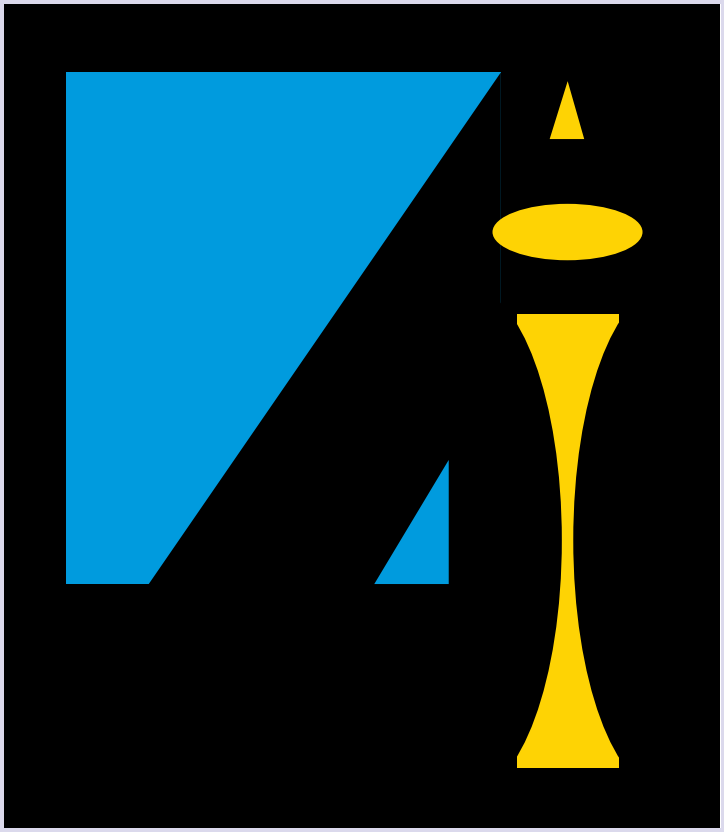
AAAI–94 / IAAI–94



# The Twelfth National Conference on Artificial Intelligence / Sixth Conference on Innovative Applications of Artificial Intelligence

# Registration Brochure

*Sponsored by the American Association for Artificial Intelligence*

July 31 – August 4, 1994

Washington State Convention and Trade Center
Seattle, Washington

## Please Join Us for AAAI-94!

- Three days of technical paper presentations by top scientists in the field
- A series of invited speakers and panels, including the opening keynote address by Raj Reddy
- Twenty four-hour tutorials taught by experienced scientists and practitioners in AI (separate registration fee)
- AAAI–94 / IAAI Joint Exhibition
- AAAI–94 Mobile Robot Exhibition and Competition
- Robot-Building Laboratory (separate registration fee)
- Machine Translation Exhibit
- AI Art Show
- Student Abstract and Poster Program
- Workshops (by invitation only)

Each year, the National Conference on Artificial Intelligence provides a unique opportunity for timely interaction and communication among researchers and practitioners from all areas of AI. This year—in response to popular demand—the program cochairs, the area chairs, and the program committee made a special effort to broaden participation and enliven the conference by increasing the number and variety of papers accepted for presentation and for publication in the proceedings.

Both the call for papers and an article in the Fall, 1993 issue of *AI Magazine* announced the goal of increasing conference participation and invited prospective authors to submit papers on a variety of topics, including those that "describe theoretical, empirical, or experimental results; represent areas of AI that may have been under-represented in recent conferences; present promising new research concepts, techniques, or perspectives; or discuss issues that cross traditional sub-disciplinary boundaries." The community responded enthusiastically, submitting 780 papers to the conference. Extrapolating from the last few years, this is approximately thirty percent higher than the expected number of submitted papers. Moreover, a straw vote among the area chairs indicates that the quality of submitted papers was at least as high as in previous years.

Each paper was reviewed by three reviewers under the supervision of one of twenty-three senior members of the AI community who served as area chairs. Evaluation criteria were expanded in an effort to recognize a broader range of scientific contributions. Reviewers and area chairs were asked to view themselves not as "gatekeepers" looking for reasons to reject papers, but rather as "scouts" looking for interesting papers to accept.

The program committee did an excellent job, increasing both the number and variety of accepted papers. Of the 780 papers originally submitted, 55 were either withdrawn by their authors or rejected without review for arriving after the specified due date or for significantly exceeding specified length limitations. Of the remaining 725 papers, 222 were accepted for the conference. Thus, AAAI-94 will be a bigger conference than in previous years, presenting a good cross-section of AI research. Familiar session topics include qualitative reasoning, case-based reasoning, and constraint satisfaction. Session topics that have not appeared in recent conference years include genetic algorithms and neural nets. Completely new topics include theater and video, art and music, believable agents, and learning robotic agents.

AAAI-94 also will have several other exciting programs. The new Student Abstract and Poster Program, which got over 100 submissions, will present a wonderful opportunity for all of us to get acquainted with some of the up-and-coming talent and their great new research ideas. As in recent years, there will be a video track (with publication for the first time this year as a video collection by AAAI), a robot competition, and a robot exhibition. A new AI and the Arts exhibition will follow the very engaging exhibition introduced at AAAI-92, and there will also be a new Machine Translation exhibition. In addition to an exciting slate of invited speakers (which, at press time, was not yet finalized), the Keynote address will be given by Professor Raj Reddy of Carnegie Mellon University and the AAAI Presidential Address will be given by Professor Barbara Grosz of Harvard University.

In sum, the AI community set a goal this year to revitalize the AAAI conference, to restore its atmosphere of excitement, innovation, controversy, and intellectual engagement. So far, the community and conference committee have made great strides toward achieving that goal. The remaining essential element? YOU! Please join us at AAAI-94.

*Barbara Hayes-Roth and Richard Korf,*
Program Cochairs, AAAI-94

## Please Join Us for IAAI-94!

- Presentations featuring sixteen deployed applications on a variety of topics
- AI-on-Line: a series of issues-oriented panels and talks
- A series of invited speakers and panels, including the opening keynote address by Raj Reddy

The Sixth Annual Conference on Innovative Applications of Artificial Intelligence will showcase the most impressive deployed AI applications of the past year. These applications are winners of a worldwide competition for the best uses of AI technology to solve real-world problems. Winning applications need to be fully deployed and achieve significant business benefit. The organizations honored this year will include many of the most prestigious names in the business world (Lockheed, EDS, Countrywide Funding, Pacific Bell, Bell Atlantic, IBM, AT&T, DuPont) and in the government (IRS, US Customs, US Navy, Texas Mental health, Australian Dept. of Veterans' Affairs). The IAAI conferences continue to demonstrate and showcase the importance of using AI technology within critical business functions.

Applications will be presented in talks that are accompanied by audiovisual presentations and live demonstrations. Meet-the-author discussions at the end of each session encourage close interaction between presenters and other conference participants. IAAI also includes the AI On-Line panels focusing on issues of particular interest to the business and government communities.

IAAI-94 sessions have been scheduled to allow participants to attend Raj Reddy's address as well as to engage in some of the other AAAI activities, including tutorials, workshops, and the exhibition. Please join us for a stimulating and rewarding conference!

*Elizabeth Byrnes,* IAAI-94 Chair
*Jan Aikins,* IAAI-94 Cochair

## *Special Invited Talks Featured at AAAI–94 / IAAI–94. ..*

*Keynote Address*

### The Excitement of AI

*Raj Reddy*

Raj Reddy is Dean of the School of Computer Science at Carnegie Mellon University and the Herbert A. Simon University Professor of Computer Science and Robotics. Dr. Reddy joined Carnegie Mellon's Department of Computer Science in 1969 and served as Director of the Robotics Institute from 1979 to 1992. He was previously an Assistant Professor of Computer Science at Stanford University from 1966 to 1969, and served as an Applied Science Representative for International Business Machines Corporation (IBM) in Australia from 1960 to 1963.

Dr. Reddy's research interests include the study of human-computer interaction and artificial intelligence. His current research projects include speech recognition and understanding systems; collaborative writing, design and planning; JIT Learning Technologies; and the Automated Machine Shop project.

Dr. Reddy's professional honors include: Fellow of the Institute of Electrical and Electronics Engineers; Fellow of the Acoustical Society of America; Fellow of the American Association for Artificial Intelligence; Member of the National Academy of Engineering; President of the American Association for Artificial Intelligence, 1987-89; and recipient of the IBM Research Ralph Gomory Visiting Scholar Award in 1991. Dr. Reddy was presented with France's Legion of Honor by President Mitterrand of France in 1984.

*AAAI Presidential Address*

### Collaborative Systems

*Barbara J. Grosz*

Barbara J. Grosz is Gordon McKay Professor of Computer Science in the Division of Applied Sciences at Harvard University. Grosz pioneered research in computational modeling of discourse and developed the discourse component of a number of natural-language processing systems. Her current research includes development of computational models of collaborative planning, investigations of the interactions between intonation and discourse, and design of techniques for combining natural language and graphics.

Professor Grosz is President of AAAI (1993–1995), and a Fellow of the American Association for the Advancement of Science and the American Association for Artificial Intelligence (AAAI). Before joining the faculty at Harvard, she was Director of the Natural Language program at SRI International, and cofounder of the Center for the Study of Language and Information. Professor Grosz received an A.B. in mathematics from Cornell University, and a Ph.D. in Computer Science from the University of California, Berkeley.

## AAAI Showcase Exhibit on Machine Translation

*August 3–4*

Machine translation is an endeavor that predates even the Dartmouth meeting often viewed as the beginning of AI. To demonstrate its continued progress and recent developments, AAAI will this year include a showcase exhibit of machine translation (MT) systems.

A number of MT systems and MT workbenches, both research and commercial, will participate, providing spectators with hands-on experiences as well as illustrative translation of new texts. In addition, system builders will describe the operation and structure of their systems in some detail.

The showcase will last two days—August 3 and 4, 1994.

## AI-Based Arts Exhibition

*August 2-4*

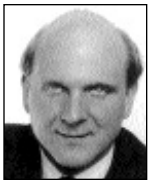
Applications of computing in entertainment and the arts have grown since the Arts Exhibition at AAAI-92. AI has a special role to play in this area, because the most sophisticated applications depend on machines functioning independently as artists, or at least as artistically trained assistants.

This year's exhibition again will be small and carefully selected. We anticipate showing approximately four works, drawn from a variety of areas of artistic performance, including painting, drawing, animation, music, and real-time interactive environments. Each piece will demonstrate the use of concrete AI technologies (such as perception, learning, or agent architectures) in the service of artistic behavior.

*Joint IAAI / IAAI Invited Talk*

### Computing in the '90s: New Platforms, Products, and Partnerships

*Steve Ballmer*



As Executive Vice President of Sales and Support, Steve Ballmer is responsible for Microsoft's sales, support and marketing activities. He shapes the new model of broad customer service in the 1990s, building and maintaining comprehensive long-term relationships with customers.

Ballmer joined Microsoft Corporation in 1980 and has held a number of positions since that time, including Vice President of Marketing and Vice President of Corporate Staffs. Most recently he served the company as Senior Vice President of Systems Software, where he directed the development, marketing and testing of systems software.

Mr. Ballmer is a graduate of Harvard University. After earning a degree in applied math and economics, he worked at Procter and Gamble as an assistant product manager. He then went on to attend the Stanford Graduate School of Business. Mr. Ballmer is a member of the Harvard Board of Overseers.

## The 1994 AAAI Robot Building Laboratory (RBL-94)

*July 31–August 4*

If you missed the fun and excitement of participating in the Robot Building Event of AAAI–93, here is your chance to participate in its formal successor: the 1994 AAAI Robot Building Laboratory (RBL-94) to be held in conjunction with AAAI-94 in Seattle, Washington.

Never built a robot before? No problem! RBL-94 will provide you the opportunity to build one using a variety of sensors, motors, a micro-controller board, and toy parts. By programming it yourself using C or Lisp, you will endow your robot with its own personality and smarts to compete against others in a series of contests.

So you have been working in AI or developing theories for robots? Ever wonder how fast you could build a working robot to test out your ideas? RBL-94 is your answer. It is a facility for rapid prototyping of small robots. These robots may lack the industrial strength robot precision and repeatability. They may also lack the reasoning power of larger robots. However, they make up for it by being cheaper, easier, and faster to build. They are also good replacements for computer simulations and theories by forcing you to deal with the real world - imperfect sensors, motors, wheels, finite energy sources (viz. batteries) and, yes, things do wear out and break in the real world. See what you can do with your ideas with real working robots. See how much of your experience you can impart to your robot.

Perhaps if you had done things a little differently, you might have won the AAAI–93 robot building event. Perhaps you should have built a little more aggressiveness into your robot. Maybe you should not have used that world map. Or maybe you could have replaced that wall-following behavior with something neater. Well, here is your second chance. Participate in RBL-94 and build it right; build to win.

Can your robot outwit the others? You may discover novel and neat ways to do things. Think of the excitement, the possibilities, the fun you will have at RBL-94. So do not miss it; participate in RBL-94.

### Structure of RBL-94

RBL-94 is composed of three major building blocks: Jump Start Session, laboratory, and contests. We strongly recommend that all participants attend the half-day Jump Start Session given by members of the organizing committee on Sunday morning, July 31, 1994. The Jump Start Session will focus exclusively on providing the necessary background and practical advice on robot building.

RBL-94 participants must belong to a team of 4 (3 is permitted). Participants should form teams as quickly as possible. Those who are unable to form their own team will be grouped into teams by the organizing committee.

The laboratory will begin immediately following the Jump Start Session. Robot kits will be distributed to teams at that time. Laboratory work continues (round the clock as necessary), until 2 PM Thursday, August 4, 1994, when the final contest starts.

Each team competes in a series of contests. These contests will take place daily with the final contest to be held the afternoon of Thursday, August 4, 1994.

Each contest is designed to require teams to build more and more capabilities into their robot. The contest-paced robot evolution is designed to help teams effectively manage their development time. It ensures early feedback, gives teams a chance to catch up, maximizes the number of robots ready for the final (most difficult and exciting) contest, and improves participant satisfaction. The final contest will include random elements (e.g., obstacles, doors, etc.), designed to encourage robust robot solutions and cooperative and/or adversarial robot interaction. *Please see registration form for fees and details.*

### Preliminary Schedule

*Sunday, July 31*, 9:00 AM - 12:30 PM: RBL-94 Jump Start Session,
1:00 PM: RBL–94 starts
*Monday, August 1*, 5:00 PM: First contest
*Tuesday, August 2*, 5:00 PM: Second contest
*Wednesday, August 3*, 5:00 PM: Third contest
*Thursday, August 4*, 2:00 PM: Final contest

## 1994 Robot Competition and Exhibition

*July 31-August 2*

"Robby, please deliver these papers to Professor Smith's office." Well, not yet, but we're working on it. The third annual robot competition and exhibition will feature the state of the art in mobile robots acting intelligently (or, at least, trying to) in an unstructured, officelike environment.

The robot competition will be a three-day event designed to test the limits of autonomous mobile robots. The competition will consist of two events:

- Office delivery: Using minimal map information, navigate in offices, around furniture and through corridors to reach a specified goal destination. Go for speed, but watch out for blocked passageways and closed doors!
- Clean up the office: Search the rooms and corridors for rubbish (cans, cups, paper wads) and deposit them in a trashbin. Multiple robots may team up in this event.

The robot exhibition will be an open venue showcasing the diversity of mobile robot research in academia and industry. A wide range of robots (rolling, flying, walking) will be on hand to perform a variety of navigation, manipulation and sensing tasks. The highlight will be the head-to-head finals of the robot competition. Come and cheer on your favorite robots!

During the conference, a forum will be held to enable participants of the competition to present technical aspects of their robotic work, highlighting the AI ideas that enable the robots to operate successfully in complex, unstructured environments. Panels will discuss pertinent issues related to autonomous mobile robots and the problems facing their integration into real office environments. (Forum participation will be by invitation only).

## AAAI–94 Opening Reception

The AAAI–94 opening reception will be held August 2 from 7–9 PM in Seattle's exciting Pacific Science Center. While enjoying a variety of hors d'oeuvres, attendees will also be able to play virtual basketball, match wits with a robot, try out computer software for home or business, compose music, enjoy an amazing moving clock tower sculpture, or star in a coffee commercial at the "Tech Zone," the Center's permanent exhibit. enjoy the Center's Tech Zone permanent exhibit. A no-host bar will also be available.

Admittance to the reception is free to IAAI-94 and AAAI-94 registrants. A $15.00 per person fee will be charged for spouses, children, and other non-technical conference registrants.

## AAAI-94/IAAI-94 Joint Exhibition

The exhibit program will offer exhibits and demonstrations by the leading suppliers of AI software as well as AI consultants and publishers displaying the latest in AI books and periodicals. Graphics presentations by selected exhibitors will be featured in the Applications Pavilion. At the time of publication, 1994 Exhibitors include AAAI Press; Ablex Publishing Corporation; Academia Book Exhibits; Acknosoft; Addison-Wesley Publishing Company; *AI Expert* Magazine; Andersen Consulting; Benjamin/Cummings Publishing Corporation; CINCOM; Cognitive Systems, Incorporated; Elsevier Science Publishers; Exsys, Incorporated; Franz, Incorporated; Gensym Corporation; Harlequin, Incorporated; The Haley Enterprise; IAKE; Kluwer Academic Publishers; Lawrence Erlbaum Associates; Micro Data Base System, Incorporated; The MIT Press; Morgan Kaufmann Publishers; Naval Research Laboratories; *PC AI* Magazine; Prentice Hall; Primetime Freeware; Statute Technologies; Talarian Corporation; and Triodyne.

## 1994 AAAI Tutorials

The AAAI tutorial program for 1994 features twenty four-hour tutorials that explore evolving techniques. Each tutorial is taught by experienced scientists and practitioners in AI. A separate registration fee applies to each tutorial. Tutorials designated "SA" will be held Sunday, July 31 from 9 AM to 1 PM. "SP" tutorials will be held Sunday, July 31, from 2–6 PM. "MA" tutorials will be held Monday, August 1, from 9 PM to 1 PM. "MP" tutorials will be held Monday, August 1, from 2–6 PM.

- ✔ **AI in Customer Service and Support, Including Help Desks (SP5)**
  Avron Barr and Anil Rewari
- ✔ **Applied Machine Learning (SP3)**
  Jeffrey C. Schlimmer
- ✔ **BPR: Using AI to Change the Organization (SP4)**
  Robert A. Friedenberg and Neal M. Goldsmith
- ✔ **Building Expert Systems in the Real World: How to Plan, Organize, Design, Develop, Engineer, Integrate and Manage for Expert Systems Success (SA2)**
  Tod Hayes Loofbourrow and Ed Mahler
- ✔ **Computational Challenges from Molecular Biology (MA1)**
  Peter Karp and Russ B. Altman
- ✔ **Conceptual Foundations of Case-Based Reasoning (SA1)**
  Janet L. Kolodner
- ✔ **Constraint Satisfaction: Theory and Practice (MA2)**
  Eugene C. Freuder and Pascal Van Hentenryck
- ✔ **Genetic Algorithms and Genetics-based Machine Learning (MP1)**
  David E. Goldberg and John R. Koza
- ✔ **Inductive Logic Programming (MP5)**
  Francesco Bergadano and Stan Matwin
- ✔ **Intelligent Multimedia Interfaces (SA4)**
  Mark T. Maybury and Eduard Hovy
- ✔ **Knowledge Acquisition for Knowledge-Based Expert Systems (SP2)**
  Bruce Buchanan and David Wilkins
- ✔ **Knowledge Sharing Technology (MP4)**
  Michael Genesereth and Jeffrey D. Ullman
- ✔ **Learning from Data: A Probabilistic Framework (MA5)**
  Wray Buntine and Padhraic Smyth
- ✔ **Learning from Examples: Recent Topics in Symbolic and Connectionist Learning (SA3)**
  Haym Hirsh and Jude Shavlik
- ✔ **Machine Learning: Combining Current Data with Prior Knowledge (MP2)**
  Tom Mitchell
- ✔ **Modeling Physical Systems: The State of the Art and Beyond (MA4)**
  P. Pandurang Nayak and Peter Struss
- ✔ **Multi-Agent Systems and Distributed Artificial Intelligence (SP1)**
  Jeff Rosenschein and Les Gasser
- ✔ **Practical Scheduling Applications ((SA5)**
  Monte Zweben and Mark Fox
- ✔ **Real-Time Intelligent Planning and Control (MP3)**
  James Hendler, Austin Tate, and David Musliner
- ✔ **Reinforcement Learning (MA3)**
  Leslie Pack Kaelbling, Michael L. Littman, and Andrew W. Moore

SA1

## Conceptual Foundations of Case-Based Reasoning

*Janet L. Kolodner,*
*Georgia Institute of Technology*

Case-based reasoning has matured in the past several years from a research idea to an approach to building applications and providing an approach or paradigm for addressing research problems that have been otherwise inaccessible. Completing these tasks adequately requires an intimate knowledge of CBR's conceptual underpinnings, but the rhetoric associated with CBR has left some people with major misconceptions about indexing and the role of rules and general knowledge in reasoning. In this tutorial, we explore the conceptual underpinnings of CBR in two areas: indexing (including choice of dimensions and vocabulary for indexing) and the cognitive model that case-based reasoning assumes and entails. In the third hour, we will see how those underpinnings can be applied to addressing a hard problem - creativity during design.

*Prerequisite Knowledge:* This tutorial is designed for those who already have strong technical background in AI or cognitive science and who know the basics of case-based reasoning. The tutorial will be largely discussion-based, and is targeted toward faculty and other researchers, advanced graduate students, and those trying to push the current boundaries of CBR in their applications.

**Janet L. Kolodner** is a professor in the College of Computing at Georgia Institute of Technology. She received her Ph.D. in computer science from Yale University in 1980. Her research investigates issues in learning, memory, and problem solving. As part of these investigations, she pioneered case based reasoning as a method for machine problem solving. The emphasis in Kolodner's lab has been on case-based reasoning for situations of real-world complexity. The lab's current emphasis is on the applications of CBR to design and the implications of CBR's cognitive model for decision aiding, education, and creative problem solving. Her newest book, *Case-Based Reasoning*, provides a comprehensive guide to the state of the art in CBR and pulls together and compares the different approaches researchers have made to addressing case-based reasoning's important issues. Professor Kolodner is Editor-in-Chief of the journal *Sciences*. She is also Interim Director of Georgia Tech's Edutech Institute and an AAAI Fellow.

SA2

## Building Expert Systems in the Real World: How to Plan, Organize, Design, Develop, Engineer, Integrate and Manage for Expert Systems Success

*Tod Hayes Loofbourrow,*
*Foundation Technologies Inc. and*
*Ed Mahler, E.G. Mahler and Associates*

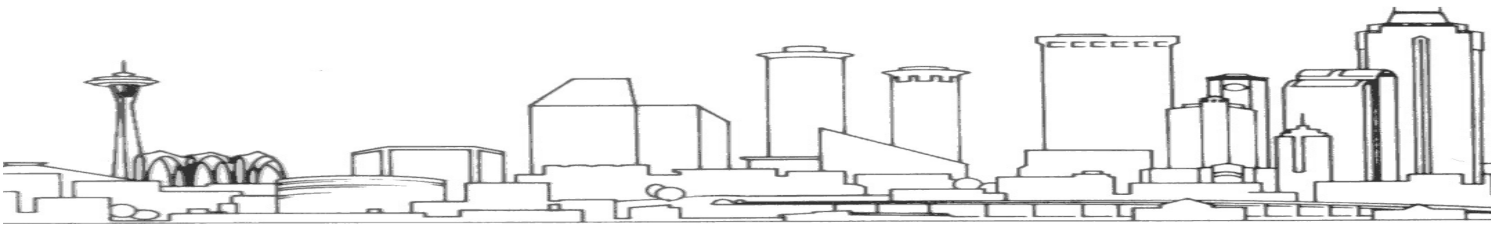
This tutorial will provide participants with an understanding of how companies that have been most successful in applying knowledge-based systems technology have organized, performed, and managed their activities. The tutorial will give participants a look behind the technology, at the organizational steps taken by corporate and divisional managers, project managers, knowledge engineers, functional specialists, and data-processing professionals to successfully build integrated knowledge-based systems, and successfully manage knowledge-based systems projects.

Participants should leave the tutorial with an understanding of the key factors which have led organizations to success in developing integrated knowledge-based systems programs; an understanding of the strategic choices facing individuals and organizations charged with building knowledge-based systems; and a set of concrete steps they can take to improve their ability to successfully develop knowledge-based systems. The tutorial will stress diverse corporate and government examples, and will make use of numerous case studies.

*Prerequisite Knowledge:* No prerequisites are required or assumed, although familiarity with knowledge-based systems is helpful. The tutorial is strategic and tactical, rather than technical, in focus. This tutorial is targeted at five audiences: functional specialists in all business disciplines (manufacturing, marketing, engineering, finance, information systems, etc.) and their supervision; individuals in corporate and government organizations charged with building and managing knowledge-based system projects; individuals interested in shaping organizational behavior and facilitating business process redesign; information systems professionals and their managers; and knowledge engineers.

**Tod Hayes Loofbourrow** is president and CEO at Foundation Technologies, Inc., of Boston, a leading knowledge-technology consulting firm. He has performed strategic consulting for clients worldwide including Aetna, The Federal Reserve, Johnson and Johnson, Liberty Mutual, Peugeot, IBM, Mobil, Reuters, and many others. He teaches graduate courses in artificial intelligence at Harvard, where he created the university's first courses on expert systems.

**Ed Mahler** is presently CEO of E.G. Mahler & Associates, Inc., a knowledge management consulting group located in Wilmington, Delaware. This group offers integrated knowledge system solutions. Dr. Mahler led the worldwide implementation program for intelligent systems at Dupont, an initiative spanning some 1500 employees. During his twenty-five year career at Elcor and Dupont, Dr. Mahler has held numerous managerial positions in research, engineering, manufacturing, strategic planning, and information technology.



SA3

## Learning from Examples: Recent Topics in Symbolic and Connectionist Learning

*Haym Hirsh, Rutgers University and Jude Shavlik, University of Wisconsin*

The task of inductive learning is to take descriptions of a set of examples, each labeled as belonging to some class, and determine a procedure for correctly assigning new examples to these classes. Inductive learning has seen its most vibrant growth in the last decade, with the successful application of both symbolic and connectionist methods to problems arising in practice. In this tutorial, we will cover the following topics: representational issues, such as the engineering of training-data representations appropriate for learning; methodological issues such as experimental design and analysis, as well as the use of pruning to avoid overfitting the training data; and analytical issues such as PAC learning and the interpretation of trained neural networks.

*Prerequisite Knowledge:* This intermediate-level tutorial is designed for those with some experience in artificial intelligence (such as an introductory textbook or course on AI) and basic methods in machine learning, particularly, the ID3 and back-propagation algorithms. It is designed for those interested in acquiring greater depth of understanding of the inductive learning problem and the successful application of symbolic and connectionist learning algorithms in various domains.

**Haym Hirsh** is an assistant professor of computer science at Rutgers University, where he conducts research on applications of machine learning in molecular biology, AI and design, and knowledge representation. He is cochair of the Eleventh International Conference on Machine Learning.

**Jude Shavlik** received his Ph.D. in 1988 from the University of Illinois for his work on explanation-based learning. Since that time he has been on the faculty of the University of Wisconsin Computer Sciences Department. Over the past several years, he has been comparing and combining symbolic and neural-network approaches to machine learning. He is coeditor (with Thomas Dietterich) of *Readings in Machine Learning*, published by Morgan Kaufmann, and was an invited speaker at the 1992 International Machine Learning Conference, where he spoke on combining symbolic and neural learning. He is also the author of several dozen journal and conference papers.

SA4

## Intelligent Multimedia Interfaces

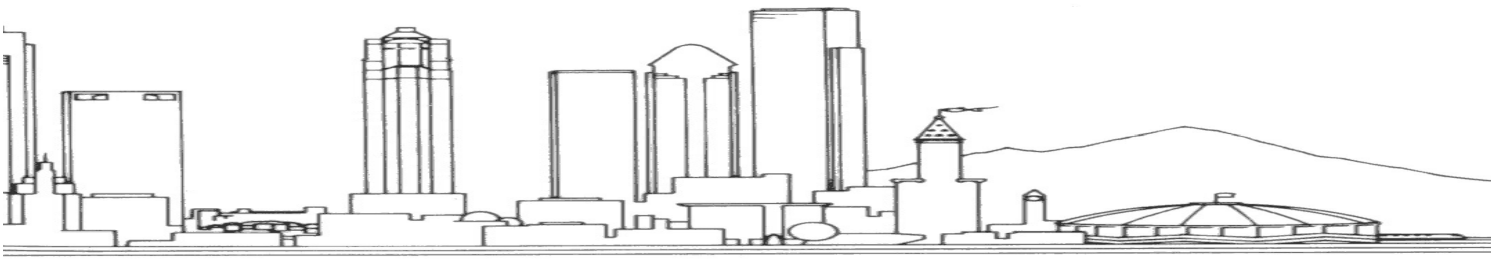
*Mark T. Maybury, MITRE; and Eduard Hovy, USC/Information Sciences Institute*

Multimedia communication is ubiquitous in daily life. When we converse with one another, we use a wide array of media to interact, including spoken language, gestures, and drawings. In communicating we exploit multiple sensory modalities including vision, audition, and taction. Although humans have a natural facility for managing and exploiting multiple media and modalities, computers do not. Consequently, providing machines with the ability to interpret multimedia input (such as natural language, gesture, gaze) and generate coordinated multimedia output (such as natural language, graphics, non-speech audio, maps, animation) would be a valuable facility for a number of key application such as information retrieval and analysis, training, and decision support. This tutorial focuses specifically on the techniques underlying intelligent interfaces that exploit multiple media and modes to facilitate human-computer communication. In addition to surveying the current state of the art, this tutorial identifies directions for future research.

*Prerequisite Knowledge:* No prerequisite knowledge is required, although general knowledge of user interfaces and artificial intelligence will enhance the value of this course for the participants.

**Mark Maybury** is director of the Artificial Intelligence Center at the MITRE Corporation in Bedford, MA. He chaired the AAAI-91 Workshop on Intelligent Multimedia Interfaces and recently edited *Intelligent Multimedia Interfaces* (AAAI/ MIT Press, 1993). Maybury received his Ph.D. in 1991 from the University of Cambridge, England.

**Eduard Hovy** heads the Penman natural language project at ISI and is an assistant research professor of computer science at the University of Southern California in Los Angeles. He received his Ph.D. in computer science (artificial intelligence) from Yale University in 1987. He is the author of one book, the coeditor of two others, has published numbers articles, and organized several national and international workshops.



SA5

## Practical Scheduling Applications

*Monte Zweben, Red Pepper Software Company and Mark Fox, University of Toronto*

This tutorial is intended for AI practitioners, AI researchers, industrial operations managers, production managers, and operations research (OR) experts. The goal of the tutorial is to present real-world scheduling problems and AI solutions to these problems. For researchers, we provide a corpus of problem domains and corresponding search methods. For the industrial audience, we provide suggested solutions to their costly operational problems. The tutorial is organized into distinct problem classes of increasing complexity. Each problem class is specified as a constraint-based optimization problem and grounded in a real-world example. The difficulty of the problem class is analyzed with respect to its domain constraints and its search space. We also indicate where problems deviate from classical constraint satisfaction formalisms (CSPs). Solution methods to these problems are cast in terms of heuristic search techniques. To compare and contrast these search methods we report the empirical and analytical performance of each method and specify the problem parameters that they are sensitive to. We address many practical applications including job shop scheduling, space shuttle maintenance, space station crew scheduling, flow shop scheduling, and Hubble space telescope observation scheduling. We also present a variety of search methods including heuristic dispatch methods, constraint-directed search, beam search, constraint-based iterative repair, min-conflicts iterative repair, bottleneck analysis, and constraint-logic programming.

*Prerequisite Knowledge:* No prerequisite knowledge is required, but familiarity with basic search methods is helpful.

**Monte Zweben** is President and CEO of the Red Pepper Software Company, which produces commercial planning and scheduling systems for manufacturing enterprises and engineering maintenance organizations. Prior to founding Red Pepper, Mr. Zweben was the deputy branch chief of the AI research branch at the NASA Ames Research Center. At NASA, Mr. Zweben managed the Space Shuttle Ground Processing Scheduling (GPSS) project, which is now operationally used at the Kennedy Space Center to coordinate space shuttle repair, maintenance, and refurbishment. Mr. Zweben received his BS in computer science and industrial management from Carnegie Mellon University and his M.S. in computer science from Stanford University. Mr. Zweben is the coeditor (with Mark Fox) of *Intelligent Scheduling*. (San Francisco: Morgan Kaufmann).

**Mark Fox** received his Ph.D. in computer science from Carnegie Mellon University in 1983. He is currently a professor of industrial engineering at the University of Toronto. Fox has served as director of the Intelligent Systems Laboratory, the Center for Integrated Manufacturing Decision Systems, and was a cofounder of Carnegie Group, Inc. Dr. Fox pioneered the application of AI to factory planning and scheduling problems (ISIS), project management (Callisto), and material design (Aladin); he designed PDS/GENAID; and created SRL and KBS. His research interests include enterprise integration, business process re-engineering, concurrent engineering, supply chain management, constraint directed reasoning and common sense modeling. Dr. Fox has published over 50 papers, and is a Fellow of AAAI and CIAR/PRECARN, as well as an AAAI councilor.

SP1

## Multi-Agent Systems and Distributed Artificial Intelligence

*Jeff Rosenschein, Hebrew University, and Les Gasser, University of California, Irvine*

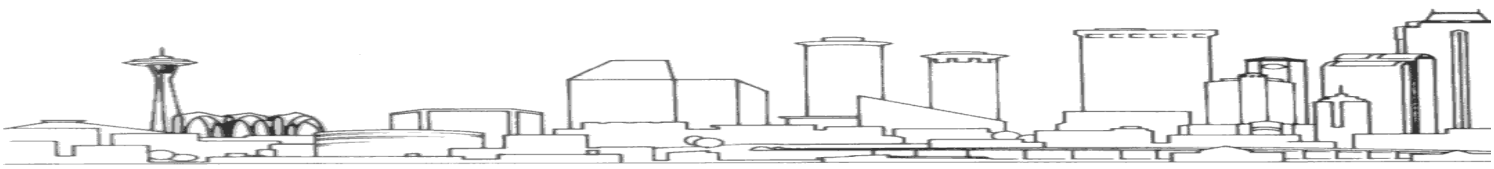
Multi-Agent Systems and Distributed AI (MAS/DAI) are concerned with how to coordinate behavior among a collection of semi-autonomous problem-solving agents: how they can act together, solve joint problems, or make individually and globally reasonable decisions despite uncertainty and conflict. MAS/DAI systems are a research reality; they are rapidly becoming practical partners in such critical tasks as telecommunications management, power distribution, distributed sensor nets, product development, manufacturing, robotics, enterprise integration/coordination, organization design, and other fields.

This tutorial will provide a thorough survey of problems, techniques and applications in contemporary multi-agent systems and distributed AI. We'll develop a comprehensive picture of current knowledge and contemporary currents in MAS/DAI, in preparation for building MAS/DAI Systems or as background for doing advanced research on outstanding MAS/DAI problems. Both presenters have participated in the MAS/DAI world since the early 1980s, and have served on the program committees of numerous DAI workshops, panels, and conferences.

*Prerequisite Knowledge:* This tutorial is designed for people who are professionally interested in building MAS/DAI systems; for AI researchers interested in learning about a range of MAS/DAI approaches,; and for technology planners and managers who need to know about leading-edge technologies. The tutorial presumes knowledge of AI at the level of an introductory AI course. Attendees should be familiar with general concepts such as first-order predicate calculus, object-oriented systems, Lisp, hierarchical and nonlinear planning, heuristic search, knowledge-based systems, reasoning under uncertainty, and so on.

**Jeffrey S. Rosenschein** received his Ph.D. (1986) in computer science from Stanford University. He is currently a lecturer in the computer science Department at Hebrew University. Dr. Rosenschein's research focuses on cooperation and competition among high-level problem solvers. He has taught DAI courses at Hebrew University and in industry, and has authored more than thirty technical articles on distributed AI. He is coauthor of a book on multi-agent interaction, to be published in 1994 by MIT Press.

**Les Gasser** received his Ph.D. (1984) in computer science from the University of California, Irvine. He is an associate professor (research) and codirector of the Computational Organization Design Laboratory at the University of Southern California, and has served on the faculties of the Ecole des Mines de Paris and the Université de Paris (VI). He has published over fifty technical articles and three books on Distributed AI



SP2

## Knowledge Acquisition for Knowledge-Based Expert Systems

*Bruce Buchanan, University of Pittsburgh and*
*David Wilkins, University of Illinois*

Since the creation of the first knowledge-based expert systems over two decades ago, many techniques have been developed to partially or fully automate the building and maintenance of knowledge-based systems. The goal of this course is to provide an overview of these techniques for those who wish to harness this accumulated store of techniques, and for those who wish to extend the state of the art. Major strides have been made recently in the field of automated knowledge acquisition; the great majority of the material covered in this course describes advances made within the last five years. A unique feature of this tutorial is a description of the Sisyphus knowledge acquisition competition. In this international competition, participants will show the efficacy of their knowledge acquisition tool by applying it to a standardized suite of real-world knowledge acquisition tasks.

*Prerequisite Knowledge:* This tutorial is intended for those who are interested in creating better methods or using the best of the existing methods of knowledge acquisition for knowledge-based systems. All areas of artificial intelligence are moving toward more knowledge-intensive methods of problem solving, and hence face the tedious process of acquiring and maintaining the relevant knowledge. The prerequisite knowledge is a graduate-level introduction to artificial intelligence course.

**Bruce G. Buchanan** is a professor of computer science, with joint appointments in the departments of medicine and philosophy, at the University of Pittsburgh. Previously, he was on the faculty in computer science at Stanford University, where he codirected the Knowledge Systems Laboratory. He has coauthored *Applications of Artificial Intelligence for Chemical Inference: The Dendral Project* (1980), *Rule-Based Expert Systems: The Mycin Experiments of the Stanford Heuristic Programming Project* ( 1984), and *Readings in Knowledge Acquisition and Learning: Automating the Construction and Improvement of Expert Systems* (1992). He has presented numerous lectures and tutorials, and has taught graduate-level courses in artificial intelligence and expert systems. Dr. Buchanan serves on the editorial boards of *Artificial Intelligence, Knowledge Acquisition, Expert Systems,* and *Machine Learning.*

**David C. Wilkins** is an assistant professor of computer science at the University of Illinois at Urbana-Champaign and where he directs the Knowledge-based Systems Laboratory. He coedited *Readings in Knowledge Acquisition and Learning: Automating the Construction and Improvement of Expert Systems* with Bruce Buchanan in 1992; presented "School of Machine Learning" in Brussels in 1991; and cochaired conference tracks on knowledge acquisition at the Eighth Machine Learning Workshop in 1991. Dr. Wilkins is on the editorial boards of *Knowledge Acquisition* and the *Journal of Expert Systems.*

SP3

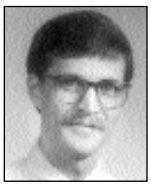
## Applied Machine Learning

*Jeffrey C. Schlimmer, School of Electrical Engineering and Computer Science, Washington State University*

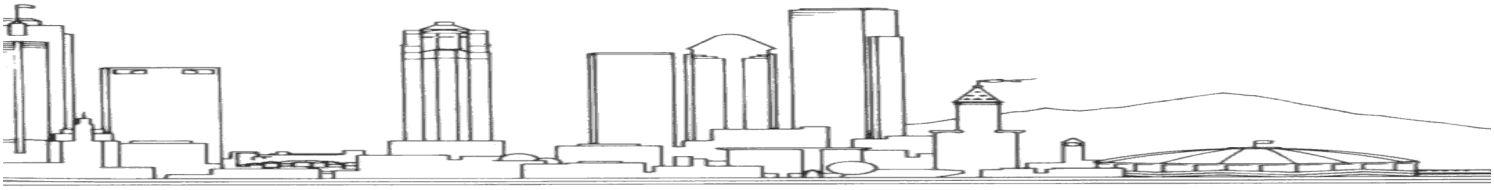
Machine learning is an innovative technology that is finding uses in many areas of computing and industry. This tutorial will discuss four proven learning methods, illustrate their use in industrial settings, and present animations of their basic operations. You will come to understand the basic issues in applying machine learning as well as key representation and algorithmic issues. To complement the tutorial, each attendee will receive a copy of the course notes, fully indexed; a video tape showing the learning methods in use and animations of their algorithms; a floppy disk containing commented Common Lisp source code for the four learning methods discussed; and a copy of a current text in machine learning for future reference. Attendees will be equipped to begin applying machine learning technology to problems of their own.

**There is an additional fee of $38.25 for these materials.**

*Prerequisite Knowledge:* The tutorial assumes some experience with the basics of computer science. Attendees will also find it helpful to have some background in search and knowledge representation. No prior knowledge of machine learning methods is assumed.



**Jeffrey C. Schlimmer** is an assistant professor of computer science at Washington State University. He received his Ph.D. in 1987 from the University of California, Irvine in the area of machine learning. From then until 1991, he held the positions of research associate and project scientist at Carnegie Mellon University. Dr. Schlimmer is a member of the editorial board of *Machine Learning* and is the author of seminal papers in the area of machine learning. His research is funded by Apple Computer, Digital Equipment Corporation, NASA, and the National Science Foundation.



SP4

## BPR: Using AI to Change the Organization

*Robert A. Friedenberg, Inference Corporation; and*
*Neal M. Goldsmith, Tribecca Research*

Business process re-engineering (BPR) is a technique used to replace a company's existing evolved infrastructure with one that is designed. Novel ways of structuring operations and organizations are actively sought, and out-of-the-box thinking about the IT process is encouraged. BPR has become so popular that virtually every Fortune 1000 company is employing the technique. Knowledge engineers are good candidates to work on re-engineering projects because of their skills in understanding how people use information to make business decisions. Knowledge-based systems are often recommended as a result of BPR analyses in order to automate decision making.
If people in the AI community have good skills to perform BPR analysis, and good skills to implement the resulting automation, then we ought to know what BPR is about, what it can and can't do, how it happens, and issues and opportunities it offers. This tutorial will begin with an overview of basic concepts of BPR analysis and implementation. Case examples will be provided illustrating the techniques used, in some cases literally to turn companies around through re-engineering. Illustrations where BPR implementation included knowledge-based systems will be discussed. After the case studies, attendees will be invited to describe their own experiences and to begin to apply BPR concepts and cases directly. AI tools to perform BPR analysis will *not* be discussed in detail.

*Prerequisite Knowledge:* This is an introductory tutorial. No formal business background is required.

**Robert A. Friedenberg,** Ph.D. is vice president of Inference Corporation's Business Process Re-engineering Consulting Group. The focus of this group is redesigning business organizations within the context of maximizing the benefits of advanced technologies. Dr. Friedenberg has also managed projects in the manufacturing, financial services, communications, and retail industries for such companies as Coopers and Lybrands, Shearson Lehman Brothers, Citibank, N.A., Touche Ross & Co., and Ebasco Services, Inc. Dr. Friedenberg has a Ph.D. in physics from Case-Western Reserve University and an MBA in corporate strategy from New York University.

**Neal M. Goldsmith,** Ph.D., is president of Tribeca Research, a technology management consulting firm specializing in strategy, process re-engineering, and advanced technology change management. He also publishes *Business Technology*. Previously, Dr. Goldsmith was director of technology strategy for American Express and an AI analyst and consultant at Gartner Group.

SP5

## AI in Customer Service and Support, Including Help Desks

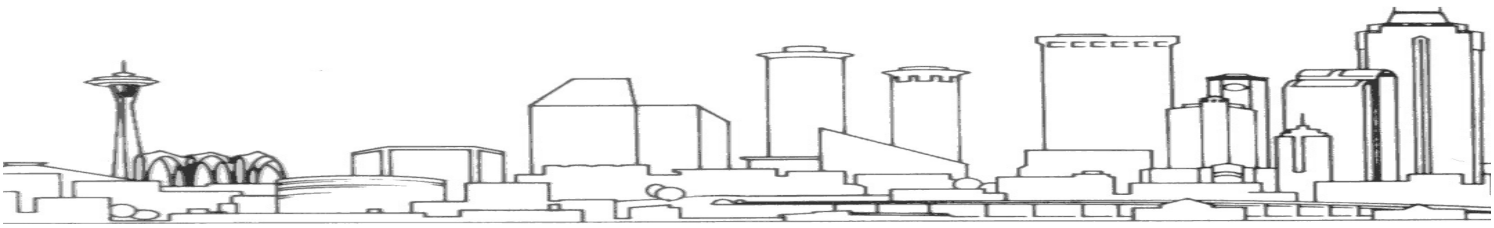
*Avron Barr, Aldo Ventures, Inc., and*
*Anil Rewari, Digital Equipment Corporation*

This tutorial will survey the use of AI technology in customer service and support—areas that are poised to be the leading areas for revenue growth for many companies in the 1990s. It is exciting to note that in addition to conventional rule-based approaches, many of the AI systems currently fielded are using more complex and powerful AI techniques. First, we focus on some of the more sophisticated AI techniques being used in developing intelligent applications, such as case-based reasoning, semantic networks, model-based reasoning, neural nets, natural language processing, and distributed AI. These are exemplified by describing real applications in service organizations. We then focus on areas within service and support where AI techniques are being used. These include troubleshooting systems, information management systems, force planning and dispatch systems, and automatic letter generation systems, among others. Given the emphasis nowadays in service organizations on help desks and call centers, we discuss this topic in greater detail. We then describe and compare some of the popular shells that are available to build service and support applications. Finally, we look at some current areas of AI research such as knowledge sharing, multi-functional knowledge bases, machine learning, and distributed AI and argue that customer service and support activities are good testbeds for research using these techniques.

*Prerequisite Knowledge:* Some familiarity with AI.

**Avron Barr** is an independent consultant and writer. He studied AI at Stanford and coedited *The Handbook of Artificial Intelligence.* Barr has been consulting about knowledge engineering, support automation, knowledge publishing, and the changing role of corporate MIS departments for eleven years with corporations and technology vendors .

**Anil Rewari** is a principal software engineer at Digital Equipment Corporation. He has worked on diagnostic and advisory systems for service and support using advanced AI techniques. He chaired workshops on related topics at AAAI–93 and CAIA–92, and is the guest editor of a series on this theme in *IEEE Expert*. Rewari holds an MS from the University of Massachusetts, Amherst.



MA1

## Computational Challenges from Molecular Biology

*Peter Karp, SRI International, and*
*Russ B. Altman, Stanford Program in Medical Informatics*

Computational problems in molecular biology provide a rich set of challenges for artificial intelligence researchers. These problems have the potential to motivate the development of more powerful AI techniques, and to shift the focus of AI researchers from toy problems to real problems with large potential payoffs. Such payoffs range from the satisfaction and respect that comes from making scientific discoveries in biology, to the commercial rewards of applications in biotechnology.

This tutorial will introduce computational problems in molecular biology to computer scientists, with an emphasis on challenges to AI. We will provide a brief road map to computational biology in general, and then focus on those problems that are particularly challenging and important. Attendees will be exposed to a smorgasbord of problems and provided with a clear problem definition, a review of approaches that have been tried, a summary of progress-to-date, and a distillation of chief lessons and challenges that remain within that problem area. Part I of the tutorial will briefly survey computational biology in general, including a review of the fundamental biological notions that will be used throughout the tutorial. Part II will provide a breadth-first summary of those problems that may be amenable to solution by AI techniques. Throughout the tutorial, we will discuss the research culture of this area.

*Prerequisite Knowledge:* We anticipate that tutorial attendees will have a firm understanding of computer science. Attendees will be lost unless they acquire a basic knowledge of biology, which can be obtained by reading Chapter One of *Artificial Intelligence and Molecular Biology*, by Lawrence Hunter (AAAI / MIT Press).

**Russ Altman** is an assistant professor of medicine (and computer science, by courtesy) in the section on medical informatics at Stanford University. His research interests currently focus on new methods for the analysis and prediction of RNA and protein structure, especially with respect to probabilistic algorithms and evaluation of uncertainty. He also is interested in the use of abstract representations of protein and nucleic acids for the purposes of more efficient computation, and in the integration of heterogeneous databases.

**Peter Karp** is a computer scientist in the Artificial Intelligence Center at SRI International. He was a postdoctoral fellow at the National Center for Biotechnology Information at the National Institute of Health. His research focuses on building large biological knowledge bases to support tasks such as design, simulation, and machine learning. He is constructing a large knowledge base of biochemical pathways, and is investigating techniques for extending the storage capabilities of knowledge representation systems and for providing them with multiuser access capabilities.

MA2

## Constraint Satisfaction: Theory and Practice

*Eugene C. Freuder, University of New Hampshire, and*
*Pascal Van Hentenryck, Brown University*

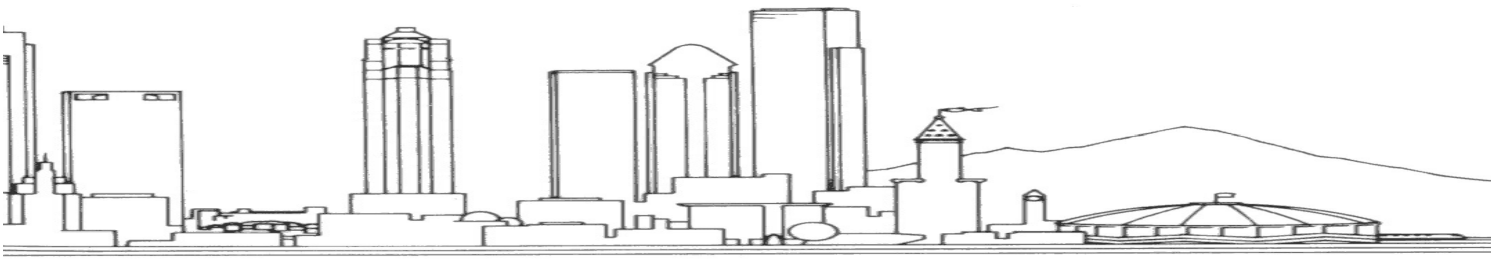
Constraint satisfaction is a powerful artificial intelligence problem-solving paradigm with many applications, such as configuration and design problems, planning and scheduling, temporal and spatial reasoning, machine vision and language understanding, qualitative and diagnostic reasoning, and expert systems. The ideal of describing a constraint problem domain in natural, declarative terms, then letting general deductive mechanisms synthesize individual problem solutions, has been to some extent realized, and even embodied in programming languages.

In this tutorial you will see how a wide variety of problems can be expressed in terms of constraints. You will be introduced to basic search and constraint propagation techniques and will learn the rudiments of constraint logic programming. A number of applications and case studies will be presented. Both symbolic and numeric constraints will be considered. This tutorial will present material at several levels, providing you with a sense of the paradigm's potential, as well as a basic technical background.

*Prerequisite Knowledge:* This tutorial should be accessible to anyone with a rudimentary knowledge of computer science, although attendees with experience in algorithms or programming languages will be better prepared to absorb some of the more technical material.

**Eugene Freuder** is a professor at the University of New Hampshire. He is a coeditor of the *Artificial Intelligence Journal* special volume: *Constraint-Based Reasoning*. Last year he copresented a tutorial at IJCAI with Dr. Van Hentenryck and lectured at the NATO Advanced Study Institute on Constraint Programming.

**Pascal Van Hentenryck** is an assistant professor at Brown University. He is a principal designer and implementor of CHIP, the constraint programming language now widely used in industry,. Van Hentenryck is also the author of *Constrain Satisfaction in Logic Programming* (MIT Press) and an NSF National Young Investigator.



MA3

## Reinforcement Learning

*Leslie Pack Kaelbling, Michael L. Littman, and Andrew W. Moore*

Reinforcement learning—the problem of learning from trial and error—has become a recent new focus of attention in the machine learning community. In this tutorial, we will discuss the basic formal background of reinforcement learning, then consider a number of important technical questions and some proposed solutions. These questions include: How should an agent explore its environment? How can it learn to select appropriate actions when their effects are only apparent in the future? When is it useful for the agent to build a model of the dynamics of its world, rather than simply to learn a reactive strategy? How can an agent take advantage of the idea that similar situations will require similar reactions? What happens if the agent is unable to completely perceive the state of its environment? We will conclude with a discussion of applications of reinforcement learning and of the important currently open problems.

*Prerequisite Knowledge:* An undergraduate-level knowledge of probability theory and mathematical notation, and some familiarity with the concepts and methods of machine learning are assumed. No previous knowledge about reinforcement learning or Markov models is necessary.

**Leslie Pack Kaelbling** was one of the first researchers to bring reinforcement learning to bear on problems of AI. Her recent book, *Learning in Embedded Systems*, has been hailed as a foundational treatment of reinforcement learning. Kaelbling was educated at Stanford University, has held positions at SRI International and Teleos Research, and is currently an assistant professor of computer science at Brown University.

**Michael L. Littman**'s research has spanned such areas of computer science as artificial life, statistical natural language processing, and high dimensional visualization. He is currently on leave from Bellcore, the research consortium of the regional telephone companies, to do his doctoral work in reinforcement learning at Brown University.

**Andrew Moore** is an assistant professor at Carnegie Mellon University, in the school of computer science and the Robotics Institute. His focus is on efficient algorithms to make complex autonomous systems learn. Moore has contributed widely to machine learning literature, and has applied his techniques to robots and industrial manufacturing tasks.

MA4

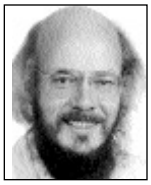
## Modeling Physical Systems: The State of the Art and Beyond

*P. Pandurang Nayak and Peter Struss*

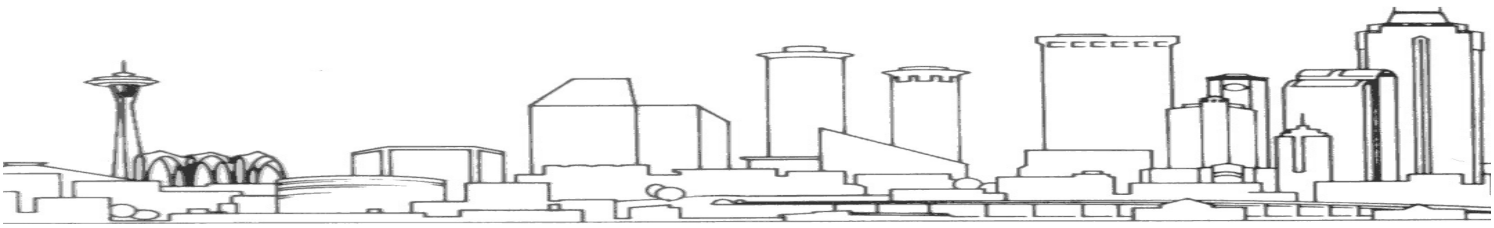
Reasoning about the physical world has always been a key problem in AI. Recently, model-based systems have become a focal point of both theoretical and practical work, and the field is now mature enough for generating significant applications. Designing an adequate model for the domain and task at hand is the key problem and step. The goal of this tutorial is to provide participants with an understanding of the issues involved in effectively modeling and reasoning about physical systems. The tutorial is organized around a number of examples of real world application domains including electro-mechanical systems (space shuttle subsystems, automobile subsystems, power networks), kinematics, chemical plants, and ecological systems. We will use these examples to focus on the specific problems that arise in modeling real systems, and show how existing techniques can be used, and where such techniques prove to be inadequate. The tutorial will analyze the properties of different ontological choices in modeling physical systems, discuss different models of behavior that support various tasks (such as simulation, tutoring, and diagnosis), and present methods for reasoning about change. We will show how the requirements of knowledge and software reuse lead to the need for compositional modeling and multiple models of phenomena, discuss recent work on automated modeling, and conclude with a discussion of other practical issues that arise in building a model-based system, including architectures and performance.

*Prerequisite Knowledge:* No extensive knowledge in AI is required, but basics knowledge of algebra, differential equations, logic, and knowledge representation and reasoning would be helpful, (although they aren't mandatory).

**P. Pandurang Nayak** is a principal investigator in the artificial intelligence research branch of the NASA Ames Research Center. He completed his Ph.D. in computer science from Stanford University in 1992 on the topic of automated modeling of physical systems. His current research interests include diagnosis, simulation, modeling, abstractions, and approximations.



**Peter Struss** has been working on qualitative reasoning and model-based systems for more than a decade. Until 1992, he was the head of a group in industrial research and development of knowledge-based systems. He is currently working as a private lecturer at the Technical University of Munich and as a consultant for industrial applications of model-based systems.



MA5

## Learning from Data: A Probabilistic Framework

*Wray Buntine, RIACS and NASA Ames Research Center; and Padhraic Smyth, Jet Propulsion Laboratory, California Institute of Technology*

The variety of different learning algorithms currently being touted in the literature and the marketplace make it difficult to objectively evaluate competing approaches. In this tutorial, we will present a probabilistic framework for learning that will allow participants to understand and compare various algorithms from a single unified perspective. Our goal is to provide a clear understanding of the basic principles that underlie probabilistic models of learning (including maximum likelihood and Bayesian approaches) and the application of these principles in algorithmic form. This tutorial will focus in particular on the interrelationships which exist among popular learning models, such as decision trees, neural network models, and memory-based methods. We will present a unified approach to understanding the basic motivation and concepts behind each model, with appropriate reference to particular algorithms, methods, and real-world applications. This presentation will serve as the basis for a wide-ranging discussion of general learning theory, practical application issues (such as how to handle missing data), and current research developments.

*Prerequisite Knowledge:* An understanding of basic concepts in probability, computing, and elementary calculus is required. Familiarity with some learning, data analysis, or knowledge discovery methods, theory, or applications would be helpful but is not essential.

**Padhraic Smyth** received his Ph.D. in electrical engineering in 1988 from the California Institute of Technology. Since 1988, he has worked at the Jet Propulsion Laboratory, Pasadena, where he is principal investigator of several projects investigating the applications of statistical pattern recognition to problems of interest to NASA.

**Wray Buntine** is a scientist at the Research Institute for Advanced Computer Science and NASA Ames AI Research Branch. Buntine applies data analysis to NASA problems, and has taught courses covering probabilistic approaches to learning at University of California, Berkeley and Stanford University. He is the author of the IND tree learning package, and has research publications in the applications and theory of learning and data analysis.

MP1

## Genetic Algorithms and Genetics-based Machine Learning

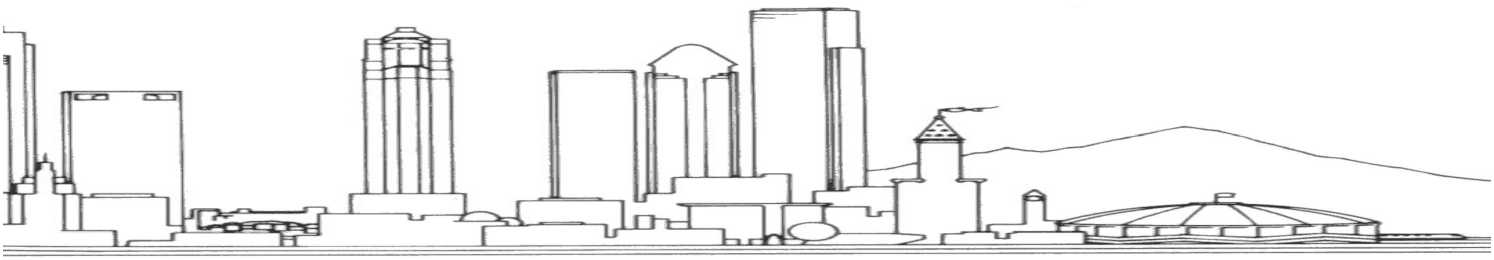
*David E. Goldberg, University of Illinois at Urbana-Champaign; and John R. Koza, Stanford University*

This tutorial will introduce participants to the ideas and applications of genetic algorithms (GAs)—computer search procedures based on the mechanics of natural genetics and natural selection—and genetics-based machine learning (GBML)—machine learning techniques that use genetic algorithms and their derivatives. GAs and GBML are receiving increased attention in practical yet difficult search and machine learning problems across a spectrum of disciplines. In this tutorial, will review the mechanics of a simple genetic algorithm and consider the implicit parallelism that underlies its power. A parade of current search applications will be reviewed along with more advanced GA techniques such as niching and messy GAs. The two most prominent techniques of GBML, *classifier systems* and *genetic programming* will also be surveyed.

*Prerequisite Knowledge:* Knowledge of genetic algorithms or biological concepts is not assumed. A general familiarity with computers and programming is required.

**David E. Goldberg** is a professor of general engineering at the University of Illinois at Urbana-Champaign. He holds a Ph.D. from the University of Michigan and has written papers on the application and foundations of genetic algorithms. His book *Genetic Algorithms in Search, Optimization, and Machine Learning* (Addison-Wesley, 1989) is widely used and his recent studies have considered traditional GA speed, convergence, and accuracy as well as the design of nontraditional GAs—called messy GAs—that work faster, better, and more reliably.

**John R. Koza** is a consulting professor of computer science at Stanford University. He received his Ph.D. in computer science from the University of Michigan in the field of machine learning and induction in 1972. He currently is investigating the artificial breeding of computer programs and has written two books: *Genetic Programming: On the Programming of Computer by Means of Natural Selection*(MIT Press, 1992) and *Genetic Programming II* (MIT Press, 1994). Between 1973 and 1987 he was chief executive officer of Scientific Games Incorporated in Atlanta, and he is currently a principal in Third Millennium Venture Capital Limited in California.



MP2

## Machine Learning: Combining Current Data with Prior Knowledge

*Tom Mitchell, Carnegie Mellon University*

The key question in machine learning is how to infer general regularities from specific training examples. Purely inductive learning methods such as decision tree and neural network methods solve this generalization problem by examining large numbers of training examples in order to determine which example features are essential and which are irrelevant. While these methods work well given sufficient data, they scale poorly to problems where data is scarce or where very complex functions must be learned. Recently, a number of learning methods have been developed that address this shortcoming by using prior knowledge to augment available training data. These recent methods have been demonstrated to generalize more correctly than pure inductive approaches across a variety of application domains, even when they are given prior knowledge that is full of errors and incomplete.

This session will survey this new class of learning methods, focusing on methods that have been demonstrated to outperform purely inductive methods, and to be robust to errors in prior knowledge. We will cover methods based on symbolic representations (such as FOCL, ML-SMART), neural network representations (such as EBNN), and combined representations (such as KBANN). We will consider both applications in which prior knowledge is provided by human experts and those in which prior knowledge is itself learned by the system.

*Prerequisite Knowledge:* Participants are assumed to have a basic knowledge of AI concepts.

**Tom M. Mitchell** is a professor of computer science and robotics at Carnegie Mellon University, and is Director of the Design Systems Laboratory within the Engineering Design Research Center. He earned his B.S. Degree (1973) from MIT and his M.S. (1975) and Ph.D. (1978) degrees from Stanford University. He taught in the computer science department at Rutgers University from 1978 until moving to Carnegie Mellon in 1986. In 1983 he received the IJCAI Computers and Thought award in recognition of his research in machine learning, and in 1984 received a National Science Foundation Presidential Young Investigator Award. In 1990 he was elected a Fellow of AAAI. His research interests include artificial intelligence, machine learning, knowledge based systems and robotics. A major current interest lies in developing learning apprentice systems: interactive knowledge-based advisors that learn continuously from observing decisions made by their users.

MP3

## Real-Time Intelligent Planning and Control

*James Hendler, University of Maryland;*
*Austin Tate, University of Edinburgh; and*
*David Musliner, University of Maryland*

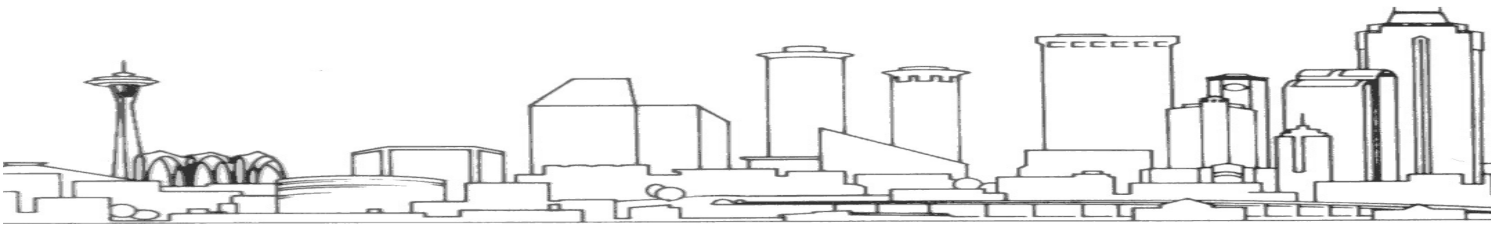
Recently, researchers have become increasingly interested in applying AI planning and control methods to systems that are required to operate in real-time dynamic domains. The potential applications are both diverse and economically important; for example, air traffic control, intelligent vehicle or highway systems, flexible manufacturing, and emergency medical care. However, traditional AI methods are not well suited to meeting the response time deadlines that are characteristic of such real-time domains. For mission-critical applications, classical AI planning is not enough. This tutorial aims to provide participants with an understanding of the issues involved in designing and building intelligent agents that can operate in these demanding domains. The tutorial will briefly review past work in the design of AI planning systems, and will then describe more recent, reactive approaches to such real-world control problems and describe the special constraints imposed by considerations of real-time performance. We will present detailed case studies of both toy and real-world systems that demonstrate aspects of real-time intelligent control behavior.

*Prerequisite Knowledge:* This tutorial is aimed at both the industrial AI practitioner interested in the development of intelligent real-time control and the AI researcher interested in learning about current research in planning and reactive behaviors. The presenters will assume a background in AI (academic or industrial), but only a basic familiarity with planning research.

**James Hendler** is an associate professor and head of the Autonomous Mobile Robots Laboratory at the University of Maryland. He is associate editor of Connection Science and the Journal of Experimental and Theoretical AI, and has authored or edited five books on planning and related fields. He is currently writing a textbook on AI planning systems.

**Austin Tate** is the Technical Director of the Artificial Intelligence Applications Institute (AIAI) at the University of Edinburgh. In the mid 1970s, he developed the Nonlin planner and its associated Task Formalism. Professor Tate's work now involves o-plan (open planning architecture), a flexible workbench for planning and control of tasks such as factory management, spacecraft operations, and distribution logistics. He is an advisor to the European Space Agency and assists a number of large multi-national corporations in their use of AI techniques.

**David Musliner** earned his Ph.D. at the University of Michigan in 1993, and is currently a researcher and lecturer at the University of Maryland. His dissertation described the cooperative intelligent real-time control architecture (CIRCA), one of the first AI systems capable of reasoning about and interacting with hard real-time domains.



MP4

## Knowledge Sharing Technology

*Michael Genesereth and Jeffrey D. Ullman, Stanford University*

This tutorial will provide both an introduction to knowledge sharing technology and an overview of present and potential applications. Technical topics will include knowledge interchange languages (notably KIF) , approaches to knowledge base update and revision, techniques for safe and efficient automated reasoning, collaboration among knowledge sharing systems, algorithms for processing logic queries efficiently, and techniques for efficient processing active elements, such as rules and constraints. Application topics will include integration of heterogeneous databases, automated and computer-aided design, distributed expert systems, software interoperation, software and hardware verification, and personal agents.

*Prerequisite Knowledge:* This tutorial should be of special value to the computer science professional who is interested in learning about this technology; it should also be of value to the knowledge technology professional who is interested in present and potential applications.

**Michael Genesereth** is an associate professor in the computer science department at Stanford University. Professor Genesereth is most known for his work on logical systems and applications of that work in engineering automation and software interoperation - for which work he has received multiple awards. He is the author of a popular book in AI; he has been program chairman for the national AI conference; and he serves on the editorial board of the *Artificial Intelligence Journal.* He is a member of the advisory board for the Arpa Knowledge Sharing Effort and cochairman of the Interlingus Committee. He is the director of the Center for Information Technology at Stanford.

**Jeffrey Ullman** is chair of the computer science department at Stanford University. His current research involves integration of heterogeneous, distributed databases. He has written numerous books on topics such as database systems, compilers, and algorithms. He is a member of the National Academy of Engineering, a former chair of the Computer Science GRE examining committee, former member of the ACM council, and several government advisory boards. He is on the editorial boards of *Journal of Computer and System Sciences, Journal of Logic Programming,* and *Theoretical Computer Science.*

MP5

## Inductive Logic Programming

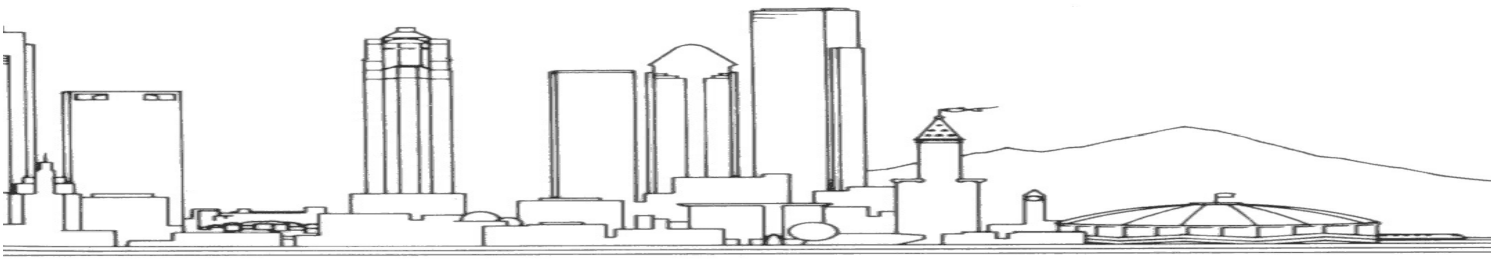
*Francesco Bergadano, University of Catania, Italy, and Stan Matwin, University of Ottawa*

Inductive logic programming (ILP) is a new field in AI, combining contributions from machine learning and logic programming. ILP learns relational (first-order logic) concept descriptions from facts. ILP can be viewed as a technique that develops logic programs from known instances of their input-output behavior. At the same time, ILP is a relational learning technique, reaching beyond the limitations of inductive learning systems based on attribute-value representation of examples and concepts. During the last several years, ILP has become a burgeoning research topic in Europe and in Japan, resulting in a well-founded theory and a number of important application domains. This tutorial will clarify the goals and the motivations of ILP in a simplified problem setting, with an analysis of possible variants and difficulties. Classical computational methods for learning Horn clauses from examples will be described in simplified form. We will then survey the recent, successful applications of ILP in areas such as pharmaceuticals design, protein folding, satellite control, CAD, and software tools.

*Prerequisite Knowledge:* Attendees are expected to have an understanding of basic logic programming notions. Some familiarity with recent machine learning research will make the motivations and the goals of ILP more easily understood.

**Francesco Bergadano** is an associate professor of computer science at the University of Catania, Italy. He has also taught AI at George Mason University. An author of more than fifty refereed papers, Bergadano has served on the program committee of major AI meetings including IJCAI and the International Machine Learning Conference, and will cochair the next European Machine Learning Conference. He also taught the machine learning tutorial at IJCAI–91.

**Stan Matwin** is a professor of computer science at the University of Ottawa, Canada. Matwin has published more than seventy papers in journals and refereed international conferences. He has been a program committee member for a number of conferences in machine learning, and is also Secretary of the Canadian Society for Computational Studies of Intelligence, a member of the Editorial Board of *IEEE Expert*, and vice-chair of IFIP Working Group 12.2 (machine learning).



## Conference Program at a Glance

| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY |
|---|---|---|---|---|
| | *IAAI–94 Conference* | | | |
| | | *AAAI–94 Technical Conference* | | |
| *Tutorials* | | | | |
| *Workshops* | | | | |
| *Robot Competition* | | | | |
| | | | *Machine Translation Showcase* | |
| *Robot Building Laboratory* | | | | |
| | | *Art Exhibit* | | |
| | | *Exhibits* | | |
| | | *Student Abstracts* | | |
| | *AAAI–94 / IAAI–94 Invited Talks* Keynote Address Presidential Address | | | |
| | | | *Tours (Also Friday)* | |

# IAAI-94 Preliminary Program

## Monday, August 1

8:30–9:00 AM
Opening Remarks
*Liz Byrnes*

9:00–9:30 AM
ALEXIS: An Intelligent Layout Tool for Publishing
*Hong-Gian Chew and Moung Liang, Information Technology Institute; Philip Koh, Daniel Ong and Jen-Hoon Tan, Singapore Press Holdings*

9:30–10:00 AM
Clavier: Applying Case-Based Reasoning to Composite Fabrication
*David Hinkle and Christopher N. Toomey, Lockheed AI Center*

10:00–10:20 AM
**Break**

10:20–10:50 AM
Clues: Countrywide Loan Underwriting Expert System
*Houman Talebzadeh, Sanda Mandutianu and Chris Winner, Countrywide Funding Corporation*

10:50–11:50 AM
Invited Talk: Automating the Distribution of Knowledge
*Avron Barr, Aldo Ventures, Inc.*
As AI technologies evolve to meet the demands of the service and support market, they are maturing from problem-solving curiosities into key enablers of a new medium.

11:50 AM–12:20 PM
Meet the Authors

12:20–2:00 PM
**Lunch**

2:00–3:30 PM
AI-on-Line Panel: Gaining Support for AI Technologies within Your Organization
*Ken Kleinberg, New Science Associates*

3:30–3:50 PM
**Break**

3:50–4:20 PM
Automating Human Service Practice Expertise—ASAP The Automated Screening and Assessment Package
*Susan Millea and Mary Anne Mendall, University of Texas at Austin*

4:20–4:50 PM
CCPS: Transforming Claims Processing Using *STATUTE* CORPORATE for Microsoft Windows
*Belinda Burgess, Francis Cremen, Peter Johnson and David Mead, SoftLaw Corporation Pty Ltd.*

4:50–5:20 PM
The Employee/Contractor Determiner
*Cheryl Wagner and Gary Morris, IRS AI Lab*

5:20–5:50 PM
Meet the Authors

6:00–7:00 PM
**IAAI–94 Opening Reception**

## Tuesday, August 2

9:00–10:10 AM
Keynote Address: The Excitement of AI
*Raj Reddy, Carnegie Mellon University*

10:10–10:30 AM
**Break**

10:30 AM–12:10 PM
AAAI–94 / IAAI–94 Joint Invited Talk: Computing in the '90s: New Platforms, Products, and Partnerships
*Steven Ballmer, Microsoft Corporation*

12:10–2:00 PM
**Lunch**

2:00–2:30 PM
Expert Investigation and Recovery of Telecommunication Charges
*Hieu Le, Pacific Bell; Gary Vrooman, Phil Klahr, David Coles and Mike Stoler, Inference Corp.*

2:30–3:00 PM
Embedded AI for Sales-Service Negotiation
*Mike Carr, Chris Costello, Karen McDonald and Debbie Cherubino, Bell Atlantic; Pamela Kemper, Inference Corporation*

3:00–3:30 PM
Integrated Problem Resolution for Business Communications
*Carol Hislop, AT&T and David Pracht, Inference*

3:30–3:50 PM
**Break**

3:50–4:20 PM
An Assistant for Re-Engineering Legacy Systems
*Zheng-Yang Liu, Michael Ballantyne and Lee Seward, EDS*

4:20–4:50 PM
Routine Design for Mechanical Engineering
*Axel Brinkop and Norbert Laudwein, Fraunhofer Institute for Information-and Data-Processing and Rudiger Maassen, EKATO*

4:50–5:20 PM
Model Based Test Generation for Processor Verification
*Yossi Lichtenstein, Yossi Malka and Aharon Aharon, IBM Science and Technology*

5:20–5:50 PM
Meet the Authors

## Wednesday, August 3

9:00–9:30 AM
The Operations Overtime Scheduling System—An Expert System Case Study
*Chris Eizember, E.I. duPont de Nemours & Co., Inc.*

9:30–10:00 AM
CCTIS: An Expert Transactions Processing System
*Terrance Swift, SUNY Stony Brook; Calvin C. Henderson, Richard Holberger and Edward Neham, Systems Development and Analysis; John Murphy, DHD Systems*

10:00–10:20 AM
**Break**

10:20–11: 30 AM
Invited Talk: Commercial Natural Language: Critical Success Factors
*Larry Harris, Linguistic Technology*
Harris addresses the technological and marketing issues that are critical to the success of commercial natural language systems. The real issues are not necessarily where we expected them to be.

11:30 AM–12:00 PM
Meet the Authors

12:00–2:00 PM
**Lunch**

2:00–2:30 PM
The VLS Tech Assist Expert System (VTAEXS)
*Robert A. Small, Vitro Corporation and Bryan Yoshimoto, Naval Surface Warfare Center*

2:30—3:00 PM
ASAP—An Approval System for Automated Procurement
*R. A. Chalmers, R. B. Pape, R. J. Rieger and W. K. Shirado, Lockheed Palo Alto Research Laboratory*

3:00–3:20 PM
**Break**

3:20–4:50 PM
AI-on-Line Panel: Reinventing AI Applications in the Age of the Information Super Highway
*Monte Zweben, Red Pepper Software*

# AAAI Preliminary Program

## Tuesday, August 2

9:00–10:10 AM
Keynote Address: The Excitement of AI
*Raj Reddy, Carnegie Mellon University*

10:10–10:30 AM
**Break**

10:30 AM–12:10 PM
AAAI–94 / IAAI–94 Joint Invited Talk: Computing in the '90s: New Platforms, Products, and Partnerships
*Steven Ballmer, Microsoft Corporation*

10:30 AM–12:10 PM
*Session 1*
### Distributed AI: Collaboration

10:30–10:50 AM
A Collaborative Parametric Design Agent
*Daniel Kuokka and Brian Livezey, Lockheed Palo Alto Research Laboratories*

10:50–11:10 AM
A Computational Market Model for Distributed Configuration Design
*Michael P. Wellman, University of Michigan*

11:10–11:30 AM
Exploiting Meta-Level Information in a Distributed Scheduling System
*Daniel E. Neiman, David W. Hildum, Victor R. Lesser and Tuomas Sandholm, University of Massachusetts*

11:30–11:50 AM
Divide and Conquer in Multi-agent Planning
*Eithan Ephrati, University of Pittsburgh and Jeffrey S. Rosenschein, Hebrew University*

11:50 AM–12:10 PM
Progressive Negotiation for Resolving Conflicts among Distributed Heterogeneous Cooperating Agents
*Taha Khedro and Michael R. Genesereth, Stanford University*

10:30 AM–12:10 PM
*Session 2*
### Model-Based Reasoning

10:30–10:50 AM
Reasoning with Models
*Roni Khardon and Dan Roth, Harvard University*

10:50–11:10 AM
An Operational Semantics for Knowledge Bases
*Ronald Fagin and Joseph Y. Halpern, IBM Almaden Research Center; Yoram Moses, Weizmann Institute; Moshe Y. Vardi, Rice University*

11:10–11:30 AM
How Things Appear to Work: Predicting Behaviors from Device Diagrams
*N. Hari Narayanan, Hiroshi Motoda and Masaki Suwa, Hitachi Ltd.*

11:30–11:50 AM
Representing Multiple Theories
*P. Pandurang Nayak, Recom Technologies, NASA Ames Research Center*

11:50 AM–12:10 PM
Prediction Sharing Across Time and Contexts
*Oskar Dressler and Hartmut Freitag, Siemens*

10:30 AM–12:10 PM
*Session 3*
### Advances in Backtracking

10:30–10:50 AM
Solution Reuse in Dynamic Constraint Satisfaction Problems
*Gérard Verfaillie, University of New Hampshire and Thomas Schiex, ONERA-CERT*

10:50–11:10 AM
The Hazards of Fancy Backtracking
*Andrew B. Baker, University of Oregon*

11:10–11:30 AM
In Search of the Best Search: An Empirical Evaluation
*Daniel Frost and Rina Dechter, University of California, Irvine*

11:30–11:50 AM
Dead-End Driven Learning
*Daniel Frost and Rina Dechter, University of California, Irvine*

11:50 AM–12:10 PM
Weak-Commitment Search for Solving Constraint Satisfaction Problems
*Makoto Yokoo, NTT Communication Science Laboratories*

10:30 AM–12:10 PM
*Session 4*
### Cognitive Modeling

10:30–10:50 AM
The Capacity of Convergence-Zone Episodic Memory
*Mark Moll, University of Twente; Risto Miikkulainen, University of Texas; Jonathan Abbey, Applied Research Laboratories*

10:50–11:10 AM
A Model of Creative Understanding
*Kenneth Moorman and Ashwin Ram, Georgia Institute of Technology*

11:10–11:30 AM
Experimentally Evaluating Communicative Strategies: The Effect of the Task
*Marilyn A. Walker, Mitsubishi Electric Research Laboratories*

11:30–11:50 AM
A Reading Agent
*Tamitha Carpenter and Richard Alterman, Brandeis University*

11:50 AM–12:10 PM
Ordering Relations in Human and Machine Planning
*Lee Spector, Mary Jo Rattermann, and Kristen Prentice, Hampshire College*

10:30–11:50 AM
*Session 5*
### Lexical Acquisition / Syntax

10:30–11:30 AM
### Lexical Acquisition

10:30–10:50 AM
Lexical Acquisition in the Presence of Noise and Homonymy
*Jeffrey Mark Siskind, University of Toronto*

10:50–11:10 AM
The Ups and Downs of Lexical Acquisition
*Peter M. Hastings, University of Michigan and Steven L. Lytinen, DePaul University*

11:10–11:50 AM
### Syntax

11:10–11:30 AM
L* Parsing: A General Framework for Syntactic Analysis of Natural Language
*Eric K. Jones and Linton M. Miller, Victoria University of Wellington*

11:30–11:50 AM
Principled Multilingual Grammars for Large Corpora
*Sharon Flank and Paul Krause, Systems Research and Applications Corporation; Carol Van Ess-Dykema, Department of Defense*

12:10–1:30 PM
**Lunch**

1:30–3:10 PM

*Session 6*

### Task Network Planning / Planning Under Uncertainty

1:30–2:30 PM

### Task Network Planning

1:30–1:50 PM

The Use of Condition Types to Restrict Search in an AI Planner

*Austin Tate, Brian Drabble and Jeff Dalton, University of Edinburgh*

1:50–2:10 PM

Schema Parsing: Hierarchical Planning for Expressive Languages

*Anthony Barrett and Daniel S. Weld, University of Washington*

2:10–2:30 PM

HTN Planning: Complexity and Expressivity

*Kutluhan Erol, James Hendler and Dana Nau, University of Maryland*

2:30–3:10 PM

### Planning Under Uncertainty

2:30–2:50 PM

An Algorithm for Probabilistic Least-Commitment Planning

*Nicholas Kushmerick, Steve Hanks and Daniel Weld, University of Washington*

2:50–3:10 PM

Control Strategies for a Stochastic Planner

*Jonathan Tash and Stuart Russell, University of California, Berkeley*

1:30–3:10 PM

*Session 7*

### Genetic Algorithms and Simulated Annealing

1:30–1:50 PM

Genetic Programming and AI Planning Systems

*Lee Spector, Hampshire College*

1:50–2:10 PM

Exploiting Problem Structure in Genetic Algorithms

*Scott Clearwater and Tad Hogg, Xerox Palo Alto Research Center*

2:10–2:30 PM

Improving Search through Diversity

*Peter Shell, Carnegie Mellon University*

2:30–2:50 PM

Hierarchical Chunking in Classifier Systems

*Gerhard Weiss, Technische Universität München*

2:50–3:10 PM

Increasing the Efficiency of Simulated Annealing Search by Learning to Recognize (Un)promising Runs

*Yoichiro Nakakuku, NEC; and Norman Sadeh, Carnegie Mellon University*

1:30 - 3:10 PM

*Session 8*

### Automated Reasoning I

1:30–1:50 PM

Avoiding Tests for Subsumption

*Anavai Ramesh and Neil V. Murray, State University of New York at Albany*

1:50–2:10 PM

ModGen: Theorem Proving by Model Generation

*Sun Kim and Hantao Zhang, University of Iowa*

2:10–2:30 PM

Using Hundreds of Workstations to Solve First-Order Logic Problems

*Alberto Maria Segre and David B. Sturgill, Cornell University*

2:30–2:50 PM

Recovering Software Specifications with Inductive Logic Programming

*William W. Cohen, AT&T Bell Laboratories*

2:50–3:10 PM

Termination Analysis of OPS5 Expert Systems

*Hsiu-yen Tsai and Albert Mo Kim Cheng, University of Houston*

1:30–3:10 PM

*Session 9*

### Decision-Tree Learning

1:30–1:50 PM

Decision Tree Pruning: Biased or Optimal

*Sholom M. Weiss, Rutgers University; and Nitin Indurkhya, University of Sydney*

1:50–2:10 PM

Learning Decision Lists Using Exhaustive Search

*Richard Segal and Oren Etzioni, University of Washington*

2:10–2:30 PM

Induction of Multivariate Regression Trees for Design Optimization

*B. Forouraghi, L. W. Schmerr and G. M. Prabhu, Iowa State University*

2:30–2:50 PM

Bottom-Up Induction of Oblivious Read-Once Decision Graphs: Strengths and Limitations

*Ron Kohavi, Stanford University*

2:50–3:10 PM

Branching in Decision Trees Generation

*Usama M. Fayyad, California Institute of Technology*

3:10 - 3:30

**Break**

3:30–5:10 PM

*Session 10*

### Instructional Environments

3:30–3:50 PM

An Instructional Environment for Practicing Argumentation Skills

*Vincent Aleven and Kevin D. Ashley, University of Pittsburgh*

3:50–4:10 PM

Learning From Highly Flexible Tutorial Instruction

*Scott B. Huffman and John E. Laird, University of Michigan*

4:10–4:30 PM

Tailoring Retrieval to Support Case-Based Teaching

*Robin Burke, University of Chicago and Alex Kass, Northwestern University*

4:30–4:50 PM

Customer-Initiative Case-Base Indexing and Interface for Mission Critical Helpdesk Applications

*Hideo Shimazu, Akihiro Shibata and Katsumi Nihei, NEC Corporation*

4:50–5:10 PM

Situated Plan Attribution for Intelligent Tutoring

*Randall W. Hill, Jr., California Institute of Technology / JPL and W. Lewis Johnson, USC/Information Sciences Institute*

3:30–4:50 PM

*Session 11*

### Two-Player Games

3:30–3:50 PM

Best-First Minimax: Othello Results

*Richard E. Korf and David Maxwell Chickering, University of California, Los Angeles*

3:50–4:10 PM

Evolving Neural Networks to Focus Minimax Search

*David E. Moriarty and Risto Miikkulainen, University of Texas at Austin*

4:10–4:30 PM

An Analysis of Forward Pruning

*Stephen J. J. Smith and Dana S. Nau, University of Maryland*

4:30–4:50 PM

A Strategic Metagame Player for General Chess-Like Games

*Barney Pell, NASA Ames Research Center*

3:30–4:50 PM

*Session 12*

### Knowledge Acquisition, Capture, and Integration

3:30–3:50 PM
Knowledge Refinement in a Reflective Architecture
*Yolanda Gil, USC/Information Sciences Institute*

3:50–4:10 PM
A User Interface for Knowledge Acquisition from Video
*Henry Lieberman, Massachusetts Institute of Technology*

4:10–4:30 PM
Building Non-Brittle Knowledge-Acquisition Tools
*Jay T. Runkel and William P. Birmingham, University of Michigan*

4:30–4:50 PM
The Acquisition, Analysis and Evaluation of Imprecise Requirements for Knowledge-Based Systems
*John Yen, Xiaoqing Liu and Swee Hor Teh, Texas A & M University*

3:30–4:50 PM

*Session 13*

### Non-Monotonic Reasoning

3:30–3:50 PM
Reasoning About Priorities in Default Logic
*Gerhard Brewka, GMD Schloss Birlinghoven*

3:50–4:10 PM
A Knowledge Representation Framework Based on Autoepistemic Logic of Minimal Beliefs
*Teodor C. Przymusinski, University of California, Riverside*

4:10–4:30 PM
Soundness and Completeness of a Logic Programming Approach to Default Logic
*Grigoris Antoniou and Elmar Langetepe, Universität Osnabrück*

4:30–4:50 PM
Is Intractability of Non-Monotonic Reasoning a Real Drawback?
*Marco Cadoli, Francesco M. Donini and Marco Schaerf, Università di Roma*

7:00–9:00 PM
**AAAI–94 Opening Reception**
*Pacific Science Center*

## Wednesday, August 3

9:00–10:10 AM
Presidential Address: Collaborative Systems
*Barbara Grosz, Harvard University*

10:10–10:30 AM
**Break**

10:30 AM–12:10 PM

*Session 14*

### Planning: Representation

10:30–10:50 AM
Causal Pathways of Rational Action
*Charles L. Ortiz, Jr., University of Pennsylvania*

10:50–11:10 AM
Reasoning with Constraints on Fluents and Events
*Eddie Schwalb, Kalev Kask and Rina Dechter, University of California, Irvine*

11:10–11:30 AM
On the Nature of Modal Truth Criteria in Planning
*Subbarao Kambhampati , Arizona State University and Dana S. Nau, University of Maryland*

11:30–11:50 AM
Generalizing Indexical-Functional Reference
*Marcel Schoppers and Richard Shu, Robotics Research Harvesting; Bonnie Webber, University of Pennsylvania*

11:50 AM–12:10 PM
To Sense or Not to Sense?
*Keith Golden, Oren Etzioni and Daniel Weld, University of Washington*

10:30 AM–12:10 PM

*Session 15*

### Spatial Reasoning

10:30–10:50 AM
Spatial Reasoning in Indeterminate Worlds
*Janice Glasgow, Queen's University*

10:50–11:10 AM
A Model for Integrated Qualitative Spatial and Dynamic Reasoning about Physical Systems
*Raman Rajagopalan, University of Texas at Austin*

11:10–11:30 AM
One-Dimensional Qualitative Spatial Reasoning
*Ralf Röhrig, Laboratory for Artificial Intelligence, Hamburg*

11:30–11:50 AM
Automatic Depiction of Spatial Descriptions
*Patrick Olivier, University of Wales; Toshiyuki Maeda and Jun-ichi Tsujii, University of Manchester*

11:50 AM–12:10 PM
On the Basic Meanings of Spatial Relations: Computation and Evaluation in 3D Space
*Klaus-Peter Gapp, Universität des Saarlandes*

10:30 AM–12:10 PM

*Session 16*

### Natural Language Applications

10:30–10:50 AM
A Prototype Reading Coach that Listens
*Jack Mostow, Steven Roth, Alexander G. Hauptmann and Matthew Kane, Carnegie Mellon University*

10:50–11:10 AM
Automated Postediting of Documents
*Kevin Knight and Ishwar Chander, USC/Information Sciences Institute*

11:10–11:30 AM
Visual Semantics: Extracting Visual Information from Text Accompanying Pictures
*Rohini K. Srihari and Debra T. Burhans, State University of New York at Buffalo*

11:30–11:50 AM
Building a Large-Scale Knowledge Base for Machine Translation
*Kevin Knight and Steve Luk, USC/Information Sciences Institute*

11:50 AM–12:10 PM
Kalos: A System for Natural Language Generation with Revision
*Ben E. Cline and J. Terry Nutter, Virginia Polytechnic Institute and State University*

10:30 AM–12:10 PM

*Session 17*

### Case-Based Reasoning

10:30–10:50 AM
Towards More Creative Case-Based Design Systems
*Linda M. Wills and Janet L. Kolodner, Georgia Institute of Technology*

10:50–11:10 AM
Retrieving Semantically Distant Analogies with Knowledge-Directed Spreading Activating
*Michael Wolverton and Barbara Hayes-Roth, Stanford University*

11:10–11:30 AM
Heuristic Harvesting of Information for Case-Based Argument
*Edwina L. Rissland, David B. Skalak and M. Timur Friedman, University of Massachusetts*

11:30–11:50 AM
Case-Based Acquisition of User Preferences for Solution Improvement in Ill-Structured Domains
*Katia Sycara, Carnegie Mellon University and Kazuo Miyashita, Matsushita Electric Industrial Co.*

11:50 AM–12:10 PM
Experience-Aided Diagnosis for Complex Devices
*M. P. Feret and J. I. Glasgow, Queen's University*

10:30 AM–12:10 PM
*Session 18*
### Perception

10:30–10:50 AM
Topological Mapping for Mobile Robots Using a Combination of Sonar and Vision Sensing
*David Kortenkamp, The MITRE Corporation and Terry Weymouth, University of Michigan*

10:50–11:10 AM
Sensible Decisions: Toward A Theory of Decision-Theoretic Information Invariants
*Keiji Kanazawa, University of California*

11:10–11:30 AM
A New Approach to Tracking 3D Objects in 2D Image Sequences
*M. Chan and D. Metaxas, University of Pennsylvania; S. Dickinson, University of Toronto*

11:30–11:50 AM
Automatic Symbolic Traffic Scene Analysis Using Belief Networks
*T. Huang, D. Koller, J. Malik, G. Ogasawara, B. Rao, S. Russell and J. Weber, University of California, Berkeley*

11:50 AM–12:10 PM
Applying VC-Dimension Analysis to 3D Object Recognition from Perspective Projections
*Michael Lindenbaum and Shai Ben-David, Technion*

12:10–1:30 PM
**Lunch**

1:30–3:10 PM
*Session 19*
### Art / Music

1:30–1:50 PM
### Art

1:30–1:50 PM
Criticism, Culture, and the Automatic Generation of Artworks
*Lee Spector and Adam Alpern, Hampshire College*

1:50–3:10 PM
### Music

1:50–2:10 PM
The Synergy of Music Theory and AI: Learning Multi-Level Expressive Interpretation
*Gerhard Widmer, University of Vienna and the Austrian Research Institute for Artificial Intelligence*

2:10–2:30 PM
Simulating Creativity in Jazz Performance
*Geber Ramalho and Jean-Gabriel Ganascia, Université Paris VI*

2:30–2:50 PM
Automated Accompaniment of Musical Ensembles
*Lorin Grubb and Roger Dannenberg, Carnegie Mellon University*

2:50–3:10 PM
Auditory Stream Segregation in Auditory Scene Analysis with a Multi-Agent System
*Tomohiro Nakatani, Hiroshi G. Okuno, and Takeshi Kawabata, Nippon Telegraph and Telephone Corporation*

1:30–3:10 PM
*Session 20*
### Belief Revision

1:30–1:50 PM
Qualitative Decision Theory
*Sek-Wah Tan, University of California, Los Angeles*

1:50–2:10 PM
Incremental Recompilation of Knowledge
*Goran Gogic and Christos H. Papadimitriou, University of California, San Diego; Martha Sideri, Athens University of Economics and Business*

2:10–2:30 PM
Conditional Logics of Belief Change
*Nir Friedman, Stanford University and Joseph Y. Halpern, IBM Almaden Research Center*

2:30–2:50 PM
On the Relation between the Coherence and Foundations Theories of Belief Revision
*Alvaro del Val, Stanford University*

2:50–3:10 PM
A Preference-Based Approach to Default Reasoning
*James P. Delgrande, Simon Fraser University*

1:30–3:10 PM
*Session 21*
### Qualitative Reasoning: Modeling

1:30–1:50 PM
Using Qualitative Physics to Build Articulate Software for Thermodynamics Education
*Kenneth D. Forbus, Northwestern University and Peter B. Whalley, Oxford University*

1:50–2:10 PM
Automated Modeling for Answering Prediction Questions: Selecting the Time Scale and System Boundary
*Jeff Rickel and Bruce Porter, University of Texas*

2:10–2:30 PM
Decompositional Modeling through Caricatural Reasoning
*Brian C. Williams and Olivier Raiman, Xerox Palo Alto Research Center*

2:30–2:50 PM
A Qualitative Physics Compiler
*Adam Farquhar, Stanford University*

2:50–3:10 PM
Automated Model Selection for Simulation
*Yumi Iwasaki, Stanford University and Alon Y. Levy, AT&T Bell Laboratories*

1:30–3:10 PM
*Session 22*
### Constraint Satisfaction Techniques

1:30–1:50 PM
Noise Strategies for Improving Local Search
*Bart Selman, Henry A. Kautz and Bram Cohen, AT&T Bell Laboratories*

1:50–2:10 PM
Improving Repair-Based Constraint Satisfaction Methods by Value Propagation
*Nobuhiro Yugami, Yuiko Ohta, Hirotaka Hara, Fujitsu Laboratories Ltd.*

2:10–2:30 PM
GENET: A Connectionist Architecture for Solving Constraint Satisfaction Problems by Iterative Improvement
*Andrew Davenport, Edward Tsang, Chang J. Wang, and Kangmin Zhu, University of Essex*

2:30–2:50 PM
Expected Gains from Parallelizing Constraint Solving for Hard Problems
*Tad Hogg and Colin P. Williams, Xerox Palo Alto Research Center*

2:50–3:10 PM
Planning from First Principles for Geometric Constraint Satisfaction
*Sanjay Bhansali, Washington State University and Glenn A. Kramer, Enterprise Integration Tech.*

1:30–3:10 PM
*Session 23*
### Discovery / Meta AI

1:30–2:30 PM
### Discovery

1:30–1:50 PM
A Discovery System for Trigonometric Functions
*Tsuyoshi Murata, Masami Mizutani and Masamichi Shimura, Tokyo Institute of Technology*

1:50–2:10 PM
A Bootstrapping Training-Data Representations for Inductive Learning
*Haym Hirsh and Nathalie Japkowicz, Rutgers University*

2:10–2:30 PM
An Implemented Model of Punning Riddles
*Kim Binsted and Graeme Ritchie, University of Edinburgh*

2:30–3:10 PM
### Meta AI

2:30–2:50 PM
Using Knowledge Acquisition and Representation Tools to Support Scientific Communities
*Brian R. Gaines and Mildred L. G. Shaw, University of Calgary*

2:50–3:10 PM
Talking About AI: A Statistical Analysis of Socially Defined Topical Language in AI
*Amy M. Steier and Richard K. Belew, University of California, San Diego*

3:10–3:30 PM
**Break**

3:30–5:10 PM
*Session 24*
### Knowledge Bases / Distributed AI: Software Agents

3:30–4:30 PM
### Knowledge Bases

3:30–3:50 PM
Extracting Viewpoints from Knowledge Bases
*Liane Acker, IBM and Bruce Porter, University of Texas at Austin*

3:50–4:10 PM
Formalizing Ontological Commitment
*Nicola Guarino and Massimiliano Carrara, National Research Council, Italy; Pierdaniele Giaretta, University of Padova*

4:10–4:30 PM
Using Induction to Refine Information Retrieval Strategies
*Catherine Baudin and Barney Pell, NASA Ames Research Center; Smadar Kedar, Northwestern University*

4:30–5:10 PM
### Distributed AI: Software Agents

4:30–4:50 PM
Collaborative Interface Agents
*Yezdi Lashkari, Max Metral and Pattie Maes, MIT Media Laboratory*

4:50–5:10 PM
An Experiment in the Design of Software Agents
*Henry A. Kautz, Bart Selman, Michael Coen, Stephen Ketchpel and Chris Ramming, AT&T Bell Laboratories*

3:30–5:10 PM
*Session 25*
### Search

3:30–3:50 PM
ITS: An Efficient Limited-Memory Heuristic Tree Search Algorithm
*S. Ghosh and D. S. Nau, University of Maryland; A. Mahanti, Indian Institute of Management Calcutta*

3:50–4:10 PM
Memory-Bounded Bidirectional Search
*Hermann Kaindl, Siemens and Ali Asghar Khorsand*

4:10–4:30 PM
The Trailblazer Search: A New Method for Searching and Capturing Moving Targets
*Fumihiko Chimura and Mario Tokoro, Keio University*

4:30–4:50 PM
Exploiting Algebraic Structure in Parallel State-Space Search
*Jonathan Bright, Simon Kasif and Lewis Stiller, The Johns Hopkins University*

4:50–5:10 PM
ε-Transformation: Exploiting Phase Transitions to Solve Combinatorial Optimization Problems
*Weixiong Zhang and Joseph C. Pemberton, University of California, Los Angeles*

3:30–4:40 PM
*Session 26*
### Neural Nets I

3:30–3:50 PM
Unclear Distinctions Lead to Unnecessary Shortcomings: Examining the Rule Versus Fact, Role Versus Filler, and Type Versus Predicate Distinctions from a Connectionist Rerepresentation and Reasoning Perspective
*Venkat Ajjanagadde , Universitàet Tuebingen*

3:50–4:10 PM
Parsing Embedded Clauses with Distributed Neural Networks
*Risto Miikkulainen, University of Texas at Austin and Dennis Bijwaard, University of Twente*

4:10–4:30 PM
Spurious Symptom Reduction in Fault Monitoring by Neural Networks and Knowledge Base Hybrid System
*Roger Records and Jai J. Choi, Boeing Computer Services*

4:30–4:50 PM
Knowledge Matrix—An Explanation and Knowledge Refinement Facility for a Rule Induced Neural Network
*Daniel S. Yeung and Hank-shun Fong, Hong Kong Polytechnic*

3:30–4:50 PM
*Session 27*
### Induction

3:30–3:50 PM
Learning to Recognize Promoter Sequences in *E. Coli* by Modeling Uncertainty in the Training Data
*Steven W. Norton, Rutgers University*

3:50–4:10 PM
Inductive Learning For Abductive Diagnosis
*Cynthia A. Thompson and Raymond J. Mooney, University of Texas*

4:10–4:30 PM
Learning Fault-Tolerant Speech Parsing with SCREEN
*S. Wermter and V. Weber, University of Hamburg*

4:30–4:50 PM
Compositional Instance-Based Learning
*Karl Branting and Patrick Broos, University of Wyoming*

## Thursday, August 4

8:30–10:10 AM
*Session 28*
### Scheduling

8:30–8:50 AM
Experimental Results on the Application of Satisfiability Algorithms to Scheduling Problems
*James M. Crawford and Andrew B. Baker, University of Oregon*

8:50–9:10 AM
Generating Feasible Schedules under Complex Metric Constraints
*Cheng-Chung Cheng and Stephen F. Smith, Carnegie Mellon University*

9:10–9:30 AM
Just-In-Case Scheduling
*Mark Drummond, John Bresina, and Keith Swanson, NASA Ames Research Center*

9:30–9:50 AM
A Constraint-Based Approach to High-School Timetabling Problems: A Case Study
*Masazumi Yoshikawa, Kazuya Kaneko, Yuriko Nomura and Masanobu Watanabe, NEC Corporation*

9:50–10:10 AM
On the Utility of Bottleneck Reasoning for Scheduling
*Nicola Muscettola, Recom Technologies, NASA Ames Research Center*

8:30 –10:10 AM

*Session 29*

## Reinforcement Learning / PAC Learning

8:30–9:30 AM

### Reinforcement Learning

8:30–8:50 AM

Learning to Catch a Baseball: A Reinforcement Learning Perspective Using Neural Networks

*Sreerupa Das, University of Colorado and Rajarshi Das, Santa Fe Institute*

8:50–9:10 AM

Reinforcement Learning Algorithms for Average-Payoff Markovian Decision Processes

*Satinder P. Singh, Massachusetts Institute of Technology*

9:10–9:30 AM

Incorporating Advice into Agents that Learn from Reinforcements

*Richard Maclin and Jude W. Shavlik, University of Wisconsin*

9:30–10:10 AM

### PAC Learning

9:30–9:50 AM

Pac-Learning Nondeterminate Clauses

*William W. Cohen, AT&T Bell Laboratories*

9:50–10:10 AM

Learning to Reason

*Roni Khardon and Dan Roth, Harvard University*

8:30–10:10 AM

*Session 30*

## Robot Control, Locomotion and Manipulation

8:30–8:50 AM

Merging Path Planners and Controllers through Local Context

*Sundar Narasimhan, MIT Artificial Intelligence Laboratory*

8:50–9:10 AM

Teleassistance: Contextual Guidance for Autonomous Manipulation

*Polly K. Pook and Dana H. Ballard, University of Rochester*

9:10–9:30 AM

Automatically Tuning Control Systems for Simulated Legged Robots

*Robert Ringrose, MIT Artificial Intelligence Laboratory*

9:30–9:50 AM

Reactive Deliberation: An Architecture for Real-Time Intelligent Control in Dynamic Environments

*Michael Sahota, University of British Columbia*

9:50–10:10 AM

Robot Behavior Conflicts: Can Intelligence Be Modularized?

*Amol Dattatraya Mali and Amitabha Mukerjee, Indian Institute of Technology*

8:30–10:10 AM

*Session 31*

## Enabling Technologies

8:30–8:50 AM

Discovering Procedural Executions of Rule-Based Programs

*David Gadbois and Daniel Miranker, University of Texas at Austin*

8:50–9:10 AM

Mechanisms for High-Performance Blackboard Systems

*Michael Hewett, University of Texas at Austin and Rattikorn Hewett, Florida Atlantic University*

9:10–9:30 AM

The Relationship Between Architectures and Example-Retrieval Times

*Eiichiro Sumita, Naoya Nisiyama and Hitoshi Iida, ATR Interpreting Telecommunications Research Laboratories*

9:30–9:50 AM

Model-Based Automated Generation of User Interfaces

*Angel R. Puerta, Henrik Eriksson, John H. Gennari and Mark A. Musen, Stanford University*

9:50–10:10 AM

Combining Left and Right Unlinking for Matching a Large Number of Learned Rules

*Robert B. Doorenbos, Carnegie Mellon University*

8:30–10:10 AM

*Session 32*

## Description Logic / Formal Models of Reactive Control

8:30–9:30 AM

### Description Logic

8:30–8:50 AM

Boosting the Correspondence between Description Logics and Propositional Dynamic Logics (Extended Abstract)

*Giuseppe De Giacomo and Maurizio Lenzerini, Università di Roma*

8:50–9:10 AM

Terminological Systems Revisited

*Martin Buchheit and Werner Nutt, German Research Center for Artificial Intelligence; Francesco M. Donini and Andrea Schaerf, Università di Roma*

9:10–9:30 AM

A Description Classifier for the Predicate Calculus

*Robert M. MacGregor, USC/Information Sciences Institute*

9:30–10:10

### Formal Models of Reactive Control

9:30–9:50

Estimating Reaction Plan Size

*Marcel Schoppers, Robotics Research Harvesting*

9:50–10:10 AM

Structured Circuit Semantics for Reactive Plan Execution Systems

*Jaeho Lee and Edmund H. Durfee, University of Michigan*

10:10–10:30 AM

**Break**

10:30 AM–12:10 PM

*Session 33*

## Theater and Video / Believable Agents

10:30–11:10 AM

### Theater and Video

10:30–10:50 AM

Semi-Autonomous Animated Actors

*Steve Strassmann, Apple Computer*

10:50–11:10 AM

Knowledge Representation for Video

*Marc Davis, MIT Media Laboratory and Interval Research Corporation*

11:10 AM–12:10 PM

### Believable Agents

11:10–11:30 AM

Social Interaction: Multimodal Conversation with Social Agents

*Katashi Nagao and Akikazu Takeuchi, Sony Computer Science Laboratory Inc.*

11:30–11:50 AM

Research Problems in the Use of a Shallow Artificial Intelligence Model of Personality and Emotion

*Clark Elliott, DePaul University and Northwestern University*

11:50 AM–12:10 PM

CHATTERBOTS, TINYMUDS, and the Turing Test Entering the Loebner Prize Competition

*Michael L. Mauldin, Carnegie Mellon University*

10:30 AM–12:10 PM

*Session 34*

## Causal Reasoning

10:30–10:50 AM

Forming Beliefs about a Changing World

*Fahiem Bacchus, University of Waterloo; Adam J. Grove, NEC Research Institute; Joseph Y. Halpern, IBM Almaden Research Center; Daphne Koller, University of California, Berkeley*

10:50–11:10 AM
Causal Default Reasoning: Principles and Algorithms
*Hector Geffner, Universidad Simón Bolívar*

11:10–11:30 AM
Symbolic Causal Networks
*Adnan Darwiche and Judea Pearl, University of California, Los Angeles*

11:30–11:50 AM
Probabilistic Evaluation of Counterfactual Queries
*Alexander Balke and Judea Pearl, University of California, Los Angeles*

11:50 AM–12:10 PM
Testing Physical Systems
*Peter Struss, Technical University of Munich*

10:30 AM–12:10 PM
*Session 35*

## Natural Language Discourse

10:30–10:50 AM
Classifying Cue Phrases in Text and Speech Using Machine Learning
*Diane J. Litman, AT&T Bell Laboratories*

10:50–11:10 AM
Linguistic Rules from Induced Decision Trees: Disambiguating Discourse Clue Words
*Eric V. Siegel and Kathleen R. McKeown, Columbia University*

11:10–11:30 AM
A Plan-Based Model for Response Generation in Collaborative Task-Oriented Dialogues
*Jennifer Chu-Carroll and Sandra Carberry, University of Delaware*

11:30–11:50 AM
An Artificial Discourse Language for Collaborative Negotiation
*Candace L. Sidner, Lotus Development Corporation*

11:50 AM–12:10 PM
Corpus-Driven Knowledge Acquisition for Discourse Analysis
*Stephen Soderland and Wendy Lehnert, University of Massachusetts*

10:30 AM–12:10 PM
*Session 35*

## Control Learning

10:30–10:50 AM
Exploiting the Ordering of Observed Problem-Solving Steps for Knowledge Base Refinement: An Apprenticeship Approach
*Steven K. Donoho and David C. Wilkins, University of Illinois*

10:50–11:10 AM
Improving Learning Performance through Rational Resource Allocation
*Jonathan Gratch and Gerald DeJong, University of Illinois; Steve Chien, JPL/California Institute of Technology*

11:10–11:30 AM
Creating Abstractions Using Relevance Reasoning
*Alon Y. Levy, AT&T Bell Laboratories*

11:30–11:50 AM
Flexible Strategy Learning: Analogical Replay of Problem Solving Episodes
*Manuela M. Veloso, Carnegie Mellon University*

11:50 AM–12:10 PM
Learning EBL Based Search Control Rules for Partial Order Planning
*Suresh Katukam and Subbarao Kambhampati, Arizona State University*

10:30–11:50 AM
*Session 36*

## Tractable Constraint-Satisfaction Problems

10:30–10:50 AM
Reasoning about Temporal Relations: A Maximal Tractable Subclass of Allen's Interval Algebra
*Bernhard Nebel, Universität Ulm and Hans-Jürgen Bürckert, DFKI*

10:50–11:10 AM
On the Inherent Level of Local Consistency in Constraint Networks
*Peter van Beek, University of Alberta*

11:10–11:30 AM
A Filtering Algorithm for Constraints of Difference in CSP
*Jean-Charles Regin, LIRMM*

11:30–11:50 AM
A Useful Extension to the Constraint Satisfaction Problem
*Randall A. Helzerman and Mary P. Harper, Purdue University*

12:10–1:30 PM
**Lunch**

1:30–3:10 PM
*Session 37*

## Planning: Agents

1:30–1:50 PM
Using Abstraction and Nondeterminism to Plan Reaction Loops
*David J. Musliner, University of Maryland*

1:50–2:10 PM
Cost-Effective Sensing during Plan Execution
*Eric A. Hansen and Scott D. Anderson, University of Massachusetts*

2:10–2:30 PM
The First Law of Robotics (A Call to Arms)
*Oren Etzioni and Daniel Weld, University of Washington*

2:30–2:50 PM
Acting Optimally in Partially Observable Stochastic Domains
*Anthony R. Cassandra, Leslie Pack Kaelbling and Michael L. Littman, Brown University*

2:50–3:10 PM
Using Abstractions for Decision-Theoretic Planning with Time Constraints
*Craig Boutilier and Richard Dearden, University of British Columbia*

1:30–3:10 PM
*Session 38*

## Automated Reasoning II

1:30–1:50 PM
Small is Beautiful: A Brute-Force Approach to Learning First-Order Formulas
*Steven Minton and Ian Underwood, Recom Technologies, NASA Ames Research Center*

1:50–2:10 PM
On Kernel Rules and Prime Implicants
*Ron Rymon*

2:10–2:30 PM
An Empirical Evaluation of Knowledge Compilation
*Henry Kautz and Bart Selman, AT&T Bell Laboratories*

2:30–2:50 PM
Rule Based Updates on Simple Knowledge Bases
*Chitta Baral, University of Texas at El Paso*

2:50–3:10 PM
Can We Enforce Full Compositionality in Uncertainty Calculi?
*Didier DuBois and Henri Prade, Institut de Recherche en Informatique de Toulouse*

1:30–3:10 PM
*Session 39*

## Uncertainty Management

1:30–1:50 PM
Abstraction in Bayesian Belief Networks and Automatic Discovery from Past Inference Sessions
*Wai Lam, University of Waterloo*

1:50–2:10 PM
Noise and Uncertainty Management in Intelligent Data Modeling
*X. Liu, G. Cheng and J. X. Wu, University of London*

2:10–2:30 PM
Focusing on the Most Important Explanations: Decision-theoretic Horn Abduction
*Paul O'Rorke, University of California, Irvine*

2:30–2:50 PM
Markov Chain Monte-Carlo Algorithms for the Calculation of Dempster-Shafer Belief
*Serafín Moral, Universidad de Granada and Nic Wilson, Queen Mary and Westfield College*

2:50–3:10 PM
The Emergence of Ordered Belief from Initial Ignorance
*Paul Snow*

1:30–3:10 PM
*Session 40*

## Corpus-Based Natural Language Processing

1:30–1:50 PM
Context-Sensitive Statistics for Improved Grammatical Language Models
*Eugene Charniak and Glenn Carroll, Brown University*

1:50–2:10 PM
A Probabilistic Algorithm for Segmenting Non-Kanji Japanese Strings
*Virginia Teller and Eleanor Olds Batchelder, The City University of New York*

2:10 –2:30 PM
Some Advances in Transformation-Based Part of Speech Tagging
*Eric Brill, MIT*

2:30–2:50 PM
Inducing Deterministic Prolog Parsers from Treebanks: A Machine Learning Approach
*John M. Zelle and Raymond J. Mooney, University of Texas*

2:50–3:10 PM
Toward the Essential Nature of Statistical Knowledge in Sense Resolution
*Jill Fain Lehman, Carnegie Mellon University*

1:30–3:10 PM
*Session 41*

## Distributed AI: Coordination

1:30–1:50 PM
Coalition, Cryptography and Stability: Mechanisms for Coalition Formation in Task Oriented Domains
*Gilad Zlotkin, MIT and Jeffrey S. Rosenschein, Hebrew University*

1:50–2:10 PM
Forming Coalitions in the Face of Uncertain Rewards
*Steven Ketchpel, Stanford University*

2:10–2:30 PM
The Impact of Locality and Authority on Emergent Conventions: Initial Observations
*James E. Kittock, Stanford University*

2:30–2:50 PM
Emergent Coordination through the Use of Cooperative State-Changing Rules
*Claudia V. Goldman and Jeffrey S. Rosenschein, Hebrew University*

2:50–3:10 PM
Learning to Coordinate without Sharing Information
*Sandip Sen, Mahendra Sekaran, and John Hale, University of Tulsa*

3:10–3:30 PM
**Break**

3:30–4:50 PM
*Session 42*

## Neural Nets II

3:30–3:50 PM
Learning To Learn: Automatic Adaption of Learning Bias
*Steve G. Romaniuk, National University of Singapore*

3:50–4:10 PM
Multi-Recurrent Networks for Traffic Forecasting
*Claudia Ulbricht, Austrian Research Institute for Artificial Intelligence*

4:10–4:30 PM
Associative Memory in an Immune-Based System
*Claude Gibert and Tom Routen, De Montfort University*

4:30–4:50 PM
Neural Programming Language for Recurrent Networks
*Hava T. Siegelmann, Bar-Ilan University*

3:30–5:10 PM
*Session 43*

## Learning Robotic Agents

3:30–3:50 PM
Learning to Explore and Build Maps
*David Pierce and Benjamin Kuipers, University of Texas at Austin*

3:50–4:10 PM
Learning Useful Landmarks
*Russell Greiner, Siemens Corporate Research and Ramana Isukapalli, Rutgers University*

4:10–4:30 PM
High Dimension Action Spaces in Robot Skill Learning
*Jeff G. Schneider, University of Rochester*

4:30–4:50 PM
Results on Controlling Action with Projective Visualization
*Marc Goodman, Cognitive Systems, Inc. and Brandeis University*

4:50–5:10 PM
Agents that Learn to Explain Themselves
*W. Lewis Johnson, USC/Information Sciences Institute*

3:30–4:50 PM
*Session 44*

## Qualitative Reasoning: Simulation

3:30–3:50 PM
Activity Analysis: The Qualitative Analysis of Stationary Points for Optimal Reasoning
*Brian C. Williams, Xerox Palo Alto Research Center and Jonathan Cagan, Carnegie Mellon University*

3:50–4:10 PM
Comparative Simulation
*Michael Neitzke and Bernd Neumann, Universität Hamburg*

4:10–4:30 PM
Qualitative Reasoning for Automated Exploration for Chaos
*Toyoaki Nishida, Nara Institute of Science and Technology*

4:30–4:50 PM
Intelligent Automated Grid Generation for Numerical Simulations
*Ke-Thia Yao and Andrew Gelsey, Rutgers University*

3:30–4:50 PM
*Session 45*

## Causal-Link Planning

3:30–3:50 PM
Derivation Replay for Partial-Order Planning
*Laurie H. Ihrig and Subbarao Kambhampati, Arizona State University*

3:50–4:10 PM
Least-Cost Flaw Repair: A Plan Refinement Strategy for Partial-Order Planning
*David Joslin and Martha E. Pollack, University of Pittsburgh*

4:10–4:30 PM
Tractable Planning with State Variables by Exploiting Structural Restrictions
*Peter Jonsson and Christer Backstrom, Linkoping University*

4:30–4:50 PM
Temporal Planning with Continuous Change
*J. Scott Penberthy, IBM T. J. Watson Research Center and Daniel S. Weld, University of Washington*

## AAAI–94/IAAI–94 Program Registration

*August 1–4, 1994*

Your AAAI–94 / IAAI–94 program registration includes admission to all sessions, invited talks, the AAAI–94 / IAAI–94 Joint Exhibition, AI-on-Line panels, the AAAI–94 and IAAI–94 opening receptions, and the AAAI–94 or IAAI–94 conference *Proceedings.* Your technical registration package includes the *Proceedings* for one conference. The other conference *Proceedings* may be purchased at additional cost.

Onsite registration will be located in the lobby of Exhibit Hall 4B on the fourth floor of the Washington State Convention and Trade Center, 800 Convention Place, Seattle, Washington 98101.

## IAAI–94 / AAAI–94 Registration Fees

*Early Registration (Postmarked by June 3)*
AAAI Members
Regular $310 Student $110
Nonmembers
Regular $360 Student $160

*Late Registration (Postmarked by July 1)*
AAAI Members
Regular $360 Student $125
Nonmembers
Regular $410 Student $175

*On-Site Registration (Postmarked after July 1 or onsite. Hours below.)*
AAAI Members
Regular $410 Student $150
Nonmembers
Regular $460 Student $200

## Tutorial Program Registration

*July 31–August 1, 1994*

Your Tutorial Program Registration includes admission to one tutorial, the AAAI–94 / IAAI–94 Joint Exhibition, the AI-on-Line panels at IAAI–94, and one tutorial syllabus. Prices quoted are per tutorial. A maximum of four may be taken due to parallel schedules.

### Tutorial Fee Schedule

*Early Registration (Postmarked by June 3)*
AAAI Members
Regular $150 Student $50
Nonmembers
Regular $200 Student $75

*Late Registration (Postmarked by July 1)*
AAAI Members
Regular $190 Student $65
Nonmembers
Regular $250 Student $95

*On-Site Registration (Postmarked after July 1 or onsite. Hours are listed below.)*
AAAI Members
Regular $240 Student $85
Nonmembers
Regular $315 Student $120

## Workshop Registration

*July 31–August 4, 1994*

Workshop registration is limited to those active participants determined by the organizer prior to the conference. Individuals attending workshops only must pay a $125.00 per workshop registration fee. Workshop registration materials will be sent directly to invited participants.

## Payment & Registration Information

Prepayment of registration fees is required. Checks, international money orders, bank transfers and traveler's checks must be in US dollars. Amex, MasterCard, Visa, and government purchase orders are also accepted. Registrations postmarked after the July 1 deadline will be subject to on-site registration fees. The deadline for refund requests is July 8, 1994. All refund requests must be made in writing. A $75. 00 processing fee will be assessed for all refunds. Student registrations must be accompanied by proof of full-time student status.

Registration forms and inquiries should be directed to:

AAAI–94 / IAAI–94
445 Burgess Drive
Menlo Park, California 94025 USA
415/328-3123; Fax: 415/321-4457
Email ncai@aaai. org.

On-Site Registration will be located in the lobby of Exhibit Hall 4B on the fourth floor of the Washington State Convention and Trade Center, 800 Convention Place, Seattle, Washington 98101.

Registration hours will be Sunday, July 31 through Wednesday, August 3 from 7:30 AM – 6:00 PM. On Thursday, August 4, hours will be 8:00 AM – 5:00 PM. All attendees must pick up their registration packets for admittance to programs.

## Child Care Services

Child care services are available from Panda, 2617 NW 59th, Suite 102, Seattle, Washington 98107, 206/ 325-2327. A child care provider will come to your hotel room at a minimum cost of $8 per hour, with a four hour minimum. The price also depends on how many children need to be cared for. All child care providers are fully licensed. Reservations must be made at least two weeks in advance and directly with Panda.

(This information is for your convenience, and does not represent an endorsement of Panda Child Care by AAAI.)

## Housing

AAAI has reserved a block of rooms in Seattle properties at reduced conference rates. To qualify for these rates, housing reservations must be made with the Housing Bureau office. The deadline for reservations is June 29, 1994.

To make housing reservations fax or mail the enclosed Housing Application Form to:

Housing Bureau
520 Pike Street, Suite 1300
Seattle, Washington 98101

The Housing Bureau reserves the right to assign a hotel if your first choice is sold out and other choices are not included. All room charges are subject to 15.2% state and room tax.

All changes and cancellations prior to June 29, 1994 should be made directly with the Housing Bureau. After this date convention rates may not apply and the Housing Bureau will be working on an availability basis. Changes and cancellations must be made in writing to the Housing Bureau. If a change or cancellation occurs within two weeks of the convention dates, contact your assigned hotel directly.

The Housing Bureau will acknowledge receipt of your reservation by mail. Con-

firmation will follow from the hotel.

A deposit is not required if a credit card number has been given. If you wish to guarantee your room with a check, you may send a first night's deposit directly to your assigned hotel. Do not mail cash or checks with the form.

### Headquarters Hotel:

**Sheraton Hotel & Towers**
1400 Sixth Avenue
Seattle, Washington 98101
Main Hotel
Single: $125.00
Double: $145.00
Suites from: $250–$500
Additional Person $25.00
*Distance to Center:* One block

### Other Hotels:

**Holiday Inn Crowne Plaza**
1113 Sixth Avenue
Seattle, WA 98101-3048
Single: $113.00
Double: $113.00
Distance to Center: Approximately five blocks

**West Coast Plaza Park Suites**
1011 Pike Street
Seattle, Washington 98101
Room – Single: $90.00
Room – Double: $100.00
Suite – Single: $120.00
Suite – Double: $130.00
Distance to Center: One block

Hotel rooms are priced as singles (1 person, 1 bed), doubles (2 persons, 2 beds), triples (3 persons, 2 beds) or quads (4 persons, 2 beds).

### Student Housing

AAAI has reserved a block of dormitory rooms at the University of Washington for student housing during the conference. Accommodations include linen service. Buses (Nos. 70, 71, 72, 73, 74 and 83) run from University Avenue to the downtown area every five minutes.
*Package Rates per person:*
Single: $139.80
Double: $99.80
*Extra Nights (July 29, 30, August 4, 5 if needed):*
Single: $29.00
Double: $19.00
The package includes four nights of housing (July 31, August 1, 2, 3,), breakfast Monday through Thursday and applicable sales tax.

Student housing reservations must be received by no later than July 8, 1994. A reservation form is enclosed in this brochure. Prepayment of housing fees is required. Checks, international money orders, bank transfers, and traveler's checks must be in US currency. MasterCard and Visa are also accepted. The deadline for refund requests is two weeks prior to scheduled arrival.

Student housing is restricted to full-time graduate or undergraduate students enrolled in an accredited college or university program. Proof of full-time status must accompany the student housing form. Housing forms and inquiries should be directed to:
Conference Reservations
Conference Housing and Special Services
University of Washington
McCarthy Hall, GR-10

A limited amount of parking is available near the residence halls. As you enter the University of Washington gates you will be charged for the first day. Permits for your full stay may be purchased on a first-come, first-served basis at the Conference Desk.

More information about student housing can be found on the back of the reservation form.

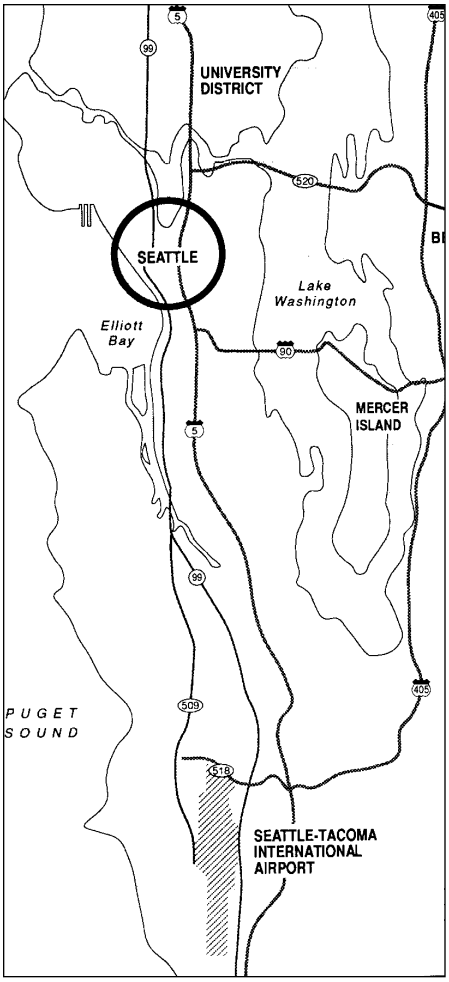
## Air Transportation and Car Rentals

### Air Transportation

The American Association for Artificial Intelligence has selected United Airlines as the official carrier. Fares will reflect a 5% discount (ticket designator is XF5) off any United or United Express published fare in effect when tickets are purchased subject to all applicable restrictions, or a 10% discount (ticket designator is XF10) off applicable United or United Express coach fares in effect when tickets are purchased 0 days in advance and the reservations are made in M class of service. These special fares are subject to availability at the time of booking. Call United Airlines directly: 800/521-4041, 7 days a week from 7:00 am–1:00 am EST, or for travel agent services, please contact Travel with Ulla, phone: 415/389-6264; fax: 415/388-6830. Be sure to provide the identification code **545RS** when making your reservation. The discount is valid for the travel period July 26–August 9, 1994.


Seattle's downtown waterfront

PHOTO: SEATTLE-KING COUNTY CONVENTION & VISITORS BUREAU




### Car Rental

Hertz has been designated as the official rental car company for the National Conference on Artificial Intelligence. To qualify for the special rates arranged with Hertz, please call the Hertz convention desk at 800/654-2240. Be sure to identify yourself as an attendee of the AAAI or IAAI Conference and give the code **CV#3339.** Hertz has three convenient rental desks located at Seattle–Tacoma airport.

## Ground Transportation

The following information provided is the best available at press time. Please confirm fares when making reservations.

### Airport Connections

Several companies provide service from Seattle–Tacoma Airport to downtown Seattle (a distance of approximately 16 miles). A sampling of companies and their one-way rates are shown below. Contact the company directly for reservations. (The convention center is located on Interstate 5 and exit 165.)

### Gray Line of Seattle

206/624-5077
Seattle–Tacoma Airport to downtown Seattle
Fare: $7; $12 round trip

### Stita Taxi

206/246-9999
From Seattle–Tacoma Airport to downtown Seattle
Fare: approximately $29.

### Bus

The Seattle Greyhound/Trailways terminal is located at Eighth and Stewart Streets, approximately five blocks from the Convention and Trade Center. For information on fares and scheduling, call 800/231-2222.

### Rail

Amtrak has ten trains daily that link Seattle to Vancouver, Portland, San Francisco, Denver, Chicago and other west coast and mid-west cities. The Amtrak Station is located at Third and Jackson Streets next to the Kingdome, approximately twelve blocks from the Convention & Trade Center (a cab ride is recommended). For Amtrak reservations or information, call 800/872-7245.

### Metro Transit

Metro operates bus service throughout Seattle and King County. Metro rides are free in the downtown Seattle area between the hours of 4:00 am and 9:00 pm. For help with routes and schedules, call Rider Information at 206/553-3000.

## Parking

Parking is available at the Washington State Convention and Trade Center at $12 a day. However, if their garage is full, parking facilities are available across the street from the Convention Center at the establishments listed below.

### The Sheraton Hotel Garage

1400 Sixth Avenue
Parking is available for both guests and nonguests of this hotel at $13.00 a day.

### Union Square Garage

601 Union Street
Parking is available at $10.00 a day.


Pike's Peak Market

PHOTO: WILLIAM STICKNEY / SEATTLE-KING COUNTY CONVENTION & VISITORS BUREAU

PHOTO: SEATTLE-KING COUNTY CONVENTION & VISITORS BUREAU

# Seattle: Jewel of the Pacific Northwest

First-time visitors are astonished at the wealth of natural beauty in and around Seattle. Literally touching the city's boundaries are thousands of square miles of evergreen forest and hundreds of miles of salt and freshwater shoreline. With this wealth of nature at their doorstep, both Seattleites and visitors concentrate much of their recreation on the outdoors.

Surrounded east and west by freshwater Lake Washington and saltwater Puget Sound, the city occupies a north-south corridor, slender at the waist and embracing numerous hills. On a clear day, the views of mountains and water are spectacular.

Most of Seattle's attractions are clustered in pedestrian-scale sections, best savored on foot. Central business district buses are free and the Monorail speeds quickly between downtown and the Seattle Center.

## Location

The city of Seattle is located on the Pacific Coast of Washington State. It is in the center of western Washington, on the eastern shore of Puget Sound, an inland water body connected to the Pacific Ocean. There are mountain ranges on both sides of Seattle; the Cascades to the east and the Olympics to the west. Built on seven hills, Seattle is a beautiful city with unmatched mountain and water views.

## Climate

Seattle has a mild climate all year round. The Olympic Mountains protect the Puget Sound area from heavy rainfall and high winds from the west. On the east, the Cascade Mountains shield the area from the winter cold.

Winter days are short, but summer days are long, with 16 hours of daylight in midsummer. The average summer temperature is 73 degrees, and maximum afternoon temperatures of 90 degrees or more are uncommon. Average yearly rainfall in Seattle is 36.2 inches. Seattle winters tend to be cloudy, with an annual snowfall of 8.6 inches.

## Sights and Scenes

A mini-poll, taken by consulting a panel of persons-about-town, produced the following best bets for a Seattle Sunday (or any day for that matter). Some are designed for rain, some for shine. Some will take a few minutes, some a whole day.

### Pike Place Market

The in-city farmers' market so captures the essence of Seattle it is on almost everyone's must-visit list. The Market, with its profusion of vegetables, flowers, fish, baked goods and crafts is open from 9:00 a.m. to 6:00 p.m. weekdays and Saturday; and Sundays, May 7 through December 31, 11:00 a.m. to 5:00 p.m. It's a great place to buy handicrafts, to eat, to people-watch, and to view the harbor.

### Pioneer Square

The area adjoining the Kingdome was settled by pioneers soon after they landed in 1851. This is where loggers built the original Skid Road (along Yesler Way) to skid logs downhill to the waterfront. Pioneer Square's handsome brick buildings—most of them recently restored, were built after the Great Fire of 1889. Pioneer Square has scores of interesting shops, antique galleries, ethnic restaurants and more art galleries per square foot than any other city in the US, most of them open weekends. The tours that go beneath the current-day Pioneer Square cobblestones provide a glimpse of Seattle, circa 1889.

### The Ballard Locks

One of Seattle's most popular attractions, the Ballard Locks serve as a watery elevator to lift vessels from the salt-water of Puget Sound to freshwater levels, and vice-versa. First-timers often get mesmerized by the sight of a lock full of vessels being raised or lowered from 6 to 26 feet (depending on the tide). The fish ladder, locks, and grounds (including the Carl English Gardens) are open to the public daily from 7:00 a.m. to 9:00 p.m. There are one hour tours of the locks at 2:00 on Saturday and Sunday. Beginning on June 15, tours run daily at 1:30 and 3:30 For more information call 783-7059.

### The Space Needle

Seattle's landmark provides visitors with a matchless view of the city and Puget Sound. On a clear day, visitors also spot Mount Rainier, Mount Baker, and the Cascade and Olympic ranges from the top-level observation deck. Hours for observation deck are mid-June through Labor Day; 7:30 a.m. to 1:00 a.m. (seven days a week); after Labor Day hours are 9:00 a.m. to midnight (seven days a week). Observation deck free with meals.

One level below, there are two restaurants: the Emerald Suite, for formal dining with matching prices; and the Space Needle Restaurant, with a more casual family-style menu. While you dine, the outer seating area revolves ever so slowly, making a complete revolution each hour. For more information call 443-2100.

### Seattle Center

Seventy four acres of arts, entertainment, recreation, shopping, dining and educational and cultural adventures for the entire family await you. Home of the 1962 World's Fair, Seattle Center hosts the Seattle Space Needle, Pacific Science Center (site of the AAAI–94 opening reception), Fun Forest Amusement Park, Seattle Children's Museum, and the historic Seattle Center Monorail, which now connects to the Westlake Center. Visit Seattle Center Today! For more information call 684-7200 or for an update of Seattle Center Events call 684-7165.

### Woodland Park Zoo

The zoo, recently named one of the nation's ten best, is known for its natural

habitats, especially a large, lush gorilla exhibit and tropical forest for elephants. The five-acre African savanna is home to hippos, lions, zebras, springboks, and giraffes. Don't miss the walk through the swamp or the trip through the Nocturnal House, home of the shy, seldom seen creatures of the night. The zoo is open everyday of the year including holidays. From March 15 through October 14 hours are 9:30 a.m. to 6:00 p.m. daily. For more information call 684-4800.

### The Waterfront

Seattle's waterfront, once known as "the Gold Rush Strip" stretches from Pier 51 on the south to Pier 70 on the north. It's a popular spot for strolling, shopping, dining, and exploring. Pier 70 houses a complex of shops and restaurants in a restored wharf. Pier 70 is open Monday through Saturday, 11:00 a.m. to 9:00 p.m. and Sundays 12:00 a.m. to 6:00 p.m. Other activities include Waterfront Park (Pier 57) with its public fishing pier, fish and chip bars, and import houses with merchandise from around the world. Ye Olde Curiosity Shop at Pier 54 specializes in souvenirs and curiosities, including two mummies (Sylvester and Sylvia). Or take a ferry ride or visit Maritime Park. While visiting the waterfront, ride on the vintage trolley system and get a feeling of some of Seattle's historic past.

### The Museum of Flight

This facility, the site of the first Boeing Airplane Company, is south of the city center at 9404 East Marginal Way South. The museum covers the history of flight and the Boeing Airplane Company from the days of Wilbur and Orville Wright. Here you can see a barnstorming Curtiss Jenny, a C-45 Mercy Plan (flying ambulance), a Grumman F-9F Cougar and a Boeing B-47 bomber. In the adjacent Red Barn, there are more exhibits, books, models, clothing and collectibles. Open 10:00 AM to 5:00 PM, Saturday through Wednesday and Friday, 10:00 a.m. to 9:00 p.m., Thursday. For more information call (206) 764-5720.

### For Additional Travel Information

Travelers wishing additional information can write Seattle-King County Convention and Visitors Bureau, Downtown Visitor Information Office, 520 Pike Street, Suite 1300, Seattle, Washington 98101, telephone (206) 461-5840.

## Travel Tours

### Wednesday, August 3

AAAI has arranged with Seattle VIP Services to offer AAAI–94 / IAAI–94 attendees a special tours program that includes some of the highlights in Seattle, nearby Washington, and British Columbia. Please check the appropriate box on the registration form to receive further information about these exciting tours.

#### Tillicum Village Salmon Bake

6:00 – 11:00 PM
Price: $54.00
Enjoy a narrated tour of Seattle's scenic harbor en route to Blake Island for a delicious dinner of alder-smoked salmon served in a traditional Native American longhouse. A thrilling performance of Northwest Coast Indian songs and dances follows the meal. Jackets and flat shoes recommended.

### Thursday, August 4

#### Seattle City Highlights Tour by Night with Dinner in the International District

6:00 – 9:30 PM
Price: $39.00
First, dinner will be served at one of the city's most renowned Chinese restaurants, The House of Hong, located in the heart of the International District. The motorcoach tour will begin directly after dinner. Included in this interesting city tour by night is historic Pioneer Square, the International District, the University of Washington, the Government Locks, and charming residential areas.

### Friday, August 5

#### Independent Victoria Day Trip

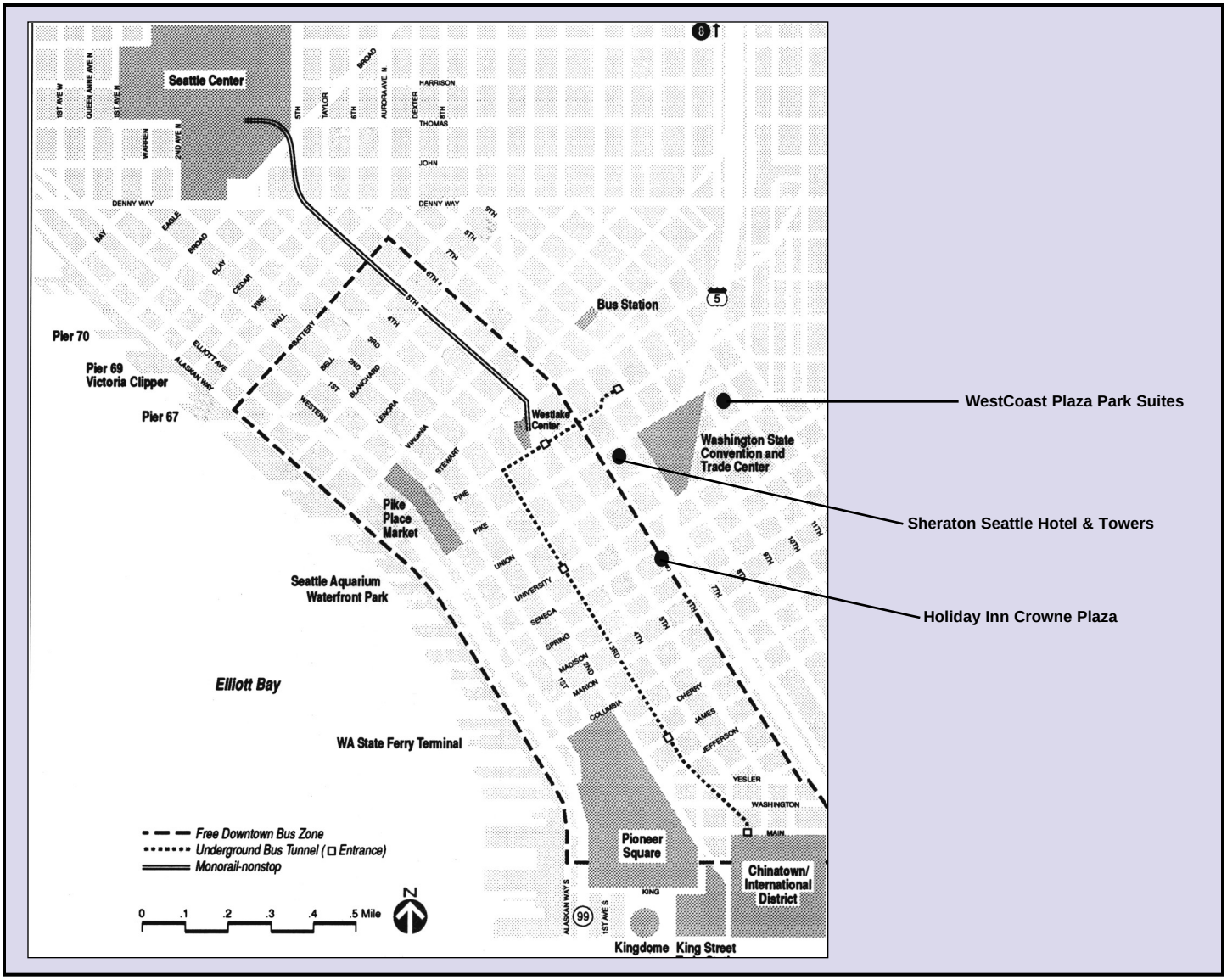
7:50 AM– 10:15 PM
Price: $89
Enjoy a day's outing to nearby Canada to visit the old English town of Victoria and view the world famous Butchart Gardens. Transportation is by Victoria Clipper jet-propelled catamaran. Note: Photo ID is required for US citizens. Guests are responsible for their own transportation to and from the Victoria Clipper Dock.

#### Mount Rainier Tour

8:00 AM – 6:00 PM
Price: $43.00
Experience the natural beauty of Mt. Rainier National Park, which offers scenic outlooks of the 14,410 foot mountain peak, nature trails, wildflowers and an informative Visitors Center. Sturdy walking shoes and a jacket are recommended.

## Disclaimer

In offering United Airlines, Hertz Rental, Panda Child Care, Seattle VIP Services, Washington State University and all other service providers (hereinafter referred to as "Supplier(s)" for the Innovative Applications Conference and the National Conference on Artificial Intelligence, AAAI acts only in the capacity of agent for the Suppliers which are the providers of the service. Because AAAI has no control over the personnel, equipment or operations of providers of accommodations or other services included as part of the AAAI–94 or IAAI–94 program, AAAI assumes no responsibility for and will not be liable for any personal delay, inconveniences or other damage suffered by conference attendees which may arise by reason of (1) any wrongful or negligent acts or omissions on the part of any Supplier or its employees, (2) any defect in or failure of any vehicle, equipment or instrumentality owned, operated or otherwise used by any Supplier, or (3) any wrongful or negligent acts or omissions on the part of any other party not under the control, direct or otherwise, of AAAI.




Downtown Seattle

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