21**
 machine learning, **2**, 4
 machine reading, **881**
 machine translation, 32, 907–912, 919
 statistical, 909–912
 Machover, M., 314, *1065*
 MacKay, D. J. C., 555, 761, 763, *1081*,
 1082
 MacKenzie, D., 360, *1081*
 Mackworth, A. K., 2, 59, 209, 210, 228,
 230, *1072*, *1081*, *1085*
 macrop (macro operator), **432**, 799
 madalines, 761
 Madigan, C. F., 277, *1083*
 magic sets, 336, 358
 Mahalanobis distance, **739**
 Mahanti, A., 112, *1081*
 Mahaviracarya, 503
 Maheswaran, R., 230, *1085*
 Maier, D., 229, 358, *1065*
 Mailath, G., 688, *1081*
 Majercik, S. M., 433, *1081*
 majority function, 731
 makespan, **402**
 Makov, U. E., 826, *1090*
 Malave, V. L., 288, *1082*
 Maldague, P., 28, *1064*
 Mali, A. D., 432, *1077*
 Malik, J., 604, 755, 762, 941, 942, 953,
 967, 968, *1065*, *1070*, *1076*,
 1081, *1088*
 Malik, S., 277, *1083*
 Manchak, D., 470, *1091*
 Maneva, E., 278, *1081*
 Maniatis, P., 275, *1080*
 manipulator, **971**
 Manna, Z., 314, *1081*
 Mannila, H., 763, *1074*

Manning, C., 883–885, 920, 921, *1078*,
 1081
 Mannion, M., 314, *1081*
 Manolios, P., 360, *1077*
 Mansour, Y., 686, 764, 855, 856, *1078*,
 1090
 mantis shrimp, 935
 Manzini, G., 111, *1081*
 map, 65
 MAP (maximum a posteriori), 804
 MAPGEN, 28
 Marais, H., 884, *1088*
 Marbach, P., 855, *1081*
 March, J. G., 637, *1075*
 Marcinkiewicz, M. A., 895, 921, *1081*
 Marcot, B., 553, *1086*
 Marcus, G., 638, *1081*
 Marcus, M. P., 895, 921, *1081*
 margin, **745**
 marginalization, **492**
 Markov
 assumption
 sensor, **568**
 process
 first-order, **568**
 Markov, A. A., 603, 883, *1081*
 Markov assumption, **568**, 603
 Markov blanket, **517**, 560
 Markov chain, **537**, 568, 861
 Markov chain Monte Carlo (MCMC),
 535, 535–538, 552, 554, 596
 decayed, **605**
 Markov decision process (MDP), 10,
 647, 684, 686, 830
 factored, **686**
 partially observable (POMDP), **658**,
 658–666, 686
 Markov games, 857
 Markov network, **553**
 Markov process, **568**
 Markov property, 577, 603, 646
 Maron, M. E., 505, 884, *1081*
 Marr, D., 968, *1081*
 Marriott, K., 228, *1081*
 Marshall, A. W., 855, *1077*
 Marsland, A. T., 195, *1081*
 Marsland, S., 763, *1081*
 Martelli, A., 110, 111, 156, *1081*
 Marthi, B., 432, 556, 605, 856, *1081*,
 1082, *1085*
 Martin, D., 941, 967, *1081*
 Martin, J. H., 885, 886, 920–922, *1077*,
 1081
 Martin, N., 358, *1067*
 Martin, P., 921, *1076*
 Mason, M., 156, 433, 1013, 1014, *1071*,
 1081
 Mason, R. A., 288, *1082*
 mass (in Dempster–Shafer theory), **549**
 mass noun, **445**
 mass spectrometer, 22
 Mataric, M. J., 1013, *1081*
 Mateescu, R., 230, *1070*
 Mateis, C., 472, *1071*
 materialism, 6
 material value, **172**
 Mates, B., 276, *1081*
 mathematical induction schema, 352
 mathematics, 7–9, 18, 30
 Matheson, J. E., 626, 638, *1076*, *1082*
 matrix, **1056**
 Matsubara, H., 191, 195, *1072*, *1078*
 Maturana, H. R., 963, *1080*
 Matuszek, C., 469, *1081*
 Mauchly, J., 14
 Mausam., 432, *1069*
 MAVEN, 195
 MAX-VALUE, **166**, 170
 maximin, **670**
 maximin equilibrium, **672**
 maximum
 global, **121**
 local, **122**
 maximum a posteriori, **804**, 825
 maximum expected utility, **483**, 611
 maximum likelihood, **805**, 806–810,
 825
 maximum margin separator, 744, **745**
 max norm, **654**
 MAXPLAN, 387
 Maxwell, J., 546, 920, *1081*
 Mayer, A., 112, 119, *1075*
 Mayne, D. Q., 605, *1075*
 Mazumder, P., 110, *1088*
 Mazurie, A., 605, *1085*
 MBP, 433
 McAllester, D. A., 25, 156, 191, 198,
 394, 395, 472, 855, 856, *1072*,
 1077, *1081*, *1090*
 MCC, 24
 McCallum, A., 877, 884, 885, *1069*,
 1072, *1077*, *1079*, *1081*, *1084*,
 1085, *1090*
 McCarthy, J., 17–19, 27, 59, 275, 279,
 314, 395, 440, 471, 1020, 1031,
 1081, *1082*
 McCawley, J. D., 920, *1082*
 McClelland, J. L., 24, *1087*
 McClure, M., 604, *1065*
 McCorduck, P., 1042, *1082*

- McCulloch, W. S., 15, 16, 20, 278, 727, 731, 761, 963, 1080, 1082
 McCune, W., 355, 360, 1082
 McDermott, D., 2, 156, 358, 394, 433, 434, 454, 470, 471, 1068, 1073, 1082
 McDermott, J., 24, 336, 358, 1082
 McDonald, R., 288, 920, 1079
 McEliece, R. J., 555, 1082
 McGregor, J. J., 228, 1082
 McGuinness, D., 457, 469, 471, 1064, 1066, 1089
 McIlraith, S., 314, 1082
 McLachlan, G. J., 826, 1082
 McMahan, B., 639, 1079
 MCMC, 535, 535–538, 552, 554, 596
 McMillan, K. L., 395, 1082
 McNealy, S., 1036
 McPhee, N., 156, 1085
 MDL, 713, 759, 805
 MDP, 10, 647, 684, 686, 830
 mean-field approximation, 554
 measure, 444
 measurement, 444
 mechanism, 679
 strategy-proof, 680
 mechanism design, 679, 679–685
 medical diagnosis, 23, 505, 517, 548, 629, 1036
 Meehan, J., 358, 1068
 Meehl, P., 1022, 1074, 1082
 Meek, C., 553, 1092
Meet (interval relation), 448
 Megarian school, 275
 megavariable, 578
 Megiddo, N., 677, 687, 1078
 Mehlhorn, K., 112, 1069
 mel frequency cepstral coefficient (MFCC), 915
 Mellish, C. S., 359, 1068
 memoization, 343, 357, 780
 memory requirements, 83, 88
 MEMS, 1045
 Mendel, G., 130, 1082
 meningitis, 496–509
 mental model, in disambiguation, 906
 mental objects, 450–453
 mental states, 1028
 Mercer's theorem, 747
 Mercer, J., 747, 1082
 Mercer, R. L., 883, 922, 1067, 1077
 mereology, 470
 Merkhofer, M. M., 638, 1082
 Merleau-Ponty, M., 1041, 1082
 Meshulam, R., 112, 1072
 Meta-DENDRAL, 776, 798
 metadata, 870
 metalevel, 1048
 metalevel state space, 102
 metaphor, 906, 921
 metaphysics, 6
 metareasoning, 189
 decision-theoretic, 1048
 metarule, 345
 meteorite, 422, 480
 metonymy, 905, 921
 Metropolis, N., 155, 554, 1082
 Metropolis–Hastings, 564
 Metropolis algorithm, 155, 554
 Metzinger, T., 1042, 1082
 Metzler, D., 884, 1069
 MEXAR2, 28
 Meyer, U., 112, 1069
 Mézard, M., 762, 1082
 MGONZ, 1021
 MGSS*, 191
 MGU (most general unifier), 327, 329, 353, 361
 MHT (multiple hypothesis tracker), 606
 Mian, I. S., 604, 605, 1079, 1083
 Michalski, R. S., 799, 1082
 Michaylov, S., 359, 1077
 Michie, D., 74, 110, 111, 156, 191, 763, 851, 854, 1012, 1071, 1082
 micro-electromechanical systems (MEMS), 1045
 micromort, 616, 637, 642
 Microsoft, 553, 874
 microworld, 19, 20, 21
 Middleton, B., 519, 552, 1086
 Miikkulainen, R., 435, 1067
 Milch, B., 556, 639, 1078, 1082, 1085
 Milgrom, P., 688, 1082
 Milios, E., 1012, 1081
 military uses of AI, 1035
 Mill, J. S., 7, 770, 798, 1082
 Miller, A. C., 638, 1082
 Miller, D., 431, 1070
 million queens problem, 221, 229
 Millstein, T., 395, 1071
 Milner, A. J., 314, 1074
 MIN-CONFLICTS, 221
 min-conflicts heuristic, 220, 229
 MIN-VALUE, 166, 170
 mind, 2, 1041
 dualistic view, 1041
 and mysticism, 12
 philosophy of, 1041
 as physical system, 6
 theory of, 3
 mind–body problem, 1027
 minesweeper, 284
 MINIMAL-CONSISTENT-DET, 786
 minimal model, 459
 MINIMAX-DECISION, 166
 minimax algorithm, 165, 670
 minimax decision, 165
 minimax search, 165–168, 188, 189
 minimax value, 164, 178
 minimum
 global, 121
 local, 122
 minimum-remaining-values, 216, 333
 minimum description length (MDL), 713, 759, 805
 minimum slack, 405
 minimum spanning tree (MST), 112, 119
 MINISAT, 277
 Minker, J., 358, 473, 1073, 1082
 Minkowski distance, 738
 Minsky, M. L., 16, 18, 19, 22, 24, 27, 434, 471, 552, 761, 1020, 1039, 1042, 1082
 Minton, S., 154, 229, 432, 799, 1068, 1082
 Miranker, D. P., 229, 1065
 Misak, C., 313, 1082
 missing attribute values, 706
 missionaries and cannibals, 109, 115, 468
 MIT, 17–19, 1012
 Mitchell, D., 154, 277, 278, 1069, 1088
 Mitchell, M., 155, 156, 1082
 Mitchell, T. M., 61, 288, 763, 776, 798, 799, 884, 885, 1047, 1066, 1067, 1069, 1082, 1084
 Mitra, M., 870, 1089
 mixed strategy, 667
 mixing time, 573
 mixture
 distribution, 817
 mixture distribution, 817
 mixture of Gaussians, 608, 817, 820
 Mizoguchi, R., 27, 1075
 ML, *see* maximum likelihood
 modal logic, 451
 model, 50, 240, 274, 289, 313, 451
 causal, 517
 (in representation), 13
 sensor, 579, 586, 603
 theory, 314
 transition, 67, 108, 134, 162, 266, 566, 597, 603, 646, 684, 832, 979
 MODEL-BASED-REFLEX-AGENT, 51
 model-based reflex agents, 59
 model checking, 242, 274

- model selection, 709, 825
 Modus Ponens, 250, 276, 356, 357, 361
 Generalized, 325, 326
 Moffat, A., 884, 1092
 MoGo, 186, 194
 Mohr, R., 210, 228, 968, 1082, 1088
 Mohri, M., 889, 1083
 Molloy, M., 277, 1064
 monism, 1028
 monitoring, 145
 monkey and bananas, 113, 396
 monotone condition, 110
 monotonicity
 of a heuristic, 95
 of a logical system, 251, 458
 of preferences, 613
 Montague, P. R., 854, 1083, 1088
 Montague, R., 470, 471, 920, 1077,
 1083
 Montanari, U., 111, 156, 228, 1066,
 1081, 1083
 MONTE-CARLO-LOCALIZATION, 982
 Monte Carlo (in games), 183
 Monte Carlo, sequential, 605
 Monte Carlo algorithm, 530
 Monte Carlo localization, 981
 Monte Carlo simulation, 180
 Montemerlo, M., 1012, 1083
 Mooney, R., 799, 902, 921, 1070, 1083,
 1093
 Moore's Law, 1038
 Moore, A., 826, 1083
 Moore, A. W., 154, 826, 854, 857, 1066,
 1077, 1083
 Moore, E. F., 110, 1083
 Moore, J. S., 356, 359, 360, 1066, 1077
 Moore, R. C., 470, 473, 922, 1076, 1083
 Moravec, H. P., 1012, 1029, 1038, 1083
 More, T., 17
 Morgan, J., 434, 1069
 Morgan, M., 27, 1069
 Morgan, N., 922, 1074
 Morgenstern, L., 470, 472, 473, 1070,
 1083
 Morgenstern, O., 9, 190, 613, 637, 1091
 Moricz, M., 884, 1088
 Morjaria, M. A., 553, 1083
 Morris, A., 604, 1089
 Morris, P., 28, 60, 431, 1064, 1077
 Morrison, E., 190, 1083
 Morrison, P., 190, 1083
 Moses, Y., 470, 477, 1072
 Moskewicz, M. W., 277, 1083
 Mossel, E., 278, 1081
 Mosteller, F., 886, 1083
 most general unifier (MGU), 327, 329,
 353, 361
 most likely explanation, 553, 603
 most likely state, 993
 Mostow, J., 112, 119, 1083
 motion, 948–951
 compliant, 986, 995
 guarded, 995
 motion blur, 931
 motion model, 979
 motion parallax, 949, 966
 motion planning, 986
 Motwani, R., 682, 760, 1064, 1073
 Motzkin, T. S., 761, 1083
 Moutarlier, P., 1012, 1083
 movies
 movies
 2001: A Space Odyssey, 552
 movies
 A.I., 1040
 movies
 The Matrix, 1037
 movies
 The Terminator, 1037
 Mozetic, I., 799, 1082
 MPI (mutual preferential
 independence), 625
 MRS (metalevel reasoning system), 345
 MST, 112, 119
 Mueller, E. T., 439, 470, 1083, 1089
 Muggleton, S. H., 789, 795, 797, 800,
 921, 1071, 1083, 1089, 1090
 Müller, M., 186, 194, 1083, 1088
 Muller, U., 762, 967, 1080
 multiagent environments, 161
 multiagent planning, 425–430
 multiagent systems, 60, 667
 multiattribute utility theory, 622, 638
 multibody planning, 425, 426–428
 multiplexer, 543
 multiply connected network, 528
 multivariate linear regression, 720
 Mumford, D., 967, 1083
 MUNIN, 552
 Murakami, T., 186
 Murga, R., 158, 1080
 Murphy, K., 555, 558, 604, 605, 1012,
 1066, 1071, 1073, 1083, 1090
 Murphy, R., 1014, 1083
 Murray-Rust, P., 469, 1083
 Murthy, C., 360, 1083
 Muscettola, N., 28, 60, 431, 432, 1077,
 1083
 music, 14
 Muslea, I., 885, 1083
 mutagenicity, 797
 mutation, 21, 128, 153
 mutex, 380
 mutual exclusion, 380
 mutual preferential independence
 (MPI), 625
 mutual utility independence (MUI), 626
 MYCIN, 23, 548, 557
 Myerson, R., 688, 1083
 myopic policy, 632
 mysticism, 12
-
- N**
- n*-armed bandit, 841
n-gram model, 861
 Nadal, J.-P., 762, 1082
 Nagasawa, Y., 1042, 1081
 Nagel, T., 1042, 1083
 Naïm, P., 553, 1086
 naive Bayes, 499, 503, 505, 808–809,
 820, 821, 825
 naked, 214
 Nalwa, V. S., 12, 1083
 Naor, A., 278, 1064
 Nardi, D., 471, 1064, 1067
 narrow content, 1028
 NASA, 28, 392, 432, 472, 553, 972
 Nash, J., 1083
 Nash equilibrium, 669, 685
 NASL, 434
 NATACHATA, 1021
 natural kind, 443
 natural numbers, 303
 natural stupidity, 454
 Nau, D. S., 111, 187, 191, 192, 195,
 372, 386, 395, 396, 432,
 1071–1073, 1079, 1083, 1084,
 1089, 1091
 navigation function, 994
 Nayak, P., 60, 157, 432, 472, 1079, 1083
 Neal, R., 762, 1083
 Nealy, R., 193
 nearest-neighbor filter, 601
 nearest-neighbors, 738, 814
 nearest-neighbors regression, 742
 neat vs. scruffy, 25
 Nebel, B., 394, 395, 1076, 1078, 1083
 needle in a haystack, 242
 Nefian, A., 604, 1083
 negation, 244
 negative example, 698
 negative literal, 244
 negligence, 1036
 Nelson, P. C., 111, 1071
 Nemirovski, A., 155, 1065, 1083
 NERO, 430, 435

- Nesterov, Y., 155, 1083
 Netto, E., 110, 1083
 network tomography, 553
 neural network, 16, 20, 24, 186, 727, 727–737
 expressiveness, 16
 feed-forward, 729
 hardware, 16
 learning, 16, 736–737
 multilayer, 22, 731–736
 perceptron, 729–731
 radial basis function, 762
 single layer, *see* perceptron
 neurobiology, 968
 NEUROGAMMON, 851
 neuron, 10, 16, 727, 1030
 neuroscience, 10, 10–12, 728
 computational, 728
 Nevill-Manning, C. G., 921, 1083
 NEW-CLAUSE, 793
 Newborn, M., 111, 1085
 Newell, A., 3, 17, 18, 26, 60, 109, 110, 191, 275, 276, 336, 358, 393, 432, 799, 1047, 1079, 1084, 1089
 Newman, P., 1012, 1066, 1071
 Newton, I., 1, 47, 131, 154, 570, 760, 1084
 Newton–Raphson method, 132
 Ney, H., 604, 883, 922, 1078, 1084
 Ng, A. Y., 686, 759, 850, 852, 855–857, 883, 1013, 1066, 1068, 1078, 1084
 Nguyen, H., 883, 1078
 Nguyen, X., 394, 395, 1084
 Niblett, T., 800, 1068
 Nicholson, A., 558, 604, 686, 687, 1070, 1079, 1084
 Nielsen, P. E., 358, 1077
 Niemelä, I., 472, 1084
 Nigam, K., 884, 885, 1069, 1077, 1084
 Nigenda, R. S., 395, 1084
 Niles, I., 469, 1084, 1085
 Nilsson, D., 639, 1084
 Nilsson, N. J., 2, 27, 31, 59, 60, 109–111, 119, 156, 191, 275, 314, 350, 359, 367, 393, 432, 434, 555, 761, 799, 1012, 1019, 1034, 1072, 1073, 1075, 1084, 1091
 Nine-Men’s Morris, 194
 Niranjan, M., 605, 855, 1070, 1087
 Nisan, N., 688, 1084
 NIST, 753
 nitroaromatic compounds, 797
 Niv, Y., 854, 1070
 Nivre, J., 920, 1079
 Nixon, R., 459, 638, 906
 Nixon diamond, 459
 Niyogi, S., 314, 1090
 NLP (natural language processing), 2, 860
 no-good, 220, 385
 no-regret learning, 753
 NOAH, 394, 433
 Nobel Prize, 10, 22
 Nocedal, J., 760, 1067
 Noda, I., 195, 1014, 1078
 node
 child, 75
 current, in local search, 121
 parent, 75
 node consistency, 208
 Noe, A., 1041, 1084
 noise, 701, 705–706, 712, 776, 787, 802
 noisy-AND, 561
 noisy-OR, 518
 noisy channel model, 913
 nominative case, 899
 nondeterminism
 angelic, 411
 demonic, 410
 nondeterministic environment, 43
 nonholonomic, 976
 NONLIN, 394
 NONLIN+, 431, 432
 nonlinear, 589
 nonlinear constraints, 205
 nonmonotonicity, 458
 nonmonotonic logic, 251, 458, 458–460, 471
 Nono, 330
 nonstationary, 857
 nonterminal symbol, 889, 890, 1060
 Normal–Wishart, 811
 normal distribution, 1058
 standard, 1058
 normal form, 667
 normalization (of a probability distribution), 493
 normalization (of attribute ranges), 739
 Norman, D. A., 884, 1066
 normative theory, 619
 North, O., 330
 North, T., 21, 1072
 Norvig, P., 28, 358, 444, 470, 604, 759, 883, 921, 922, 1074, 1078, 1084, 1087
 notation
 infix, 303
 logical, 4
 prefix, 304
 noughts and crosses, 162, 190, 197
 Nourbakhsh, I., 156, 1073
 Nowak, R., 553, 1068
 Nowatzyk, A., 192, 1076
 Nowick, S. M., 279, 1084
 Nowlan, S. J., 155, 1075
 NP (hard problems), 1054–1055
 NP-complete, 8, 71, 109, 250, 276, 471, 529, 762, 787, 1055
 NQTHM, 360
 NSS chess program, 191
 nuclear power, 561
 number theory, 800
 Nunberg, G., 862, 883, 921, 1078, 1084
 NUPRL, 360
 Nussbaum, M. C., 1041, 1084
 Nyberg, L., 11, 1067
-
- O**
- O()* notation, 1054
 O’Malley, K., 688, 1092
 O’Reilly, U.-M., 155, 1084
 O-PLAN, 408, 431, 432
 Oaksford, M., 638, 1068, 1084
 object, 288, 294
 composite, 442
 object-level state space, 102
 object-oriented programming, 14, 455
 objective case, 899
 objective function, 15, 121
 objectivism, 491
 object model, 928
 observable, 42
 observation model, 568
 observation prediction, 142
 observation sentences, 6
 occupancy grid, 1012
 occupied space, 988
 occur check, 327, 340
 Och, F. J., 29, 604, 921, 922, 1067, 1084, 1093
 Ockham’s razor, 696, 757–759, 777, 793, 805
 Ockham, W., 696, 758
 Oddi, A., 28, 1068
 odometry, 975
 Odyssey, 1040
 Office Assistant, 553
 offline search, 147
 Ogasawara, G., 604, 1076
 Ogawa, S., 11, 1084
 Oglesby, F., 360, 1074
 Oh, S., 606, 1084
 Ohashi, T., 195, 1091
 Olalaity, B., 432, 1073

Olesen, K. G., 552–554, 1064, 1084
 Oliver, N., 604, 1084
 Oliver, R. M., 639, 1084
 Oliver, S. G., 797, 1078
 Olshen, R. A., 758, 1067
 omniscience, 38
 Omohundro, S., 27, 920, 1039, 1084, 1089
 Ong, D., 556, 1082
ONLINE-DFS-AGENT, 150
 online learning, 752, 846
 online planning, 415
 online replanning, 993
 online search, 147, 147–154, 157
 ontological commitment, 289, 313, 482, 547
 ontological engineering, 437, 437–440
 ontology, 308, 310
 upper, 467
 open-coding, 341
 open-loop, 66
 open-universe probability model (OUPM), 545, 552
 open-world assumption, 417
 open class, 890
OPENCYC, 469
 open list, *see* frontier
OPENMIND, 439
 operationality, 783
 operations research, 10, 60, 110, 111
 Oppacher, F., 155, 1084
 OPS-5, 336, 358
 optical flow, 939, 964, 967
 optimal brain damage, 737
 optimal controllers, 997
 optimal control theory, 155
 optimality, 121
 optimality (of a search algorithm), 80, 108
 optimality theory (Linguistics), 921
 optimally efficient algorithm, 98
 optimal solution, 68
 optimism under uncertainty, 151
 optimistic description (of an action), 412
 optimistic prior, 842
 optimization, 709
 convex, 133, 153
 optimizer's curse, 619, 637
OPTIMUM-AIV, 432
OR-SEARCH, 136
 orderability, 612
 ordinal utility, 614
 Organon, 275, 469
 orientation, 938
 origin function, 545
 Ormoneit, D., 855, 1084

OR node, 135
 Osawa, E., 195, 1014, 1078
 Osborne, M. J., 688, 1084
 Oscar, 435
 Osherson, D. N., 759, 1084
 Osindero, S., 1047, 1075
 Osman, I., 112, 1086
 Ostland, M., 556, 606, 1085
 Othello, 186
 OTTER, 360, 364
OUPM, 545, 552
 outcome, 482, 667
 out of vocabulary, 864
 Overbeek, R., 360, 1092
 overfitting, 705, 705–706, 736, 802, 805
 overgeneration, 892
 overhypotheses, 798
 Overmars, M., 1013, 1078
 overriding, 456
 Owens, A. J., 156, 1072
 OWL, 469

P

P (probability vector), 487
 $P(s' | s, a)$ (transition model), 646, 832
PAC learning, 714, 716, 759
 Padgham, L., 59, 1084
 Page, C. D., 800, 1069, 1084
 Page, L., 870, 884, 1067
PageRank, 870
 Palacios, H., 433, 1084
 Palay, A. J., 191, 1084
 Palmer, D. A., 922, 1084
 Palmer, J., 287, 1080
 Palmer, S., 968, 1084
 Palmieri, G., 761, 1073
 Panini, 16, 919
 Papadimitriou, C. H., 154, 157, 277, 685, 686, 883, 1059, 1070, 1079, 1084
 Papadopoulos, T., 968, 1072
 Papavassiliou, V., 855, 1084
 Papert, S., 22, 761, 1082
PARADISE, 189
 paradox, 471, 641
 Allais, 620
 Ellsberg, 620
 St. Petersburg, 637
 parallel distributed processing, *see* neural network
 parallelism
 AND-, 342
 OR-, 342
 parallel lines, 931
 parallel search, 112
 parameter, 520, 806

parameter independence, 812
 parametric model, 737
 paramodulation, 354, 359
 Parekh, R., 921, 1084
 Pareto dominated, 668
 Pareto optimal, 668
 Parisi, D., 921, 1071
 Parisi, G., 555, 1084
 Parisi, M. M. G., 278, 1084
 Park, S., 356, 1075
 Parker, A., 192, 1084
 Parker, D. B., 761, 1084
 Parker, L. E., 1013, 1084
 Parr, R., 686, 854, 856, 857, 1050, 1074, 1077–1079, 1084, 1087
 Parrod, Y., 432, 1064
 parse tree, 890
 parsing, 892, 892–897
 Partee, B. H., 920, 1086
 partial assignment, 203
 partial evaluation, 799
 partial observability, 180, 658
 partial program, 856
PARTICLE-FILTERING, 598
 particle filtering, 597, 598, 603, 605
 Rao-Blackwellized, 605, 1012
 partition, 441
 part of, 441
 part of speech, 888
 Parzen, E., 827, 1085
 Parzen window, 827
 Pasca, M., 885, 1071, 1085
 Pascal's wager, 504, 637
 Pascal, B., 5, 9, 504
 Pasero, R., 314, 358, 1069
 Paskin, M., 920, 1085
PASSIVE-ADP-AGENT, 834
PASSIVE-TD-AGENT, 837
 passive learning, 831
 Pasula, H., 556, 605, 606, 1081, 1085
 Patashnik, O., 194, 1085
 Patel-Schneider, P., 471, 1064
 path, 67, 108, 403
 loopy, 75
 redundant, 76
 path consistency, 210, 228
 path cost, 68, 108
PATHFINDER, 552
 path planning, 986
 Patil, R., 471, 894, 920, 1068, 1071
 Patrick, B. G., 111, 1085
 Patrinos, A., 27, 1069
 pattern database, 106, 112, 379
 disjoint, 107
 pattern matching, 333
 Paul, R. P., 1013, 1085

- Paulin-Mohring, C., 359, *1066*
 Paull, M., 277, *1072*
 Pauls, A., 920, *1085*
 Pavlovic, V., 553, *1093*
 Pax-6 gene, 966
 payoff function, 162, *667*
 Pazzani, M., 505, 826, *1071*
 PCFG
 lexicalized, *897*, 919, 920
 P controller, **998**
 PD controller, **999**
 PDDL (Planing Domain Definition Language), 367
 PDP (parallel distributed processing), 761
 Peano, G., 313, *1085*
 Peano axioms, **303**, 313, 333
 Pearce, J., 230, *1085*
 Pearl, J., 26, 61, 92, 110–112, 154, 191, 229, 509, 511, 517, 549, 552–555, 557, 558, 644, 826, 827, *1070*, 1073, 1074, 1076, 1078, *1085*
 Pearson, J., 230, *1085*
 PEAS description, **40**, 42
 Pease, A., 469, *1084*, *1085*
 Pecheur, C., 356, *1075*
 Pednault, E. P. D., 394, 434, *1085*
 peeking, **708**, 737
 PEGASUS, 850, 852, 859
 Peirce, C. S., 228, 313, 454, 471, 920, 1085
 Pelikan, M., 155, *1085*
 Pell, B., 60, 432, *1083*
 Pemberton, J. C., 157, *1085*
 penalty, 56
 Penberthy, J. S., 394, *1085*
 Peng, J., 855, *1085*
 PENGI, 434
 penguin, 435
 Penix, J., 356, *1075*
 Pennachin, C., 27, *1074*
 Pennsylvania, Univ. of, 14
 Penn Treebank, 881, 895
 Penrose, R., 1023, *1085*
 Pentagon Papers, 638
 Peot, M., 433, 554, *1085*, *1088*
 percept, **34**
 perception, 34, 305, **928**, 928–965
 perception layer, **1005**
 perceptron, 20, **729**, 729–731, 761
 convergence theorem, 20
 learning rule, **724**
 network, **729**
 representational power, 22
 sigmoid, **729**
 percept schema, **416**
 percept sequence, **34**, 37
 Pereira, F., 28, 339, 341, 470, 759, 761, 884, 885, 889, 919, 1025, *1071*, 1074, *1079*, 1083, 1085, 1088, 1091
 Pereira, L. M., 341, *1091*
 Peres, Y., 278, 604, 605, *1064*, *1080*, 1081
 Perez, P., 961, *1080*
 perfect information, 666
 perfect recall, 675
 performance element, **55**, 56
 performance measure, **37**, 40, 59, 481, 611
 Perkins, T., 439, *1089*
 Perlis, A., 1043, *1085*
 Perona, P., 967, *1081*
 perpetual punishment, **674**
 perplexity, **863**
 Perrin, B. E., 605, *1085*
 persistence action, **380**
 persistence arc, **594**
persistent (variable), 1061
 persistent failure model, **593**
 Person, C., 854, *1083*
 perspective, 966
 perspective projection, **930**
 Pesch, E., 432, *1066*
 Peshkin, M., 156, *1092*
 pessimistic description (of an action), **412**
 Peters, S., 920, *1071*
 Peterson, C., 555, *1085*
 Petrie, K., 230, *1073*
 Petrie, T., 604, 826, *1065*
 Petrik, M., 434, *1085*
 Petrov, S., 896, 900, 920, *1085*
 Pfeffer, A., 191, 541, 556, 687, *1078*, 1085
 Pfeifer, G., 472, *1071*
 Pfeifer, R., 1041, *1085*
 phase transition, 277
 phenomenology, 1026
 Philips, A. B., 154, 229, *1082*
 Philo of Megara, 275
 philosophy, 5–7, 59, 1020–1043
 phone (speech sound), **914**
 phoneme, **915**
 phone model, **915**
 phonetic alphabet, 914
 photometry, 932
 photosensitive spot, 963
 phrase structure, **888**, 919
 physicalism, **1028**, 1041
 physical symbol system, **18**
 Pi, X., 604, *1083*
 Piccione, C., 687, *1093*
 Pickwick, Mr., 1026
 pictorial structure model, **958**
 PID controller, **999**
 Pieper, G., 360, *1092*
 pigeons, 13
 Pijls, W., 191, *1085*
 pineal gland, 1027
 Pineau, J., 686, 1013, *1085*
 Pinedo, M., 432, *1085*
 ping-pong, 32, 830
 pinhole camera, **930**
 Pinkas, G., 229, *1085*
 Pinker, S., 287, 288, 314, 921, *1085*, 1087
 Pinto, D., 885, *1085*
 Pipatsrisawat, K., 277, *1085*
 Pippenger, N., 434, *1080*
 Pisa, tower of, 56
 Pistore, M., 275, *1088*
 pit, bottomless, 237
 Pitts, W., 15, 16, 20, 278, 727, 731, 761, 963, *1080*, *1082*
 pixel, **930**
PL-FC-ENTAILS?, **258**
PL-RESOLUTION, **255**
 Plaat, A., 191, *1085*
 Place, U. T., 1041, *1085*
 PLAN-ERS1, 432
 PLAN-ROUTE, **270**
 planetary rover, **971**
 PLANEX, 434
 Plankalkül, 14
 plan monitoring, 423
 PLANNER, 24, 358
 planning, 52, 366–436
 and acting, 415–417
 as constraint satisfaction, 390
 as deduction, 388
 as refinement, 390
 as satisfiability, 387
 blocks world, 20
 case-based, **432**
 conformant, 415, 417–421, 431, **433**, 994
 contingency, **133**, 415, 421–422, 431
 decentralized, **426**
 fine-motion, **994**
 graph, **379**, 379–386, 393
 serial, **382**
 hierarchical, 406–415, 431
 hierarchical task network, 406
 history of, 393
 linear, **394**
 multibody, **425**, 426–428

- multieffector, 425
 non-interleaved, 398
 online, 415
 reactive, 434
 regression, 374, 394
 route, 19
 search space, 373–379
 sensorless, 415, 417–421
 planning and control layer, 1006
 plan recognition, 429
 PlanSAT, 372
 bounded, 372
 plateau (in local search), 123
 Plato, 275, 470, 1041
 Platt, J., 760, 1085
 player (in a game), 667
 Plotkin, G., 359, 800, 1085
 Plunkett, K., 921, 1071
 ply, 164
 poetry, 1
 Pohl, I., 110, 111, 118, 1085
 point-to-point motion, 986
 pointwise product, 526
 poker, 507
 Poland, 470
 Poli, R., 156, 1079, 1085
 Policella, N., 28, 1068
 policy, 176, 434, 647, 684, 994
 evaluation, 656, 832
 gradient, 849
 improvement, 656
 iteration, 656, 656–658, 685, 832
 asynchronous, 658
 modified, 657
 loss, 655
 optimal, 647
 proper, 650, 858
 search, 848, 848–852, 1002
 stochastic, 848
 value, 849
 POLICY-ITERATION, 657
 polite convention (Turing's), 1026, 1027
 Pollack, M. E., 434, 1069
 polytree, 528, 552, 575
 POMDP-VALUE-ITERATION, 663
 Pomerleau, D. A., 1014, 1085
 Ponce, J., 968, 1072
 Ponte, J., 884, 922, 1085, 1093
 Poole, D., 2, 59, 553, 556, 639, 1078,
 1085, 1093
 Popat, A. C., 29, 921, 1067
 Popescu, A.-M., 885, 1072
 Popper, K. R., 504, 759, 1086
 population (in genetic algorithms), 127
 Porphyry, 471
 Port-Royal Logic, 636
 Porter, B., 473, 1091
 Portner, P., 920, 1086
 Portuguese, 778
 pose, 956, 958, 975
 Posegga, J., 359, 1065
 positive example, 698
 positive literal, 244
 positivism, logical, 6
 possibility axiom, 388
 possibility theory, 557
 possible world, 240, 274, 313, 451, 540
 Post, E. L., 276, 1086
 post-decision disappointment, 637
 posterior probability, *see* probability
 conditional
 potential field, 991
 potential field control, 999
 Poultney, C., 762, 1086
 Poundstone, W., 687, 1086
 Pourret, O., 553, 1086
 Powers, R., 857, 1088
 Prade, H., 557, 1071
 Prades, J. L. P., 637, 1086
 Pradhan, M., 519, 552, 1086
 pragmatic interpretation, 904
 pragmatics, 904
 Prawitz, D., 358, 1086
 precedence constraints, 204
 precision, 869
 precondition, 367
 missing, 423
 precondition axiom, 273
 predecessor, 91
 predicate, 902
 predicate calculus, *see* logic, first-order
 predicate indexing, 328
 predicate symbol, 292
 prediction, 139, 142, 573, 603
 preference, 482, 612
 monotonic, 616
 preference elicitation, 615
 preference independence, 624
 premise, 244
 president, 449
 Presley, E., 448
 Press, W. H., 155, 1086
 Preston, J., 1042, 1086
 Price, B., 686, 1066
 Price Waterhouse, 431
 Prieditis, A. E., 105, 112, 119, 1083,
 1086
 Princeton, 17
Principia Mathematica, 18
 Prinz, D. G., 192, 1086
 PRIOR-SAMPLE, 531
 prioritized sweeping, 838, 854
 priority queue, 80, 858
 prior knowledge, 39, 768, 778, 787
 prior probability, 485, 503
 prismatic joint, 976
 prisoner's dilemma, 668
 private value, 679
 probabilistic network, *see* Bayesian
 network
 probabilistic roadmap, 993
 probability, 9, 26, 480–565, 1057–1058
 alternatives to, 546
 axioms of, 488–490
 conditional, 485, 503, 514
 conjunctive, 514
 density function, 487, 1057
 distribution, 487, 522
 history, 506
 judgments, 516
 marginal, 492
 model, 484, 1057
 open-universe, 545
 prior, 485, 503
 theory, 289, 482, 636
 probably approximately correct (PAC),
 714, 716, 759
 PROBCUT, 175
 probit distribution, 522, 551, 554
 problem, 66, 108
 airport-siting, 643
 assembly sequencing, 74
 bandit, 840, 855
 conformant, 138
 constraint optimization, 207
 8-queens, 71, 109
 8-puzzle, 102, 105
 formulation, 65, 68–69
 frame, 266, 279
 generator, 56
 halting, 325
 inherently hard, 1054–1055
 million queens, 221, 229
 missionaries and cannibals, 115
 monkey and bananas, 113, 396
 n queens, 263
 optimization, 121
 constrained, 132
 piano movers, 1012
 real-world, 69
 relaxed, 105, 376
 robot navigation, 74
 sensorless, 138
 solving, 22
 touring, 74
 toy, 69
 traveling salesperson, 74
 underconstrained, 263

VLSI layout, 74, 125
 procedural approach, 236, 286
 procedural attachment, 456, 466
 process, 447, 447
 PRODIGY, 432
 production, 48
 production system, 322, 336, 357, 358
 product rule, 486, 495
 PROGOL, 789, 795, 797, 800
 programming language, 285
 progression, 393
 Prolog, 24, 339, 358, 394, 793, 899
 parallel, 342
 Prolog Technology Theorem Prover (PTTP), 359
 pronunciation model, 917
 proof, 250
 proper policy, 650, 858
 property (unary relation), 288
 proposal distribution, 565
 proposition
 probabilistic, 483
 symbol, 244
 propositional attitude, 450
 propositionalization, 324, 357, 368, 544
 propositional logic, 235, 243–247, 274, 286
 proprioceptive sensor, 975
 PROSPECTOR, 557
 Prosser, P., 229, 1086
 protein design, 75
 prototypes, 896
 Proust, M., 910
 Provan, G. M., 519, 552, 1086
 pruning, 98, 162, 167, 705
 forward, 174
 futility, 185
 in contingency problems, 179
 in EBL, 783
 pseudocode, 1061
 pseudoexperience, 837
 pseudoreward, 856
 PSPACE, 372, 1055
 PSPACE-complete, 385, 393
 psychological reasoning, 473
 psychology, 12–13
 experimental, 3, 12
 psychophysics, 968
 public key encryption, 356
 Puget, J.-F., 230, 800, 1073, 1087
 Pullum, G. K., 889, 920, 921, 1076, 1086
 PUMA, 1011
 Purdom, P., 230, 1067
 pure strategy, 667
 pure symbol, 260

Puterman, M. L., 60, 685, 1086
 Putnam, H., 60, 260, 276, 350, 358, 505, 1041, 1042, 1070, 1086
 Puzicha, J., 755, 762, 1065
 Pylyshyn, Z. W., 1041, 1086

Q

$Q(s, a)$ (value of action in state), 843
 Q-function, 627, 831
 Q-learning, 831, 843, 844, 848, 973
 Q-LEARNING-AGENT, 844
 QA3, 314
 QALY, 616, 637
 Qi, R., 639, 1093
 QUACKLE, 187
 quadratic dynamical systems, 155
 quadratic programming, 746
 qualia, 1033
 qualification problem, 268, 481, 1024, 1025
 qualitative physics, 444, 472
 qualitative probabilistic network, 557, 624
 quantification, 903
 quantifier, 295, 313
 existential, 297
 in logic, 295–298
 nested, 297–298
 universal, 295–296, 322
 quantization factor, 914
 quasi-logical form, 904
 Cubic, 194
 query (logical), 301
 query language, 867
 query variable, 522
 question answering, 872, 883
 queue, 79
 FIFO, 80, 81
 LIFO, 80, 85
 priority, 80, 858
 Quevedo, T., 190
 quiescence, 174
 Quillian, M. R., 471, 1086
 Quine, W. V., 314, 443, 469, 470, 1086
 Quinlan, J. R., 758, 764, 791, 793, 800, 1086
 Quirk, R., 920, 1086
 QXTRACT, 885

R

R1, 24, 336, 358
 Rabani, Y., 155, 1086
 Rabenau, E., 28, 1068
 Rabideau, G., 431, 1073

Rabiner, L. R., 604, 922, 1086
 Rabinovich, Y., 155, 1086
 racing cars, 1050
 radar, 10
 radial basis function, 762
 Radio Rex, 922
 Raedt, L. D., 556, 1078
 Raghavan, P., 883, 884, 1081, 1084
 Raiffa, H., 9, 621, 625, 638, 687, 1078, 1081
 Rajan, K., 28, 60, 431, 1064, 1077
 Ralaivola, L., 605, 1085
 Ralphs, T. K., 112, 1086
 Ramakrishnan, R., 275, 1080
 Ramanan, D., 960, 1086
 Ramsey, F. P., 9, 504, 637, 1086
 RAND Corporation, 638
 randomization, 35, 50
 randomized weighted majority algorithm, 752
 random restart, 158, 262
 random set, 551
 random surfer model, 871
 random variable, 486, 515
 continuous, 487, 519, 553
 indexed, 555
 random walk, 150, 585
 range finder, 973
 laser, 974
 range sensor array, 981
 Ranzato, M., 762, 1086
 Rao, A., 61, 1092
 Rao, B., 604, 1076
 Rao, G., 678
 Raphael, B., 110, 191, 358, 1074, 1075
 Raphson, J., 154, 760, 1086
 rapid prototyping, 339
 Raschke, U., 1013, 1069
 Rashevsky, N., 10, 761, 1086
 Rasmussen, C. E., 827, 1086
 Rassenti, S., 688, 1086
 Ratio Club, 15
 rational agent, 4, 4–5, 34, 36–38, 59, 60, 636, 1044
 rationalism, 6, 923
 rationality, 1, 36–38
 calculative, 1049
 limited, 5
 perfect, 5, 1049
 rational thought, 4
 Ratner, D., 109, 1086
 rats, 13
 Rauch, H. E., 604, 1086
 Rayner, M., 784, 1087
 Rayson, P., 921, 1080
 Rayward-Smith, V., 112, 1086

- RBFS, 99–101, 109
RBL, 779, 784–787, 798
RDF, 469
reachable set, 411
reactive control, 1001
reactive layer, 1004
reactive planning, 434
real-world problem, 69
realizability, 697
reasoning, 4, 19, 234
 default, 458–460, 547
 intercausal, 548
 logical, 249–264, 284
 uncertain, 26
recall, 869
Rechenberg, I., 155, 1086
recognition, 929
recommendation, 539
reconstruction, 929
recurrent network, 729, 762
RECURSIVE-BEST-FIRST-SEARCH, 99
RECURSIVE-DLS, 88
recursive definition, 792
recursive estimation, 571
Reddy, R., 922, 1081
reduction, 1059
Reeson, C. G., 228, 1086
Reeves, C., 112, 1086
Reeves, D., 688, 1092
reference class, 491, 505
reference controller, 997
reference path, 997
referential transparency, 451
refinement (in hierarchical planning), 407
reflectance, 933, 952
REFLEX-VACUUM-AGENT, 48
reflex agent, 48, 48–50, 59, 647, 831
refutation, 250
refutation completeness, 350
regex, 874
Regin, J., 228, 1086
regions, 941
regression, 393, 696, 760
 linear, 718, 810
 nonlinear, 732
 tree, 707
regression to the mean, 638
regret, 620, 752
regular expression, 874
regularization, 713, 721
Reichenbach, H., 505, 1086
Reid, D. B., 606, 1086
Reid, M., 111, 1079
Reif, J., 1012, 1013, 1068, 1086
reification, 440
REINFORCE, 849, 859
reinforcement, 830
reinforcement learning, 685, 695, 830–859, 1025
 active, 839–845
 Bayesian, 835
 distributed, 856
 generalization in, 845–848
 hierarchical, 856, 1046
 multiagent, 856
 off-policy, 844
 on-policy, 844
Reingold, E. M., 228, 1066
Reinsel, G., 604, 1066
Reiter, R., 279, 395, 471, 686, 1066, 1086
REJECTION-SAMPLING, 533
rejection sampling, 532
relation, 288
relational extraction, 874
relational probability model (RPM), 541, 552
relational reinforcement learning, 857
relative error, 98
relaxed problem, 105, 376
relevance, 246, 375, 779, 799
relevance (in information retrieval), 867
relevance-based learning (RBL), 779, 784–787, 798
relevant-states, 374
Remote Agent, 28, 60, 356, 392, 432
REMOTE AGENT, 28
renaming, 331
rendering model, 928
Renner, G., 155, 1086
Rényi, A., 504, 1086
repeated game, 669, 673
replanning, 415, 422–434
REPOP, 394
representation, *see* knowledge representation
 atomic, 57
 factored, 58
 structured, 58
representation theorem, 624
REPRODUCE, 129
reserve bid, 679
resolution, 19, 21, 253, 252–256, 275, 314, 345–357, 801
 closure, 255, 351
 completeness proof for, 350
 input, 356
 inverse, 794, 794–797, 800
 linear, 356
 strategies, 355–356
resolvent, 252, 347, 794
resource constraints, 401
resources, 401–405, 430
response, 13
restaurant hygiene inspector, 183
result, 368
result set, 867
rete, 335, 358
retrograde, 176
reusable resource, 402
revelation principle, 680
revenue equivalence theorem, 682
Reversi, 186
revolute joint, 976
reward, 56, 646, 684, 830
 additive, 649
 discounted, 649
 shaping, 856
reward-to-go, 833
reward function, 832, 1046
rewrite rule, 364, 1060
Reynolds, C. W., 435, 1086
Riazanov, A., 359, 360, 1086
Ribeiro, F., 195, 1091
Rice, T. R., 638, 1082
Rich, E., 2, 1086
Richards, M., 195, 1086
Richardson, M., 556, 604, 1071, 1086
Richardson, S., 554, 1073
Richter, S., 395, 1075, 1086
ridge (in local search), 123
Ridley, M., 155, 1086
Rieger, C., 24, 1086
Riesbeck, C., 23, 358, 921, 1068, 1088
right thing, doing the, 1, 5, 1049
Riley, J., 688, 1087
Riley, M., 889, 1083
Riloff, E., 885, 1077, 1087
Rink, F. J., 553, 1083
Rintanen, J., 433, 1087
Ripley, B. D., 763, 1087
risk aversion, 617
risk neutrality, 618
risk seeking, 617
Rissanen, J., 759, 1087
Ritchie, G. D., 800, 1087
Ritov, Y., 556, 606, 1085
Rivest, R., 759, 1059, 1069, 1087
RMS (root mean square), 1059
Robbins algebra, 360
Roberts, G., 30, 1071
Roberts, L. G., 967, 1087
Roberts, M., 192, 1065
Robertson, N., 229, 1087
Robertson, S., 868
Robertson, S. E., 505, 884, 1069, 1087
Robinson, A., 314, 358, 360, 1087

- Robinson, G., 359, *1092*
 Robinson, J. A., 19, 276, 314, 350, 358,
1087
- Robocup, **1014**
- robot, **971**, 1011
 game (with humans), 1019
 hexapod, 1001
 mobile, **971**
 navigation, 74
 soccer, 161, 434, **1009**
- robotics, **3**, 592, 971–1019
- robust control, **994**
- Roche, E., 884, *1087*
- Rochester, N., 17, 18, 1020, *1082*
- Rock, I., 968, *1087*
- Rockefeller Foundation, 922
- Röger, G., 111, *1075*
- rollout, **180**
- Romania, 65, 203
- Roomba, **1009**
- Roossin, P., 922, *1067*
- root mean square, **1059**
- Roscoe, T., 275, *1080*
- Rosenblatt, F., 20, 761, *1066*, *1087*
- Rosenblatt, M., 827, *1087*
- Rosenblitt, D., 394, *1081*
- Rosenbloom, P. S., 26, 27, 336, 358,
432, 799, 1047, *1075*, *1079*
- Rosenblueth, A., 15, *1087*
- Rosenbluth, A., 155, 554, *1082*
- Rosenbluth, M., 155, 554, *1082*
- Rosenholtz, R., 953, 968, *1081*
- Rosenschein, J. S., 688, *1087*, *1089*
- Rosenschein, S. J., 60, 278, 279, *1077*,
1087
- Ross, P. E., 193, *1087*
- Ross, S. M., **1059**, *1087*
- Rossi, F., 228, 230, *1066*, *1087*
- rotation, 956
- Roth, D., 556, *1070*
- Roughgarden, T., 688, *1084*
- Roussel, P., 314, 358, 359, *1069*, *1087*
- route finding, 73
- Rouveiro, C., 800, *1087*
- Roveri, M., 396, 433, *1066*, *1068*
- Rowat, P. F., 1013, *1087*
- Roweis, S. T., 554, 605, *1087*
- Rowland, J., 797, *1078*
- Rowley, H., 968, *1087*
- Roy, N., 1013, *1087*
- Rozonoer, L., 760, *1064*
- RPM, **541**, 552
- RSA (Rivest, Shamir, and Adelman),
356
- RSAT, 277
- Rubik's Cube, 105
- Rubin, D., 604, 605, 826, 827, *1070*,
1073, *1087*
- Rubinstein, A., 688, *1084*
- rule, **244**
 causal, **317**, 517
 condition-action, **48**
 default, **459**
 diagnostic, **317**, 517
 if-then, 48, 244
 implication, 244
 situation-action, 48
 uncertain, 548
- rule-based system, 547, 1024
 with uncertainty, 547–549
- Rumelhart, D. E., 24, 761, *1087*
- Rummery, G. A., 855, *1087*
- Ruspini, E. H., 557, *1087*
- Russell, A., 111, *1071*
- Russell, B., 6, 16, 18, 357, *1092*
- Russell, J. G. B., 637, *1087*
- Russell, J. R., 360, *1083*
- Russell, S. J., 111, 112, 157, 191, 192,
198, 278, 345, 432, 444, 556,
604–*606*, 686, 687, 799, 800,
826, 855–857, 1012, 1048, 1050,
1064, *1066*, *1069*–*1071*, *1073*,
1076, *1077*, *1081*–*1085*, *1087*,
1090, *1092*, *1093*
- Russia, 21, 192, 489
- Rustagi, J. S., 554, *1087*
- Ruzzo, W. L., 920, *1074*
- Ryan, M., 314, *1076*
- RYBKA, 186, 193
- Rzepe, H. S., 469, *1083*
-
- S**
- S-set, **774**
- Sabharwal, A., 277, 395, *1074*, *1076*
- Sabin, D., 228, *1087*
- Sacerdoti, E. D., 394, 432, *1087*
- Sackinger, E., 762, 967, *1080*
- Sadeh, N. M., 688, *1064*
- Sadri, F., 470, *1087*
- Sagiv, Y., 358, *1065*
- Sahami, M., 29, 883, 884, *1078*, *1087*
- Sahin, N. T., 288, *1087*
- Sahni, S., 110, *1076*
- SAINT, 19, 156
- St. Petersburg paradox, 637, 641
- Sakuta, M., 192, *1087*
- Salisbury, J., 1013, *1081*
- Salmond, D. J., 605, *1074*
- Salomaa, A., 919, *1087*
- Salton, G., 884, *1087*
- Saltzman, M. J., 112, *1086*
- SAM, 360
- sample complexity, **715**
- sample space, **484**
- sampling, 530–535
- sampling rate, **914**
- Samuel, A. L., 17, 18, 61, 193, 850,
854, 855, *1087*
- Samuelson, L., 688, *1081*
- Samuelson, W., 688, *1087*
- Samuelsson, C., 784, *1087*
- Sanders, P., 112, *1069*
- Sankaran, S., 692, *1080*
- Sanna, R., 761, *1073*
- Sanskrit, 468, 919
- Santorini, B., 895, 921, *1081*
- SAPA, 431
- Sapir–Whorf hypothesis, 287
- Saraswat, V., 228, *1091*
- Sarawagi, S., 885, *1087*
- SARSA, **844**
- Sastry, S., 60, 606, 852, 857, 1013,
1075, *1084*
- SAT, **250**
- Satia, J. K., 686, *1087*
- satisfaction (in logic), **240**
- satisfiability, **250**, 277
- satisfiability threshold conjecture, **264**,
278
- satisficing, **10**, 1049
- SATMC, 279
- Sato, T., 359, 556, *1087*, *1090*
- SATPLAN, 387, 392, 396, 402, 420, 433
- SATPLAN, **272**
- saturation, **351**
- SATZ, 277
- Saul, L. K., 555, 606, *1077*, *1088*
- Saund, E., 883, *1087*
- Savage, L. J., 489, 504, 637, *1088*
- Sayre, K., 1020, *1088*
- scaled orthographic projection, **932**
- scanning lidars, **974**
- Scarcello, F., 230, 472, *1071*, *1074*
- scene, **929**
- Schabes, Y., 884, *1087*
- Schaeffer, J., 112, 186, 191, 194, 195,
678, 687, *1066*, *1069*, *1081*,
1085, *1088*
- Schank, R. C., 23, 921, *1088*
- Schapire, R. E., 760, 761, 884, *1072*,
1088
- Scharir, M., 1012, *1088*
- Schaub, T., 471, *1070*
- Schauenberg, T., 678, 687, *1066*
- scheduling, **403**, 401–405
- Scheines, R., 826, *1089*
- schema (in a genetic algorithm), **128**

- schema acquisition, 799
 Schervish, M. J., 506, 1070
 Schickard, W., 5
 Schmid, C., 968, 1088
 Schmidt, G., 432, 1066
 Schmolze, J. G., 471, 1088
 Schneider, J., 852, 1013, 1065
 Schnitzius, D., 432, 1070
 Schnizlein, D., 687, 1091
 Schoenberg, I. J., 761, 1083
 Schölkopf, B., 760, 762, 1069, 1070, 1088
 Schomer, D., 288, 1087
 Schöning, T., 277, 1088
 Schoppers, M. J., 434, 1088
 Schrag, R. C., 230, 277, 1065
 Schröder, E., 276, 1088
 Schubert, L. K., 469, 1076
 Schulster, J., 28, 1068
 Schultz, W., 854, 1088
 Schultze, P., 112, 1079
 Schulz, D., 606, 1012, 1067, 1088
 Schulz, S., 360, 1088, 1090
 Schumann, J., 359, 360, 1071, 1080
 Schütze, H., 883–885, 920, 921, 1081, 1088
 Schütze, H., 862, 883, 1078
 Schwartz, J. T., 1012, 1088
 Schwartz, S. P., 469, 1088
 Schwartz, W. B., 505, 1074
 scientific discovery, 759
 Scott, D., 555, 1088
 Scrabble, 187, 195
 scruffy vs. neat, 25
 search, 22, 52, 66, 108
 - A*, 93–99
 - alpha–beta, 167–171, 189, 191
 - B*, 191
 - backtracking, 87, 215, 218–220, 222, 227
 - beam, 125, 174
 - best-first, 92, 108
 - bidirectional, 90–112
 - breadth-first, 81, 81–83, 108, 408
 - conformant, 138–142
 - continuous space, 129–133, 155
 - current-best-hypothesis, 770
 - cutting off, 173–175
 - depth-first, 85, 85–87, 108, 408
 - depth-limited, 87, 87–88
 - general, 108
 - greedy best-first, 92, 92
 - heuristic, 81, 110
 - hill-climbing, 122–125, 150
 - in a CSP, 214–222
 - incremental belief-state, 141
 - informed, 64, 81, 92, 92–102, 108
 - Internet, 464
 - iterative deepening, 88, 88–90, 108, 110, 173, 408
 - iterative deepening A*, 99, 111
 - learning to, 102
 - local, 120–129, 154, 229, 262–263, 275, 277
 - greedy, 122
 - local, for CSPs, 220–222
 - local beam, 125, 126
 - memory-bounded, 99–102, 111
 - memory-bounded A*, 101, 101–102, 112
 - minimax, 165–168, 188, 189
 - nondeterministic, 133–138
 - online, 147, 147–154, 157
 - parallel, 112
 - partially observable, 138–146
 - policy, 848, 848–852, 1002
 - quiescence, 174
 - real-time, 157, 171–175
 - recursive best-first (RBFS), 99–101, 111
 - simulated annealing, 125
 - stochastic beam, 126
 - strategy, 75
 - tabu, 154, 222
 - tree, 163
 - uniform-cost, 83, 83–85, 108
 - uninformed, 64, 81, 81–91, 108, 110- search cost, 80
- search tree, 75, 163
- Searle, J. R., 11, 1027, 1029–1033, 1042, 1088
- Sebastiani, F., 884, 1088
- Segaran, T., 688, 763, 1088
- segmentation (of an image), 941
- segmentation (of words), 886, 913
- Sejnowski, T., 763, 850, 854, 1075, 1083, 1090
- Self, M., 826, 1068
- Selfridge, O. G., 17
- Selman, B., 154, 229, 277, 279, 395, 471, 1074, 1077, 1078, 1088
- semantic interpretation, 900–904, 920
- semantic networks, 453–456, 468, 471
- semantics, 240, 860
 - database, 300, 343, 367, 540
 - logical, 274
- Semantic Web, 469
- semi-supervised learning, 695
- semidecidable, 325, 357
- semidynamic environment, 44
- Sen, S., 855, 1084
- sensitivity analysis, 635
- sensor, 34, 41, 928
 - active, 973
 - failure, 592, 593
 - model, 579, 586, 603
 - passive, 973
- sensor interface layer, 1005
- sensorless planning, 415, 417–421
- sensor model, 566, 579, 586, 603, 658, 928, 979
- sentence
 - atomic, 244, 294–295, 299
 - complex, 244, 295
 - in a KB, 235, 274
 - as physical configuration, 243
- separator (in Bayes net), 499
- sequence form, 677
- sequential
 - environment, 43
- sequential decision problem, 645–651, 685
- sequential environment, 43
- sequential importance-sampling resampling, 605
- serendipity, 424
- Sergot, M., 470, 1079
- serializable subgoals, 392
- Serina, I., 395, 1073
- Sestoft, P., 799, 1077
- set (in first-order logic), 304
- set-cover problem, 376
- SETHEO, 359
- set of support, 355
- set semantics, 367
- Settle, L., 360, 1074
- Seymour, P. D., 229, 1087
- SGP, 395, 433
- SGPLAN, 387
- Sha, F., 1025, 1088
- Shachter, R. D., 517, 553, 554, 559, 615, 634, 639, 687, 1071, 1088, 1090
- shading, 933, 948, 952–953
- shadow, 934
- Shafer, G., 557, 1088
- shaft decoder, 975
- Shah, J., 967, 1083
- Shahookar, K., 110, 1088
- Shaked, T., 885, 1072
- Shakey, 19, 60, 156, 393, 397, 434, 1011
- Shalla, L., 359, 1092
- Shanahan, M., 470, 1088
- Shankar, N., 360, 1088
- Shannon, C. E., 17, 18, 171, 192, 703, 758, 763, 883, 913, 1020, 1082, 1088
- Shaparau, D., 275, 1088
- shape, 957

- from shading, 968
 Shapiro, E., 800, 1088
 Shapiro, S. C., 31, 1088
 Shapley, S., 687, 1088
 Sharir, M., 1013, 1074
 Sharp, D. H., 761, 1069
 Shatkay, H., 1012, 1088
 Shaw, J. C., 109, 191, 276, 1084
 Shawe-Taylor, J., 760, 1069
 Shazeer, N. M., 231, 1080
 Shelley, M., 1037, 1088
 Sheppard, B., 195, 1088
 Shewchuk, J., 1012, 1070
 Shi, J., 942, 967, 1088
 Schieber, S., 30, 919, 1085, 1088
 Shimelevich, L. I., 605, 1093
 Shin, M. C., 685, 1086
 Shinkareva, S. V., 288, 1082
 Shmoys, D. B., 110, 405, 432, 1080
 Shoham, Y., 60, 195, 230, 359, 435,
 638, 688, 857, 1064, 1079, 1080,
 1088
 short-term memory, 336
 shortest path, 114
 Shortliffe, E. H., 23, 557, 1067, 1088
 shoulder (in state space), 123
 Shpitser, I., 556, 1085
 SHRDLU, 20, 23, 370
 Shreve, S. E., 60, 1066
 sibyl attack, 541
 sideways move (in state space), 123
 Sietsma, J., 762, 1088
 SIGART, 31
 sigmoid function, 726
 sigmoid perceptron, 729
 signal processing, 915
 significance test, 705
 signs, 888
 Siklossy, L., 432, 1088
 Silver, D., 194, 1073
 Silverstein, C., 884, 1088
 Simard, P., 762, 967, 1080
 Simmons, R., 605, 1012, 1088, 1091
 Simon's predictions, 20
 Simon, D., 60, 1088
 Simon, H. A., 3, 10, 17, 18, 30, 60, 109,
 110, 191, 276, 356, 393, 639,
 800, 1049, 1077, 1079, 1084,
 1088, 1089
 Simon, J. C., 277, 1089
 Simonis, H., 228, 1089
 Simons, P., 472, 1084
SIMPLE-REFLEX-AGENT, 49
 simplex algorithm, 155
SIMULATED-ANNEALING, 126
 simulated annealing, 120, 125, 153, 155,
 158, 536
 simulation of world, 1028
 simultaneous localization and mapping
 (SLAM), 982
 Sinclair, A., 124, 155, 1081, 1086
 Singer, P. W., 1035, 1089
 Singer, Y., 604, 884, 1072, 1088
 Singh, M. P., 61, 1076
 Singh, P., 27, 439, 1082, 1089
 Singh, S., 1014, 1067
 Singh, S. P., 157, 685, 855, 856, 1065,
 1077, 1078, 1090
 Singhal, A., 870, 1089
 singly connected network, 528
 singular, 1056
 singular extension, 174
 singularity, 12
 technological, 1038
 sins, seven deadly, 122
 SIPE, 431, 432, 434
 SIR, 605
 Sittler, R. W., 556, 606, 1089
 situated agent, 1025
 situation, 388
 situation calculus, 279, 388, 447
 Sjolander, K., 604, 1079
 skeletonization, 986, 991
 Skinner, B. F., 15, 60, 1089
 Skolem, T., 314, 358, 1089
 Skolem constant, 323, 357
 Skolem function, 346, 358
 skolemization, 323, 346
 slack, 403
 Slagle, J. R., 19, 1089
SLAM, 982
 slant, 957
 Slate, D. J., 110, 1089
 Slater, E., 192, 1089
 Slattery, S., 885, 1069
 Sleator, D., 920, 1089
 sliding-block puzzle, 71, 376
 sliding window, 943
 Slocum, J., 109, 1089
 Sloman, A., 27, 1041, 1082, 1089
 Slovic, P., 2, 638, 1077
 small-scale learning, 712
 Smallwood, R. D., 686, 1089
 Smarr, J., 883, 1078
 Smart, J. J. C., 1041, 1089
 SMA*, 109
 Smith, A., 9
 Smith, A. F. M., 605, 811, 826, 1065,
 1074, 1090
 Smith, B., 28, 60, 431, 470, 1077, 1089
 Smith, D. A., 920, 1089
 Smith, D. E., 156, 157, 345, 359, 363,
 395, 433, 1067, 1073, 1079,
 1085, 1089, 1091
 Smith, G., 112, 1086
 Smith, J. E., 619, 637, 1089
 Smith, J. M., 155, 688, 1089
 Smith, J. Q., 638, 639, 1084, 1089
 Smith, M. K., 469, 1089
 Smith, R. C., 1012, 1089
 Smith, R. G., 61, 1067
 Smith, S. J. J., 187, 195, 1089
 Smith, V., 688, 1086
 Smith, W. D., 191, 553, 1065, 1083
SMODELS, 472
 Smola, A. J., 760, 1088
 Smolensky, P., 24, 1089
 smoothing, 574–576, 603, 822, 862,
 863, 938
 linear interpolation, 863
 online, 580
 Smallyan, R. M., 314, 1089
 Smyth, P., 605, 763, 1074, 1089
 SNARC, 16
 Snell, J., 506, 1074
 Snell, M. B., 1032, 1089
 SNLP, 394
 Snyder, W., 359, 1064
 SOAR, 26, 336, 358, 432, 799, 1047
 soccer, 195
 social laws, 429
 society of mind, 434
 Socrates, 4
 Soderland, S., 394, 469, 885, 1065,
 1072, 1089
 softbot, 41, 61
 soft margin, 748
 softmax function, 848
 soft threshold, 521
 software agent, 41
 software architecture, 1003
 Soika, M., 1012, 1066
 Solomonoff, R. J., 17, 27, 759, 1089
 solution, 66, 68, 108, 134, 203, 668
 optimal, 68
 solving games, 163–167
 soma, 11
 Sompolinsky, H., 761, 1064
 sonar sensors, 973
 Sondik, E. J., 686, 1089
 sonnet, 1026
 Sonneveld, D., 109, 1089
 Sontag, D., 556, 1082
 Sörensson, N., 277, 1071
 Sosic, R., 229, 1089
 soul, 1041

- soundness (of inference), **242**, 247, 258, 274, 331
 sour grapes, **37**
 Sowa, J., **473**, *1089*
 Spaan, M. T. J., **686**, *1089*
 space complexity, **80**, 108
 spacecraft assembly, 432
 spam detection, **865**
 spam email, 886
 Sparck Jones, K., 505, 868, 884, *1087*
 sparse model, **721**
 sparse system, **515**
 SPASS, 359
 spatial reasoning, **473**
 spatial substance, **447**
 specialization, **771**, *772*
 species, 25, 130, 439–441, 469, 817, 860, 888, 948, 1035, 1042
 spectrophotometry, 935
 specularities, **933**
 specular reflection, **933**
 speech act, **904**
 speech recognition, 25, **912**, *912–919*, 922
 sphex wasp, 39, 425
 SPI (Symbolic Probabilistic Inference), 553
 Spiegelhalter, D. J., 553–555, 639, 763, 826, *1069*, *1073*, *1080*, *1082*, *1089*
 Spielberg, S., 1040, *1089*
 SPIKE, 432
 SPIN, 356
 spin glass, 761
 Spirites, P., 826, *1089*
 split point, **707**
 Sproull, R. F., 639, *1072*
 Sputnik, 21
 square roots, 47
 SRI, 19, 314, 393, 638
 Srinivasan, A., 797, 800, *1084*, *1089*
 Srinivasan, M. V., 1045, *1072*
 Srivas, M., 356, *1089*
 Srivastava, B., 432, *1077*
 SSD (sum of squared differences), 940
 SSS* algorithm, 191
 Staab, S., 469, *1089*
 stability
 of a controller, **998**
 static vs. dynamic, **977**
 strict, **998**
 stack, 80
 Stader, J., 432, *1064*
 STAGE, 154
 STAHL, 800
 Stallman, R. M., 229, *1089*
 STAN, 395
 standardizing apart, **327**, 363, 375
 Stanfill, C., 760, *1089*
 Stanford University, 18, 19, 22, 23, 314
 Stanhope Demonstrator, 276
 Staniland, J. R., 505, *1070*
 STANLEY, 28, 1007, 1008, 1014, 1025
 start symbol, **1060**
 state, 367
 repeated, **75**
 world, 69
 State-Action-Reward-State-Action (SARSA), **844**
 state abstraction, **377**
 state estimation, **145**, 181, 269, 275, 570, 978
 recursive, **145**, 571
 States, D. J., 826, *1076*
 state space, **67**, 108
 metalevel, 102
 state variable
 missing, **423**
 static environment, **44**
 stationarity (for preferences), **649**
 stationarity assumption, **708**
 stationary distribution, **537**, 573
 stationary process, **568**, 568–570, 603
 statistical mechanics, 761
 Stefik, M., 473, 557, *1089*
 Stein, J., 553, *1083*
 Stein, L. A., 1051, *1089*
 Stein, P., 192, *1078*
 Steiner, W., 1012, *1067*
 stemming, **870**
 Stensrud, B., 358, *1090*
 step cost, **68**
 Stephenson, T., 604, *1089*
 step size, **132**
 stereopsis, binocular, 948
 stereo vision, **974**
 Stergiou, K., 228, *1089*
 Stern, H. S., 827, *1073*
 Sternberg, M. J. E., 797, *1089*, *1090*
 Stickel, M. E., 277, 359, 884, 921, *1075*, *1076*, *1089*, *1093*
 stiff neck, 496
 Stillier, L., 176, *1089*
 stimulus, 13
 Stob, M., 759, *1084*
 stochastic beam search, **126**
 stochastic dominance, **622**, 636
 stochastic environment, **43**
 stochastic games, **177**
 stochastic gradient descent, **720**
 Stockman, G., 191, *1089*
 Stoffel, K., 469, *1089*
 Stoica, I., 275, *1080*
 Stoic school, 275
 Stokes, I., 432, *1064*
 Stolcke, A., 920, *1089*
 Stoljar, D., 1042, *1081*
 Stone, C. J., 758, *1067*
 Stone, M., 759, *1089*
 Stone, P., 434, 688, *1089*
 Stork, D. G., 763, 827, 966, *1071*, *1089*
 Story, W. E., 109, *1077*
 Strachey, C., 14, 192, 193, *1089*, *1090*
 straight-line distance, **92**
 Strat, T. M., 557, *1087*
 strategic form, **667**
 strategy, **133**, 163, 181, 667
 strategy profile, **667**
 Stratonovich, R. L., 604, 639, *1089*
 strawberries, enjoy, 1021
 Striebel, C. T., 604, *1086*
 string (in logic), **471**
 STRIPS, 367, 393, 394, 397, 432, 434, 799
 Stroham, T., 884, *1069*
 Strohm, G., 432, *1072*
 strong AI, **1020**, 1026–1033, 1040
 strong domination, **668**
 structured representation, **58**, 64
 Stuckey, P. J., 228, 359, *1077*, *1081*
 STUDENT, 19
 stuff, **445**
 stupid pet tricks, 39
 Stutz, J., 826, *1068*
 stylometry, **886**
 Su, Y., 111, *1071*
 subcategory, **440**
 subgoal independence, **378**
 subjective case, 899
 subjectivism, **491**
 submodularity, **644**
 subproblem, **106**
 Subrahmanian, V. S., 192, *1084*
 Subramanian, D., 278, 472, 799, 1050, *1068*, *1087*, *1089*, *1090*
 substance, 445
 spatial, **447**
 temporal, **447**
 substitutability (of lotteries), **612**
 substitution, **301**, 323
 subsumption
 in description logic, **456**
 in resolution, **356**
 subsumption architecture, **1003**
 subsumption lattice, 329
 successor-state axiom, **267**, 279, 389
 successor function, 67
 Sudoku, **212**

Sulawesi, 223
SUMMATION, **1053**
 summer's day, 1026
 summing out, 492, 527
 sum of squared differences, **940**
 Sun Microsystems, 1036
 Sunstein, C., 638, *1090*
 Sunter, A., 556, *1072*
 Superman, 286
 superpixels, **942**
 supervised learning, **695**, 846, 1025
 support vector machine, **744**, 744–748, 754
 sure thing, 617
 surveillance, 1036
 survey propagation, **278**
 survival of the fittest, 605
 Sussman, G. J., 229, 394, *1089*, *1090*
 Sussman anomaly, 394, **398**
 Sutcliffe, G., 360, *1090*
 Sutherland, G. L., 22, *1067*
 Sutherland, I., 228, *1090*
 Sutphen, S., 194, *1088*
 Suttner, C., 360, *1090*
 Sutton, C., 885, *1090*
 Sutton, R. S., 685, 854–857, *1065*, *1090*
 Svartvik, J., 920, *1086*
 Svestka, P., 1013, *1078*
 Svetnik, V. B., 605, *1093*
 Svore, K., 884, *1090*
 Swade, D., 14, *1090*
 Swartz, R., 1022, *1067*
 Swedish, 32
 Swerling, P., 604, *1090*
 Swift, T., 359, *1090*
 switching Kalman filter, **589**, 608
 syllogism, 4, **275**
 symbolic differentiation, 364
 symbolic integration, 776
 symmetry breaking (in CSPs), **226**
 synapse, **11**
 synchro drive, **976**
 synchronization, **427**
 synonymy, 465, 870
 syntactic ambiguity, **905**, 920
 syntactic categories, **888**
 syntactic sugar, **304**
 syntactic theory (of knowledge), **470**
 syntax, 23, **240**, 244
 of logic, 274
 of natural language, 888
 of probability, 488
 synthesis, **356**
 deductive, **356**
 synthesis of algorithms, 356
 Syrjänen, T., 472, *1084*, *1090*

systems reply, 1031
 Szafron, D., 678, 687, *1066*, *1091*
 Szathmáry, E., 155, *1089*
 Szepesvari, C., 194, *1078*

T

T (fluent holds), 446
 T-SCHED, 432
 T4, 431
TABLE-DRIVEN-AGENT, **47**
 table lookup, **737**
 table tennis, 32
 tabu search, **154**, 222
 tactile sensors, **974**
 Tadepalli, P., 799, 857, *1090*
 Tait, P. G., 109, *1090*
 Takusagawa, K. T., 556, *1085*
 Talos, 1011
TALPLANNER, 387
 Tamaki, H., 359, 883, *1084*, *1090*
 Tamaki, S., 277, *1077*
 Tambe, M., 230, *1085*
 Tank, D. W., 11, *1084*
 Tardos, E., 688, *1084*
 Tarjan, R. E., 1059, *1090*
 Tarski, A., 8, 314, 920, *1090*
 Tash, J. K., 686, *1090*
 Taskar, B., 556, *1073*, *1090*
 task environment, **40**, 59
 task network, 394
 Tasmania, 222
 Tate, A., 394, 396, 408, 431, 432, *1064*, *1065*, *1090*
 Tatman, J. A., 687, *1090*
 Tattersall, C., 176, *1090*
 taxi, 40, 694
 in Athens, 509
 automated, 56, 236, 480, 695, *1047*
 taxonomic hierarchy, 24, 440
 taxonomy, **440**, 465, 469
 Taylor, C., 763, 968, *1070*, *1082*
 Taylor, G., 358, *1090*
 Taylor, M., 469, *1089*
 Taylor, R., 1013, *1081*
 Taylor, W., 9, 229, 277, *1068*
 Taylor expansion, **982**
TD-GAMMON, 186, 194, 850, 851
 Teh, Y. W., 1047, *1075*
 telescope, 562
 television, 860
 Teller, A., 155, 554, *1082*
 Teller, E., 155, 554, *1082*
 Teller, S., 1012, *1066*
 Temperley, D., 920, *1089*
 template, **874**

temporal difference learning, 836–838, 853, 854
 temporal inference, 570–578
 temporal logic, **289**
 temporal projection, 278
 temporal reasoning, 566–609
 temporal substance, **447**
 Tenenbaum, J., 314, *1090*
 Teng, C.-M., 505, *1079*
 Tennenholz, M., 855, *1067*
 tennis, 426
 tense, **902**
 term (in logic), **294**, 294
 ter Meulen, A., 314, *1091*
 terminal states, **162**
 terminal symbol, **890**, 1060
 terminal test, **162**
 termination condition, 995
 term rewriting, 359
 Tesauro, G., 180, 186, 194, 846, 850, 855, *1090*
 test set, **695**
TETRAD, 826
 Teukolsky, S. A., 155, *1086*
 texel, **951**
 text classification, **865**, 882
TEXTRUNNER, 439, 881, 882, 885
 texture, **939**, 948, 951
 texture gradient, 967
 Teyssier, M., 826, *1090*
 Thaler, R., 637, 638, *1090*
 thee and thou, 890
THEO, 1047
 Theocharous, G., 605, *1090*
 theorem, **302**
 incompleteness, 8, 352, 1022
 theorem prover, 2, 356
 theorem proving, **249**, 393
 mathematical, 21, 32
 Theseus, 758
 Thiele, T., 604, *1090*
 Thielscher, M., 279, 470, *1090*
 thingification, 440
 thinking humanly, 3
 thinking rationally, 4
 Thitimajshima, P., 555, *1065*
 Thomas, A., 554, 555, 826, *1073*
 Thomas, J., 763, *1069*
 Thompson, H., 884, *1066*
 Thompson, K., 176, 192, *1069*, *1090*
 thought, 4, 19, **234**
 laws of, 4
 thrashing, **102**
 3-SAT, 277, 334, 362
 threshold function, **724**
 Throop, T. A., 187, 195, *1089*

Thrun, S., 28, 605, 686, 884, 1012–1014, 1067, 1068, 1072, 1083–1085, 1087, 1090, 1091
 Tibshirani, R., 760, 761, 763, 827, 1073, 1075
 tic-tac-toe, 162, 190, 197
 Tikhonov, A. N., 759, 1090
 tiling, 737
 tilt, 957
 time (in grammar), 902
 time complexity, 80, 108
 time expressions, 925
 time interval, 470
 time of flight camera, 974
 time slice (in DBNs), 567
 Tinsley, M., 193
 Tirole, J., 688, 1073
 Tishby, N., 604, 1072
 tit for tat, 674
 Titterington, D. M., 826, 1090
 TLPLAN, 387
 TMS, 229, 461, 460–462, 472, 1041
 Tobarra, L., 279, 1064
 Toffler, A., 1034, 1090
 tokenization, 875
 Tomasi, C., 951, 968, 1090
 toothache, 481
 topological sort, 223
 torque sensor, 975
 Torralba, A., 741, 1090
 Torrance, M. C., 231, 1073
 Torras, C., 156, 433, 1077
 total cost, 80, 102
 Toth, P., 395, 1068
 touring problem, 74
 toy problem, 69
 TPTP, 360
 trace, 904
 tractability of inference, 8, 457
 trading, 477
 tragedy of the commons, 683
 trail, 340
 training
 curve, 724
 set, 695
 replicated, 749
 weighted, 749
 transfer model (in MT), 908
 transhumanism, 1038
 transient failure, 592
 transient failure model, 593
 transition matrix, 564
 transition model, 67, 108, 134, 162, 266, 566, 597, 603, 646, 684, 832, 979
 transition probability, 536

transitivity (of preferences), 612
 translation model, 909
 transpose, 1056
 transposition (in a game), 170
 transposition table, 170
 traveling salesperson problem, 74
 traveling salesperson problem (TSP), 74, 110, 112, 119
 Traverso, P., 275, 372, 386, 395, 396, 433, 1066, 1068, 1073, 1088
 tree, 223
 TREE-CSP-SOLVER, 224
 TREE-SEARCH, 77
 treebank, 895, 919
 Penn, 881, 895
 tree decomposition, 225, 227
 tree width, 225, 227, 229, 434, 529
 trial, 832
 triangle inequality, 95
 trichromacy, 935
 Triggs, B., 946, 968, 1069
 Troyanskii, P., 922
 Trucco, E., 968, 1090
 truth, 240, 295
 functionality, 547, 552
 preserving inference, 242
 table, 245, 276
 truth maintenance system (TMS), 229, 461, 460–462, 472, 1041
 assumption-based, 462
 justification-based, 461
 truth value, 245
 Tsang, E., 229, 1076
 Tsitsiklis, J. N., 506, 685, 686, 847, 855, 857, 1059, 1066, 1081, 1084, 1090
 TSP, 74, 110, 112, 119
 TT-CHECK-ALL, 248
 TT-ENTAILS?, 248
 Tumer, K., 688, 1090
 Tung, F., 604, 1086
 tuple, 291
 turbo decoding, 555
 Turcotte, M., 797, 1090
 Turing, A., 2, 8, 14, 16, 17, 19, 30, 31, 54, 192, 325, 358, 552, 761, 854, 1021, 1022, 1024, 1026, 1030, 1043, 1052, 1090
 Turing award, 1059
 Turing machine, 8, 759
 Turing Test, 2, 2–4, 30, 31, 860, 1021
 total, 3
 Turk, 190
 Tversky, A., 2, 517, 620, 638, 1072, 1077, 1090
 TWEAK, 394

Tweedie, F. J., 886, 1078
 twin earths, 1041
 two-finger Morra, 666
 2001: A Space Odyssey, 552
 type signature, 542
 typical instance, 443
 Tyson, M., 884, 1075

U

U (utility), 611
 u_T (best prize), 615
 u_\perp (worst catastrophe), 615
 UCPOP, 394
 UCT (upper confidence bounds on trees), 194
 UI (Universal Instantiation), 323
 Ulam, S., 192, 1078
 Ullman, J. D., 358, 1059, 1064, 1065, 1090
 Ullman, S., 967, 968, 1076, 1090
 ultraintelligent machine, 1037
 Ulysses, 1040
 unbiased (estimator), 618
 uncertain environment, 43
 uncertainty, 23, 26, 438, 480–509, 549, 1025
 existence, 541
 identity, 541, 876
 relational, 543
 rule-based approach to, 547
 summarizing, 482
 and time, 566–570
 unconditional probability, *see*
 probability, prior
 undecidability, 8
 undergeneration, 892
 unicorn, 280
 unification, 326, 326–327, 329, 357
 and equality, 353
 equational, 355
 unifier, 326
 most general (MGU), 327, 329, 353, 361
 UNIFORM-COST-SEARCH, 84
 uniform-cost search, 83, 83–85, 108
 uniform convergence theory, 759
 uniform prior, 805
 uniform probability distribution, 487
 uniform resource locator (URL), 463
 UNIFY, 328
 UNIFY-VAR, 328
 Unimate, 1011
 uninformed search, 64, 81, 81–91, 108, 110
 unique action axioms, 389
 unique names assumption, 299, 540

unit (in a neural network), **728**
 unit clause, **253**, 260, 355
 United States, 13, 629, 640, 753, 755, 922, 1034, 1036
 unit preference, 355
 unit preference strategy, **355**
 unit propagation, **261**
 unit resolution, **252**, 355
 units function, **444**
 universal grammar, **921**
 Universal Instantiation, **323**
 universal plan, 434
 unmanned air vehicle (UAV), **971**
 unmanned ground vehicle (UGV), **971**
 UNPOP, 394
 unrolling, **544**, 595
 unsatisfiability, 274
 unsupervised learning, **694**, 817–820, 1025
 UOSAT-II, 432
 update, 142
 upper ontology, 467
 URL, 463
 Urmson, C., 1014, **1091**
 urn-and-ball, 803
 URP, 638
 Uskov, A. V., 192, **1064**
 Utgoff, P. E., 776, 799, **1082**
 utilitarianism, 7
 utility, **9**, 53, 162, 482
 axioms of, 613
 estimation, **833**
 expected, **53**, 61, 483, 610, 611, 616
 function, **53**, 54, 162, 611, 615–621, 846
 independence, **626**
 maximum expected, **483**, 611
 of money, 616–618
 multiattribute, 622–626, 636, 648
 multiplicative, **626**
 node, **627**
 normalized, **615**
 ordinal, **614**
 theory, **482**, 611–615, 636
 utility-based agent, 1044
 utopia, 1052
 UWL, 433

V

vacuum tube, 16
 vacuum world, 35, 37, 62, 159
 erratic, **134**
 slippery, 137
 vagueness, 547
 Valiant, L., 759, **1091**

validation
 cross, 737, 759, 767
 validation, cross, **708**
 validation set, **709**
 validity, **249**, 274
 value, **58**
 VALUE-ITERATION, **653**
 value determination, 691
 value function, **614**
 additive, **625**
 value iteration, **652**, 652–656, 684
 point-based, 686
 value node, *see* utility node
 value of computation, 1048
 value of information, 628–633, 636, 644, 659, 839, 1025, 1048
 value of perfect information, **630**
 value symmetry, **226**
 VAMPIRE, 359, 360
 van Beek, P., 228–230, 395, 470, 1065, 1078, **1087**, **1091**
 van Bentham, J., 314, **1091**
 Vandenberghe, L., 155, **1066**
 van Harmelen, F., 473, 799, **1091**
 van Heijenoort, J., 360, **1091**
 van Hoeve, W.-J., 212, 228, **1091**
 vanishing point, **931**
 van Lambalgen, M., 470, **1091**
 van Maaren, H., 278, **1066**
 van Nunen, J. A. E. E., 685, **1091**
 van Run, P., 230, **1065**
 van der Gaag, L., 505, **1081**
 Van Emden, M. H., 472, **1091**
 Van Hentenryck, P., 228, **1091**
 Van Roy, B., 847, 855, **1090**, **1091**
 Van Roy, P. L., 339, 342, 359, **1091**
 Vapnik, V. N., 759, 760, 762, 763, 967, 1066, **1069**, **1080**, **1091**
 Varaiya, P., 60, 856, **1072**, **1079**
 Vardi, M. Y., 470, 477, **1072**
 variabilization (in EBL), 781
 variable, **58**
 atemporal, **266**
 elimination, **524**, 524–528, 552, 553, 596
 in continuous state space, **131**
 indicator, **819**
 logic, 340
 in logic, **295**
 ordering, 216, 527
 random, 486, 515
 Boolean, 486
 continuous, 487, 519, 553
 relevance, 528
 Varian, H. R., 688, 759, **1081**, **1091**
 variational approximation, **554**
 variational parameter, **554**
 Varzi, A., 470, **1068**
 Vaucanson, J., 1011
 Vauquois, B., 909, **1091**
 Vazirani, U., 154, 763, **1064**, **1078**
 Vazirani, V., 688, **1084**
 VC dimension, **759**
 VCG, **683**
 Vecchi, M. P., 155, 229, **1078**
 vector, **1055**
 vector field histograms, **1013**
 vector space model, 884
 vehicle interface layer, **1006**
 Veloso, M., 799, **1091**
 Vempala, S., 883, **1084**
 Venkataraman, S., 686, **1074**
 Venugopal, A., 922, **1093**
 Vere, S. A., 431, **1091**
 verification, **356**
 hardware, 312
 Verma, T., 553, 826, **1073**, **1085**
 Verma, V., 605, **1091**
 Verri, A., 968, **1090**
 VERSION-SPACE-LEARNING, **773**
 VERSION-SPACE-UPDATE, **773**
 version space, **773**, 774, 798
 version space collapse, 776
 Vetterling, W. T., 155, **1086**
 Vickrey, W., 681
 Vickrey-Clarke-Groves, **683**
 Vienna, 1028
 views, multiple, 948
 Vinge, V., 12, 1038, **1091**
 Viola, P., 968, 1025, **1091**
 virtual counts, **812**
 visibility graph, **1013**
 vision, **3**, 12, 20, 228, 929–965
 Visser, U., 195, 1014, **1091**
 Visser, W., 356, **1075**
 Vitali set, 489
 Vitanyi, P. M. B., 759, **1080**
 Viterbi, A. J., 604, **1091**
 Viterbi algorithm, **578**
 Vlassis, N., 435, 686, **1089**, **1091**
 VLSI layout, 74, 110, 125
 vocabulary, **864**
 Volk, K., 826, **1074**
 von Mises, R., 504, **1091**
 von Neumann, J., 9, 15, 17, 190, 613, 637, 687, **1091**
 von Stengel, B., 677, 687, **1078**
 von Winterfeldt, D., 637, **1091**
 von Kempelen, W., 190
 von Linne, C., 469
 Voronkov, A., 314, 359, 360, **1086**, 1087

Voronoi graph, **991**
 Vossen, T., 396, **1091**
 voted perceptron, 760
 VPI (value of perfect information), 630

W

Wadsworth, C. P., 314, **1074**
 Wahba, G., 759, **1074**
 Wainwright, M. J., 278, 555, **1081**, **1091**
 Walden, W., 192, **1078**
 Waldinger, R., 314, 394, **1081**, **1091**
 Walker, E., 29, **1069**
 Walker, H., 826, **1074**
WALKSAT, **263**, 395
 Wall, R., 920, **1071**
 Wallace, A. R., 130, **1091**
 Wallace, D. L., 886, **1083**
 Walras, L., 9
 Walsh, M. J., 156, **1072**
 Walsh, T., 228, 230, 278, **1066**, **1087**,
 1089
 Walsh, W., 688, **1092**
 Walter, G., 1011
 Waltz, D., 20, 228, 760, **1089**, **1091**
WAM, 341, 359
 Wang, D. Z., 885, **1067**
 Wang, E., 472, **1090**
 Wang, Y., 194, **1091**
 Wanner, E., 287, **1091**
 Warmuth, M., 109, 759, **1066**, **1086**
WARPLAN, 394
 Warren, D. H. D., 339, 341, 359, 394,
 889, **1085**, **1091**
 Warren, D. S., 359, **1090**
 Warren Abstract Machine (WAM), 341,
 359
 washing clothes, 927
 Washington, G., 450
 wasp, sphex, 39, 425
 Wasserman, L., 763, **1091**
 Watkins, C. J., 685, 855, **1091**
 Watson, J., 12
 Watson, J. D., 130, **1091**
 Watt, J., 15
 Wattenberg, M., 155, **1077**
 Waugh, K., 687, **1091**
WBRIDGE5, 195
 weak AI, **1020**, 1040
 weak domination, **668**
 weak method, **22**
 Weaver, W., 703, 758, 763, 883, 907,
 908, 922, **1088**, **1091**
 Webber, B. L., 31, **1091**
 Weber, J., 604, **1076**
 Wefald, E. H., 112, 191, 198, 1048,
 1087

Wegbreit, B., 1012, **1083**
 Weglarz, J., 432, **1066**
 Wei, X., 885, **1085**
 Weibull, J., 688, **1091**
 Weidenbach, C., 359, **1091**
 weight, **718**
 weight (in a neural network), **728**
WEIGHTED-SAMPLE, **534**
 weighted linear function, **172**
 weight space, **719**
 Weinstein, S., 759, **1084**
 Weiss, G., 61, 435, **1091**
 Weiss, S., 884, **1064**
 Weiss, Y., 555, 605, 741, **1083**,
 1090–1092
 Weissman, V., 314, **1074**
 Weizenbaum, J., 1035, 1041, **1091**
 Weld, D. S., 61, 156, 394–396, 432,
 433, 469, 472, 885, 1036, **1069**,
 1071, **1072**, **1079**, **1085**, **1089**,
 1091, **1092**
 Wellman, M. P., 10, 555, 557, 604, 638,
 685–688, 857, 1013, **1070**, **1076**,
 1091, **1092**
 Wells, H. G., 1037, **1092**
 Wells, M., 192, **1078**
 Welty, C., 469, **1089**
 Werbos, P., 685, 761, 854, **1092**
 Wermuth, N., 553, **1080**
 Werneck, R. F., 111, **1074**
 Wertheimer, M., 966
 Wesley, M. A., 1013, **1092**
 West, Col., 330
 Westinghouse, 432
 Westphal, M., 395, **1086**
 Wexler, Y., 553, **1092**
 Weymouth, T., 1013, **1069**
 White, J. L., 356, **1075**
 Whitehead, A. N., 16, 357, 781, **1092**
 Whiter, A. M., 431, **1090**
 Whittaker, W., 1014, **1091**
 Whorf, B., 287, 314, **1092**
 wide content, **1028**
 Widrow, B., 20, 761, 833, 854, **1092**
 Widrow-Hoff rule, **846**
 Wiedijk, F., 360, **1092**
 Wiegley, J., 156, **1092**
 Wiener, N., 15, 192, 604, 761, 922,
 1087, **1092**
 wiggly belief state, 271
 Wilczek, F., 761, **1065**
 Wilensky, R., 23, 24, 1031, **1092**
 Wilfong, G. T., 1012, **1069**
 Wilkins, D. E., 189, 431, 434, **1092**
 Williams, B., 60, 278, 432, 472, **1083**,
 1092
 Williams, C. K. I., 827, **1086**
 Williams, R., 640
 Williams, R. J., 685, 761, 849, 855,
 1085, **1087**, **1092**
 Williamson, J., 469, **1083**
 Williamson, M., 433, **1072**
 Willighagen, E. L., 469, **1083**
 Wilmer, E. L., 604, **1080**
 Wilson, A., 921, **1080**
 Wilson, R., 227, **1092**
 Wilson, R. A., 3, 1042, **1092**
 Windows, 553
 Winikoff, M., 59, **1084**
 Winker, S., 360, **1092**
 Winkler, R. L., 619, 637, **1089**
 winner's curse, **637**
 Winograd, S., 20, **1092**
 Winograd, T., 20, 23, 884, **1066**, **1092**
 Winston, P. H., 2, 20, 27, 773, 798,
 1065, **1092**
 Wintermute, S., 358, **1092**
 Witbrock, M., 469, **1081**
 Witten, I. H., 763, 883, 884, 921, **1083**,
 1092
 Wittgenstein, L., 6, 243, 276, 279, 443,
 469, **1092**
 Wizard, 553
 Wöhler, F., 1027
 Wojciechowski, W. S., 356, **1092**
 Wojcik, A. S., 356, **1092**
 Wolf, A., 920, **1074**
 Wolfe, D., 186, **1065**
 Wolfe, J., 157, 192, 432, **1081**, **1087**,
 1092
 Wolpert, D., 688, **1090**
 Wong, A., 884, **1087**
 Wong, W.-K., 826, **1083**
 Wood, D. E., 111, **1080**
 Woods, W. A., 471, 921, **1092**
 Wooldridge, M., 60, 61, **1068**, **1092**
 Woolsey, K., 851
 workspace representation, **986**
 world model, in disambiguation, 906
 world state, 69
 World War II, 10, 552, 604
 World Wide Web (WWW), 27, 462,
 867, 869
 worst possible catastrophe, 615
 Wos, L., 359, 360, **1092**
 wrapper (for Internet site), **466**
 wrapper (for learning), **709**
 Wray, R. E., 358, **1092**
 Wright, O. and W., 3
 Wright, R. N., 884, **1085**
 Wright, S., 155, 552, **1092**
 Wu, D., 921, **1092**

- Wu, E., 885, *1067*
 Wu, F., 469, *1092*
 wumpus world, **236**, 236–240, 246–247,
 279, 305–307, 439, 499–503,
 509
 Wundt, W., 12
 Wurman, P., 688, *1092*
 WWW, 27, 462, 867, 869

X

- XCON, 336
 XML, 875
 xor, 246, 766
 Xu, J., 358, *1092*
 Xu, P., 29, 921, *1067*

Y

- Yakimovsky, Y., 639, *1072*
 Yale, 23
 Yan, D., 431, *1073*
 Yang, C. S., 884, *1087*
 Yang, F., 107, *1092*
 Yang, Q., 432, *1092*
 Yannakakis, M., 157, 229, *1065*, *1084*
 Yap, R. H. C., 359, *1077*
 Yardi, M., 278, *1068*
 Yarowsky, D., 27, 885, *1092*
 Yates, A., 885, *1072*

- Yedidia, J., 555, *1092*
 Yglesias, J., 28, *1064*
 Yip, K. M.-K., 472, *1092*
 Yngve, V., 920, *1092*
 Yob, G., 279, *1092*
 Yoshikawa, T., 1013, *1092*
 Young, H. P., 435, *1092*
 Young, M., 797, *1078*
 Young, S. J., 896, 920, *1080*
 Younger, D. H., 920, *1092*
 Yu, B., 553, *1068*
 Yudkowsky, E., 27, 1039, *1093*
 Yung, M., 110, 119, *1064*, *1075*
 Yvanovich, M., 432, *1070*

Z

- Z-3, 14
 Zadeh, L. A., 557, *1093*
 Zahavi, U., 107, *1092*
 Zapp, A., 1014, *1071*
 Zaragoza, H., 884, *1069*
 Zaritskii, V. S., 605, *1093*
 zebra puzzle, 231
 Zecchina, R., 278, *1084*
 Zeldner, M., 908
 Zelle, J., 902, 921, *1093*
 Zeng, H., 314, *1082*
 Zermelo, E., 687, *1093*

- zero-sum game, 161, 162, 199, **670**
 Zettlemoyer, L. S., 556, 921, *1082*, *1093*
 Zhai, C., 884, *1079*
 Zhang, H., 277, *1093*
 Zhang, L., 277, 553, *1083*, *1093*
 Zhang, N. L., 553, 639, *1093*
 Zhang, W., 112, *1079*
 Zhang, Y., 885, *1067*
 Zhao, Y., 277, *1083*
 Zhivotovsky, A. A., 192, *1064*
 Zhou, R., 112, *1093*
 Zhu, C., 760, *1067*
 Zhu, D. J., 1012, *1093*
 Zhu, W. L., 439, *1089*
 Zilberstein, S., 156, 422, 433, 434,
 1075, *1085*
 Zimdars, A., 857, *1087*
 Zimmermann, H.-J., 557, *1093*
 Zinkevich, M., 687, *1093*
 Zisserman, A., 960, 968, *1075*, *1086*
 Zlotkin, G., 688, *1087*
 Zog, 778
 Zollmann, A., 922, *1093*
 Zuckerman, D., 124, *1081*
 Zufferey, J. C., 1045, *1072*
 Zuse, K., 14, 192
 Zweber, M., 432, *1070*
 Zweig, G., 604, *1093*
 Zytkow, J. M., 800, *1079*