Courtesy, Providence / Warwick Convention & Visitors Bureau

Fourteenth National Conference on Artificial Intelligence (AAAI-97) Ninth Conference on Innovative Applications of Artificial Intelligence (IAAI-97)

July 27-31, 1997

Sponsored by the American Association for Artificial Intelligence

Featuring: An opening *keynote address* by James Allen (University of Rochester) § Three days of *technical paper presentations* by top scientists in the field § A three-day parallel track of *invited talks* on topics ranging from the emergence of spacecraft autonomy, to AI and the changing concept of computation § *Innovative Application Award* winners § Invited talks and presentations on *emerging AI applications and technologies* § The *Mobile Robot Competition*, where robots will challenge each other with their latest earth-bound skills at vacuuming rooms, finding TV remote controls, and serving hors d'ouevres, and their latest extra-terrestrial skills at discovering life on Mars § *The Hall of Champions*, where many of the best computer players of classic games of strategy including chess, checkers, bridge, scrabble, and backgammon will play a series of challenge matches against some of the best human players § A continuing education program, the *Tutorial Forum*, where one ticket allows attendance at two days of courses on the latest developments in sub-fields of AI and related technologies § *Joint Exhibition* § *Student Abstract and Poster* program, and associated *SIGART/AAAI Doctoral Consortium* program § *Workshops* on a variety of research topics (invitation only).

AAAI-97: A Preview

As in years past, AAAI-97 continues to serve three major roles in the community:

- Satisfying the needs of current and future technical specialists through 13 workshops and 50 technical sessions, the Student Poster Display, and the SIGART/AAAI Doctoral Consortium
- Providing continued professional education through the Tutorial Forum and keynote and invited speakers, including reports on highlights from recent UAI, ML, KR and KDD conferences
- Educating the public (while stimulating ongoing research projects) through the Hall of Champions and Robot Competition.

The Hall of Champions is new to AAAI-97. At the Hall will be demonstrations of the best computer players of a variety of classic games of strategy. AAAI-97 attendees and the public will be able to compete with these programs, discuss technical and social issues with their authors, and view them playing a series of challenge matches against some of the best human players around.

The popular Tutorial Forum, introduced at AAAI-96, also continues this year, with admission allowing participation in up to four consecutive tutorials during two full days. This year, among other topics will be "Belief Networks and Decision-Theoretic Reasoning for AI," "Mobile Robot Control Architectures," "Physics-Based Modeling for Vision and Virtual Human Animation," and "Data Mining."

We will also be continuing the popular Student Abstract and Poster program, an opportunity for students to present and discuss their work during its early stages, meet peers with related interests, and introduce themselves to more senior members of the field. It presents a wonderful opportunity for all of us to get acquainted with some of the up-and-coming talent and their new research ideas. Also for students is the SIGART/AAAI Doctoral Consortium program—a small, focused gathering that allows selected students to present their work to a faculty panel and their peers for discussion and practical advice.

In sum, the AI community continues its goal of enhancing the atmosphere of excitement, innovation, controversy, and intellectual engagement at its annual conference. Please join us by taking part in AAAI-97!

- Ben Kuipers and Bonnie Webber
Program Cochairs, AAAI-97

IAAI-97: A Preview

The Ninth Annual Conference on Innovative Applications of Artificial Intelligence (IAAI-97), held Monday – Wednesday, July 28-30, continues the IAAI tradition of case studies of deployed applications with measurable benefits whose value depends on the use of AI technology. In addition, IAAI-97, for the first time, augments these case studies with papers that address emerging areas of AI technology or applications. It also includes a series of invited talks organized around this same theme of emerging areas. IAAI is organized as an independent program within the National Conference, and the schedules are coordinated, to allow attendees to move freely between IAAI and National Conference sessions. IAAI and the National Conference are jointly sponsoring several invited talks that fit the theme of both programs.

A key goal of IAAI-97 is to promote a dialog between basic and applied AI. Basic AI research will benefit by learning about challenges of real-world domains and difficulties and successes in applying AI techniques to real business problems. AI applications developers will benefit from learning about new AI techniques that will enable the next generation of applications. IAAI-97 will address the full range of AI techniques including knowledge-based systems, natural language, and vision.

IAAI-97 showcases 11 winners of the "Innovative Application Award." These applications are the most impressive AI applications of the past year. They are selected for their demonstrated business value and their technical innovation. The papers are case studies that provide a valuable guide to designing, building, managing, and deploying systems incorporating AI technologies. These applications provide clear evidence of the impact and value that AI technology has in today's world. Organizations honored this year are leading businesses and government agencies from the US, Europe, and Asia. They include Air Products and Chemicals, Inc.; Brightware, Inc.; Carnegie Mellon University; Clarity Systems Pte Ltd, Singapore; Fannie Mae; Hewlett Packard Company; Hyundai Engineering & Construction Company, Ltd, Korea; Hyundai Information Technology Company, Ltd, Korea; IBM Corporation; Information Technology Institute, Singapore; ISoft, France; Korea Advanced Institute of Science and Technology; New York State Education Department; Oxford Health Plans; The Parallaz Corporation; Siena College; SISCOG – Sistemas Cognitivos Lda., Portugal; and Union Pacific Railroad.

This year completes the changes instituted last year to revitalize IAAI. A new track, Emerging Applications and Technologies, has been added to "bridge the gap" between AI research and AI applications development. Papers in this track describe efforts whose goal is the engineering of AI applications, and which inform AI researchers about the utility of specific AI techniques for and constraints imposed by applications domains and/or AI applications developers about tools, techniques, or methods that will enable the next generation of new and more powerful applications.

IAAI-97 also includes a series of invited talks that address key areas in which we expect to see AI applied in the near future. Invited talks will address (1) technical background—what AI techniques are applicable to this area? (2) current breakthroughs—what has happened recently to make applications feasible in this area? (3) emerging applications—what are some sample applications that are beginning to appear? (4) barriers—what are the remaining technical and institutional roadblocks to widespread use of AI in this area? (5) strategies for progress—what can and should the AI community do to overcome these barriers? We invite you to contribute to the dialog between basic and applied AI by joining us for IAAI-97.

Ted E. Senator, *IAAI–97 Program Chair*
Bruce G. Buchanan, *IAAI–97 Program Cochair*

AAAI-97 Program Cochairs: Benjamin J. Kuipers, University of Texas at Austin; Bonnie Webber, University of Pennsylvania

AAAI-97 Associate Chair: Ramesh Patil, University of Southern California / Information Sciences Institute

IAAI-97 Conference Chair: Ted E. Senator

IAAI-97 Conference Cochair: Bruce Buchanan

Hall of Champions Chair: Matthew L. Ginsberg, CIRL/University of Oregon

Robot Building Laboratory Chair: David Miller, KISS Institute for Practical Robotics

Robot Competition Chair: Ronald C. Arkin, Georgia Institute of Technology

Student Abstract and Poster Chair: Polly K. Pook, Massachusetts Institute of Technology

Tutorial Cochairs: Bart Selman, ATT Laboratories

Brian C. Williams, NASA Ames Research Center

Workshop Chair: Raymond C. Mooney, University of Texas at Austin

SIGART/AAAI-97 Doctoral Consortium Organizers: Vibhu O. Mittal, University of Pittsburgh & Loren G. Terveen, AT&T Research

Keynote Address: AI Growing Up: The Changes and Opportunities

James F. Allen, *University of Rochester*
9:00 – 10:00 AM, Tuesday, July 29

If we draw an analogy between the development of AI and the stages of human development, I would argue that AI research so far has been a varied and exploratory childhood-with false starts, great leaps of faith, no clearly defined goals, and even some antisocial behavior. Yet, like most people, we have somehow survived and have learned some of the basic facts of life. But we are now moving onto adolescence, where we must learn much of our self-discipline and acquire a set of life-long habits. The reason that I think we are at this profound transition point is that it is now possible to build simple intelligent artifacts, from simple robots, to reasoning systems that analyze and predict phenomena, to simple natural language dialog systems. The presence of such artifacts will enable us, in fact require us, to develop a new paradigm of research that combines theoretical work with a significant empirical component. I will draw from my own and other's work in natural language, especially work aimed at defining conversationally proficient intelligent agents, to illustrate why we are at such a critical point. I'll then lay out some choices we have to make and explore what I believe are our excellent prospects for the future.

James Allen is the John Dessauer Professor of Computer Science at the University of Rochester, where he has been on the faculty since 1979, after receiving his Ph.D in computer science from the University of Toronto. He was one of the first recipients (1984) of the Presidential Young Investigator award from NSF and is a Fellow of the American Association for Artificial Intelligence (AAAI). He was editor-in-chief of *Computational Linguistics* from 1983-1993 and is the author of *Natural Language Understanding*, published by Benjamin Cummings in 1987, with a second edition published in 1995, and *Reasoning About Plans*, published by Morgan Kaufmann in 1991. He was general chair of the Second International Conference on Principles of Knowledge Representation held in 1991 and was chairman of the Computer Science Department at Rochester from 1987-1990. From 1992-1996, he was Director of the cognitive science program at the University of Rochester. He is currently codirector of the Center for the Sciences of Language at the University of Rochester. He has received numerous grants for his research, from NSF, ARPA, ONR, AFOSR, Rome Labs, and other agencies.

His research is generally aimed at defining a computational model of an intelligent, conversational agent, and many projects address the interface between knowledge representation and reasoning and language comprehension. He has published numerous research articles in the areas of natural language understanding, knowledge representation, temporal reasoning, planning and plan recognition.

AAAI-97 Opening Reception

The AAAI-97 opening reception will be held Tuesday, July 29 from 6:00 – 7:00 PM in the Rhode Island Convention Center. Attendees will have an opportunity to view the exhibits and perhaps challenge one of the computer players of a variety of classic games of strategy in the Hall of Champions. The AAAI-97 Student Abstract Poster Session will be held simultaneously, as will the poster session for the SIGART/AAAI-97 Doctoral Consortium. A variety of hors d'oeuvres, some served by robots from the Sixth Annual Mobile Robot Competition, and a no-host bar will be available. Admittance to the reception is free to AAAI-97 registrants. A $20.00 per person fee will be charged for spouses, children, and other nontechnical conference registrants.

AAAI-97/IAAI-97 Invited Presentations

Tuesday – Thursday, July 29-31

The Mobile Robot Competition: Martians, Remotes, Hors d'Ouevres, and Cleaning up the Mess Afterwards

Ronald C. Arkin, *Georgia Institute of Technology* and
R. James Firby, *University of Chicago*
2:00 – 3:00 PM, Tuesday, July 29

This year's competition, the sixth annual held at AAAI, continues to expand upon the legacy of those which preceded it. In this talk we first review the event's history and goals. This year, however, marks a significant departure from the past. We survey the four different events which make up this year's competition (find life on Mars, find the remote control, home vacuuming, and hors d'ouevres anyone?). Their significance to the AI and robotics communities lies along several lines: addressing opportunities in the exploration of Mars that are inspired by NASA's recent launch of the Pathfinder mission and its Sojourner robot, coupled with the teasing scientific possibility of life on that planet; developing assistive robotic technology for the disabled; mainstreaming service robot applications; and heightening human-robot interaction by having robots serve food to the AAAI conference attendees at this year's conference reception. This talk aspires to provide the research and intellectual backdrop that highlights the various aspects of AI, robotics, and computer vision which are challenged by each event, and to describe which specific research approaches are being used by the various competitors, that you may have only read about but not actually seen in action.

Complete and up-to-date information on the AAAI–97 conference can be found on the world wide web at www.aaai.org/Conferences/National/1997/

Embodied Intelligent Agents: Issues and Trends in Robotics

George A. Bekey, *University of Southern California*
2:00 – 3:00 PM, Wednesday, July 30

We survey some of the changes in robotics during the past 20 years, from simple industrial manipulators to autonomous intelligent agents, with an emphasis on the role of AI. Included are developments in robot control, learning, locomotion and group behavior, and current trends such as miniaturization, humanoids, robot colonies and human-robot interaction.

The Emergence of Spacecraft Autonomy (Joint Conferences Talk)

Richard J. Doyle, *Jet Propulsion Laboratory*
9:00 – 10:00 AM, Wednesday, July 30

The challenge of space flight in NASA's future is to enable more frequent and more intensive space exploration missions at lower cost. Nowhere is this challenge more acute than among the planetary exploration missions which JPL conducts for NASA. The launching of a new era of solar system exploration—beyond reconnaissance—is being designed for the first time around the concept of sustained intelligent presence on the space platforms themselves. Artificial intelligence, spacecraft engineering, mission design, software engineering and systems engineering all have a role to play in this vision, and all are being integrated in new work on spacecraft autonomy.

What Does KR Have to Say to AI?

David Etherington, *CIRL/University of Oregon*
11:40 AM – 12:40 PM, Tuesday, July 29

In recent years, Knowledge Representation (KR) has become more and more of a discipline unto itself, focusing on artificial problems while other areas of AI have tended to develop their own representations and algorithms. This talk will consider what traditional KR has to offer to AI.

Computer Game Players: What They Mean for Society and for Science (Panel)

Organizer: Matthew L. Ginsberg, *CIRL/University of Oregon*
11:40 AM – 12:40 PM, Wednesday, July 30

Computer game players have come of age, exhibiting world class performance in many — if not yet quite all — games of strategy. This panel discussion will focus on the lessons to be drawn from these successes: How can the rest of AI duplicate the successes of the game players? Is the fact that humans are being displaced as the world's best game players an anomaly, or a harbinger of things to come? The panelists will be drawn from the participants in the Hall of Champions, and will include both program authors and human champions.

Advances in Uncertain Reasoning

Eric Horvitz, *Microsoft Research*
4:30 – 6:00 PM, Wednesday, July 30

For thirteen years, the Conference on Uncertainty and Artificial Intelligence (UAI) has been a central meeting for researchers from computer science, decision science, operations research, statistics, and psychology with interest in developing computational methods for grappling effectively with inescapable uncertainties in the real world. I will discuss recent advances in uncertain reasoning, highlighting key developments in representation, inference, and learning.

Machine Learning for Intelligent Systems

Pat Langley, *Daimler-Benz Research* and *Technology Center and Institute for the Study of Learning and Expertise*
3:10 – 4:10 PM, Tuesday, July 29

Recent research in machine learning has focused on supervised induction for simple classification or prediction and, in the process, has become disconnected from AI's original goal of creating complete intelligent agents. In this talk, Langley reviews recent work on machine learning for planning, natural language, and related topics that runs counter to this trend and thus holds interest for the AI research community at large.

Prospects, Trends and Issues In Government Support of AI: Views of the Funding Agencies (Panel)

Organizer: Mel Montemerlo, *NASA*
2:10 – 3:10 PM, Thursday, July 31

Resource-Bounded Language Processing

Fernando Pereira, *AT&T Bell Labs*
10:30 – 11:30 AM, Wednesday, July 30

Much of natural-language processing research in the past thirty years assumed a ready supply of general and linguistic knowledge, and limitless computational resources to use it in understanding and producing language. However, in practice accurate knowledge is hard to acquire and computational power is limited. Trying to keep within that resource budget, approximate, often statistical, knowledge sources and less profligate, often finite-state, processing models have been developed and applied with remarkable success to problems such as speech recognition, parsing and translation. Furthermore, the new approaches have close connections with recent developments elsewhere in AI.

The Ascent of Soar

Paul S. Rosenbloom, *USC/Information Sciences Institute*; John Laird, *University of Michigan;* and Jill Lehman, *Carnegie Mellon University*
10:30 – 11:30 AM, Tuesday, July 29



For the past fifteen years we have been evolving Soar from its origins as a problem solving agent towards the grand challenge of a human-like intelligent agent. Here we reflect on this past history, describe Soar's present form, and speculate on the future path towards human-like intelligent agents.

Preaching What We Practice: How AI is Changing the Concept of Computation

Lynn Andrea Stein, *Massachusetts Institute of Technology*
1:00 – 2:00 PM, Thursday, July 31

AI is transforming computer science, replacing notions of computation as calculation with computation as interaction, shifting focus from algorithmic I/O to sustained behavior patterns. Yet our pedagogy remains virtually unchanged. Stein will describe a radical introduction to computer science that teaches students this model from the outset.

James Bond and Mike Ovitz: The Secret Life of Agents

Katia P. Sycara, *Carnegie Mellon University*
9:00 – 10:00 AM, Thursday, July 31

As agents populate Cyberspace in their many guises and roles, they coordinate and interact in different ways, spanning self-interested, as well as collaborative interactions. Agent coordination should be supported by an agent's internal architecture and agent societal frameworks. We take a microeconomic view of coordination. In this talk we report on our work on adaptive agent architecture, agent organizations, and presence of middle agents.

Performance Models for Dialogue Agents

Marilyn Walker, *ATT Laboratories*
3:10 – 4:10 PM, Wednesday, July 30

Recent advances in dialogue modeling and spoken language processing have made it possible to build spoken dialogue agents for many tasks. However, one obstacle to progress in spoken dialogue is the lack of a general performance model for comparing agent strategies. This talk discusses recent empirical studies whose goal is to develop and test such a performance model.

Market-Oriented Programming

Mike Wellman, *University of Michigan*
10:30 – 11:30 AM, Thursday, July 31

Market-oriented programming is the construction of computational economies, where agents interact through a price system. Markets can provide effective allocation of resources for a variety of distributed environments, and economic analysis a powerful design tool for interaction mechanisms. The spread of electronic commerce puts a premium on market-aware agents, and presents a case for market awareness on the part of agent developers and AI researchers as well.

Recent Advances in KDD (Joint Conferences Talk)

4:30 – 6:00 PM, Tuesday, July 29

AAAI-97/IAAI-97 Joint Exhibition

Tuesday – Thursday, July 29-31

The exhibit program will offer exhibits and demonstrations by leading suppliers of AI software as well as AI consultants and publishers displaying the latest in AI books and periodicals. Recent AAAI Exhibitors have included:

- AAAI Press
- Academia Book Exhibits
- Academic Press
- Angoss Software International, Ltd.
- Elsevier Science Publishers
- Franz, Inc.
- Harlequin Ltd
- ILOG, Inc.
- Intelligent Automation, Inc.
- Kluwer Academic Publishers
- Lawrence Erlbaum Associates
- The MIT Press
- Morgan Kaufmann Publishers, Inc.
- OXCO, Inc.
- PCAI
- Prentice Hall
- PWS Publishers/ITP
- Real World Interface, Inc.
- Springer Verlag New York, Inc.
- Talarian Corporation
- Wizsoft

AAAI-97 Hall of Champions

Tuesday – Thursday, July 29-31

AAAI-97 will include demonstrations of the best computer players of a variety of classic games of strategy. The games selected are expected to include the following:

Game	Program	Author
backgammon	TD-Gammon	Gerry Tesauro
bridge	GIB	Matt Ginsberg
checkers	Chinook	Jonathan Schaeffer
chess	Rebel Chess	Ed Schroeder
go	Handtalk	Sidney Yuan
Othello	Logistello	Michael Buro
Scrabble	Maven	Brian Sheppard

(Rebel Chess was selected over Deep Blue because the programs are of roughly comparable strength and Rebel Chess runs on a microprocessor.) Several classic solved games will also be included, such as go-moku (tic-tac-toe on a large board where the object is to get five marks in a row), connect-4, and nine man's morris.

AAAI-97 attendees will be able to interact with these programs in a variety of ways. first, all of the programs themselves will be available during the conference and attendees will be able to compete against them. Second, many of the programs' authors will be available to discuss both the technical issues involved in creating the programs and the social issues involved in introducing world-class computer players into tournament play. And finally, human experts will be on hand to play a series of challenge matches against the programs themselves. The Hall of Champions will include a spectators' area where AAAI attendees can view these matches as they progress. Admittance to the Hall of Champions is included in the technical program registration fee or the onsite exhibits-only registration fee. High-school students are welcome and will be admitted without fee upon presentation of a valid high-school student ID. Children under 12 must be accompanied by an adult conference registrant. The Hall of Champions is being organized by Matthew L. Ginsberg, ginsberg@cirl.uoregon.edu.

6 Robot Program

1997 AAAI-97 Mobile Robot Competition and Exhibition

Tuesday – Thursday, July 29-31

This year, four events and an exhibition will be held at the Sixth Annual Mobile Robot Competition.

Event 1: Find Life on Mars

This task is inspired by the upcoming Pathfinder Mission to Mars, as well as the tantalizing (albeit limited) possibility of life on Mars as depicted by a recent meteorite analysis. The robot's mission is to explore a large area of Mars, looking for signs of past and current life, and return the life-forms, and only those life-forms, to the lander for further analysis. From satellite imagery, we have some clues as to where life may exist, but it is up to the robot to make a thorough exploration before its batteries run dead.

Event 2: Find the Remote Control

This event is inspired by the need for robot assistants to perform 'fetch-it' tasks in partially known environments. Imagine a robot assistant helping a handicapped person around the home. The person might ask the robot to fetch an orange, the TV remote, a cup of coffee, and so on. While the robot may not know where all of these items are initially, over time it will learn roughly where they are kept. The event will take place in an arena that contains tables, chairs, and shelves at varying heights. Scattered throughout the area, on the floor, the shelves, and the tables, will be 12 different objects. The robot will start the event near a human sitting in a chair (i.e., judge) who will ask the robot to fetch three items. Once these items have been returned, the human will ask for three more items. The winner will be the robot that can find and return the most items in the allotted time.

Event 3: Home Vacuum

The point of this contest is to explore the usefulness of intelligence in a task that appears to only require essentially unskilled labor—simple household vacuuming. We believe that unlike vacuuming in the service industry (factories, warehouses, etc.) home vacuuming will require sensate intelligence to deal with the humans in an everyday environment. For the AAAI contest, vacuuming robots ought to be short on vacuum mechanisms and long on intelligence. That is to say, simple suction, storage, and disposal devices are sufficient for these tasks, but the robots will probably have to make reasoned trade-offs among subtasks in real time to achieve a high score.

Event 4: (Special event) Hors d'Oeuvres Anyone?

This event will occur at the AAAI main reception where there will be heavy interaction with the attendees. Judging will be conducted by the attendees. The goal is to provide solid refreshments to people in close quarters. Safety and self-protection are paramount. A human escort (only one allowed per team within the area) will always be nearby for safety and control of the robot (i.e., if it moves out of the designated area), but will be limited in their interaction with the attendees. The robots must be fully autonomous. The escort will also replenish the hors d'oeuvres on an as needed basis.

Exhibition

The intent of the Robot Exhibition is to showcase current research in robotics that does not fit into the competition tasks. We welcome robot demos (scheduled or continuous), robot soccer entries, posters with or without robots present, and videos.

More information, points-of-contact, and the official rules can all be found at the following web sites: http://spbtrc.gtri.gatech.edu/AAAI97/ (Competition) and http://www.ai.mit.edu/people/holly/AAAI97/ (Exhibition.)

AAAI-97 Robot Building Laboratory (RBL)

Sunday – Monday, July 27-28, 1997

AI meets the road! Participants will spend the day learning about how AI can (and can't) be integrated into the world of mobile robots. Most of the day will be hands-on: building and programming small mobile robots to do a variety of tasks.

Much of the current AI research deals with the actions of embedded agents. In this course it will become apparent that simulations of an agent's environment are often inadequate for effective evaluation of systems. The RBL will give the attendees the necessary information to start embedding their systems in physical agents mobile robots that can interact with realistic environments.

Material to be covered:

- Realistic versus idealized robots
- Major components of robot systems
- Sensor and effector integration
- A crash course in behavior control programming
- Everything an AI researcher needs to know about PID
- Vendors and suppliers for getting robots into your lab or home.

Functional mechanical modules will be available from the start of the program. Participants will be able to spend their time designing and programming the robot, with only a bare minimum of LEGO®-hacking to get their robots to move reliably. The lab will begin with a brief tutorial on sensors, effectors and robot capabilities to get everyone up to speed, followed by the actual robot building. Throughout the day there will be a series of short tutorials, both for individual teams and for the group as a whole, on particular aspects of robot building and programming. On Monday, July 28, all the robots will be displayed in the arena to show off their special capabilities and to compete head to head in a contest of speed and intelligence. This exhibition will be open to all of the conference attendees. Please see the registration form on page 21 for the fee schedule.

The goals of this lab event are to give all participants exposure to the intricacies of melding AI and robotics; show the value of performing AI experiments on physical devices; familiarize the participants with the current robotic experimental technology; and give everyone a chance to play with AI that they can get their hands around.

This lab is aimed at AI researchers and practitioners who want to move their systems out of simulations and into the physical world. A basic understanding of common AI techniques and programming languages will be assumed.

The lab is being organized and taught by the KISS Institute for Practical Robotics (KIPR) for AAAI. Instructors and assistants will come from KIPR's trained staff. David Miller will be the lead instructor. For updated information about this event, please refer to www.kipr.org/rbl97.

AAAI-97 / IAAI-97 Paper Sessions

Monday, July 28

(IAAI-97 Award Winning Deployed Application Papers Only)

9:00 – 10:00 AM
Session 1: IAAI-97: Introduction/Scheduling I

10:30 – 11:30 AM
Session 2: IAAI-97: Scheduling II

11:40 AM – 12:40 PM
Session 3: IAAI-97: Planning/Layout

2:00 – 3:00 PM
Session 4: IAAI-97: Regulatory Compliance/Eligibility Determination I

3:10 – 4:10 PM
Session 5: IAAI-97: Regulatory Compliance/Eligibility Determination II

4:30 – 5:30 PM
Session 6: IAAI-97: Computer Diagnosis

Tuesday, July 29

10:30 – 11:30 AM
Session 7: Planning Under Uncertainty
Session 8: Qualitative Reasoning 1
Session 9: Description Logics
Session 10: Constraint Satisfaction Problems: Symmetry
Session 11: IAAI-97: Invited Talk: Alexa Macray

11:40 AM – 12:40 PM
Session 12: Classification
Session 13: Automated Reasoning/Diagnosis
Session 14: Multi-Agent Systems
Session 15: IAAI-97: Information Extraction I
Session 16: IAAI-97: Complex Systems Design I

2:00 – 3:00 PM
Session 17: Natural Language Generation
Session 18: Constraint Satisfaction Problems and Bayes Networks
Session 19: Text Retrieval and Learning
Session 20: IAAI-97: Military I
Session 21: IAAI-97: Transportation Diagnosis

3:10 – 4:10 PM
Session 22: Reactive Behavior
Session 23: Agent Architecture
Session 24: Knowledge Representation: Ontologies
Session 25: IAAI-97: Military II
Session 26: IAAI-97: Design II

4:30 – 6:00 PM
Session 27: Spatial Uncertainty
Session 28: Plan Generation
Session 29: Model Selection and Overfitting
Session 30: Structure of Constraint Satisfaction Problems

6:00 – 7:00 PM
AAAI-97 Student Abstract Poster Session and SIGART/AAAI Doctoral Consortium Poster Session
(in conjunction with Opening Reception)

Wednesday, July 30

9:00 – 10:00 AM
Session 31: Problem Solving & Computational Resources
Session 32: Belief and Decision
Session 33: Information Retrieval
Session 34: Computational Systems for Education

10:30 – 11:30 AM
Session 35: Parallelism in Learning
Session 36: Diagnosis
Session 37: IAAI-97: Space
Session 38: Flexible Hierarchical Planning
Session 39: IAAI-97: Multimedia

11:40 AM – 12:40 PM
Session 40: Knowledge Discovery in Databases
Session 41: Knowledge Representation: Nonmonotonic Logic
Session 42: Agent Coordination
Session 43: Heuristics for Scheduling
Session 44: IAAI-97: Space/Knowledge Management

2:00 – 3:00 PM
Session 45: Knowledge Representation: Reasoning about Action I
Session 46: Local Search: Beyond SAT
Session 47: Automated Reasoning & the User Interface
Session 48: Modeling for Decision Processes
Session 49: Information Extraction II

3:10 – 4:10 PM
Session 50: Negotiation
Session 51: Knowledge Representation: Expert Systems
Session 52: Probability and Planning
Session 53: Search (Cost)
Session 54: IAAI-97: Invited Talk

4:30 – 6:00 PM
Session 55: Navigation & Perception
Session 56: Constraint Satisfaction Techniques
Session 57: Language and Learning
Session 58: Formal Analyses of Learning
Session 59: IAAI-97: Design III

Thursday, July 31

9:00 – 10:00 AM
Session 60: Machine Learning (Probabilistic)
Session 61: Optimal Planning
Session 62: Knowledge Representation: Theorem Proving
Session 63: Efficient Reasoning

10:30 – 11:30 AM
Session 64: Scheduling
Session 65: Reasoning about Physical Systems
Session 66: Building and Modifying Knowledge Bases
Session 67: Natural Language

1:00 – 2:00 PM
Session 68: Knowledge Representation for Automated Reasoning
Session 69: Learning In Linguistic Domains
Session 70: Case-Based Reasoning and Planning
Session 71: Local Search Techniques

2:10 – 3:10 PM
Session 72: Reasoning about Action II
Session 73: Experimental Methodology
Session 74: Techniques for Temporal Reasoning

A complete AAAI-97/IAAI-97 program schedule can be found at http://www.aaai.org/Conferences/National/1997/

1997 AAAI Tutorial Forum

The 1997 AAAI Tutorial Forum features sixteen four-hour tutorials that explore hot topics within and outside the AI field. Each tutorial is taught by experienced scientists and practitioners in AI. We encourage all attendees to take advantage of this opportunity to learn about advances in areas outside their personal focus. One low fee will entitle tutorial forum registrants to attend up to four consecutive tutorials, including four tutorial syllabi.

SESSION I: Sunday, July 27, 9:00 AM – 1:00 PM

SA1: Belief Networks and Decision-Theoretic Reasoning for Artificial Intelligence
Daphne Koller and Jack Breese

SA2: Evolutionary Computation and Artificial Life
Melanie Mitchell and John Batali

SA3: Agent Development in Soar
John Laird, Clare Congdon, and Randolph Jones
(Please note: This is a full-day tutorial.)

SA4: Data Mining
Usama Fayyad and Evangelos Simoudis

SESSION II: Sunday, July 27, 2:00 – 6:00 PM

SP1: Reinforcement Learning
Leslie Pack Kaelbling and Richard S. Sutton

SP2: Model-Based Autonomous Systems
Brian Williams and Pandurang Nayak

SP3: Modeling with Defaults: Causal and Temporal Reasoning
Hector Geffner

SP4: Principles of Ontological Engineering
Michael Gruninger and Mike Uschold

SESSION III: Monday, July 28, 9:00 AM – 1:00 PM

MA1: Topics in the Theory of the Practice of Machine Learning
Michael Kearns

MA2: Genetic Programming
Astro Teller and David Andre

MA3: The Database Perspective on Knowledge Representation and Information Integration
Alon Levy and Jeffrey D. Ullman

MA4: Physics-Based Modeling for Vision and Virtual Human Animation
Dimitris Metaxas and Norman Badler

SESSION IV: Monday, July 28, 2:00 – 6:00 PM

MP1: Compute-Intensive Methods in Artificial Intelligence
Henry Kautz and Bart Selman

MP2: Computer Vision
Daniel Huttenlocher and Todd Cass

MP3: Practical Planning
Steve Chien and Brian Drabble

MP4: Mobile Robot Control Architectures
R. James Firby and Reid G. Simmons

Agent Development in Soar (SA3)

John Laird, Clare Congdon and Randolph Jones
9:00 AM – 6:00 PM, Sunday, July 27

The major thrust of this tutorial will be to give the participants an understanding of the details of Soar so that they can create simple Soar programs. This will be a full-day tutorial, with an emphasis in the morning on understanding the syntax and structure of the architecture (the memories and processes), and an emphasis in the afternoon on agent development. In the morning, participants will run, modify, and debug small demonstration programs that illustrate the various parts of Soar's structure. In the afternoon, we will work on simple agents that interact with a dynamic simulated environment. The students will build their own complete agents that navigate and compete in a simple maze world. The class will culminate with a competition among the agents designed by students.

We expect participants to have general programming experience and a basic understanding of symbolic processing, match, AI, problem solving, etc. No prior knowledge of Soar or rule-based systems required.

John Laird received his Ph.D. in computer science from Carnegie Mellon University in 1983. Since 1986 he has been on the faculty of the University of Michigan in the Electrical Engineering and Computer Science Department where he is currently an associate professor and director of the Artificial Intelligence Laboratory. His research interests center on the development of integrated intelligent agents and their underlying architecture. Laird is one of the original developers of Soar and is actively involved in its continual evolution and application.

Clare Congdon is a visiting assistant professor of computer science at Bowdoin College. She earned her Ph.D. in computer science at the University of Michigan in 1995. Her research interests include machine learning and robotics, and she is currently focused on teaching issues, especially the role of computer science in liberal arts schools.

Randolph Jones holds a Ph.D. in information and computer science from the University of California, Irvine. He has served on the research faculty at Carnegie Mellon University, the University of Pittsburgh, and currently at the University of Michigan. His research interests include intelligent agents, machine learning, and psychological modeling.

Belief Networks and Decision-Theoretic Reasoning for AI (SA1)

Daphne Koller and Jack Breese
9:00 AM – 1:00 PM, Sunday, July 27

Uncertainty is an inherent feature in real life. Therefore, reasoning and decision making under uncertainty are central to intelligent behavior. Over the past decade, a new and successful technology has emerged for automating these capabilities. In this approach, an agent's uncertainty and objectives are explicitly modeled using probabilities and utilities; principled decision-theoretic techniques are then used to determine the agent's beliefs given its limited observations, and to decide on a rational course of action (one that maximizes expected utility).

In this tutorial, we describe some of the fundamental representations and algorithms in this area. We present Bayesian belief networks, which combine qualitative information about causal structure with probabilis-

tic information to provide a compact natural encoding of complex probabilistic models. We outline several key algorithms for exact and approximate probabilistic inference in belief networks. We describe how this technology can be scaled up to more complex domains by exploiting additional types of structure (e.g., hierarchical decomposition), by automated construction of models from knowledge bases, and by learning models directly from data. Finally, we illustrate the use of belief networks as part of a broader architecture for decision-theoretic planning.

Participants should be familiar with basic probability theory. No prior knowledge of belief networks is required.

Daphne Koller received her Ph.D. from Stanford University in 1993. After two years at the University of California, Berkeley, she returned to Stanford as an assistant professor. She has done extensive work on representation, inference, and learning in probabilistic models. She is the recipient of the Arthur Samuel Award for best thesis in the Computer Science Department and of the Sloan Foundation Faculty Fellowship.

Jack Breese is a senior researcher in the Decision Theory and Adaptive Systems Group in Microsoft Research. He has published over the past ten years in the areas of uncertainty in artificial intelligence and computational decision analysis. He received his Ph.D. in 1987 from the Department of Engineering Economic Systems at Stanford University and joined Microsoft Research in 1993.

Compute-Intensive Methods in Artificial Intelligence (MP1)

Henry Kautz and Bart Selman
2:00 – 6:00 PM, Monday, July 28

In the 1970s and 1980s the success of knowledge-intensive approaches to problem solving eclipsed earlier work on compute-intensive weak methods. However, in recent years compute-intensive methods have made a surprising comeback. One of the most prominent examples is the success of IBM's Deep Blue in defeating Gary Kasparov in the first game of the 1996 ACM Challenge match. The game led Kasparov to exclaim, "I could feel — I could smell — a new kind of intelligence across the table." Yet Deep Blue derives its strength mainly from highly optimized search.

Another dramatic development in the compute-intensive approach was the recent computer proof resolving the Robbins problem (McCune, Oct. 1996). The Robbins problem is a well-known problem in Boolean algebra, and was open for over sixty years. The computer proof was found by applying powerful search techniques guided by general search tactics. Unlike previous results in the area of automated theorem proving, this time several aspects of the computer proof could be called "creative" by mathematicians' standards.

Deep Blue's performance and the resolution of the Robbins problem are good examples of the dramatic improvement in performance of compute-intensive approaches compared to just a few years ago. Other examples of the recent success of such methods are in planning, qualitative reasoning about physical systems, and learning.

This tutorial will explore how and why quantitative changes in compute-intensive methods can lead to dramatic qualitative changes in overall performance. These technique promise to alleviate the knowledge acquisition bottleneck in AI by allowing expert-level performance to be achieved with only a a minimal amount of domain knowledge. We will discuss how these lessons can be broadly applied to problems in artificial intelligence, and we will speculate on where the next breakthroughs might occur.

Henry Kautz is head of the Artificial Intelligence Principles Research Department of AT&T Labs. His research interests include knowledge representation, intelligent software agents, and efficient reasoning systems. He received his Ph.D. from the University of Rochester in 1987, and joined AT&T Bell Labs that year. In 1989 he received the Computers and Thought Award from the International Joint Conference on Artificial Intelligence. His work on stochastic search for planning won the best paper award at the 1996 conference of the American Association for Artificial Intelligence.

Bart Selman is a member of the Artificial Intelligence Principles Research Department at AT&T Laboratories. He holds a Ph.D. and M.Sc. in computer science from the University of Toronto, and a M.Sc. in physics from Delft University of Technology. His research has covered many areas in artificial intelligence, including tractable inference, knowledge representation, search, planning, default reasoning, constraint satisfaction, and natural language understanding. He has received best paper awards at both the American and Canadian national artificial intelligence conferences, and at the International Conference on Knowledge Representation. His current research projects are on efficient reasoning, stochastic search methods, planning, knowledge compilation, and software agents.

Computer Vision (MP2)

Daniel Huttenlocher and Todd Cass
2:00 – 6:00 PM, Monday, July 28

The goal of computer vision is to extract content from images by understanding the properties of the physical world that gives rise to those images. While image processing is concerned primarily with the manipulation and transformation of image signals, computer vision goes beyond this by studying properties of the world and of the cameras which produce image signals.

This tutorial will provide a broad introduction to the many techniques and applications in computer vision. We will consider how the geometry of the world and the physics of the imaging process encode the structure of scenes in images, and how computer vision techniques uncover and utilize this structure in interpreting images. We will also cover applications of computer vision to problems in areas such as image databases, analyzing video, and robot navigation.

Examples of topics include low-level extraction of image properties such as detecting intensity edges, computing visual motion, and analyzing color information, middle-level processing which recovers three-dimensional information using two or more viewpoints in space or time, such as stereopsis and structure from motion, and higher-level processing such as recognition methods which identify known objects in an image for use in visual inspection, image database searches, and human face recognition.

This is an introductory tutorial, requiring no prior knowledge of computer vision, and relying only on college-level material in computer science and mathematics.

Todd Cass received his Ph.D. in electrical engineering in 1992 from the Massachussetts Insitute of Technology where he was a member of the MIT Artificial Intelligence Laboratory. Since 1992 he has been a member of the research staff at the Xerox Palo Alto Research Center (Xerox PARC). His current interests include model-based object recognition, digital watermarking and embedded data.

Daniel Huttenlocher is an associate professor of computer science at Cornell University, and a principal scientist in the Image Understanding Area at Xerox PARC. His research interests are in computer vision, digital libraries and computational geometry. He received his bachelors degree from University of Michigan in 1980 and Ph.D. from MIT in 1988.

The Database Perspective on Knowledge Representation and Information Integration (MA3)

Alon Levy and Jeffrey D. Ullman
9:00 AM – 1:00 PM, Monday, July 28

The fields of deductive database systems and knowledge representation have both developed concepts and techniques for modeling and manipulating data. Even though the two fields considered very closely related problems, the techniques developed emphasized the specific needs of each field. While database systems deal with large amounts of relatively simple data, knowledge representation systems tend to manipulate smaller amounts of more complex data. The tutorial will survey several bodies of work in the database community that are closely related to knowledge representation problems. Special emphasis will be put on illustrating the relevance of the results to the artificial intelligence community. We begin by covering several fundamental topics such as the tradeoffs in designing query languages for database systems and different treatments of negation. We describe the problems of query containment and rewriting queries using views, that are closely related to the problem of performing inference in knowledge representation systems based on first-order logic. We illustrate the use of these techniques in the problem of information integration, and compare the different approaches taken to this problem in the two fields. Finally, we describe several recent research directions in database systems, such as the management of semistructured data and active database systems.

Alon Levy is a principal member of technical staff at AT&T Labs. He received his Ph.D. in computer science from Stanford University in 1993 and his BSc in mathematics and computer science from Hebrew University, Jerusalem, in 1988. In his work he has made contributions to the fields of artificial intelligence and database systems. The focus of his work in the past few years has been on the problem of information integration, leading the Information Manifold project at AT&T Labs. His other research interests include description logics, knowledge base verification, abstraction and reformulation of computational theories, query optimization in databases, materialized views, web-site management systems, and management of semistructured data.

Jeffrey D. Ullman (Ph.D., Princeton University, 1966), is a professor at Stanford University, and a leading researcher in database systems, knowledge-base systems, theoretical computer science, analysis of algorithms, and programming languages and compilers. He served as the computer science department chair at Stanford University, from 1990 to 1994 and has served on the editorial boards of many journals, including the SIAM journal *Computing*, *ACM Computer and System Sciences*, and *Logic Programming*. He is working on the efficient implementation of data cubes for data warehousing and data mining.

Data Mining (SA4)

Usama Fayyad and Evangelos Simoudis
9:00 AM – 1:00 PM, Sunday, July 27

Knowledge discovery in databases (KDD) is a rapidly growing AI field that combines techniques from machine learning, pattern recognition, statistics, databases, and visualization to automatically extract knowledge (or information) from lower level data (databases). This knowledge is subsequently used to support human decision-making, e.g., prediction and classification tasks, summarize the contents of databases, or explain observed phenomena. The use of KDD systems alleviates the problem of manually analyzing the large amounts of collected data which decision-makers face currently. Successful KDD systems have been implemented and are currently in use in finance, fraud detection, market data analysis, astronomy, diagnosis, manufacturing, and biology. This tutorial presents a comprehensive picture of current research paradigms in the field of KDD. The tutorial will provide an introduction to KDD, define the basic terms and the relation between data mining and the KDD process, present methods for data preparation and preprocessing, describe major data mining techniques from the fields of AI, pattern recognition, databases, and visualization, discuss major KDD systems from academia and industry and provide a guide for developing a KDD system. In the process, the tutorial addresses such issues as role of various steps in the KDD process such as sampling, selection, projection and dimensionality reduction, extraction of patterns and models, and the use of extracted knowledge. There are no prerequisites for this tutorial other than familiarity with basic concepts in AI.

Evangelos Simoudis is vice president, Global Business Intelligence Solutions—IBM North America, where he is responsible for the development and deployment of data mining and decision support solutions to IBM's customers worldwide. Prior to joining IBM, Evangelos worked at Lockheed Corporation where he led the company's data mining research, and was responsible for the design and commercial introduction of the Recon data mining system, as well as its application to the financial and retail markets. Simoudis received a BA in physics from Grinnell College, a BS in electrical engineering from California Institute of Technology, an M.S. in computer science from the University of Oregon, and a Ph.D. in computer science from Brandeis University. Before Lockheed, Simoudis worked as a principal research staff at Digital Equipment Corporation's Artificial Intelligence Center where he conducted research on machine learning and pattern recognition, knowledge-based systems, and distributed artificial intelligence. His research work at DEC has been incorporated in products for engineering design and diagnostic tasks. Simoudis has written extensively on data mining and machine learning, and is editor in chief of the *Artificial Intelligence Review*.

Usama Fayyad is a senior researcher at Microsoft Research. Prior to joining Microsoft, he headed the Machine Learning Group at JPL and was principal investigator on several tasks in targeting automated data analysis in science and NASA data sets. He received a NASA medal (1994) and the 1993 Lew Allen Award for Excellence at JPL. He cochaired KDD-94 and KDD-95 and was general chair of KDD-96. He is a coeditor of *Advances in Knowledge Discovery and Data Mining* (AAAI Press / The MIT PRess 1996), and editor-in-chief of the new journal on this topic (Kluwer).

Evolutionary Computation and Artificial Life (SA2)

Melanie Mitchell and John Batali
9:00 AM – 1:00 PM, Sunday, July 27

Biologically inspired computation and computational models of complex adaptive systems are new approaches of fundamental importance for the artificial intelligence community. This tutorial will provide a selected survey of recent research in these areas, especially those relevant to machine learning and cognitive science.

Topics will include the theory of genetic algorithms and their applications to problems such as automatic programming, decentralized parallel computation, and evolving neural networks; new results in the theory of evolutionary computation; behavioral ecology and the mathematical theory of evolution; and artificial life models of the evolutionary dynamics of learning, altruism, communication and social behavior. No previous knowledge of these areas is required.

Melanie Mitchell received a Ph.D. in computer science from the University of Michigan in 1990. Since 1992 she has been on the research faculty of the Santa Fe Institute in Santa Fe, New Mexico, and directs the Institute's program in adaptive computation. She is also on the research faculty of the Computer Science Department of the Unversity of New Mexico in Albuquerque. She is the author of *An Introduction to Genetic Algorithms* (MIT Press, 1996) and has published two other books and numerous research papers in the fields of artificial intelligence, cognititve science, and complex systems, with particular focus on evolutionary computation and adaptive systems.

John Batali received a Ph.D. in electrical engineering and computer science from the MIT Artificial Intelligence Laboratory in 1991. He is currently an assistant professor in the Cognitive Science Department at the University of California at San Diego.

Genetic Programming (MA2)

Astro Teller and David Andre
9:00 AM – 1:00 PM, Monday, July 28

The tutorial will introduce the ideas and applications of genetic programming (GP), a computer search procedure inspired by the theory of natural evolution. Starting with a primordial ooze of randomly created programs composed of functions, constants, and variables appropriate to a problem, a population of computer programs is progressively evolved over many generations by applying the Darwinian principle of survival of the fittest, a recombination operation, and occasional mutation. Genetic programming has found applications in a wide variety of different areas of artificial intelligence including pattern recognition, data mining, distributed AI, optimal control, molecular biology, system identification, and engineering design.

We will briefly review the properties and mechanics of genetic programming, and then discuss the techniques that have been employed to successfully apply genetic programming to a variety of difficult real-world problems. Topics include multi-part programs, automatically defined functions, iteration, recursion, memory structures, mental models, architecture-altering operations, cellular encoding, neural programming, genetic design of electrical circuits, assembly code evolution, evolvable hardware, promising application areas for genetic programming, a thorough presentation of the important current problems and issues for GP research, and the implications of GP research to the field of artificial intelligence.

No advance knowledge about genetic algorithms, genetic programming, or biology is required.

Astro Teller is pursing research in artificial intelligence at Carnegie Mellon University. Teller is an expert in the area of signal classification in genetic programming. He is the author of several book chapters, journal articles, and conference papers on the subject of novel techniques in genetic programming.

David Andre is pursuing research on genetic programming and artificial intelligence at UC Berkeley. He has published more than 30 chapters and papers on genetic programming and is working on an upcoming book. David Andre was copresenter of a tutorial on genetic programming at AAAI-96.

Mobile Robot Control Architectures (MP4)

R. James Firby and Reid G. Simmons
2:00 – 6:00 PM, Monday, July 28

This tutorial will present the state-of-the art in architectural frameworks for controlling autonomous mobile robots. In recent years, a consensus has developed around a three-level architectural style — a bottom layer providing behavioral (reactive) control, a top layer providing planning (deliberation), and a middle (sequencing) layer bridging the gap between them.

The tutorial will begin by presenting factors that influence the development of such architectures: actuator and sensor control, complex changing environments, the desire to perform a wide variety of tasks, and the need for execution monitoring and exception handling. The tutorial will focus on case studies of implemented systems that emphasize reactive and sequencing layers; planning for mobile robots will be examined only briefly. The strengths and weaknesses of different architectural approaches will be analyzed in terms of the tasks and environments they readily support, the role of perception in task achievement and execution monitoring, and how exceptions are propagated and handled. Finally, the tutorial will discuss the pros and cons of the three-layer consensus and examine alternative avenues of research.

This is an intermediate-level tutorial intended for people who need to develop or evaluate mobile robotic systems. No previous experience with robotics is required, but a familiarity with control theory is helpful.

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 people in complex, changing environments. Firby is currently working on an architecture that integrates task planning, synchronization with external processes, and low-level robot control. That architecture has been implemented on an indoor mobile robot. Firby received his Ph.D. in artificial intelligence 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 1989-1991 Firby worked as a research scientist at the Jet Propulsion Lab designing and building local navigation software for the Pathfinder Planetary Rover project.

Reid G. Simmons is a senior research scientist in the School of Computer Science at Carnegie Mellon University. Since coming to CMU in 1988, 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, probabilistic robot planning and navigation, robust error detection and recovery, and selective perception. The ideas have been used in a half-dozen robots, including indoor mobile manipulators and legged and wheeled planetary rovers. Simmons has published over 50 articles and conference papers on his work in robotics and robot architectures. Simmons received his Ph.D. in artificial intelligence from MIT 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.

Model-Based Autonomous Systems (SP2)

Brian Williams and Pandurang Nayak
2:00 – 6:00 PM, Sunday, July 27

A new generation of autonomous systems are being developed that have the potential for profound social, environmental, and economic change. These include autonomous space probes, chemical plant control systems, power grids, life support systems, and reconfigurable traffic systems, to highlight but a few. To be economically viable these autonomous systems will need to be programmable purely through high level compositional models, supporting a "plug and play" approach to software and hardware development. This tutorial is a comprehensive introduction to the science and art of building the executive kernel that provides the sense/response loop for such model-based autonomous systems.

The focus of building a model-based executive kernel provides a framework for unifying a diverse set of research results. We discuss representation formalisms, starting with component-based propositional representations and building up to concurrent transition systems and qualitative algebras. We discuss the core algorithms, starting with the basics of model-based diagnosis, planning, real-time propositional reasoning, and model compilation, ultimately working towards a model-based executive with extensive diagnosis and planning embedded within the reactive control loop. We present a modeling "style" guide, where we discuss specific methods for modeling a variety of different autonomous systems. We conclude with a discussion of research on developing hybrid model-based executives that coordinate continuous adaptive estimation and control methods. Throughout the tutorial we illustrate the issues with examples drawn from fielded applications, including NASA's first autonomous space probe Deep Space One.

Brian Williams leads the intelligent systems group at NASA Ames Research Center, and is a flight colead for the autonomous spacecraft, Deep Space One. He received a Ph.D. at MIT, served as guest editor of *Artificial Intelligence* and is on the editorial board of *JAIR*. Research interests include immobile robots, model-based autonomy, diagnosis, model-based learning, qualitative reasoning, and design.

Pandurang Nayak is a research scientist at the NASA Ames Research Center. He holds a Ph.D. in computer science from Stanford University (1992), and his dissertation was an ACM Distinguished Thesis. He is currently an associate editor of *JAIR*, and his research interests include abstractions, model-based autonomous systems, diagnosis and recovery, qualitative and causal reasoning.

Modeling with Defaults: Causal and Temporal Reasoning (SP3)

Hector Geffner
2:00 – 6:00 PM, Sunday, July 27

A robot pushes a block and expects the block to move. The block however does not move. He pushes again but harder. The block moves. Inferences of this type are easy for people but hard for robots. Part of the problem is that modeling languages in AI do not deal with uncertainty in a natural way. Logical languages do not handle uncertainty, while probabilistic languages deal with uncertainty at a precision and cost that is seldom needed. Default languages are a new type of modeling languages that aim to fill the gap between the two languages, providing modelers with the means to map soft inputs into soft outputs in a meaningful and principled way. Default models combine the convenience of logical languages with the flexibility of a probabilistic semantics and the transparency of argumentation algorithms.

The goal of this tutorial is to provide a coherent and self-contained survey of such work. I focus in particular on the problems that arise when modeling causality and time, analyzing what works, what doesn't work, and why. I also illustrate the use of default languages in areas such as qualitative reasoning, decision making, planning and control. The tutorial is intended for people interested in commonsense modeling. There are no prerequisites except a basic knowledge of logic and probabilities.

Hector Geffner earned his Ph.D. at UCLA under the supervision of Judea Pearl with a dissertation on default reasoning that was the cowinner of the 1990 ACM Dissertation Award. Then he worked as Staff Research Member at the IBM T. J. Watson Research Center, before returning to the Universidad Simon Bolivar in Caracas, where he currently teaches. Geffner has served on the program committees of the major AI conferences and is a member of the editorial board of the *Journal of Artificial Intelligence Research*.

Physics-Based Modeling for Vision and Virtual Human Animation (MA4)

Dimitris Metaxas and Norman Badler
9:00 AM – 1:00 PM, Monday, July 28

In only a few years, the technology of virtual human modeling and animation has progressed from crude wireframe robotic models to realistic shaded smooth deformable figures. Driven by underlying dramatic increases in workstation compute power and 3D graphics, the future holds promise of ever more accurate (and beautiful) biomechanically robust models. The challenge, however, remains to provide effective and easily learned user interfaces to control, manipulate and animate these models. We discuss two coordinated directions: expressively effective and real-time physics-based simulations, and high-level language-motivated interfaces. This framework provides access to a rich behavioral vocabulary of parametrized virtual human actions. Benefits to be realized from these combined approaches include enhanced vir-

tual human behavior sets, articulated and deformable motion capture from video and their use in animations, facial modeling, multi-user team coordination studies, job training, and instruction manual interpretation and generation. This tutorial will assume the participant has some knowledge of introductory physics, mathematics, and programming, but will focus on the formulation, integration, and application of the models rather than their implementation details.

Dimitris Metaxas is an assistant professor of computer and information science at the University of Pennsylvania. He specializes in physics-based modeling techniques. He is the author of *Physics-Based Deformable Models: Applications to Computer Vision, Graphics and Medical Imaging*, a recipient of an NSF career award, and on ONR YIP.

Norman Badler is a professor of computer and information science at the University of Pennsylvania. He is coeditor of *Graphical Models and Image Processing* and coauthor of *Simulating Humans*. He directs the Center for Human Modeling and Simulation, which has produced the Jack virtual human software.

Practical Planning (MP3)

Steve Chien and Brian Drabble
2:00 – 6:00 PM, Monday, July 28

Automated planning is the generation of a low-level sequence of actions to achieve some desired world state while obeying domain constraints. Planning systems can automate procedure generation problems such as science data analysis, image processing, crisis response, space payload operations, and communications antenna operations. Automated planning technology can reduce operations costs, decrease manual errors, and reduce dependency on key personnel.

This tutorial covers basic domain-independent AI planning: search, representing planning knowledge, plan and state space planning, operator-based planning and hierar chical task network planning. Advanced concepts such as integrated planning and scheduling, decision theoretic planning, and mixed initiative planning will also be briefly discussed. This tutorial will answer the questions:

- Are planning techniques applicable to my problem?
- What are the most appropriate planning representations and techniques for my problem?
- How to acquire, verify, and maintain, my planning knowledge base?
- How to embed a planning system into an operational setting?

This tutorial targets AI practioners seeking a thorough overview of the state-of the art in AI planning technology and key issues in fielding applications.; and planning and related AI researchers seeking an overview of the current state of the art in AI planning and insights into key bottlenecks in fielding AI planning systems.

Prerequisite knowledge of basic AI (search, logiclike representations) required; familiarity with some planning and scheduling systems, basic search strategies, reactive systems, and/or scripting languages would be helpful.

Steve Chien is the technical group supervisor of the Artificial Intelligence Group, at the Jet Propulsion Laboratory, California Institute of Technology where he leads efforts in automated planning and scheduling for spacecraft and ground operations. He holds a BS, MS, and Ph.D. in computer science, all from the University of Illinois. Chien is also an adjunct assistant professor in computer science at the University of Southern California.

Brian Drabble received his Ph.D. in artificial intelligence planning systems from the University of Aston in 1988. He is a senior research associate at the Computational Intelligence Research Laboratory at the University of Oregon. Previous to this, he was a member of the Artificial Intelligence Applications Institute at the University of Edinburgh where has was project leader and coprincipal investigator on the O-Plan project. His research interests are in intelligent planning and scheduling, temporal reasoning and qualitative reasoning. Drabble has presented tutorials and courses on the practical applications of planning and scheduling to audiences from both academia and industry.

Principles of Ontological Engineering (SP4)

Michael Gruninger and Mike Uschold
2:00 – 6:00 PM, Sunday, July 27

Disparate backgrounds, languages, tools, and techniques are a major barrier to effective communication among people, organisations, and/or software systems. In this tutorial, we show how the development and implementation of an ontology (an explicit account of a shared understanding in a given subject area) can improve such communication, which in turn can give rise to greater reuse, sharing, interoperability, and more reliable software.

After motivating their need, we clarify the definition of ontologies and the purposes that they serve. The tutorial will be driven by the examination of ontologies used in practice in such diverse applications as processes, enterprise modelling, products, and engineering mathematics. After exploring concrete examples of ontologies, we outline two approaches towards a methodology for developing and using ontologies, ranging from a suite of informal techniques to the role of formal languages and techniques in the specification, implementation and evaluation of ontologies. Finally, we review the state of the art and current practice in this emerging field, considering various case studies, software tools for ontology development, and future prospects.

The goal of the tutorial will be to provide participants with a working knowledge of the field that will enable them to design and implement ontologies for various domains.

Mike Uschold has been actively involved in the development and use of ontologies for over a decade. Uschold received his bachelors degree in mathematics and physics, and a masters degree in computer science from Rutgers University, where he worked as a research assistant on expert systems projects until 1982. From 1983-1987 he was a research associate and a lecturer in Edinburgh. He received his Ph.D. in 1991, and has been at AIAI since 1987. Uschold has been involved in numerous ontology workshops over the past few years.

Michael Gruninger has been a research scientist in the Enterprise Integration Laboratory at the University of Toronto since 1993 and is project manager of the Enterprise Engineering

Project. He received a B.Sc. in computer science from the University of Alberta in 1987 and his M.Sc. in computer science from the University of Toronto in 1989. His doctoral work at the University of Toronto has been in the area of logic and object recognition in computer vision, constructing ontologies to support 2D object recognition in scenes with occlusion.

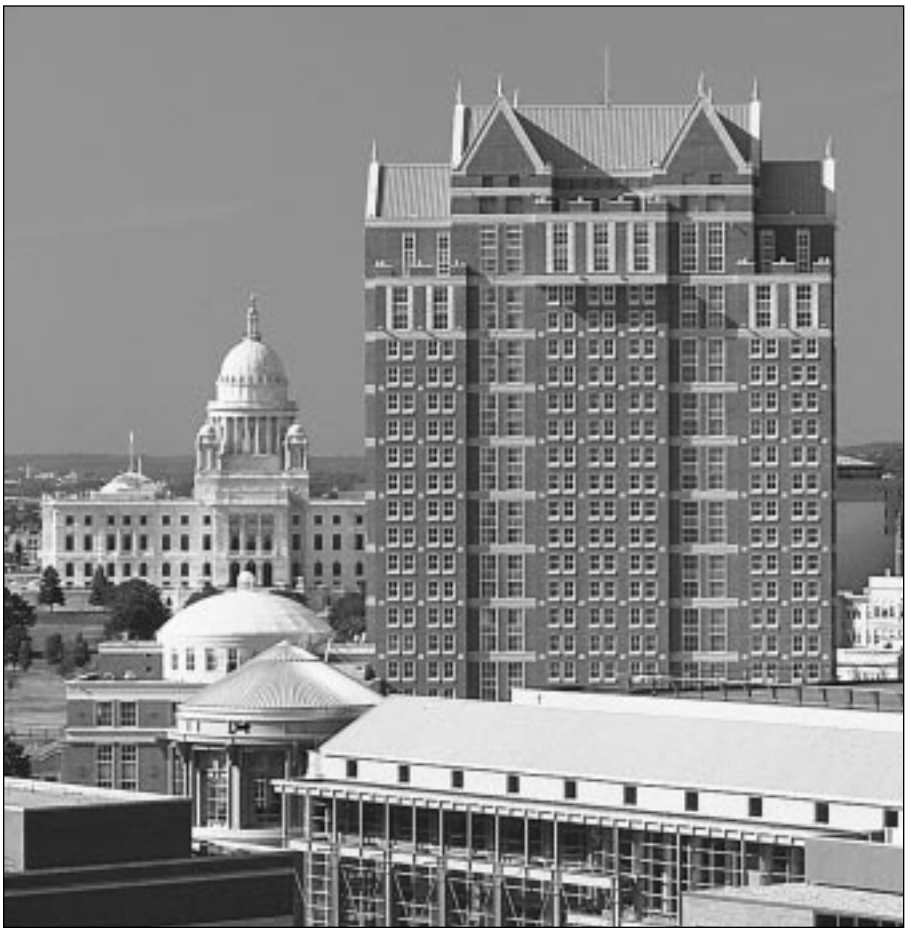
Reinforcement Learning (SP1)

Richard S. Sutton and
Leslie Pack Kaelbling
2:00 – 6:00 PM, Sunday, July 27

Reinforcement learning is learning about, from, and while interacting with an environment in order to attain some objective. In other words, it is a relatively direct model of the learning that people and animals do in their normal lives. In the last two decades, this age-old problem has come to be much better understood by integrating ideas from psychology, optimal control, artificial neural networks, and artificial intelligence. New methods and combinations of methods have enabled much better solutions to large-scale applications than had been possible by all other means. This tutorial will provide a top-down introduction to the field, covering Markov decision processes and approximate value functions as the formulation of the problem, and dynamic programming, temporal-difference learning, and Monte Carlo methods as the principal solution methods. The role of neural networks, evolutionary methods, and planning will also be covered. The emphasis will be on understanding the capabilities and appropriate role of each of class of methods within in an integrated system for learning and decision making.

Richard S. Sutton is one of the founders of the field of reinforcement learning and the author of the original paper on temporal-difference learning. He is a senior research scientist at the University of Massachusetts in Amherst, and before that he worked for nine years at GTE Laboratories. He is the author with Andrew Barto of a forthcoming text on reinforcement learning, to be published by The MIT Press.

Leslie Pack Kaelbling is associate professor of computer science at Brown University.



Courtesy, Providence / Warwick Convention & Visitors Bureau

She previously held positions at the Artificial Intelligence Center of SRI International and at Teleos Research. She received an AB in philosophy in 1983 and a Ph.D. in computer science in 1990, both from Stanford University. Kaelbling has done substantial research on programming paradigms and languages for embedded systems, on mobile robot design and implementation, and on reinforcement learning algorithms. Her current research directions include integrating learning modules into systems programmed by humans, algorithms for learning and navigating using hierarchical domain representations, and methods for learning perceptual strategies. She is an NSF Presidential Faculty Fellow, a member of the AAAI Executive Council, a member of the IJCAI Advisory Committee, and the 1997 recipient of the IJCAI Computers and Thought Award.

Topics in the Theory of the Practice of Machine Learning (MA1)

Michael Kearns
9:00 AM – 1:00 PM, Monday, July 28

This tutorial will concentrate on tools and techniques from computational learning theory, statistics and related fields that directly bear on the practice of machine learning. The emphasis will be on understanding the underlying ideas rather than on rigor and formalization, and on how the various mathematical intuitions derived can inform practitioners. Possible topics include complexity regularization and model selection, boosting, and the VC dimension and its generalizations. Wherever possible, examples from the experimental literature will be used to highlight and examine the theory.

Michael Kearns received a Ph.D. in computer science from Harvard University in 1989 and was a postdoctoral fellow at MIT and the International Computer Science Institute in Berkeley. He joined AT&T Bell Labs in 1991, and is now a principal member of technical staff in the Machine Learning and Information Retrieval department at AT&T Labs Research. With Umesh Vazirani, he is coauthor of *An Introduction to Computational Learning Theory* (MIT Press 1994).

1997 AAAI Workshops *(by invitation only)*

Abstraction, Decisions, and Uncertainty
Contact: Christopher Geib; geib@cs.ubc.ca
Monday, July 28

AI and Knowledge Management
Contact: Bradley Whitehall; brad.l.whitehall@JCI.com
Sunday, July 27

AI Approaches to Fraud Detection and Risk Management
Contact: Tom Fawcett; fawcett@nynexst.com
Sunday, July 27

Building Resource-Bounded Reasoning Systems
Contact: Shlomo Zilberstein; shlomo@cs.umass.edu
Sunday, July 27

Constraints and Agents
Contact: Eugene C. Freuder; ecf@cs.unh.edu
Sunday, July 27

Deep Blue Versus Kasparov: The Significance for Artificial Intelligence
Contact: Robert Morris; morris@cs.fit.edu
Monday, July 28

Language and Space
(two-day workshop)
Contact: Patrick Olivier; plo@aber.ac.uk
Sunday and Monday, July 27-28

Multiagent Learning
Contact: Sandip Sen; sandip@kolkata.mcs.utulsa.edu
Monday, July 28

On-Line Search
Contact: Sven Koenig; skoenig=search@cs.cmu.edu
Monday, July 28

Robots, Softbots, Immobots: Theories of Action, Planning and Control
Contact: Chitta Baral; chitta@cs.utep.edu
Monday, July 28

Spatial and Temporal Reasoning
Contact: Frank D. Anger; fanger@nsf.gov
Monday, July 28

Using AI in Electronic Commerce, Virtual Organizations and Enterprise Knowledge Management to Reengineer the Corporation
Contact: Daniel E. O'Leary; oleary@rcf.usc.edu
Monday, July 28

Verification & Validation of Knowledge-Based Systems
Contact: Robert Plant; rplant@umiami.miami.edu
Sunday, July 27

Registration Information

AAAI-97/IAAI-97 Registration Fees

Your AAAI-97 / IAAI-97 program registration includes admission to all sessions, invited talks, exhibitions, the Student Abstract Poster Session, the opening reception, and the AAAI-97 / IAAI-97 Conference *Proceedings*. Nonmember registration includes a one-year AAAI membership. Onsite registration will be located outside Hall D, second level, Rhode Island Convention Center, One Sabin Street, Providence, Rhode Island, 02903-1859.

Early Registration (Postmarked by May 28)
AAAI Members
Regular $395 Students $120
Nonmembers
Regular $470 Students $185

Late Registration (Postmarked by June 25)
AAAI Members
Regular $445 Students $145
Nonmembers
Regular $520 Students $210

On-Site Registration (Postmarked after June 25 or onsite.)
AAAI Members
Regular $495 Students $170
Nonmembers
Regular $570 Students $235

Workshop Registration

Workshop registration is limited to those active participants determined by the organizer prior to the conference. Individuals attending workshops but not the AAAI-97 conference must pay a $150.00 per workshop registration fee. Workshop registration materials will be sent directly to invited participants. (The workshop schedule is preliminary, and subject to change without notice.)

Robot Building Lab

Your robot building lab registration includes admission to the robot building lab and the exhibition program. Fees are $150.00 for members or nonmembers, and $75.00 for students. Attendance is limited and early registration is strongly encouraged.

AAAI-97 Tutorial Forum Fees

Your tutorial program registration includes admission to no more than four consecutive tutorials and the corresponding four tutorial syllabi. A maximum of four consecutive tutorials may be attended due to parallel schedules. Extra syllabi from other tutorials will be available for purchase onsite for $15.00 each. Your tutorial program registration also includes admission to the exhibition program.

Early Registration (Postmarked by May 28)
AAAI Members
Regular $170 Students $75
Nonmembers
Regular $225 Students $105

Late Registration (Postmarked by June 25)
AAAI Members
Regular $200 Students $100
Nonmembers
Regular $255 Students $130

On-Site Registration (Postmarked after June 25 or onsite.)
AAAI Members
Regular $230 Students $125
Nonmembers
Regular $300 Students $155

Payment Information

Prepayment of registration fees is required. Checks, international money orders, bank transfers, and traveler's checks must be in US dollars. American Express, MasterCard, VISA, and government purchase orders are also accepted. Registration applications postmarked after the early registration deadline will be subject to the late registration fees. Registration applications postmarked after the late registration deadline will be subject to on-site registration fees. Student registrations must be accompanied by proof of full-time student status.

Refund Requests

The deadline for refund requests is July 7, 1997. All refund requests must be made in writing. A $75.00 processing fee will be assessed for all refunds.

Registration Hours

Registration hours will be Sunday and Monday, July 27-28, 7:30 AM – 6:00 PM; Tuesday and Wednesday, July 29-30, 8:00 AM – 6:00 PM; and Thursday, July 31, 8:00 AM – 3:00 PM. All attendees must pick up their registration packets for admittance to programs.

Housing

AAAI has reserved a block of rooms in Providence properties at reduced conference rates. Conference attendees must contact the hotels directly and identify themselves as AAAI-97 registrants to qualify for the reduced rates. Important! **Attendees must submit their name, address, fax and phone numbers when making reservations.** Please note the cut-off date for reservations and the reservation method/information under each hotel. Hotel rooms are priced as singles (1 person, 1 bed), doubles (2 persons, 2 beds), triples (3 persons, 2 beds), or quads (4 persons, 2 beds). Rooms will be assigned on a first-come, first-served basis. All rooms are subject to a 12% state and city tax.

The Westin Hotel Providence *(Headquarters Hotel)*

One West Exchange Street
Providence, RI 02903
Reservations: 1-800-WESTIN1
Telephone: 401-598-8000
Fax: 401-598-8290
Single/Double/Triple/Quad: $115.00
Additional Person: $20.00
Distance to center: connected
Cut-off date for reservations: 5:00 pm EDT June 25, 1997.

All reservation requests for arrival after 6:00 PM must be accompanied by a first night room deposit, or guaranteed with a major credit card. The Westin Hotel Providence will not hold any reservations after 6:00 PM unless guaranteed by one of the above methods. Reservations received after the cut-off time will be accepted on a space available basis.

Reservations accepted without a credit card guarantee or advance deposit are subject to cancellation at 6:00 PM on the day of arrival. Departure date changes resulting in a shortened stay at the hotel made after check-in to the hotel are subject to a $25.00 change fee plus applicable taxes.

Providence Biltmore

Kennedy Plaza
Providence, RI 02903
Telephone: 401-421-0700
Fax: 401-455-3050
Single/double: Superior room $109.00
Single/double: Deluxe room $115.00
Distance to center: Two blocks
Cut-off date for reservations: 5:00 pm EDT July 3, 1997.

All reservations must be accompanied by one night's deposit or credit card guarantee. Room type requests are processed according to the availability at the time of reservation. Deposits will be retained if the individual traveler does not arrive or cancels within 48 hours of arrival.

Holiday Inn Providence Downtown

I-95 at Atwells
Providence, RI 02903
Telephone: 401-831-3900
Fax: 401-751-0007
Single: $79.00
Double: $89.00
Triple: $99.00
Quad: $109.00
Distance to center: One block
Cut-off date for reservations: 5:00 pm EDT July 2, 1997.

Rooms to be guaranteed by credit card or advance deposit of first nights room and tax. Individuals may cancel up until 6pm night of arrival without penalty. Complimentary shuttle service to and from T. F. Green Airport based upon availability.

Student Housing, Brown University

AAAI-97 has reserved a block of dormitory rooms at Brown University for student housing during the conference. Accommodations are double or single rooms with shared male or female washrooms. Linen and towels are provided upon arrival, but are not changed during the conference. Telephone service is available in each room, but there are no telephones in rooms. Guests must bring their own telephone instruments. The lines are toll-direct lines, and local telephone calls are free of charge. Long distance telephone calls must be made by using a credit card, calling card or call collect. Breakfast is available in the Sharpe Refectory from 7:30-9:00 AM, but is not included in the housing package. Public transportation is available to the Rhode Island Convention Center. More detailed general information will be included with reservation confirmations.

Double room rate per person and night is $32.00 in non-airconditioned rooms and single room rate per person and night is $36.00 in non-airconditioned rooms or $45.00 in airconditioned rooms (proof of full time student status must be included with the housing reservation form). **Reservations must be made by June 21, 1997.** Reservations received by June 21, 1997 will be confirmed. A reservation form is enclosed in this brochure. Room reservations must be guaranteed by completing the credit card authorization part of the housing reservation form. VISA, Mastercard and American Express only. Cancellations or changes must be submitted in writing. One night's payment is not refundable if cancellation occurs after July 21, 1997. Reservations should be sent to:

AAAI-97 Student Housing
Brown University
Conference Services
Box 1864
Providence, RI 02912
or fax to: 401-863-7300

Parking is available on campus and the cost is $1.00/day. Please use the reservation form to sign up for parking passes.

Air Transportation and Car Rental

Providence, Rhode Island—Get there for less! Discounted fares have been negotiated for this event. Call Conventions in America at 800-929-4242 and ask for Group #428. You will receive 5% – 10% off the lowest applicable fares on American Airlines, or the guar-

anteed lowest available fare on any carrier. Travel between July 24 and August 3, 1997. All attendees booking through CIA will receive free flight insurance and be entered in their bi-monthly drawing for worldwide travel for two on American Airlines! Hertz Rent A Car is also offering special low conference rates, with unlimited free mileage. Call Conventions in America at 800-929-4242, ask for Group #428. Reservation hours: M-F 6:30 am–5:00 pm Pacific Time. Outside US and Canada, call 619-453-3686 / Fax 619-453-7679. Internet: scitravel@aol.com/24-hour emergency service 1-800-748-5520. If you call direct: American 800-433-1790, ask for index #S 9485. Hertz 800-654-2240, ask for CV#24250.

Ground Transportation

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

Airport Connections

Airport Van Shuttle
Telephone: 401-736-1900
Located at T.F. Green Airport
$9.00 one way, $14.00 round trip
Contact: Richard Sprague

Cline Transportation
Telephone: 401-751-2546
$9.00 one way, $16.00 round trip,
Individual car or limo is $24.00 T. F. Green Airport to Providence
Advance reservations needed
Contact: Linda Cline

Hotel Shuttles

Complimentary, Providence-Holiday Inn Hotel

Taxi

Taxis are available at T. F. Green Airport. Approximate fare from the airport to downtown Providence is $24.00.

Bus

Bonanza Bus Lines—New York, Boston. The depot is located at Kennedy Plaza. For information on fares and scheduling, call 401-751-8800.

Rail

The Amtrak station is located at Capitol Hill. For general information and ticketing, call 800-872-7245.

City Transit System

Rhode Island Public Transit Authority (RIPTA) is a statewide bus transit. Schedules are available at the main depot located at Kennedy Center (across from the Biltmore Hotel). Basic local fare is $1.00. For general information call 800-244-0444.

Parking

A parking garage is available at the Rhode Island Convention Center. The maximum daily rate is $8.50.

Disclaimer

In offering American Airlines, the Biltmore Hotel, Brown University, Conventions in America, Hertz Rent A Car, the Holiday Inn, the Westin Hotel and all other service providers, (hereinafter referred to as "Supplier(s)" for the National Conference on Artificial Intelligence and the Innovative Applications Conference, AAAI acts only in the capacity of agent for the Suppliers that 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-97 or IAAI-97 program, AAAI assumes no responsibility for and will not be liable for any personal delay, inconveniences or other damage suffered by conference participants 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.

Providence Visitor Information

The Providence Warwick Convention & Visitors Bureau welcomes you to Providence! They can assist with dining reservations, directions, tour bookings, entertainment suggestions, transportation, and hotel information. Maps and brochures are available.

One West Exchange Street
Providence, RI 02903
Telephone: 401-274-1636
URL: http://www.providenceri.com/home.html

Courtesy, Providence / Warwick Convention & Visitors Bureau

18 Conferences at a Glance

MORNING	AFTERNOON	EVENING
Sunday, July 27 Registration Tutorial Forum Workshops RBL–97	Registration Tutorial Forum Workshops RBL–97	
Monday, July 28 Registration Tutorial Forum Workshops IAAI–97 AAAI/SIGART DC RBL–97	Registration Tutorial Forum Workshops IAAI–97 AAAI/SIGART DC RBL–97	1997 Fellows Dinner
Tuesday, July 29 Registration AAAI–97 Keynote & Invited Talks IAAI–97 Exhibition Robot Competition Hall of Champions	Registration AAAI–97 Invited Talks IAAI–97 Exhibition Robot Competition Hall of Champions	AAAI–97 Opening Reception Student Poster Session
Wednesday, July 30 Registration AAAI–97 Invited Talks IAAI–97 Exhibition Robot Competition Hall of Champions	Registration AAAI–97 Invited Talks IAAI–97 Exhibition Robot Competition Hall of Champions	Program Committee Dinner
Thursday, July 31 Registration AAAI–97 Invited Talks Exhibition Robot Competition Hall of Champions	Registration AAAI–97 Invited Talks Exhibition Robot Competition Hall of Champions	

Brown University Housing Registration Form

American Association for Artificial Intelligence
July 25 - August 1, 1997
Brown University
Providence, RI 02912

PLEASE PRINT:

NAME: _____ SEX: ☐ M ☐ F
Last First Middle Initial

MAILING ADDRESS: _____

_____

_____

TELEPHONE NUMBER: _____ _____
Home Business

E-MAIL ADDRESS: _____

ARRIVAL DATE: _____ TIME: _____

DEPARTURE DATE: _____ TIME: _____

HOUSING PREFERRED:

_____ Nights in an air-conditioned single room @ $45.00/person/night $ _____

_____ Nights in a single dormitory room @ $36.00/person/night $ _____

_____ Nights in a double dormitory room @ $32.00/person/night $ _____

NAME OF PERSON SHARING WITH YOU:

_____

☐ Please assign a roommate for me.

(If we are unable to assign you a roommate, you will be billed for a single room.)

TOTAL HOUSING: $ _____

PARKING: (Necessary only if staying in on-campus housing)

_____ nights @ $1.00/night x _____ cars TOTAL PARKING: $ _____

TOTAL DUE: $ _____

continued on reverse

PAYMENT AUTHORIZATION: Your room reservation must be guaranteed by completing this credit card authorization form. ***Master Card, VISA and American Express only.*** One night's payment is not refundable if cancellation occurs after July 21, 1997.

Credit Card Type
(Master Card, VISA, Am EX only)

Credit Card Number

Expiration Date

Name on Credit Card
(Please print)

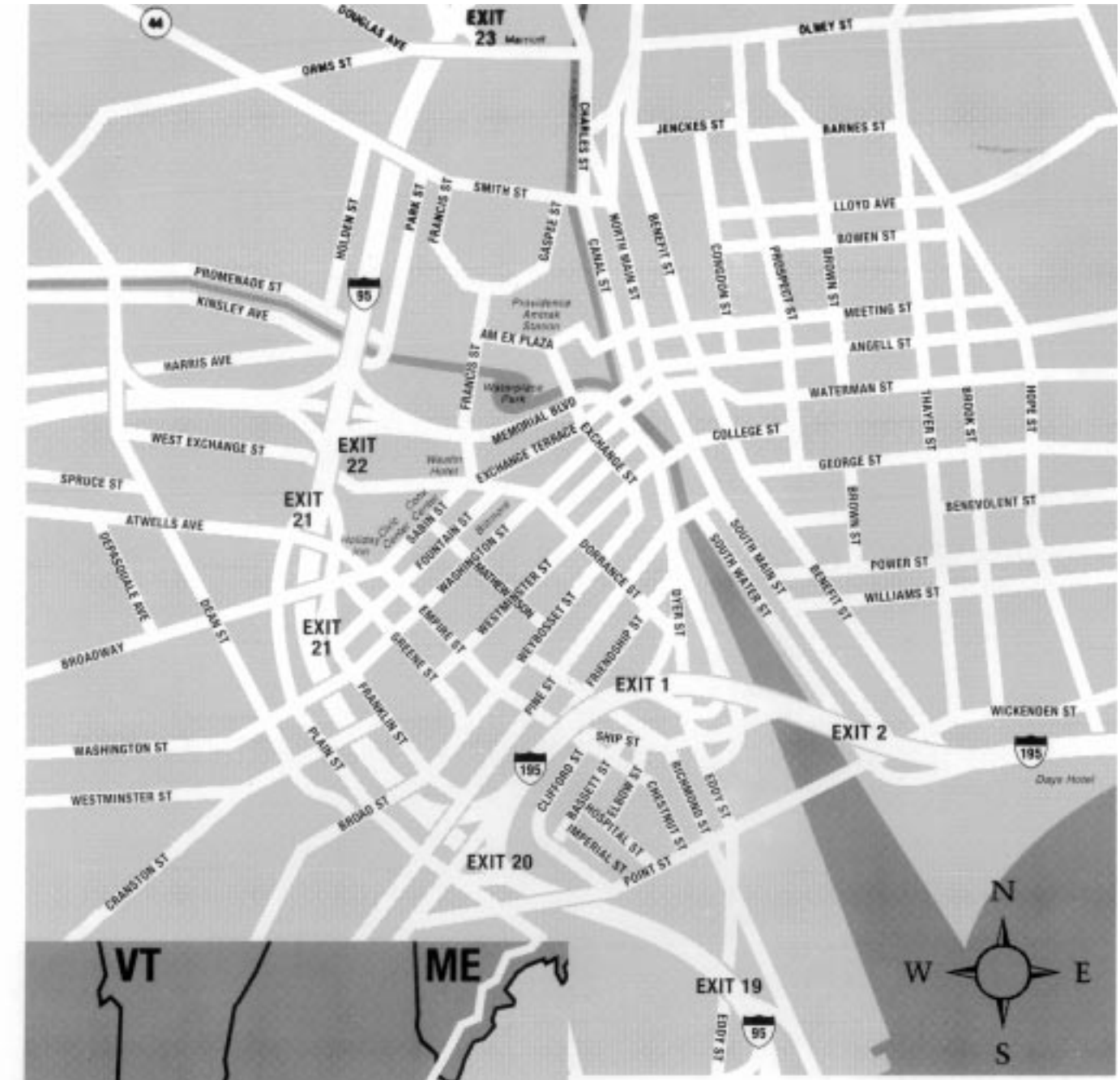
Signature of Authorization

☐ If you intend to pay by Purchase Order, please check here. You must list credit card information to guarantee your reservation until the purchase order is received.

Please return this housing registration form by June 21, 1997 to: Brown University, Conference Services, Box 1864, Providence, RI 02912. Or FAX to (401) 863-7300. Reservations cannot be made by telephone. Reservations received by June 21 will be confirmed. Cancellations or changes must be submitted in writing directly with Brown University Conference Services.

PLEASE RETURN THIS FORM BY JUNE 21, 1997.

Please indicate below if you have any physical impairments or dietary requirements which we should know about to help make your stay on the Brown campus as comfortable as possible:



Downtown & New England Locations

DISTANCES

Boston — Providence

45 miles

NYC — Providence

185 miles

American Association for
Artificial Intelligence
445 Burgess Drive
Menlo Park, California 94025-3496
(415) 328-3123

Postmaster: Time Dependent Material

Inside: