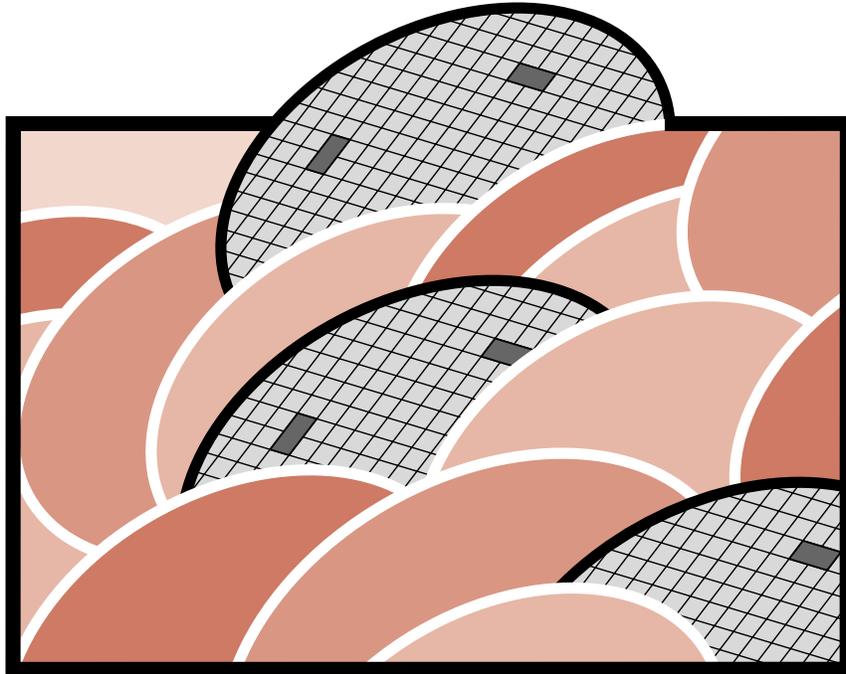


AAAI-92

Tenth National Conference on Artificial Intelligence

IAAI-92

Fourth Innovative Applications of Artificial Intelligence Conference



Registration Brochure

July 12 – 16, 1992

**San Jose Convention Center
San Jose, California**

Please join us at AAI-92

The National Conference on Artificial Intelligence has been and remains the forum at which the highest quality new research in artificial intelligence is presented. The highly competitive review and selection process helps assure this. For the 1992 conference, only 133 of 636 submitted papers were accepted. This year, the program committee was encouraged especially to seek out research results that help to bridge the gaps growing between maturing sub-disciplines of AI. We have, as usual, also sought out the new, innovative research ideas that may be tomorrow's popular research areas.

The content of the program reflects those areas where much current research is focused. A series of nine sessions will explore exciting results in learning, approached from diverse viewpoints. Another series of ten sessions covers new results in planning and coordination, and problem-solving topics including search and constraint satisfaction. One session looks at the empirical revolution in natural language processing, and another explores issues that arise in scaling up AI systems to realistic, real-world sizes. Although applications are relatively rare in the program, the conference is collocated with the Innovative Applications of AI Conference, which has an excellent sampling of such topics.

Session chairpeople will strive valiantly to make sure that time remains for questions after every paper. We hope that you will take advantage of the opportunity to ask incisive questions. The resulting dialog can make for a more vibrant meeting and can help advance the field.

In addition to the refereed papers, we have also invited a set of speakers to introduce or survey exciting areas of AI research. Oliver Selfridge, our keynote speaker, will present his vision of research in learning. Other topics include learning visual behaviors, a control-theory perspective on learning to act, case-based reasoning, and distributed AI. In addition, speakers will illuminate applications of AI in legal reasoning, molecular biology, machine translation, and multimedia. There will also be a survey of the newly-emerging discipline of artificial life.

This year we are introducing two new exhibitions in addition to the traditional exhibit program: a mobile robot exhibition and an AI art show. The mobile robot exhibition marks the resurgence of interest in AI in robotics and focuses on the interaction of various parts of AI to achieve effective behavior in the real world. The AI art exhibition will feature the use of AI in the production of serious works of art in a number of media.

Paul Rosenbloom & Peter Szolovits
Cochairs, AAI-92 Program Committee



Oliver G. Selfridge,
Senior Staff Scientist, GTE Laboratories

AAAI-92 Program

July 12-16, 1992

The AAI-92 program is multi-faceted, and holds wide appeal for the varying interests of the members of the AI community. Highlights include:

- 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 Oliver Selfridge
- Twenty four-hour tutorials that explore evolving techniques taught by experienced scientists and practitioners in AI (separate registration fee)
- AAI-92 / IAAI-92 Joint Exhibition, featuring approximately seventy exhibits and demonstrations
- AAI Robot Exhibition and Competition, combining a live competition of mobile robots from research labs around the world with video presentations from several US robot manufacturers
- AAI Arts Exhibition, presenting several pieces judged to have both artistic merit and a substantial AI component
- A series of nineteen small workshops with selected focus. (Attendance is limited and determined prior to conference.)

For more detailed descriptions of the exhibitions, please turn to page six. The AAI-92 Preliminary Program begins on page sixteen. Tutorial descriptions begin on page seven.

Opening Address

The Gardens of Learning— The Vision of AI

by Oliver G. Selfridge, Senior Staff Scientist,
GTE Laboratories

Tuesday Morning, July 14, 1992

With studies of other kinds of learning in symbolic and numeric domains, and with the resurgence of interest in neural networks, Oliver Selfridge hopes that learning, the single most important component of intelligence, may be eventually understood well enough even to be useful. He insists that learning itself is no single or simple thing; that why you learn is as important as what; that learning is not only the key to AI, but also its essence; and that in this way AI will in the long run become the cornerstone of computer science, and will help to make software technology effective and powerful.

Selfridge has consulted very extensively for the United States Government, and has served on panels for the Department of Defense, the Intelligence Community, and the National Institutes of Health. He is a Fellow of the American Association for the Advancement of Science and the American Association for Artificial Intelligence.

Oliver Selfridge studied mathematics as an undergraduate at the Massachusetts Institute of Technology, where he met Walter Pitts and Warren McCulloch, who had just written the first paper that proposed that neural nets were powerful computational devices. He continued his study of mathematics under Norbert Wiener, and extended it into cybernetics, Wiener's main concentration at the time.

In 1951, Selfridge joined MIT's Lincoln Laboratory, where his immediate early AI interests were in both Pattern Recognition and Learning: that is, not merely in how a network recognizes a pattern, but also in how it gets to be able to do so. In 1956, he participated in the Dartmouth Summer Study, often recognized as the beginning of AI.

In the middle sixties, Selfridge initiated Project MAC, the beginning of time-sharing and personal computation, later serving as its Associate Director for two years. His interest and research in learning were continued strongly in the 1970s at Bolt Beranek and Newman.

In the early 1980s, Selfridge moved to GTE Laboratories, where with Bud Frawley he helped to start a considerable effort in machine learning, probably the largest in the industrial world. He is continuing his work as a Senior Staff Scientist in the Computer and Intelligent Systems Laboratory.

“The biggest and most complete AI event of the year.... [Putting AAAI and IAAI together] is a clever and natural teaming because people interested in one are — or should be — interested in the other Speakers at this conference offered a whole array of applications. And they were not pie-in-the-sky. They are working systems that are increasing productivity, increasing service, and saving money right now.”

Don Felice

The Computer Conference

Analysis Newsletter, July 22, 1991.

Please join us at IAAI-92

The Fourth Annual Conference on Innovative Applications of Artificial Intelligence will showcase the most innovative deployed applications of AI. These applications are winners of a worldwide competition for the best use of AI technology to solve real-world problems. As in earlier years, applications will be described in talks that are accompanied by audiovisual presentations and live demonstrations. Meet-the-authors discussions at the end of each session will encourage close interaction between the presenters and other conference participants.

This year the conference will also include AI-on-Line panel discussions that address issues of particular interest to the developers of AI applications.

IAAI-92 sessions have been scheduled to allow participants to attend the plenary session of the concurrent National Conference on Artificial Intelligence (AAAI-92) and the joint exhibition. The conference schedule also permits attendees to enroll in tutorials or other portions of the National Conference.

Please join us for a stimulating and rewarding conference!

Carli Scott

IAAI-92 Program Chair

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“[The combination of IAAI and the national conference makes this] a gathering place not only for AI researchers, but also for people in industry who are trying to put AI to work. My impression last year that AI was making steady progress as a technology ... was strengthened by this year’s papers at IAAI and AI-on-Line.”

B. Chandrasekaran

IEEE Expert, October 1991

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IAAI-92 Program

Paper Presentations

Twenty-one deployed applications will be featured this year at IAAI. Sessions have been organized around the following topics:

- Finance
- Customer Service
- Industrial
- Data Analysis
- Software Development
- Regulatory
- Routing.

Please see page fourteen for the preliminary program.

AI-on-Line

Now entering its third year, AI-on-Line is a series of vendor-organized issue-oriented panels. Short presentations by users of deployed applications are followed by intensive, interactive discussions. This year, the AI-on-Line series has been incorporated into the schedule of IAAI, and will provide a balance each day to the presentation of the twenty-one award-winning IAAI papers. Topics for 1992 include:

- Technology Transfer/Corporate Adoption
- Case-Based Reasoning Systems
- Neural Networks
- LISP Applications
- Hidden Experts

Representatives from the following American and international companies and institutions participated in 1991: Accurate Automation, American Airlines, Ameritech, Andersen Consulting, Bellcore, Boeing, Boston Children’s Hospital, The Boston Company, CAMPSA, Carnegie Mellon University, Chase Manhattan, Continental Insurance, Covia Technology, Digital Equipment, Duke Power, Dun & Bradstreet, DuPont, Ford, Frito Lay, Hughes Aircraft, IBM, Inrets (France), LEGENT, Lockheed, London Life, Manufacturer’s Hanover Bank, Metropolitan Life, NASA Johnson Space Center, NCR, Promised Land Technologies, Sears, Texaco, Inc., University of California at Berkeley, and US West.

The AI-on-Line panels are open to both AAAI-92 and IAAI-92 attendees.

Special IAAI Plenary Session: Japan Watch 1992 Panel—Expert System Applications & Advanced Knowledge-Based Systems Research

8:00 PM, July 15, 1992

Panelists: Edward Feigenbaum (Chair), Stanford University; Robert S. Englemore, Stanford University; Peter Friedland, NASA Ames Research Center; Bruce Johnson, Andersen Consulting; Penny Nii, Stanford University; Herbert Schorr, USC/Information Sciences Institute; and Howard E. Shrobe, Symbolics, Inc./Massachusetts Institute of Technology

This exciting panel will report the findings of a study, including many site visits in March 1992, of Japanese work in

- Industrial and commercial applications of expert systems
- Advanced knowledge based systems research in university and industrial labs. Work of national labs in fuzzy systems, fifth generation systems, and large knowledge bases will also be covered.

The study was conducted under the auspices of the Japan Technology Evaluation Center (JTEC), primarily sponsored by the National Science Foundation.

Due to the widespread appeal of this panel, it will also be open to AAAI-92 attendees. The panel will be held in the Civic Auditorium on Wednesday evening.



*The San Jose Convention Center:
Site of AAAI-92 and IAAI-92*

6 The Exhibit Program

AAAI-92 & IAAI-92 Joint Exhibition

July 14–16, 1992



The exhibit program will once again include approximately seventy exhibits and demonstrations by the leading suppliers of AI hardware and software, as well as consulting organizations and publishers displaying their new products or services. Graphic presentations by selected exhibitors will be featured in the Applications Pavilion. At the time of publication, 1992 exhibitors include AAAI Press, Ablex Publishing Corporation, Academic Press, Addison Wesley Publishing Company, AICorp, *AI Expert*, AI Technologies, AION Corporation, Alcatel-Austria, Andersen Consulting, Benjamin/Cummings Publishing Company, BIM SA/NV, Blackboard Technology Group, Cambridge University Press, Chestnut Software, Cognitive Systems, Covia Technologies, Digital Equipment Corporation, Elsevier Science Publishers, EXSYS, Inc., Franz, Inc., French Pavilion (a consortium of French companies), Gensym Corporation, Harlequin Ltd., IBM, Ibuki, *IEEE Expert*, ImageSoft, Inference Corporation, IntelliCorp, John Wiley & Sons, Kluwer Academic Publishers, Lawrence Erlbaum & Associates, Lockheed Missiles & Space, Inc., Lucid Inc., The MIT Press, Morgan Kaufmann Publishers Inc., Neural Ware, Inc., Neuron Data Inc., *PC AI*, Pergamon Press, Production Systems Technologies, Inc., Quintus Computer Systems Inc., Reduct Systems, Rosh Intelligent Systems, Schwartz Associates, Springer-Verlag New York Inc., Symbolics Inc., Talarian Corporation, US Air Force, Venue, and W. H. Freeman and Company.

Robot Exhibition and Competition

This exciting new addition to the exhibition will feature a competition among mobile robot entries from research laboratories and universities throughout the world. The competition will involve three stages, including:

- House-breaking (roaming in a natural environment)
- Spatial search (exploration in a natural environment)
- Object detection / classification (directed search in a natural environment).

At the time of print, the following participants have entered into the competition: Odysseus, Carnegie Mellon University; Dewey, Brown University; Archi, University of Chicago; George descendant, Georgia Institute of Technology/Denning Mobile Robotics; CARMEL, University of Michigan; Flakey, SRI International; Soda-Pup, NASA Johnson Space Center; William, JPL/MIT; Flash, MITRE Corp; Beamer, IBM TJ Watson Research Center; Flash Zorton, Ecole Polytechnique of Montreal; and SPIDER, NIST. Demonstrations of Bert and Ernie, MIT and The Flying Fusco Brothers, Georgia Institute of Technology will also be presented.

In addition to the competition, the exhibition will include a video and graphic display of robots by US manufacturers. Anticipated participants include General Motors and Chrysler Corporation.

AAAI Arts Exhibition

Intense recent development of multimedia technologies is a sign of the growing use of computing in service of art and entertainment. AI will play an essential role in this process, as artists and scientists work to develop machines that have a substantive understanding of aesthetics. The AAAI-92 Arts Exhibition will be the first forum exclusively for the display of such systems.

This first Arts Exhibition will be small, presenting pieces from a range of areas to convey the variety of work we wish to encourage and hope to show in future years. Each piece will demonstrate the use of concrete AI technologies, in the acquisition, representation, or processing of artistic knowledge.

We expect to show approximately six works from among several areas of artistic performance, including still images, animation, music, drama, expressive speech and natural language generation, aesthetic robot motion, and realtime interactive environments.



San Jose's Tech Museum of Innovation features an exhibit hall where interactive exhibits put today's technology in your hands. AAAI-92 and IAAI-92 attendees are eligible for a special ticket offer. See page twenty-four for details

1992 AAI Tutorials

The AAI tutorial program for 1992 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 all tutorials (see page twenty-one for fees).

- Building Expert Systems in the Real World (MP2)
- CASE, Knowledge-Based Systems and Object-Oriented Programming (MA2)
- Case-Based Reasoning: Theory and Practice (SP5)
- Computers in Context: Tailoring Expert Systems to Real Workplaces (SP3)
- Constraint-Directed Reasoning (MA4)
- Distributed Artificial Intelligence Tools (MP5)
- Experimental Methods for Evaluating AI Systems (MP4)
- Genetic Algorithms & Genetics-based Machine Learning (SA3)
- Graphical Interface Design for AI Applications (SP2)
- KADS: An Overview of a Structured Methodology for KBS Development (SP1)
- Knowledge Acquisition Techniques (SA1)
- Knowledge-Based Production Management (SP4)
- Machine Learning for Classification Tasks (MA1)
- Machine Learning for Planning, Problem Solving, and Natural Language (MP1)
- Natural Language Generation (MP3)
- Planning and Real-Time Reasoning (SA4)
- Robot Architectures (SA5)
- Text Interpretation (MA3)
- User Modeling & User-Adapted Interaction (SA2)
- Verification and Validation of Knowledge-Based Systems (MA5)

SA1 (Sunday, 9 AM - 1 PM, July 12)

Knowledge Acquisition Techniques

Jan Clayton, Vice President, Expert Support Inc. and Carli Scott, Principal Engineer, Expert Support Inc.

This tutorial focuses on the relationship between knowledge acquisition and the development of expert systems. The most common knowledge-acquisition activities will be discussed, along with how those activities change as a project progresses. In addition, the presenters will describe guidelines, techniques, and procedures that have proven successful in developing applications.

Instead of discussing the theory behind knowledge acquisition, the tutorial presenters will focus on the practice of knowledge acquisition. The presenters will spend very little time discussing how to ask questions. Instead, they will focus on what questions to ask. In addition, the tutorial will cover problems that knowledge engineers are likely to encounter, how to avoid these problems, and how to correct them when they do occur.

Prerequisite Knowledge: This is an introductory to intermediate level tutorial. Basic knowledge of AI and expert systems is required. Development of a prototype of a small expert system is helpful. Knowledge of a particular expert-system shell is not needed.

Jan Clayton has eleven years of experience in the field of artificial intelligence and expert-systems technology. Her research and commercial experience includes:

- Application development of small- and large-scale expert systems
- Documentation and training development
- Expert-systems methodology development

Jan was a member of Stanford's Heuristic Programming Project from 1978 to 1982. In 1982 she joined Teknowledge Inc. as a knowledge engineer. During her seven years at Teknowledge, Jan participated heavily in both application and training development. As such, she worked on several successfully fielded expert systems. In 1990, Jan became a founder of Expert Support Inc.

Carli Scott has seventeen years of experience in the field of artificial intelligence and expert-systems technology. Her research and commercial experience span a wide range of activities including:

- Building expert-system applications
- Designing, implementing, documenting, testing, maintaining, and extending expert-system shells
- Developing and delivering courses about expert-systems shells and knowledge engineering methodology

Carli worked for Stanford's Heuristic Programming Project from 1974 to 1982 on the MYCIN and ONCOCCIN projects as a knowledge engineer and lead programmer, respectively. In 1981, Carli became founder of Teknowledge Inc., and in 1982, she went to work for Teknowledge on a full-time basis as a senior knowledge engineer, where she worked on both application and product development. In 1990, she became a founder of Expert Support Inc.

SA2 (Sunday, 9 AM - 1 PM, July 12)

User Modeling &

User-Adapted Interaction

Sandra Carberry, Associate Professor of Computer Science, University of Delaware and Alfred Kobsa, Associate Professor of Information Science, University of Konstanz

This tutorial will familiarize participants with the key concepts, techniques, and issues involved in user modeling and user-adapted interaction. We will first consider the beliefs about the user that might be captured in a user model, including the user's domain knowledge, goals, and partially developed plans for accomplishing these goals, and attitudes and emotions. Then we will present techniques for acquiring, representing, and revising user models and for exploiting them to tailor the system's behavior to the individual user. We will critically analyze each approach, discuss its advantages and disadvantages, and describe prototypical implementations. We will also examine practical and ethical considerations related to user modeling, describe existing shell systems for constructing user models, and provide the participants with practical tips and guidelines for systems development.

Prerequisite Knowledge: This is an intermediate-level tutorial. Participants should be familiar with basic concepts in knowledge representation and reasoning. Some familiarity with user modeling will be helpful but is not required.

Sandra Carberry is an associate professor of computer science at the University of Delaware and has been working in the field of user modeling since 1981. Her work focuses on incrementally recognizing the user's plans and goals during the course of an ongoing dialogue and on exploiting the acquired knowledge to produce more robust and cooperative interaction with the user. Dr Carberry is a member of the *User Modeling and User-Adapted Interaction* editorial board. She is also the author of *Plan Recognition in Natural Language Dialogue*, and has coauthored several computer science textbooks. Dr. Carberry received an excellence in teaching award from the student ACM chapter at the University of Delaware.

Alfred Kobsa is an associate professor of information science at the University of Konstanz, Germany, and has been working in the field of user modeling since 1982. His research has been concerned both with theoretical issues in user modeling, such as representing and reasoning with user beliefs, and with practical applications, including user modeling components for natural-language interfaces to expert systems and the development of user modeling shell systems. Technical papers by him have appeared at international AI conferences and in AI-related journals.

Dr. Kobsa was the cochairman of the First International Workshop on User Modeling and is the coeditor of the first comprehensive survey of the user modeling field, which appeared in a special issue of *Computational Linguistics* and a volume in the Symbolic Computation Series of Springer-Verlag. He is also the editor of the *User Modeling and User-Adapted Interactions* journal.

8 Tutorials

SA3 (Sunday, 9 AM - 1 PM, July 12)

Genetic Algorithms & Genetics-based Machine Learning

David E. Goldberg, Associate Professor of General Engineering and the Beckman Institute, University of Illinois at Urbana-Champaign and John R. Koza, Consulting Associate Professor of Computer Science, 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. We review the mechanics of a simple genetic algorithm and consider the implicit parallelism that underlies its power. A parade of current search applications is reviewed as are more advanced GA techniques such as niching and messy GAs. The two most prominent techniques of GBML, classifier systems and genetic programming, are also surveyed.

Prerequisite knowledge: This tutorial level is introductory. Knowledge of genetic algorithms or biological concepts is not assumed. A general familiarity with computers and programming is required.

David E. Goldberg is an associate professor of general engineering and the Beckman Institute 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 the theory of deception, the role of noise in GA convergence, and the theory and development of messy GAs.

John R. Koza is a consulting associate 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 is currently investigating the artificial breeding of computer programs and has recently completed *Genetic Programming* (MIT Press) that surveys these efforts. 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.

SA4 (Sunday, 9 AM - 1 PM, July 12)

Planning and Real-Time Reasoning

James Hendler, University of Maryland, and Michael Georgeff, Director, Australian AI Institute

During the last few years, AI researchers have become increasingly concerned with the problem of designing architectures for intelligent systems that are required to operate in complex and dynamic domains. The potential applications are both diverse and economically important—for example, air traffic control, intelligent networking, monitoring industrial processes, on-line fault diagnosis and malfunction handling, and emergency health care.

This tutorial aims to provide participants with an understanding of the issues involved in designing and building such intelligent agents. It will briefly review past work in the design of AI planning systems and discuss why these are inadequate to the sorts of dynamic domains described above. Description of new approaches and case studies of both toy-world and real-world systems will be presented.

Prerequisite knowledge: This intermediate-level tutorial is aimed at both the industrial AI practitioner interested in the development of planning-related systems and the AI researcher interested in learning about current research in the planning area. The presenters will assume a background in AI, academic or industrial, but only a basic familiarity with planning research.

James Hendler is an assistant professor in the Department of Computer Science at the University of Maryland. He is the author of *Integrating Marker-passing and Problem-Solving* and is coeditor of *Readings in Planning*. Dr. Hendler has also done a large amount of nonuniversity teaching in the area of AI as well as teaching management courses on the development of expert systems in the US and abroad. His main area of research is in the design of situated planning agents.

Michael Georgeff is the director of the Australian Artificial Intelligence Institute, Australia's leading research and development organization for advanced information technology. He is also a member of the Artificial Intelligence Center at SRI International, Menlo Park, California, one of the world's foremost research centers in artificial intelligence. He is coeditor of *Reasoning about Actions and Plans* and was a senior member of the SRI team that developed the research and development plans for NASA's proposed space station.

SA5 (Sunday, 9 AM - 1 PM, July 12)

Robot Architectures

Reid G. Simmons, Research Computer Scientist, Carnegie Mellon University and R. James Firby, Assistant Professor, University of Chicago

This tutorial will introduce concepts in robot architectures, concentrating on architectures for autonomous mobile robots. The tutorial will begin by presenting factors that influence modern robotic architectures: actuator and sensor control, complex changing environments, and the desire to perform a wide variety of tasks. The tutorial will continue with case studies of deliberative (hierarchical), reactive (behavior-based), hybrid and learning architectures. The strengths and weaknesses of each methodology will be analyzed in terms of the types of tasks and environments it readily supports. Particular attention will be paid to the problems of dealing with uncertainty, complexity, and resource constraints. Finally, the tutorial will discuss specific architectural designs for the AAAI-92 robot competition.

Prerequisite Knowledge: This intermediate-level tutorial is intended for people who need to develop or evaluate complex robotic systems. No previous experience with robotics is required but a basic understanding of AI planning concepts is essential.

Reid G. Simmons is a research scientist in the School of Computer Science and Robotics Institute at Carnegie Mellon University. Since coming to CMU in 1988, Dr. Simmons's research has focused on developing self-reliant robots that can autonomously operate over extended periods of time in unknown, unstructured environments. This work involves issues of robot architectures that combine deliberative and reactive control, selective perception, and robust error detection and recovery. The ideas are currently being applied to a six-legged planetary rover and an indoor mobile manipulator.

Dr. Simmons received his Ph.D. from MIT in AI in 1988. His dissertation focused on the combination of associational and causal reasoning for planning and interpretation tasks. The research involved the use of multiple representations of the physical world and developed a domain-independent theory of debugging plans.

R. James Firby is an assistant professor of computer science at the University of Chicago. His main interest is the construction of systems that interact with complex, changing environments. Dr. Firby is currently working on an architecture to integrate symbolic planning with low-level robot control. That architecture is being implemented on an indoor mobile robot.

Dr. Firby received his Ph.D. in AI from Yale University in 1989. His dissertation introduced the RAP system for reactive plan execution using situation specific task methods. That research addressed problems in error recovery, task-directed perception, and opportunism. From 1989 to 1991 Dr. Firby worked as a research scientist at the Jet Propulsion Lab designing and building local navigation software for the Pathfinder Planetary Rover project.

SP1 (Sunday, 2 - 6 PM, July 12)

KADS: An Overview of a Structured Methodology for KBS Development

R. A. Martil, AI Coordinator, Lloyd's Register, UK and
B. J. Wielinga, Professor, Social Sciences, University of
Amsterdam

This tutorial will present a practical overview of the KADS methodology, the result of an ongoing series of European Community-funded ESPRIT technology projects. The tutorial will concentrate on two key areas in KAD, knowledge modeling and project management. The presenters will then bring attendees up to date on developments within the latest ESPRIT project, KADS-II. The material will be presented through a series of exercises supported by lectures, intended to provide a more practical understanding of the methodology than the extensive published literature can provide. The material for the tutorial has been developed from an industrial two-day course presented by Professor Wielinga and Mr. Martil, who are both involved in the KADS-II project.

Prerequisite Knowledge: This intermediate-level course is aimed toward those wishing to develop, or manage the development of, knowledge-based systems in a disciplined way. Anyone with some experience of developing expert systems, or who has been involved in knowledge acquisition with an expert will certainly understand the issues and the material presented.

Bob Wielinga has lectured at the University of Amsterdam on knowledge-based systems for more than ten years, and prior to that acted as a Senior Research Officer in AI at the University of Essex (UK) from 1974 to 1977. He became a full professor at the Social Science Informatics Department in 1986. Besides teaching, his duties include research in AI and cognitive science. Currently he is project leader of externally funded research projects on acquisition of problem solving skills, models of learning processes, and intelligent coach for teaching physics. Since 1983, he has performed research on the methodology of knowledge-based system acquisition, analysis and design. He was team leader for Uv A of the KADS project, and now leads work in KADS-II and ACKnowledge. As such he is a major contributor to the development of the KADS-II methodology. He is action coordinator of the ESPRIT REFLECT basic research project.

Robert Martil is technical R & D manager in AI at Lloyd's Register, UK. He is project manager for the KADS-II project and Coordinator of all LR's AI work. His technical work on the KADS-II has been primarily concerned with the development of the KADS-II life cycle model and project management cycle, and with the development of the complete KADS-II model set, a focus for KADS-II work. He initiated and organizes an ongoing series of industrial courses on KADS copresented with Professor Wielinga, and is involved in the organization of the KBS methodologies and KADS user groups in the UK and Europe.

Mr. Martil gained a degree in computer science from Warwick University, England, and an M.Sc. in intelligent systems at Brunel University.

SP2 (Sunday, 2 - 6 PM, July 12)

Graphical Interface Design for AI Applications

Michael D. Williams, Chief Scientist, IntelliCorp

This tutorial surveys graphical interface design for AI applications. A number of paradigmatic examples are examined and analyzed in order to highlight successful as well as unsuccessful techniques. The first half of the tutorial presents a history of key interface developments and summarizes implications of selected current research. The second half of the tutorial focuses on practical guidelines for managing the development of AI systems with substantial interface components. Based on experience with a variety of applications, potential pitfalls are identified and useful techniques are described. Detailed examples are used to help characterize the process and craft of effective interface design.

Prerequisite Knowledge: This beginning/intermediate-level tutorial presupposes a basic understanding of knowledge representation and object oriented programming.

Mike Williams is chief scientist at IntelliCorp. He has had over fifteen years experience building AI and object-oriented systems and tools. He was a principal in the development of STEAMER, an early AI-based computer training system to teach steam plant operation; RABBIT, an intelligent database interface; and a number of knowledge engineering tools, including KEE, KEEconnection, SimKit, ActiveImages, and IntelliScope. Most recently he was one of the principals in the design and development of ProKappa, an object-oriented development environment for commercial software applications. Prior to joining IntelliCorp he was a member of the technical staff at Xerox PARC.

SP3 (Sunday, 2 - 6 PM, July 12)

Computers in Context: Tailoring Expert Systems to Real Workplaces

William J. Clancey, Senior Research Scientist, Institute for
Research on Learning, and John McDermott, Technical
Director, Artificial Intelligence Technology Center, Digital
Equipment Corporation

This tutorial introduces software developers and managers to business analysis methods that are sensitive to how people think and learn from each other. How can we design computer systems that fit the social realities of the workplace? How can we design tools that deal not only with routine, well-understood situations, but help people innovate and change how their work is done? Knowledge engineering will come of age only when it comes to grips with its potential intrusiveness. New methods of observation, user collaboration, and evolutionary design—based on ethnography and video interaction analysis—are changing expert systems development. Building our lectures around case studies, we illustrate how to usefully integrate and learn from these new perspectives on software design, business practices, and human cognition.

Prerequisite Knowledge: This is an intermediate-level tutorial. Familiarity with knowledge-based systems is helpful; knowledge of social sciences is not required.

William J. Clancey is a senior research scientist at the Institute for Research on Learning (IRL). At IRL, Dr. Clancey works with social scientists to understand their perspective on software design and relate it to qualitative modeling techniques. His approach includes relating AI programming to traditional engineering modeling, facilitating communication instead of merely automating what people do, and reconceiving how models of knowledge relate to human reasoning. Before joining the IRL in 1987, Dr. Clancey was a member of the Stanford Knowledge Systems Lab for thirteen years, where he developed NEOMYCIN, one of the earliest second-generation expert systems.

Dr. Clancey received his Ph.D. from Stanford University in Computer Science in 1979. He is the author of three books and over thirty-five journal articles and book chapters, a senior editor of *Cognitive Science*, and editor-in-chief of the AAAI Press.

John McDermott is a member of the technical staff at Digital Equipment Corporation and is also a faculty member of the Computer Science Department at Carnegie-Mellon University. Dr. McDermott was a cofounder of Carnegie Group, Inc. He received a Ph.D. in philosophy from the University of Notre Dame in 1969. His AI research interests are in the application of AI techniques to industrial problems. This has included addressing the problems involved in developing expert systems. In 1980 he completed work on R1, a program used by DEC to configure computer systems. Since 1989, he has built on the earlier knowledge acquisition work, but focused it on creating software tools to make the development of effective application programs easier. His experiences have made him acutely aware of the importance of workplace analysis for developing successful expert systems.

10 Tutorials

SP4 (Sunday, 2 - 6 PM, July 12)

Knowledge-Based Production Management

Stephen F. Smith, *The Robotics Institute, Carnegie Mellon University* and Norman M. Sadeh, *The Robotics Institute, Carnegie Mellon University*

This tutorial will introduce participants to the concepts, techniques, and methodologies that have emerged from work in knowledge-based production management. We will first consider the shortcomings of traditional approaches to production management (e.g. MRP / MRP II) and identify opportunities provided by knowledge-based technologies both in overcoming these limitations, and in contributing to effective implementation of modern manufacturing philosophies (e.g. Just in Time). We will then review in more detail the essential concepts and techniques underlying dominant approaches to knowledge based production management, including object-centered modeling frameworks, simulation and rule-based techniques, temporal constraint management, blackboard and multi-perspective techniques, constrained heuristic search, uncertainty management, iterative improvement techniques, distributed production management and *Leitstand* frameworks. Finally, we will examine a few successful applications, and assess the current state of theory and practice.

Prerequisite Knowledge: This intermediate-level tutorial is aimed at anyone interested in applying knowledge-based techniques to practical production management problems. The tutorial assumes knowledge of AI at the level of an introductory course as well as some familiarity with basic production management concepts.

Stephen F. Smith is a senior research scientist in the Robotics Institute at Carnegie Mellon University, and Director of the Production Scheduling and Control Laboratory within the Robotics Institute's Center for Integrated Manufacturing Decision Systems. He received his Ph.D. degree in Computer Science from the University of Pittsburgh in 1980. His current research focuses on mechanisms for reactive schedule/plan adaptation under changing circumstances, integration of planning and scheduling processes, distributed coordination in resource-constrained multi-agent domains, and automated acquisition of scheduling and planning strategies from experience.

Norman M. Sadeh is a research scientist at Carnegie Mellon's Robotics Institute, and a member of the Center for Integrated Manufacturing Decision Systems, where he directs a large project in decentralized production scheduling and control. Dr. Sadeh is also the developer of the MICROBOSS factory scheduling system, a system that has yielded important reductions in scheduling costs (both tardiness and inventory costs) over more traditional bottleneck-centered approaches to factory scheduling.

Dr. Sadeh's research interests include the applications of AI and operations research techniques to both engineering and management problems.

SP5 (Sunday, 2 - 6 PM, July 12)

Case-Based Reasoning: Theory and Practice

Kevin D. Ashley, *University of Pittsburgh* and Evangelos Simoudis, *Lockheed AI Center*

Case-based reasoning (CBR) is a new AI methodology that applies past experience, as represented by prior cases, to current decision making. CBR systems have been designed to handle such diverse tasks as planning, design, diagnosis, argumentation, negotiation and running a help desk. CBR requires a memory where past cases are organized. Successful cases are stored so that they can be retrieved and used in similar situations. Failures are also stored so that they can warn the problem solver of potential difficulties and provide repairs. This tutorial will introduce the basics of CBR, illustrate and compare five paradigmatic CBR approaches, and examine design issues and tradeoffs in building CBR systems. As a major new component, the tutorial will focus on recent real-world applications of CBR technology and lessons learned in transferring this technology.

Prerequisite Knowledge: No special prerequisites, but familiarity with basic AI concepts helpful. This intermediate-level tutorial is intended for AI professionals interested in current CBR research issues, managers interested in alternative methodologies for expert system development, and knowledge engineers considering CBR applications.

Kevin Ashley is an assistant professor of law and intelligent systems at the University of Pittsburgh and a research scientist at the Learning Research and Development Center. He has written *Modeling Legal Argument: Reasoning with Cases and Hypotheticals*, (The MIT Press/Bradford Books). His research interests include case-based and analogical reasoning, argumentation and explanation and designing computer systems for assisting attorneys in law teaching and practice. He received a J.D. from Harvard Law School in 1976.

Evangelos Simoudis is a research scientist in the AI center of Lockheed corporation where he heads the Learning Systems Group. He directs research on case-based reasoning and inductive learning in manufacturing settings. He is also conducting research in the area of distributed AI, applying it to help desks. Dr. Simoudis received a Ph.D. in Computer Science from Brandeis University in 1991. His Ph.D. research resulted in the development of CASCADE and COAST, two case-based diagnostic systems that can be used in help desk settings where they reason from past cases captured by help desk engineers.

MA1 (Monday, 9 AM - 1 PM, July 13)

Machine Learning for Classification Tasks

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

After an initial survey of the field of machine learning, the primary focus of this tutorial will be on symbolic and neural network approaches to inductive learning from examples. This problem can be briefly defined as follows: given descriptions of a set of examples each labeled as belonging to a particular class, determine a procedure for correctly assigning new examples to these classes. Both symbolic and neural-network approaches to this problem will be presented. Quinlan's ID3, Michalski's AQ, and Rumelhart's Backpropagation algorithms will be described and illustrated with simple examples. These algorithms have been applied to real-world tasks; the approaches taken and the results obtained will be covered. The tutorial will also describe some recent comparisons between ID3 and Backpropagation using real-world data sets. Finally, it will discuss the strengths and weaknesses of this form of machine learning, as well as current research problems in the area.

Prerequisite Knowledge: This intermediate-level tutorial is addressed to computer scientists with some experience in AI, roughly at the level of an introductory textbook. A basic understanding of rule-based expert systems, particularly the concepts of pattern matching and backward/forward chaining, is necessary.

Haym Hirsh is an assistant professor of computer science at Rutgers University. He received his Ph.D. (1989) degree in computer science from Stanford University, and spent a year as a visiting scholar at Carnegie Mellon University and the University of Pittsburgh. He is the author of *Incremental Version-Space Merging: A General Framework for Concept Learning* and of a number of book chapters and papers in machine learning. His current machine-learning research interests include applications of machine learning in both molecular biology and ship design, as well as computational issues for inductive learning.

Jude Shavlik is an assistant professor of computer science at the University of Wisconsin. He received B.S. degrees from MIT in electrical engineering and biology in 1979, a S.M. degree in molecular biophysics and biochemistry in 1980 from Yale, and, after working for the Mitre Corporation for several years, was awarded a Ph.D in computer science from the University of Illinois. He is the author of *Extending Explanation-Based Learning by Generalizing the Structure of Explanations*, coeditor of *Readings in Machine Learning*, and has published over two-dozen papers on machine learning. His current research interests include comparing and combining symbolic and neural network approaches to machine learning, as well as the application of machine learning techniques to problems in the Human Genome Project. He is an invited speaker at the 1992 International Machine Learning Conference.

MA2 (Monday, 9 AM - 1 PM, July 13)

CASE, Knowledge-Based Systems and Object-Oriented Programming

Jan Aikins, Vice President of Technology, AION Corporation and Paul Harmon, Editor, Object-Oriented Strategies newsletter

This tutorial will introduce participants to the concepts underlying computer-aided software engineering (CASE), knowledge-based systems, and object-oriented programming (OOP). We will consider the advantages of each approach, and propose possible ways of combining them for system development. We will review several popular CASE tools, object-oriented tools, and knowledge-based system tools, and discuss the experiences of some companies that have used both conventional and intelligent CASE products. We will also provide participants with an overview of the current CASE market and an understanding of the evolving role that object-oriented and knowledge-based systems techniques are playing within the software development market.

Prerequisite Knowledge: This is an introductory-level tutorial. Familiarity with knowledge-based systems is helpful; knowledge of object-oriented programming or CASE is not required.

Paul Harmon is the editor of two newsletters, *Object-Oriented Strategies* and *Intelligent Software Strategies*. The former reports on commercial developments in object-oriented technologies while the latter reports on the commercial developments in the field of AI and expert systems, neural networks and intelligent CASE.

He is also the coauthor of *Expert Systems: Artificial Intelligence in Business* and two other books on expert systems. His latest book, *ObjectCraft*, (Addison-Wesley) provides an overview of OOP and is a manual for the graphical programming tool of the same name. Mr. Harmon is the CEO of ObjectCraft, Inc.

Jan Aikins is a founder and vice president of technology for Aion, a knowledge-based system's tool vendor for IBM PC and mainframe tools. At Aion she is responsible for assessing technological developments in AI and related fields. She directs advanced development projects and provides technological and competitive information to Aion's marketing and sales departments.

Prior to joining Aion, Dr. Aikins held research positions at both Hewlett-Packard and IBM where she gained extensive experience in creating expert systems for both scientific and commercial applications.

Dr. Aikins received her Ph.D. from Stanford University in AI in 1980. Her dissertation introduced one of the earliest hybrid knowledge representations and explored the impact of an explicit control representation for expert systems.

MA3 (Monday, 9 AM - 1 PM, July 13)

Text Interpretation

Jerry R. Hobbs, SRI International and Lisa Rau, General Electric Research Center

Text interpretation is that branch of natural language processing that concerns itself with analyzing natural language texts to extract some of the information they convey. Applications of this technology include message routing and prioritizing, automatic database entry, and text retrieval. This field has made significant advances recently. We will cover the principal techniques that have been developed. Among the topics covered will be pattern identification, statistical methods, syntax and parsing methods in relation to the particular problems of naturally-occurring texts, methods for making processing faster and more robust, reasoning about the content of texts for disambiguation, linking different parts of the text together and issues in evaluating the performance of systems. The discussions will be grounded in the experience of the instructors with large-scale text-interpretation systems.

Prerequisite knowledge: This intermediate-level tutorial presumes familiarity with the basic concepts and terminology involved in natural language processing.

Jerry R. Hobbs received his Ph.D. degree from New York University and has taught at Yale University and the City University of New York. He has been at SRI International since 1977, where he led the development of the Tacitus system for text interpretation. He has done extensive research in discourse analysis, knowledge representation, lexical semantics, syntax, and parsing.

Lisa Rau, since joining GE in 1985, has initiated and led GE's research in text interpretation. Ms. Rau is the principal designer of the SCISOR prototype and the GE NLToolset, deployed in applications across the company. Prior to joining GE, she received her BS and MS in computer science from the University of California at Berkeley. She has authored over thirty publications in the areas of natural language, text and conceptual information retrieval.

In addition to leading research, Ms. Rau has directed the transfer of technology in text interpretation from the laboratory to GE businesses. Her work has been featured in *Popular Science* and *Information Week* and was cited recently in *More Future Stuff* as "an invention that will change your life by the year 2001."

MA4 (Monday, 9 AM - 1 PM, July 13)

Constraint-Directed Reasoning

Bernard A. Nadel, Computer Science Dept., Wayne State University and D. Navinchandra, Robotics Institute, School of Computer Science, Carnegie Mellon University

Constraint satisfaction techniques are central to many areas of AI. This tutorial will survey these techniques and their applications. The constraint satisfaction problem (CSP) and several of its basic algorithms will be introduced, such as backtracking, backjumping, forward checking and network consistency techniques. Heuristics will be given for ordering the search performed by these algorithms. Applications of CSP will be used to illustrate advanced concepts. These will include areas such as temporal reasoning, layout problems, engineering design and concurrent engineering. These applications will be used to motivate some important extensions of the standard version of CSP such as the integration of continuous-valued variables and hierarchically-structured domains of values as well as versions of CSP that require all solutions, any single solution, or the optimum solution. We will also treat the use of constrained-influence graphs to guide problem solving processes and the management of large constraint networks in organizations with multi-agent interaction and constraint negotiation. The CSP formulations of many of our application examples will be made concrete by the use of explicit, compact Prolog programs for their solution.

Prerequisite Knowledge: Some familiarity with the use of constraints in AI systems would be helpful. This is an intermediate-level tutorial.

Bernard Nadel is an assistant professor of computer science at Wayne State University, Detroit. His interests include the design and analysis of algorithms in general, with constraint satisfaction algorithms being his main focus. He is also interested in the application of constraint satisfaction techniques to engineering, manufacturing and physics problems. Recent applications of his include the automated design of automobile power transmissions, with Ford Motor Company, and the manufacture of synthetic diamond, with the Wayne State University Institute for Manufacturing Research.

D. Navinchandra is an assistant professor at the Robotics Institute, Carnegie Mellon University. He is also an adjunct faculty member of the Department of Civil Engineering at CMU. His research interests include knowledge representation, design theories, project management, and the application of AI to engineering problems. He has published a book and several papers in these areas. Dr. Navinchandra is originator of the concept of Green Engineering: the study of product design for environmental friendliness without compromising product quality. Dr. Navinchandra cofounded the Intelligent Engineering Systems Laboratory at MIT in 1985. He heads up the Concurrent Engineering and KAD laboratory at the Robotics Institute.

12 Tutorials

MA5 (Monday, 9 AM - 1 PM, July 13)

Verification and Validation of Knowledge-Based Systems

Daniel E. O'Leary, Associate Professor, University of Southern California and Kirstie Bellman, The Aerospace Corporation

This tutorial will survey the concepts underlying the verification and validation of knowledge-based systems. We will present a hierarchical approach to expert systems quality that includes verification and validation. Techniques of verification of rules, frames and other forms of knowledge representation are investigated. Considerable attention is then aimed at structuring, designing, and implementing validation tests. Statistical approaches to verification and validation are summarized in a case-study setting. Recent developments in verification and validation tools are also presented. The tutorial concludes with a review of what is actually done in practice.

Prerequisite Knowledge: This is an introductory to intermediate-level tutorial, requiring some familiarity with knowledge-based systems and different forms of knowledge representations, such as rules and frames. The tutorial assumes an interest in the evaluation process. This tutorial is designed for the systems developer or manager interested in some of the primary techniques and approaches to verification and validation, and quality management.

Daniel E. O'Leary is an associate professor at the University of Southern California. He received his Ph.D. from Case Western Reserve University and his Master's degree from the University of Michigan. Professor O'Leary has published papers in *Expert Systems with Applications*, *IEEE Expert*, *International Journal of Expert Systems: Research and Applications*, *International Journal of Intelligent Systems*, *International Journal of Man-Machine Studies* and elsewhere. In 1991, Dan was the chairperson of the AAAI Workshop on Verification, Validation and Testing of Knowledge-Based Systems.

Kirstie Bellman is a research scientist with The Aerospace Corporation. In 1989, Dr. Bellman was the chairperson at the IJCAI Workshop on Verification, Validation and Testing of Knowledge-Based Systems. Dr. Bellman has published papers in a number of journals and proceedings, including *Expert Systems with Applications*, *Proceedings of the Space Quality Conference* and *Proceedings on AI and Simulation*.

MP1 (Monday, 2 - 6 PM, July 13)

Machine Learning for Planning, Problem Solving, and Natural Language

Pat Langley, Senior Scientist, NASA Ames Research Center and Raymond Mooney, Assistant Professor, University of Texas at Austin

This tutorial will present an overview of machine learning methods for problem solving, planning, control, and natural language. Historically, research in machine learning has focused on acquiring knowledge for classification. Although classification has many applications, such as diagnosis, it is not directly relevant to many domains. Consequently, there has been a recent growth of interest in learning for alternative tasks, although much of this research builds on the earlier work in classification. We will review basic learning methods for the acquisition of search heuristics, primitive operators, and macrooperators drawing on empirical, explanation-based, genetic, analogical, and connectionist approaches to these tasks. We will also discuss the application of such methods to various problems, such as robot planning, natural language parsing, and plan recognition.

Prerequisite Knowledge: Participants in this intermediate-level tutorial should be familiar with basic issues and methods in artificial intelligence, particularly knowledge representation, search, planning, and natural language. Some knowledge of learning methods for classification would be useful but is not necessary.

Pat Langley is a senior scientist at NASA Ames Research Center, where he carries out research on machine learning and intelligent agents. Before coming to NASA, Dr. Langley was an associate professor of computer science at the University of California, Irvine, and a research scientist at Carnegie Mellon University, where he received his Ph.D. in cognitive psychology. He has taught numerous courses in AI, including graduate seminars and tutorials on machine learning. Dr. Langley has published papers on scientific discovery, concept formation, heuristics learning, motor learning, and language acquisition. He is coauthor of *Scientific Discovery* and coeditor of *Production System Models of Learning and Development*, *Computation Models of Scientific Discovery and Theory Formation*, and *Concept Formation: Knowledge and Experience in Unsupervised Learning*.

Raymond Mooney is an assistant professor in the Department of Computer Sciences at the University of Texas at Austin. He was educated at the University of Illinois at Urbana-Champaign where he earned a Ph.D. in computer science in 1988. His dissertation was published in *A General Explanation-Based Learning Mechanism and Its Application to Narrative Understanding*. He is author of over twenty-five papers in machine learning and was cochair of the Seventh International Conference on Machine Learning. His recent research has concerned comparing symbolic and neural-network learning, combining explanation-based and empirical learning, abductive reasoning, and knowledge-base and theory refinement.

MP2 (Monday, 2 - 6 PM, July 13)

Building Expert Systems in the Real World

Tod Hayes Loofbourrow, President and CEO, Foundation Technologies, Inc. and Ed Mahler, Program Manager for Artificial Intelligence, DuPont

This tutorial is designed to provide participants with an understanding of how companies which 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 to 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; the strategic choices facing individuals and organizations charged with building knowledge-based systems, and a set of concrete steps that 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 in this introductory tutorial, although familiarity with knowledge-based systems is helpful.

Tod Hayes Loofbourrow is president and CEO of Foundation Technologies, Inc., a leading knowledge technology consulting firm. He has performed strategic consulting for clients worldwide and teaches graduate courses in AI at Harvard University, where he created the university's first courses on expert systems. Mr. Loofbourrow is author of the "Managing Knowledge" column in *Expert Systems* magazine, is a featured columnist for the *Software Engineering* journal, and served as a columnist for *Globetech Magazine*.

Ed Mahler is currently program manager for AI at DuPont with responsibility for leading their implementation program worldwide. Widely known for his highly successful no nonsense business-oriented approach, he has frequently been quoted in such diverse publications as *Time*, *Computerworld*, and *EDP Analyzer*. His program at DuPont won the award for innovation from *High Technology* magazine in 1987.

Ed received his B.S. and Ph.D. degrees in chemical engineering from the University of Texas. He worked for a small chemical company before joining DuPont in 1969. He held numerous managerial positions in research and manufacturing prior to a five year assignment in Corporate strategic planning. While serving as liaison for emerging technologies, he founded an ad hoc group, the Corporate Artificial Intelligence Task Force, to exploit AI in DuPont. This activity precipitated the creation of his current position in 1986.

MP3 (Monday, 2 - 6 PM, July 13)

Natural Language Generation

Kathleen F. McCoy, Associate Professor, Department of Computer and Information Sciences, University of Delaware and Johanna D. Moore, Assistant Professor, Department of Computer Science and Learning Research and Development Center, University of Pittsburgh

This tutorial is intended to provide an introduction to natural language generation for those who wish to undertake research in this field, and to serve as a practical decision-making tool for product developers who have applications that could benefit from this technology. We will introduce the field's theoretical problems as well as some solutions, and will also describe well-established techniques that can and are being used in real applications. We will examine several general approaches to generation and the particular tasks to which these approaches can be applied. We will then delve into three important application areas: Report generation, expert system explanation generation, and tutorial dialogues. Finally, we will characterize the needs of several different classes of applications and also identify the capabilities offered by different generation techniques in order to enable attendees to choose a technique suited to their needs.

Prerequisite Knowledge: Familiarity with basic AI concepts, techniques, and algorithms such as search techniques, early work in planning (STRIPS and NOAH), pattern matching, unification, production systems, and deductive retrieval is assumed. No background in linguistics or computational linguistics is required in this introductory tutorial.

Kathleen F. McCoy is an associate professor in the Department of Computer and Information Sciences at the University of Delaware where she holds a joint appointment in the Department of Linguistics. She has published articles in the area of natural language generation in the *Artificial Intelligence*, *Computational Linguistics*, and *Computational Intelligence* journals as well as in conference proceedings. Her current interest is in combining natural language processing techniques with the field of augmentative communication in order to develop technology to enhance the communicative capabilities of people with various kinds of disabilities.

Dr. Johanna D. Moore holds interdisciplinary appointments as an assistant professor of computer science and as a research scientist at the Learning Research and Development Center at the University of Pittsburgh. Her research interests are to improve human-computer interaction through the use of explanation and natural language generation. Dr. Moore has worked extensively in the area of explanation for expert systems and is now extending this work to providing explanation capabilities for information-giving and intelligent tutoring systems.

Dr. Moore has written and lectured extensively on the topic explanation for expert systems, and an implementation of an explanation component for an expert system shell she developed with her colleagues Drs. Cecile Paris and William Swartout at USC/Information Sciences Institute.

MP4 (Monday, 2 - 6 PM, July 13)

Experimental Methods for Evaluating AI Systems

Paul Cohen, Associate Professor, Computer Science, University of Massachusetts at Amherst and Bruce Porter, Associate Professor, Computer Science, University of Texas at Austin

This tutorial will introduce, through case studies, designs for exploratory and confirmatory experiments, a few statistical techniques for analyzing results, and techniques for evaluating what results mean to research and development programs. Our objective is to provide methods by which researchers and practitioners can test hypotheses and substantiate claims of system performance. We will focus on experiments in knowledge-based systems, machine learning and planning, although much of our discussion will apply to broader areas of AI. The case studies illustrate techniques for measuring and comparing levels of performance, analyzing the effects of adding knowledge to a system, finding interactions between components of systems, and isolating causes of poor performance. We will discuss some tricky problems, including designing representative test sets and getting representative samples of data; and we will describe some open problems, for which convincing techniques are not yet available, such as generalizing results from one system to others.

Prerequisite Knowledge: Some familiarity with knowledge-based systems and basic machine learning and planning techniques is helpful but not essential. No knowledge of statistics is assumed. This is an introductory-level tutorial.

Paul Cohen is an associate professor at the University of Massachusetts at Amherst, where he directs the Experimental Knowledge Systems Lab. His research concerns planning in uncertain, real-time environments. Cohen has been involved in the development of research methods for AI and computer science in general for several years, and in 1990 published a critical survey of AI research papers, and suggested a new methodology. Dr. Cohen received his Ph.D. from Stanford University, and joined the faculty at the University of Massachusetts in 1983. He is an editor of *The Handbook of Artificial Intelligence*, volumes III and IV.

Bruce Porter is an associate professor of computer sciences at the University of Texas at Austin. His current research is developing large knowledge bases and methods for generating coherent explanations to answer questions using them. His earlier research with Ray Bareiss produced the PROTONS knowledge acquisition system and a comprehensive evaluation of its performance. Dr. Porter has taught many short courses on AI, machine learning, and expert systems, and he has consulted with numerous companies on AI projects.

Dr. Porter received his Ph.D. from the University of California at Irvine in 1984 following his dissertation on machine learning. Dr. Porter was honored with a Presidential Young Investigator Award from the National Science Foundation in 1988.

MP5 (Monday, 2 - 6 PM, July 13)

Distributed Artificial Intelligence Tools

Edmund H. Durfee, Assistant Professor, University of Michigan and Katia P. Sycara, Research Scientist, Carnegie Mellon University

This tutorial will be a thorough survey of problems, techniques and applications in contemporary DAI, in preparation for building DAI systems or as background for doing research to advance the state of DAI practice. Particular emphasis will be given to DAI tools and to methodologies for building and evaluating DAI systems. Real-world applications of DAI are only beginning to emerge, and an objective of this tutorial is to speed this process along by introducing DAI algorithms and paradigms to attendees in practical, rather than only theoretical, terms.

Prerequisite Knowledge: The tutorial presumes knowledge of AI at the level of an introductory course, and familiarity with such general concepts as object-oriented systems, planning, heuristic search, knowledge-based systems, reasoning under uncertainty, and so on.

Edmund H. Durfee received his Ph.D. degree in computer and information science from the University of Massachusetts, Amherst, in 1987. His Ph.D. research developed an approach for planning coordinated actions and interactions in a network of distributed AI problem-solving systems. He is currently an assistant professor in the Department of Electrical Engineering and Computer Science at the University of Michigan, where his interests are in distributed artificial intelligence, planning, blackboard systems, and real-time problem solving. He is author of *Coordination of Distributed Problem Solvers* (Kluwer Academic Press) and received a Presidential Young Investigator award from the National Science Foundation.

Katia P. Sycara is a research scientist in the School of Computer Science at Carnegie Mellon University. She is also the director of the Laboratory for Enterprise Integration. She is directing and conducting research in investigating and integrating decision making across the manufacturing product life cycle. She is currently involved in research on integrating planning, scheduling and case-based learning, developing an information infrastructure for manufacturing decision making, and concurrent engineering design. She holds a Ph.D. in computer science from Georgia Institute of Technology. Her Ph.D. dissertation research resulted in the development of an approach for multi-agent conflict resolution and negotiation that integrates case-based reasoning and decision theoretic techniques. While continuing work on case-based reasoning, she has investigated extensively distributed factory scheduling, fusing distributed expertise, and distributed decision support for enterprise integration. She has published extensively in these areas and delivered seminars in universities and companies in the U.S., Europe and Japan. She is also the AI editor for *Group Decision and Negotiation*, a journal published by The Institute for Management Science (TIMS).

14 IAAI-92 Preliminary Program

IAAI-92 Preliminary Program

(Subject to change)

Monday, July 13

8:30 – 9:00 AM

Opening Remarks

Carli Scott, IAAI Conference Chair

Finance Applications

9:00 – 9:40 AM

The Credit Assistant: The Second Leg in the

Knowledge Highway for American Express

James Dzierzanowski and Susan Lawson, American Express; Eric Hestenes, Inference Corporation

9:40 – 10:20 AM

MOCCA: A Set of Instruments to Support

Mortgage Credit Granting

Steve Hottiger and Dieter Wenger, Swiss Bank Corporation

10:20 – 10:40 AM

Break

10:40 – 11:20 AM

PHAROS – The Single European Market

Adviser

Ebby Adhami and Malcolm McKenzie,

Ernst & Young Management Consultants;

Mike Thornley, National Westminster NatWest

11:20 AM – 12:00 PM

CRESUS: An Integrated Expert System for

Cash Management

Pete Shell, Carnegie Mellon University; Gonzalo

Quiroga, Juan A. Hernandez-Rubio and Javier

Berbiela, Union Fenosa S.A.; Jose Garcia,

Norsistemas Consultores S.A.

12:00 – 12:30 PM

Meet the Authors

12:30 – 2:00 PM

Lunch

AI-on-Line Panel

2:00 – 3:30 PM

Technology Transfer to Corporate America

Organized by Spang Robinson and Inference

Corporation

3:30 – 3:50 PM

Break

Customer Service Applications

3:50 – 4:30 PM

A Knowledge-Based System Within A

Cooperative Processing Environment

Dale Danilewitz, Whirlpool Corporation; Frederick

E. Freiheit IV, Technology Solutions Corporation

4:30 – 5:10 PM

SMART, Support Management Automated

Reasoning Technology for Compaq

Customer Service

Timothy L. Acorn, Compaq Computer Corporation;

Sherry H. Walden, Inference Corporation

5:10 – 5:50 PM

HelpDesk: Using AI to Improve Customer

Service

Jeffrey Kenyon and Debra Logan,

Carnegie Group Inc.

5:50 – 6:20 PM

Meet the Authors

6:30 – 7:30 PM

IAAI Opening Reception

Tuesday, July 14

AI-on-Line Panel

11:00 AM – 12:30 PM

Developing Case-Based Reasoning Systems:

Approaches, Applications, Advantages, and

Tools

Organized by Cognitive Systems

12:30 – 2:00 PM

Lunch

Industrial Applications

2:00 – 2:40 PM

DMCM: A Knowledge Based Cost

Estimation Tool

Norman Crowfoot, Scott Hatfield and Mike Swank,

Xerox Corporation

2:40 – 3:20 PM

The Ford Motor Company European

Automotive Operations Computer Aided

Parts Estimating System

Adam Cunningham, Ford Motor Company;

Robert Smart, Inference Europe Ltd.

3:20 – 3:40 PM

Break

3:40 – 4:20 PM

An Application for Model Based Reasoning

in Experiment Design

Andrew B. Parker, Sun Microsystems Inc.; W. Scott

Spangler, General Motors

4:20 – 5:00 PM

SlurryMINDER: A Rational Oil Well

Completion Design Module

E. B. Kelly, P. Caillot, R. Roemer and T. Simien,

Dowell Schlumberger

5:00 – 5:40 PM

Microsoft Product Manager's Workbench,

Inventing Technology with an Integrated

Expert System

William P. Shields, Microsoft Corporation;

Brian R. Watkins, Andersen Consulting

5:40 – 6:10 PM

Meet the Authors

Wednesday, July 15

Data Analysis

8:30 – 9:10 AM

Making Sense of Gigabytes: A System for

Knowledge-Based Market Analysis

Tej Anand and Gary Kahn, A. C. Nielsen

9:10 – 9:50 AM

TPF Dump Analyzer: A System to Provide

Expert Assistance to Analysts in Solving

Run-time Program Exceptions by Deriving

Program Intention from a TPF Assembly

Language Program

R. Greg Arbon, Laurie Atkinson, James Chen

and Chris Guida, Covia Technologies

9:50 – 10:30 AM

MARVEL: A Distributed Real-time

Monitoring and Analysis Application

Ursula M. Schwuttke, Raymond Yeung, Alan G.

Quan, Robert Angelino, Cynthia L. Childs, John R.

Veregge and Monica B. Rivera, Jet Propulsion

Laboratory, California Institute of Technology

10:30 – 10:50 AM

Break



Join us in San Jose, California this summer for IAAI-92 / AAAI-92. Located approximately sixty miles south of San Francisco, San Jose is nestled in the heart of the Santa Clara Valley. Daily maximum July temperatures average 81, with minimum temperatures averaging 55.

Software Development

10:50 - 11:30 AM
Knowledge-Based Code Inspection with ICICLE
L. Brothers, V. Sembugamoorthy and A. Irgon, Bellcore

11:30 AM - 12:10 PM
Automatic Programming for Sequence Control
Hiroyuki Mizutani, Yasuko Nakayama, Satoshi Ito, Yasuo Namioka and Takayuki Matsudaira, Toshiba Corporation

12:10 - 12:40 PM
Meet the Authors

12:40 - 2:00 PM
Lunch

AI-on-Line Panel

2:00 - 3:30 PM
The Art of Pioneering a Neural Network in Your Organization
Organized by NeuralWare

3:30 - 3:50 PM
Break

Regulatory Applications

3:50 - 4:30 PM
The CARE System
J. P. Little and Mark Gingrich, United HealthCare Corporation

4:30 - 5:10 PM
A Truly MAGIC Solution
Rita C. Kidd, Merced County Human Services Agency; Robert J. Carlson, Andersen Consulting

5:10 - 5:50 PM
Meet the Authors

Special IAAI Plenary Session

8:00 - 10:00 PM, July 15, 1992
Japan Watch 1992 Panel: Expert System Applications and Advanced Knowledge-Based Systems Research
Panelists: *Edward Feigenbaum (Chair), Stanford University; Robert S. Englemore, Stanford University; Peter Friedland, NASA Ames Research Center; Bruce Johnson, Andersen Consulting; Penny Nii, Stanford University; Herbert Schorr, USC/Information Sciences Institute; and Howard E. Shrobe, Symbolics, Inc./Massachusetts Institute of Technology*

Thursday, July 15

AI-on-Line Panel

8:30 - 10:00 AM
Successful Deployment of LISP Applications
Organized by Lucid Inc.

10:00 - 10:20 AM
Break

Routing Applications

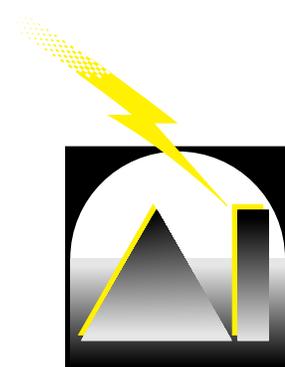
10:20 - 11:00 AM
Arachne: Weaving the Telephone Network at NYNEX
Elissa Gilbert, Rangnath Salgame, Afshin Goodarzi, Yuling Lin, Sanjeev Sardana, Jim Euchner, NYNEX Science and Technology, Inc.

11:00 - 11:40 AM
Hub SIAAching: A Knowledge-Based System for Severe, Temporary Airline Schedule Reduction
Trish Dutton, American Airlines

11:40 AM - 12:10 PM
Meet the Authors
12:10 - 2:00 PM
Lunch

AI-on-Line Panel

2:00 - 3:30 PM
Hidden Experts: Knowledge-Based Systems in Action
Organized by Aion Corporation and Covia Technologies



16 AAAI-92 Preliminary Program

AAAI-92 Preliminary Program

(Subject to Change)

Tuesday, July 14

8:30 – 10:10 AM

Plenary Session: Keynote Address

The Gardens of Learning: The Vision of AI

Oliver G. Selfridge, Senior Staff Scientist, GTE Laboratories

10:10 – 10:40 AM

Break

10:40 AM – 12:20 PM

Session: Learning—Inductive I

10:40 – 11:05 AM

ChiMerge: Automatic Discretization of Numeric Features

Randy Kerber, Lockheed AI Center

11:05 – 11:30 AM

The Feature Selection Problem: Traditional Methods and a New Algorithm

Kenji Kira, Mitsubishi Electric Corporation; Larry A. Rendell, University of Illinois

Invited Talks

TUESDAY, JULY 14 – THURSDAY, JULY 16
(Schedule to be announced)

Learning Visual Behaviors

Dana H. Ballard, University of Rochester

Learning to Act: A Perspective from Control Theory

Andrew Barto, University of Massachusetts

The Distributed AI Melting Pot

Edmund H. Durfee, University of Michigan

Reasoning as Remembering: The Theory and Practice of CBR

Kristian Hammond, University of Chicago

AI and Molecular Biology

Lawrence Hunter, National Library of Medicine

Artificial Life

Christopher G. Langton, Los Alamos National Laboratory

Progress in Legal Reasoning

Edwina L. Rissland, University of Massachusetts and Harvard Law School

AI and Multimedia

Roger C. Schank, Northwestern University

Machine Translation—Now

Yorick Wilks, New Mexico State University

11:30 – 11:55 AM

Classifier Learning from Noisy Data as Probabilistic Evidence Combination

Steven W. Norton, Rutgers University & Siemens Corporate Research; Haym Hirsh, Rutgers University

11:55 AM – 12:20 PM

Learning in FOL with a Similarity Measure

Gilles Bisson, Université Paris-sud

10:40 AM – 12:20 PM

Session: Problem Solving

10:40 – 11:05 AM

Systematic and Nonsystematic Search Strategies

Pat Langley, NASA Ames Research Center

11:05 – 11:30 AM

Linear-Space Best-First Search: Summary of Results

Richard E. Korf, University of California, Los Angeles

11:30 – 11:55 AM

An Analysis of Branch-and-Bound with Applications: Summary of Results

Weixiong Zhang and Richard E. Korf, University of California, Los Angeles

11:55 AM – 12:20 PM

Performance of IDA on Trees and Graphs

A. Mahanti, S. Ghosh, D. S. Nau, L. N. Kanal, University of Maryland; A. K. Pal, IIM, Calcutta

10:40 AM – 12:20 PM

Session: Representation & Reasoning—Belief I

10:40 – 11:05 AM

From Statistics to Beliefs

Fahiem Bacchus, University of Waterloo; Adam Grove and Daphne Koller, Stanford University; Joseph Y. Halpern, IBM Almaden Research Center

11:05 – 11:30 AM

A Belief-Function Logic

Alessandro Saffiotti, Université Libre de Bruxelles

11:30 – 11:55 AM

Abstract States of Belief and

Conditionalization

Adnan Y. Darwiche and Matthew L. Ginsberg, Stanford University

11:55 AM – 12:20 PM

Lexical Imprecision and Fuzzy Constraint Networks

James Bowen, Robert Lai and Dennis Bahler, North Carolina University

12:20 – 2:00 PM

Lunch

2:00 – 3:40 PM

Session: Learning: Inductive II

2:00 – 2:25 PM

Polynomial-Time Learning with Version Spaces

Haym Hirsh, Rutgers University

2:25 – 2:50 PM

COGIN: Symbolic Induction with Genetic Algorithms

David Perry Greene and Stephen F. Smith, Carnegie Mellon University

2:50 – 3:15 PM

TDAG: An Algorithm for Learning to Predict Discrete Sequences

Philip Laird, NASA Ames Research Center

3:15 – 3:40 PM

A Personal Learning Apprentice

Lisa Dent, Jesus Boticario, Tom Mitchell and David Zabowski, Carnegie Mellon University; John McDermott, Digital Equipment Corporation

2:00 – 3:40 PM

Session: Problem Solving—Search II and Expert Systems

2:00 – 2:25 PM

Minimax Is Not Optimal for Imperfect Game Players

Eric B. Baum, NEC Research Institute

2:25 – 2:50 PM

Improved Decision-Making in Game Trees: Recovering from Pathology

Arthur L. Delcher, Loyola College in Maryland; Simon Kasif, The Johns Hopkins University

2:50 – 3:15 PM

Moving Target Search with Intelligence

Toru Ishida, NTT Communication Science Laboratories

3:15 – 3:40 PM

Modeling Accounting Systems to Support

Multiple Tasks: A Progress Report

Walter Hamscher, Price Waterhouse Technology Centre

2:00 – 3:40 PM

Session: Representation & Reasoning—Belief II

2:00 – 2:25 PM

Combining Circumscription and Modal Logic

Jacques Wainer, University of Colorado

2:25 – 2:50 PM

A Logic for Subjunctive Queries

Craig Boutilier, University of British Columbia

AAAI-92 Preliminary Program 17

2:50 – 3:15 PM

Ideal Introspective Belief

Kurt Konolige, SRI International

3:15 – 3:40 PM

Logic of Knowledge and Belief for Recursive Modeling – Preliminary Report

Piotr J. Gmytrasiewicz and Edmund H. Durfee, University of Michigan

3:40 – 4:10 PM

Break

4:10 – 5:50 PM

Session: Learning—Inductive III

4:10 – 4:35 PM

The Attribute Selection Problem in Decision Tree Generation

Usama M. Fayyad, Jet Propulsion Laboratory, California Institute of Technology; Keki B. Irani, The University of Michigan

4:35 – 5:00 PM

Sparse Data and the Effect of Overfitting Avoidance in Decision Tree Induction

Cullen Schaffer, CUNY/Hunter College

5:00 – 5:25 PM

Complementary Discrimination Learning with Decision Lists

Wei-Min Shen, Microelectronics and Computer Technology Corporation

5:25 – 5:50 PM

Learning to Learn Decision Trees

Vlad G. Dabija, Stanford University; Katsuhiko Tsujino and Shogo Nishida, Mitsubishi Electric Corporation

4:10 – 5:25 PM

Session: Problem Solving—Hardness and Easiness

4:10 – 4:35 PM

Hard and Easy Distributions of SAT Problems

David Mitchell, Simon Fraser University; Bart Selman, AT&T Bell Laboratories; Hector Levesque, University of Toronto

4:35 – 5:00 PM

When Heuristic Solutions Work

Ron Musick and Stuart Russell, University of California, Berkeley

5:00 – 5:25 PM

Using Deep Structure to Locate Hard Problems

Colin P. Williams and Tad Hogg, Xerox Palo Alto Research Center

4:10 – 5:50 PM

Session: Representation and Reasoning—Case-Based

4:10 – 4:35 PM

Common Sense Retrieval

A. Julian Craddock, University of British Columbia

4:35 – 5:00 PM

When Should a Cheetah Remind You of a Bat? Reminding in Case-Based Teaching

Daniel C. Edelson, Northwestern University

5:00 – 5:25 PM

Model-Based Case Adaptation

Eric K. Jones, Victoria University of Wellington

5:25 – 5:50 PM

Generating Dialectical Examples Automatically

Kevin D. Ashley and Vincent Alevan, University of Pittsburgh

6:30 – 7:30 PM

AAAI-92 Opening Reception

Wednesday, July 15

8:30 – 10:10 AM

Session: Learning—Neural Network and Hybrid

8:30 – 8:55 AM

Using Knowledge-Based Neural Networks to Improve Algorithms: Refining the Chou-Fasman Algorithm for Protein Folding

Richard Maclin and Jude W. Shavlik, University of Wisconsin

8:55 – 9:20 AM

Using Symbolic Inductive Learning to Improve Knowledge-Based Neural Networks

Geoffrey G. Towell, Siemens Corporate Research, and Jude W. Shavlik, University of Wisconsin

9:20 – 9:45 AM

A Framework for Integrating Fault Diagnosis and Incremental Knowledge Acquisition in Connectionist Expert Systems

Joo-Hwee Lim, Ho-Chung Lui and Pei-Zhuang Wang, National University of Singapore

9:45 – 10:10 AM

Adapting Bias by Gradient Descent: An Incremental Version of Delta-Bar-Delta

Richard S. Sutton, GTE Laboratories Incorporated

8:30 – 10:10 AM

Session: Problem Solving—Real-Time

8:30 – 8:55 AM

Can Real-Time Search Algorithms Meet Deadlines?

Babak Hamidzadeh and Shashi Shekhar, University of Minnesota

8:55 – 9:20 AM

Real-time Metareasoning with Dynamic Trade-off Evaluation

Ursula M. Schwuttke, Jet Propulsion Laboratory; Les Gasser, University of Southern California

9:20 – 9:45 AM

Run-Time Prediction for Production Systems

Franz Barachini and Hans Mistelberger, Alcatel-ELIN Research Center; Anoop Gupta, Stanford University

9:45 – 10:10 AM

Comparison of Three Algorithms for Ensuring Serializable Executions in Parallel Production Systems

James G. Schmolze, Tufts University; Daniel Neiman, University of Massachusetts

8:30 – 10:10 AM

Session: Representation and Reasoning—Terminological

8:30 – 8:55 AM

Recognition Algorithms for the LOOM Classifier

Robert M. MacGregor and David Brill, USC/Information Sciences Institute

8:55 – 9:20 AM

Computing Least Common Subsumers in Description Logics

William W. Cohen, AT&T Bell Laboratories; Alex Borgida and Haym Hirsh, Rutgers University

9:20 – 9:45 AM

A Non-Well-Founded Approach to Terminological Cycles

Robert Dionne, Eric Mays and Frank J. Oles, IBM T. J. Watson Research Center

9:45 – 10:10 AM

An Empirical Analysis of Terminological Representation Systems

Jochen Heinsohn, Daniel Kudenko, Bernhard Nebel and Hans-Jurgen Profitlich, German Research Center for Artificial Intelligence

10:10 – 10:40 AM

Break

10:40 AM – 12:20 PM

Session: Learning—Constructive & Linguistic

10:40 – 11:05 AM

Learning to Disambiguate Relative Pronouns

Claire Cardie, University of Massachusetts

11:05 – 11:30 AM

A Connectionist Parser with Recursive Sentence Structure and Lexical Disambiguation

George Berg, State University of New York at Albany

18 AAAI-92 Preliminary Program

11:30 – 11:55 AM

Learning Relations by Pathfinding

Bradley L. Richards and Raymond J. Mooney, University of Texas at Austin

11:55 AM – 12:20 PM

Discrimination-Based Constructive Induction of Logic Programs

Boonserm Kijssirikul, Masayuki Numao, and Masamichi Shimura, Tokyo Institute of Technology

10:40 AM – 12:20 PM

Session: Robot Navigation

10:40 – 11:05 AM

Integrating Planning and Reacting in a Heterogeneous Asynchronous Architecture for Controlling Real-World Mobile Robots

Erann Gat, Jet Propulsion Laboratory, California Institute of Technology

11:05 – 11:30 AM

Reactive Navigation through Rough Terrain: Experimental Results

David P. Miller, Rajiv S. Desai, Erann Gat, Robert Ivlev and John Loch, Jet Propulsion Laboratory, California Institute of Technology

11:30 – 11:55 AM

A Reactive Robot System for Find and Fetch Tasks in an Outdoor Environment

H. James Antonisse, R. Peter Bonasso and Marc G. Slack, The MITRE Corporation

11:55 AM – 12:20 PM

Landmark-Based Robot Navigation

Anthony Lazanas and Jean-Claude Latombe, Stanford University

10:40 AM – 11:55 PM

Session: Representation and Reasoning—Tractability

10:40 – 11:05 AM

The Complexity of Propositional Default Logics

Jonathan Stillman, General Electric Research and Development Center

11:05 – 11:30 AM

Speeding Inference by Acquiring New Concepts

Henry Kautz and Bart Selman, AT&T Bell Laboratories

11:30 – 11:55 AM

A New Incremental Algorithm for Generating Prime Implicates

Johan de Kleer, Xerox Palo Alto Research Center

12:20 – 2:00 PM

Lunch

2:00 – 3:40 PM

Session: Learning—Utility and Bias

2:00 – 2:25 PM

Empirical Analysis of the General Utility Problem in Machine Learning

Lawrence B. Holder, University of Texas at Arlington

2:25 – 2:50 PM

COMPOSER: A Probabilistic Solution to the Utility Problem in Speed-Up Learning

Jonathan Gratch and Gerald DeJong, University of Illinois at Urbana-Champaign

2:50 – 3:15 PM

A Solution to the EBL Utility Problem

Russell Greiner and Igor Jurisica, University of Toronto

3:15 – 3:40 PM

Inductive Policy

Foster John Provost and Bruce G. Buchanan, University of Pittsburgh

2:00 – 3:40 PM

Session: Multi-Agent Coordination

2:00 – 2:25 PM

A General Equilibrium Approach to Distributed Transportation Planning

Michael P. Wellman, USAF Wright Laboratory

2:25 – 2:50 PM

Using Joint Responsibility to Coordinate Collaborative Problem Solving in Dynamic Environments

N. R. Jennings, Queen Mary & Westfield College

2:50 – 3:15 PM

Constrained Intelligent Action: Planning Under the Influence of a Master Agent

Eithan Ephrati and Jeffrey S. Rosenschein, Hebrew University

3:15 – 3:40 PM

On the Synthesis of Useful Social Laws for Artificial Agents Societies (Preliminary Report)

Yoav Shoham and Moshe Tennenholtz, Stanford University

2:00 – 3:40 PM

Session: Representation and Reasoning: Qualitative

2:00 – 2:25 PM

Towards a Qualitative Lagrangian Theory of Fluid Flow

Gordon Skorstad, University of Illinois

2:25 – 2:50 PM

Qualitative Simulation Based on a Logical Formalism of Space and Time

Z. Cui, A. G. Cohen and D. A. Randell, University of Leeds

2:50 – 3:15 PM

On the Qualitative Structure of a Mechanical Assembly

Randall H. Wilson and Jean-Claude Latombe, Stanford University

3:15 – 3:40 PM

Self-Explanatory Simulations: Scaling Up to Large Models

Kenneth D. Forbus, Northwestern University; Brian Falkenhainer, Xerox Palo Alto Research Center

3:40 – 4:10 PM

Break

4:10 – 5:50 PM

Session: Scaling Up

4:10 – 4:35 PM

Building Large-Scale and Corporate-Wide Case-Based Systems: Integration of the Organization and Machine Executable Algorithms

Hiroaki Kitano, Akihiro Shibata, Juichirou Kajihara, and Atsumi Sato, NEC Corporation

4:35 – 5:00 PM

Wafer Scale Integration for Massively Parallel Memory-Based Reasoning

Hiroaki Kitano and Moritoshi Yasunaga, Carnegie Mellon University

5:00 – 5:25 PM

Learning 10,000 Chunks: What's It Like Out There?

Bob Doorenbos, Milind Tambe, and Allen Newell, Carnegie Mellon University

5:25 – 5:50 PM

Mega-Classification: Discovering Motifs in Massive Datastreams

Nomi L. Harris, Lawrence Hunter, and David J. States, National Institutes of Health

4:10 – 5:25 PM

Session: Perception

4:10 – 4:35 PM

Grouping Iso-Velocity Points for Ego-Motion Recovery

Yibing Yang, Harvard University

4:35 – 5:00 PM

Computational Model for Face Location Based on Cognitive Principles

Venu Govindaraju, Sargur N. Srihari and David Sher, State University of New York at Buffalo

5:00 – 5:25 PM

Computation of Upper-Bounds for Stochastic Context-Free Languages

A. Corazza, Istituto per la Ricerca Scientifica e Tecnologica; R. De Mori, McGill University; G. Satta, University of Pennsylvania

4:10 – 5:50 PM

Session: Representation and Reasoning—Qualitative Model Construction

4:10 – 4:35 PM

Automated Model Selection Using Context-Dependent Behaviors

P. Pandurang Nayak, Stanford University

4:35 – 5:00 PM

Automatic Abduction of Qualitative Models

Bradley L. Richards and Benjamin J. Kuipers, University of Texas, Austin; Ina Kraan, University of Edinburgh

5:00 – 5:25 PM

Causal Approximations

P. Pandurang Nayak, Stanford University; Leo Joskowicz and Sanjaya Addanka, IBM T. J. Watson Research Center

5:25 – 5:50 PM

Learning Engineering Models with the Minimum Description Length Principle

R. Bharat Rao and Stephen C-Y. Lu, University of Illinois at Urbana-Champaign

8:00 – 10:00 PM

Session: Special IAAI Plenary Panel

Panel: Japan Watch 1992: Expert System Applications and Advanced Knowledge-Based Systems Research

Panelists: Edward Feigenbaum (Chair), Stanford University; Robert S. Englemore, Stanford University; Peter Friedland, NASA Ames Research Center; Bruce Johnson, Andersen Consulting; Penny Nii, Stanford University; Herbert Schorr, USC/Information Sciences Institute; and Howard E. Shrobe, Symbolics, Inc./Massachusetts Institute of Technology

Thursday, July 16

8:30 – 10:10 AM

Session: Problem Solving—Constraint Satisfaction I

8:30 – 8:55 AM

Efficient Propositional Constraint Propagation

Mukesh Dalal, Rutgers University

8:55 – 9:20 AM

An Efficient Cross Product Representation of the Constraint Satisfaction Problem Search Space

Paul D. Hubbe and Eugene C. Freuder, University of New Hampshire

9:20 – 9:45 AM

Solving Constraint Satisfaction Problems Using Finite State Automata

Vempaty, Nageshwara Rao, University of Central Florida

9:45 – 10:10 AM

On the Minimality and Decomposability of Constraint Networks

Peter van Beek, University of Alberta

8:30 – 10:10 AM

Session: Representation and Reasoning—Action and Change

8:30 – 8:55 AM

Formalizing Reasoning about Change: A Qualitative Reasoning Approach (Preliminary Report)

James M. Crawford and David W. Etherington, AT&T Bell Laboratories

8:55 – 9:20 AM

Concurrent Actions in the Situation Calculus

Fangzhen Lin and Yoav Shoham, Stanford University

9:20 – 9:45 AM

Deriving Properties of Belief Update from Theories of Action

Alvaro del Val and Yoav Shoham, Stanford University

9:45 – 10:10 AM

Nonmonotonic Sorts for Feature Structures

Mark A. Young, The University of Michigan

8:30 – 10:10 AM

Session: Natural Language—Parsing

8:30 – 8:55 AM

A Probabilistic Parser Applied to Software Testing Documents

Mark A. Jones, AT&T Bell Laboratories; Jason Eisner, Emmanuel College

8:55 – 9:20 AM

Parsing Rum Amok: Relation-Driven Control for Text Analysis

Paul S. Jacobs, GE Research & Development Center

9:20 – 9:45 AM

Shipping Departments vs. Shipping Pacemakers: Using Thematic Analysis to Improve Tagging Accuracy

Uri Zernik, General Electric Research & Development Center

9:45 – 10:10 AM

Classifying Texts Using Relevancy Signatures

Ellen Riloff and Wendy Lehnert, University of Massachusetts

10:10 – 10:40 AM

Break

10:40 AM – 12:20 PM

Session: Learning—Robotic

10:40 – 11:05 AM

Reinforcement Learning with Perceptual Aliasing: The Predictive Distinctions Approach

Lonnie Chrisman, Carnegie Mellon University

11:05 – 11:30 AM

Reinforcement Learning with a Hierarchy of Abstract Models

Satinder P. Singh, University of Massachusetts

11:30 – 11:55 AM

Acquisition of Automatic Activity through Practice: Changes in Sensory Input

Jack Gelfond, Marshall Flax, Raymond Endres, Stephen Lane and David Handelman, Princeton University

11:55 AM – 12:20 PM

Automatic Programming of Robots Using Genetic Programming

John R. Koza and James P. Rice, Stanford University

10:40 AM – 12:20 PM

Session: Problem Solving—Constraint Satisfaction II

10:40 – 11:05 AM

On the Density of Solutions in Equilibrium Points for the Queens Problem

Paul Morris, IntelliCorp

11:05 – 11:30 AM

A New Method for Solving Hard Satisfiability Problems

Bart Selman, AT&T Bell Laboratories; Hector Levesque, University of Toronto; and David Mitchell, Simon-Fraser University

11:30 – 11:55 AM

A New Improved Connectionist Activation Function for Energy Minimization

Gadi Pinkas, Washington University; Rina Dechter, University of California, Irvine

11:55 AM – 12:20 PM

Semantic Evaluation as Constraint Network Consistency

Nicholas J. Haddock, Hewlett Packard Laboratories

10:40 AM – 12:20 PM

Session: Representation and Reasoning—Temporal

10:40 – 11:05 AM

On the Computational Complexity of Temporal Projection and Plan Validation

Bernhard Nebel, German Research Center for Artificial Intelligence; Christer Backstrom, Linköping University

20 AAAI-92 Preliminary Program

11:05 – 11:30 AM

Algorithms and Complexity for Reasoning about Time (Extended Abstract)

Martin Charles Golumbic, IBM Israel Scientific Center; Ron Shamir, Tel Aviv University

11:30 – 11:55 AM

Complexity Results for Serial Decomposability

Tom Bylander, The Ohio State University

11:55 AM – 12:20 PM

Temporal Reasoning in Sequence Graphs

Jurgen Dorn, Technical University Vienna

10:40 AM – 12:20 PM

Session: Natural Language—Interpretation

10:40 – 11:05 AM

An On-Line Computational Model of Human Sentence Interpretation

Daniel Jurafsky, University of California, Berkeley

11:05 – 11:30 AM

Literal Meaning and the Comprehension of Metaphors

Steven L. Lytinen, Jeffrey D. Kirtner, and Robert R. Burridge, The University of Michigan

11:30 – 11:55 AM

Actions, Beliefs and Intentions in Rationale Clauses and Means Clauses

Cecile T. Balkanski, Harvard University

11:55 AM – 12:20 PM

An Approach to the Representation of Iterative Situations

Michael J. Almeida, SUNY Plattsburgh

12:20 – 2:00 PM

Lunch

2:00 – 3:40 PM

Session: Learning—Theory

2:00 – 2:25 PM

An Analysis of Bayesian Classifiers

Pat Langley, Wayne Iba, and Kevin Thompson; NASA Ames Research Center

2:25 – 2:50 PM

A Theory of Unsupervised Speedup Learning

Prasad Tadepalli, Oregon State University

2:50 – 3:15 PM

Inferring Finite Automata with Stochastic Output Functions and an Application to Map Learning

Thomas Dean, Kenneth Basye, Leslie Kaelbling, Evangelos Kokkevis, and Oded Maron, Brown University

3:15 – 3:40 PM

Oblivious PAC Learning of Concept Hierarchies

Michael J. Kearns, AT&T Bell Laboratories

2:00 – 3:40 PM

Session: Planning I

2:00 – 2:25 PM

The Expected Value of Hierarchical Problem-Solving

Fahiem Bacchus and Qiang Yang, University of Waterloo

2:25 – 2:50 PM

Achieving the Functionality of Filter Conditions in a Partial Order Planner

Gregg Collins and Louise Pryor, Northwestern University

2:50 – 3:15 PM

On the Complexity of Domain-Independent Planning

Kutluhan Erol, Dana S. Nau, and V. S. Subrahmanian, University of Maryland

3:15 – 3:40 PM

Constrained Decision Revision

Charles Petrie, MCC AI Lab

2:00 – 3:40 PM

Session: Representation and Reasoning—Abduction and Diagnosis

2:00 – 2:25 PM

Consistency-Based Diagnosis in Physiological Domains

Keith L. Downing, Linköping University

2:25 – 2:50 PM

Adaptive Model-Based Diagnostic Mechanism Using a Hierarchical Model Scheme

Yoichiro Nakakuki, Yoshiyuki Koseki, and Midori Tanaka, NEC Corporation

2:50 – 3:15 PM

Dynamic MAP Calculations for Abduction

Eugene Charniak, Brown University

3:15 – 3:40 PM

Reasoning MPE to Multiply Connected Belief Networks Using Message Passing

Bon K. Sy, Queens College, City University of New York

3:40 – 4:10 PM

Break

4:10 – 5:50 PM

Session: Learning—Discovery

4:10 – 4:35 PM

Operational Definition Refinement: A Discovery Process

Jan M. Zytkow, Jieming Zhu, and Robert Zembowicz, Wichita State University

4:35 – 5:00 PM

Discovery of Equations: Experimental Evaluation of Convergence

Robert Zembowicz and Jan M. Zytkow, Wichita State University

5:00 – 5:25 PM

Conjecture of Hidden Entities in Theory-Driven Discovery: The MECHEM System

Raul E. Valdes-Perez, Carnegie Mellon University

5:25 – 5:50 PM

Symmetry as Bias: Rediscovering Special Relativity

Michael Lowry, Kestrel Institute

4:10 – 5:25 PM

Session: Planning II

4:10 – 4:35 PM

Learning from Goal Interactions in Planning: Goal Stack Analysis and Generalization

Kwang Ryel Ryu and Keki B. Irani, The University of Michigan

4:35 – 5:00 PM

Analyzing Failure Recovery to Improve Planner Design

Adele E. Howe, University of Massachusetts

5:00 – 5:25 PM

Cultural Support for Improvisation

Philip E. Agre, University of California, San Diego; Ian D. Horswill, Massachusetts Institute of Technology

4:10 – 5:50 PM

Session: Explanation and Tutoring

4:10 – 4:35 PM

Understanding Causal Descriptions of Physical Systems

Gary C. Borchardt, Massachusetts Institute of Technology

4:35 – 5:00 PM

Steps from Explanation Planning to Model Construction Dialogues

Daniel Suthers, Beverly Woolf, and Matthew Cornell, University of Massachusetts

5:00 – 5:25 PM

Generating Cross-References for Multimedia Explanation

Kathleen R. McKeown, Steven K. Feiner, Jacques Robin, Doree D. Seligmann, Michael Tanenblatt, Columbia University

5:25 – 5:50 PM

Encoding Domain and Tutoring Knowledge Via a Tutor Construction Kit

Tom Murray and Beverly Park Woolf, University of Massachusetts

AAAI-92 Technical Program Registration

July 14-16, 1992

Your AAAI-92 technical program registration includes admission to technical sessions, invited talks, the AAAI-92 / IAAI-92 joint exhibition, AI-on-Line panels and the Wednesday evening plenary session at IAAI-92, the AAAI-92 opening reception, and the AAAI-92 conference *Proceedings*.

IAAI-92 Registration

July 13-16, 1992

Your IAAI-92 registration includes admission to IAAI-92, the AI-on-Line sessions, the AAAI-92 / IAAI-92 joint exhibition, the AAAI-92 opening address, the IAAI-92 opening reception, and *Innovative Applications 4*.

IAAI-92 / AAAI-92 Registration Fees

Early Registration (Postmarked by 15 May)

AAAI Members

Regular \$245 Student \$95

Nonmembers

Regular \$290 Student \$155

Late Registration (Postmarked by 12 June)

AAAI Members

Regular \$295 Student \$95

Nonmembers

Regular \$340 Student \$155

On-Site Registration (Postmarked after 12 June or onsite. Hours below)

AAAI Members

Regular \$360 Student \$100

Nonmembers

Regular \$400 Student \$170

AAAI-92 / IAAI-92 Combined Registration

To attend both the AAAI-92 and the IAAI-92 Conferences, and to receive the proceedings of both, please add \$95.00 to the appropriate registration fee above.

Tutorial Program Registration

July 12-13, 1992

The Tutorial Program Registration includes admission to one tutorial, the AAAI-92 / IAAI-92 Joint Exhibition, the AI-on-Line panels at IAAI-92, and the 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 15 May)

AAAI Members

Regular \$195 Student \$70

Nonmembers

Regular \$240 Student \$90

Late Registration (Postmarked by 12 June)

AAAI Members

Regular \$235 Student \$95

Nonmembers

Regular \$275 Student \$115

On-Site Registration (Postmarked after 12 June or onsite. Hours are listed below.)

AAAI Members

Regular \$295 Student \$125

Nonmembers

Regular \$335 Student \$145

Workshop Registration

July 12-16, 1992

Workshop registration is limited to active participants determined by the organizer prior to the conference. Those individuals attending workshops only are subject to a \$100.00 registration fee.

Payment & Registration Information

Prepayment of registration fees is required. Checks, international money orders, bank transfers and traveler's checks must be in US\$. Amex, MasterCard, Visa, and government purchase orders are also accepted. **Registrations postmarked after the June 12 deadline will be subject to on-site registration fees.** The deadline for refund requests is June 18, 1992. **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.



See you in San Jose this July!

Registration forms and inquiries should be directed to:

AAAI-92 / IAAI-92

445 Burgess Drive

Menlo Park, California 94025-3496 USA

415/328-3123; Fax: 415/321-4457

Email ncai@aaai.org.

On-Site Registration will be located on the lower level of the San Jose Convention Center, 408 Almaden Avenue, San Jose, California.

Registration hours will be Sunday, July 12 through Thursday, July 16 from 7:30 AM – 6:00 PM. All attendees **must** pick up their registration packets for admittance to programs.

Housing

AAAI has reserved a block of rooms in San Jose hotel properties at reduced conference rates. To qualify for these rates, housing reservations, including requests for suites, must be made with the San Jose Convention & Visitors Bureau housing office. A deposit must accompany the housing form to guarantee a reservation. Checks and money orders should be made payable to the San Jose Convention & Visitors Bureau. American Express, Diner's Club, MasterCard and Visa are also accepted.

The San Jose Convention & Visitors Bureau Housing Office will acknowledge the receipt of reservations. If an acknowledgement is not received within a reasonable period (two – three weeks), please resubmit the

22 Housing & Transportation

original request with a confirming letter. If choice(s) for housing are not available, reservations will be forwarded to a comparable property. Confirmations will be issued by hotels.

The deadline for housing reservations is June 12, 1992. Reservations received after this date **cannot** be guaranteed housing availability or special rates. Please act early to guarantee space availability. Changes or cancellations of reservations must be made in writing with the San Jose Convention & Visitors Bureau until June 12, 1992. After June 12, all changes and cancellations must be made directly with the hotels. All rates quoted are per person and subject to a room tax of 10%. Please see maps on pages twenty-four and thirty-one.

Headquarters Hotel

The Fairmont Hotel

170 South Market Street

\$108.00 (S/D/T)

Distance to Center: One block

Other Hotels

Holiday Inn-Park Center Plaza

282 Almaden Boulevard

\$75.00 (S/D)

Distance to Center: One block

Hotel De Anza

233 West Santa Clara Street

\$105.00 (S); \$120.00 (D)

Distance to Center: Three blocks

Radisson Hotel

1471 North Fourth Street

\$91.00 (S/D)

Distance to Center: Three miles

Located on Light Rail Line.

Red Lion Hotel

2050 Gateway Place

\$80.00 (S/D)

Distance to Center: Three and one-half miles

Complimentary shuttle to Light Rail Line.

Student Housing

AAAI has reserved a block of dormitory rooms at Santa Clara University, Santa Clara for student housing during the conference. Accommodations include five nights stay (July 12-16) with linen service, and the following meals:

July 12 Dinner

July 13 Breakfast & dinner

July 14 Breakfast (*No dinner due to AAAI-92 opening reception*)

July 15 Breakfast & dinner

July 16 Breakfast & dinner

July 17 Breakfast

Rates per person

Double \$191.27

Single \$236.27

Additional nights can be reserved for \$26.50 (Double), \$35.50 (Single). No meals are included.

The deadline for student housing reservations is June 12, 1992. Reservations received after June 12 cannot be guaranteed availability or special rates. Prepayment of housing fees is required. Checks, international money orders, bank transfers, and traveler's checks must be in US currency. American Express, MasterCard, and Visa, are also accepted. Refund requests must be made in writing. The deadline for refund requests is June 18, 1992. **A \$50.00 processing fee will be assessed for all refunds.**

Student housing is restricted to full-time graduate or undergraduate students enrolled in an accredited college or university program. Proof of full-time student status **must** accompany the student housing form (see page twenty-nine). Housing forms and inquiries should be directed to

AAAI-92 / IAAI-92

445 Burgess Drive

Menlo Park, California 94025-3496 USA

415/328-3123; Fax: 415/321-4457

Email ncai@aaai.org.

Air Transportation

The American Association for Artificial Intelligence has selected American Airlines as the official carrier. Negotiated fares will reflect a savings of five percent off any applicable discounted coach fare or forty-five percent off full, unrestricted, round-trip coach class (y/yn/y28) fares in effect. Tickets must be purchased at least three days before the conference and reservations must be made in M class for full coach fares or appropriate class of service, whatever applies. AAAI's preferred travel agent is Custom Travel, phone (415) 369-2105 or (800) 367-2105. You or your travel agent may also call American Airlines at (800) 433-1790 between 6:00 AM and 12:00 midnight Central Standard Time. Please give the special discount code: Star #S01Z2U8.

Restrictions: Reservations for flights requiring advance purchase must adhere to all restrictions that apply to that fare. Regular coach fares and some other nonrestrictive fares do not require advance booking but all tickets must be issued at least three days before the conference. To be sure of availability,

book early. In order to qualify for these special discounted fares, travel must be round-trip within the continental United States and travel must take place between July 10 and July 19, 1992.

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 San Francisco International (SFO) and San Jose International (SJC) Airports to downtown San Jose. A sampling of companies and their one-way rates are shown below. Contact the company directly for reservations.

In addition to the following firms, all official convention hotels offer complimentary shuttle service to and from the San Jose International Airport.

Bay Porter Express

415/467-1800

SFO to San Jose: \$30.00 first person,

\$10.00 each additional person

The Airport Connection

415/885-5352

SFO to Fairmont Hotel:

\$17.00 each person

South Bay Shuttle

408/559-9477

SFO to San Jose: \$21.00 first person,

\$5.00 each additional person

SJC to San Jose: \$12.50 first person,

\$5.00 each additional person

Express Airport Shuttle

408/378-6270

SFO to San Jose: \$21.00 first person,

\$5.00 each additional person

SJC to San Jose: \$12.00 first person,

\$5.00 each additional person

Car Rentals

AAAI has selected Hertz Rental Car as the official car rental agency for AAAI-92 / IAAI-92. Special rates will be honored from July 5-24, 1992, and include unlimited mileage. For reservations, please call Custom Travel at 415/369-2105 or 800/367-2105. You may also contact the Hertz convention desk at 800/654-2240, identify yourself as a

AAAI-92 registrant, and give the special code#CV2110. You may also ask for special rates available at time of booking.

Terms and Conditions:

Applicable charges for taxes, optional refueling service, PAI, PEC and LIS are extra. Optional LDW may be purchased at \$13 or less per day. Rates are nondiscountable nor usable with any promotion or coupon, with the exception of Hertz gift certificates with PC#27952. Rentals are subject to Hertz minimal rental and driving age of twenty-five, driver's license and credit requirements as well as car availability. Weekend rentals are available for pick-up between noon Thursday and noon Sunday and must be returned no later than 11:59 PM Monday. Weekend minimum rentals are as follows: Thursday pick-ups, three days; Friday pick-ups, two days; Saturday and Sunday pick-ups, one day. Weekly rentals are available from five to seven days and must be kept over a Saturday night. Saturday Night Keep rentals are available for pick-up any day of the week and must be kept over a Saturday night.

Parking

Parking will be available at the San Jose Convention Center parking garage for a one-time entrance fee of \$4 per day or \$6 per day for in/out privileges.

Additional parking is available across the street from the Convention Center at the corner of San Carlos and Almaden Streets. Rates for this lot are seventy-five cents per half-hour for the first hour and fifty cents per half-hour every hour thereafter for a maximum of \$9.50 per day. For Sunday (all day) and weekdays (after 6:00 pm) there is a \$3.00 flat fee.

Bus

The San Jose Greyhound station is located at 70 Almaden Avenue, approximately two blocks from the Convention Center. 408/297-8890.

Rail

The Amtrak station is located at 65 Cahill Street, approximately one-half mile from the Convention Center. 800/872-7245.

Disclaimer

In offering American Airlines, Hertz Rental Cars, KiddieCorp, and all other service providers (hereinafter referred to as "Supplier(s)") for the Innovative Applications Conference and the National Conference of Artificial Intelligence, AAAI acts only in the ca-

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-92 or IAAI-92 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.

Tours

Tours are scheduled for Wednesday, July 15, and Thursday, July 16, and include transportation from the San Jose Convention Center and return. Tour times do not include travel, estimated to be forty-five minutes to one hour each way. Departure and return times will be indicated with confirmation of reservation. Register early as space is limited for each tour. Please see registration form on page twenty-five.

IBM's Santa Teresa Laboratory, San Jose

Wednesday, July 15, 7:00-9:00 PM

\$20.00 per person (includes box dinner).

The Santa Teresa Laboratory (STL) is one of IBM's major programming development sites. More than 1,800 programmers work at this site on products as diverse as database, high level languages and knowledge based systems. The tour will be hosted by Dr. Kevin Seppi and several other members of the STL programming community. Part of the tour will include visits to 10 STL Knowledge Mining Centers™ and product demonstrations.

Robotics Laboratory & Computer Science Department, Stanford University

Thursday, July 16, 5:00-7:00 PM

\$20.00 per person (includes box dinner).

Work in the Robotics Laboratory centers around two interwoven themes: modeling and reasoning about the physical world, and modeling and reasoning about agents func-

tioning in the real world. Reasoning about the physical world involves, among other things, the modeling of, and reasoning about, space and time, kinematics and dynamics, and machine vision. Work on agent architectures involves foundational questions in the representation of time, action, belief and similar notions, investigating various forms of inference, machine learning, and reconciling problem-solving with real-time performance requirements. Throughout the projects, emphasis is placed on development of rigorous theories, coupled with substantial experimental validation. The research in the laboratory will be explained through live robotic demonstrations, videos, posters, and personal explanations.

Neuron Data, Palo Alto

Wednesday, July 15, 7:00 - 8:30 PM,

\$20.00 per person (includes box dinner).

Neuron Data develops and markets software tools and libraries for building and deploying smarter applications. The company's major current products are NEXTPERT OBJECT™, an expert system development tool installed worldwide, and Neuron Data Open Interface™, a development tool for building portable graphical interfaces across operating systems and windowing systems. The NEXTPERT and Open Interface libraries are embedded in a wide variety of software applications and products.

Neuron Data staff will discuss, through existing case studies, the new role of AI and GUI software as critical tools for competitiveness. The presentation will take place at Neuron Data's world headquarters in Palo Alto, California.

Teleos Research, Palo Alto

Thursday, July 16, 7:00-8:30 PM

\$20.00 per person (includes box dinner).

Teleos Research is working in the fields of intelligent, embedded, real-time systems and machine vision. Teleos will present an overview of the current research program and demonstrations on the robot testbed as well as PRISM-3: a real-time stereo vision system; Rex and Gapps: software tools for building intelligent, real-time systems; and Iconicode: a visual programming environment.

24 Tours, Childcare, & Map

The Tech Museum of Innovation, San Jose

Special Ticket Offer

Discounted Tech Museum tickets are available for purchase through AAAI. Located directly across the street from the San Jose Convention Center, the Tech Museum of Innovation brings Silicon Valley ingenuity to life with imaginative exhibits and labs. The Tech Museum features interactive exhibits in six areas: Microelectronics, Space Exploration, High Tech Bikes, Robotics, Materials and Biotechnology. Prices are \$5.00 (adults) and \$3.00 (children, 6-18). Tickets valid for unlimited entry Tuesday through Sunday, 10:00 AM-5:00 PM. Closed Monday. Please see registration form on page twenty-five to order.

Child Care

Child care will be provided by KiddieCorp. Their experienced staff will offer CLUB KID, a program geared towards infants, preschool and school-age children up to age eleven. Fees include age-appropriate games and toys; arts and crafts; a separate, supervised nap room; movies and videos; and snacks. Lunch provided for children in care between 12:00 and 1:00 PM.

The schedule for CLUB KID is:

Sunday, July 12: 8:00 AM - 6:30 PM

Monday, July 13: 8:00 AM - 6:30 PM

Tuesday, July 14: 8:00 AM - 7:30 PM

Wednesday, July 15: 8:00 AM - 6:00 PM

Thursday, July 16: 8:00 AM - 6:00 PM

Cost is \$6.00 per hour per child. To register, complete the form on page twenty-six and return to AAAI by June 12, 1992. Inquiries regarding CLUB KID should be directed to Kiddiecorp at 619/455-1718.

Get Your Registration Form in Early!

The first 1,500 preregistrants will receive a commemorative AAAI Tenth Anniversary Pin

