

Program & Exhibit Guide

AAAI 96

Thirteenth National Conference on Artificial Intelligence

IAAI 96

Eighth Conference on Innovative Applications of Artificial Intelligence

KDD 96

Second International Conference on Knowledge Discovery and Data Mining

Sponsored by the American Association for Artificial Intelligence

August 2-8, 1996 • Portland, Oregon

Contents / Acknowledgements

Contents

Acknowledgements / 2
AAAI-96 Invited Talks / 26
AAAI-96 Technical Program / 32
Conference at a Glance / 8
Corporate Sponsorship / 2
Exhibition / 38
Fellows / 2
General Information / 3
IAAI-96 Program / 22
KDD-96 Program / 9
Robot Competition and Exhibition / 43
SIGART/AAAI Doctoral Consortium / 30
Special Events/Programs / 30
Special Meetings / 31
Technical Program Tuesday / 32
Technical Program Wednesday / 34
Technical Program Thursday / 36
Tutorial Program / 20
Workshop Program / 19

Acknowledgements

The American Association for Artificial Intelligence wishes to acknowledge and thank the following individuals for their generous contributions of time and energy to the successful creation and planning of the Thirteenth National Conference on Artificial Intelligence, the Eighth Conference on Innovative Applications of Artificial Intelligence, and the Second International Conference on Knowledge Discovery and Data Mining.

– *Barbara Hayes-Roth,*
Conference Committee Chair, Stanford University

AAAI-96

Program Cochairs: William J. Clancey, Institute for Research on Learning and Daniel S. Weld, University of Washington

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

Robot Competition Chair: David Kortenkamp, NASA Johnson Space Center

Student Abstract Chair: Maja Mataric, Brandeis University

Tutorial Forum Chair: Brian C. Williams, NASA Ames Research Center

Workshop Chair: Subbarao Kambhampati, Arizona State University

Volunteer Coordinator: Thomas G. Dietterich, Oregon State University

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

IAAI-96

Program Chair: Howard E. Shrobe, Massachusetts Institute of Technology

Program Cochair: Ted E. Senator, National Association of Securities Dealers

KDD-96

General Conference Chair: Usama M. Fayyad, Microsoft Research

Program Cochairs: Jiawei Han, Simon Fraser University and Evangelos Simoudis, IBM Almaden Research Center

Publicity Chair: Padhraic Smyth, University of California, Irvine

Sponsorship Chair: Gregory Piatetsky-Shapiro, GTE Laboratories

Demo Session and Exhibits Chair: Tej Anand, NCR Corporation

A complete listing of the AAAI-96, IAAI-96 and KDD-96 Program Committee members appears in the AAAI-96/IAAI-96 and KDD-96 Proceedings. Thanks to all!

Corporate Sponsorship

AAAI gratefully acknowledges the generous contribution of the following corporations and organizations to AAAI-96 and KDD-96:

- General Motors Corporation
- Microsoft Corporation
- NASA/Jet Propulsion Laboratory
- NCR Corporation
- Silicon Graphics, Inc.
- Sun Microsystems

AAAI-96 Fellows

Each year the American Association for Artificial Intelligence recognizes a small number of members who have made significant sustained contributions to the field of artificial intelligence, and who have attained unusual distinction in the profession. AAAI is pleased to announce the five newly elected Fellows for 1996. (The Fellows Recognition Dinner will be held Monday, August 5 at 6:00 PM in the Pacific Northwest Ballroom of the Red Lion Lloyd Center.)

Piero P. Bonissone, *General Electric Corporation*
Dana S. Nau, *University of Maryland*
Martha E. Pollack, *University of Pittsburgh*
Charles E. Thorpe, *Carnegie Mellon University*
Beverly P. Woolf, *University of Massachusetts*

General Information

AAAI Logo Shirts

Polo shirts with the AAAI logo will be for sale during registration hours in the registration area in Concourse A, main level of the Oregon Convention Center. Supplies are limited. Price: \$20.00 each onsite.

Admission

Each conference attendee will receive a name badge upon registration. This badge is required for admittance to the technical, tutorial, exhibit, IAAI, KDD, robot and workshop programs. Tutorial and workshop attendees will also be checked off a master registration list at individual rooms. Smoking, drinking, and eating are not allowed in any of the technical, tutorial, workshop, IAAI, KDD, robot or exhibit sessions.

Baggage Holding

There is no baggage holding area at the Oregon Convention Center. Please check your luggage with the bellman at your hotel after you have checked out. Neither the AAAI nor the Oregon Convention Center accept liability for the loss or theft of any suitcase, briefcase, or other personal belongings brought to the site of AAAI-96/IAAI-96/KDD-96.

Banking

The closest bank to the Oregon Convention Center is the First Interstate Bank, located at 510 NE Broadway (cross street is Grand). Automatic Teller Machines (ATM) are available on the outside of the Oregon Convention Center next to the ticket offices. The ATM on the MLK Jr. Blvd side is operated by First Interstate Bank. The networks available are VISA, American Express Cash, Mastercard, Cirrus, Excel, The Exchange, and Plus Systems. The ATM on the Holladay side is operated by UBank, and the networks available are The Exchange, Star, Excel, Cirrus, VISA, Plus, Amex, Mastercard and Discovery Novus.

For exchange of all major foreign currencies, please use Thomas Cook Agency, Pioneer Courthouse Square, Powells Travel Store, 701

SW 6th Avenue. The phone number is 503-222-2665. Hours: Monday–Friday: 9:00 AM–5:30 PM; Saturday: 9:00 AM–1:00 PM; closed Sundays .

Major credit cards are accepted in hotels, most restaurants and department stores.

Business Center

A Business Center is available at the Oregon Convention Center, located in the Martin Luther King Jr. Lobby. Hours are 8:00 AM–5:00 PM every day during the AAAI-96/IAAI-96/KDD-96 conferences. Services include fax, copies, computer rental, laser printing, shipping by FedEx and UPS, and other general office services.

Career Information

A bulletin board for job opportunities in the artificial intelligence industry will be made available in the registration area on the main level of the Oregon Convention Center. Attendees are welcome to post job descriptions of openings at their company or institution.

Child Care Services

Care Givers Placement Agency, Inc. offers referrals of screened childcare providers. These providers can come to your hotel or take the child(ren) off property to activities around Portland. Please contact Care Givers Placement Agency, Inc. directly at 10211 SW Barbur Blvd, Suite 201A, Portland, OR 97219, phone: 503-244-6370, fax: 503-244-6856. Hours: 7:00 AM–7:00 PM Sunday–Friday, 7:00 AM–5:00 PM Saturdays. Advance scheduling is preferred, but same-day temporary service is available. Rates: Sitters are paid \$6.75 per hour for 1-2 children and \$1.00 extra per hour for each additional child, plus parking expenses. A maximum of 4 children per caregiver is recommended. Care Givers Placement Agency charges a \$10.00 fee per placement. This referral fee is billed to your credit card.

(This information is for your convenience, and does not represent an endorsement of Care Givers Placement Agency, Inc. by AAAI.)

Coffee Breaks

Coffee will be served in Lobby B, main level of the Oregon Convention Center during KDD-

General Information

96; in Lobby A and B during workshop sessions; in Lobby A and C during the Tutorial Forum; and outside the technical and invited talk rooms during AAAI-96/IAAI-96.

Copy Services

A 24-hour Kinko's is located on Martin Luther King Jr. Boulevard and Weidler. Copy service is also available at the Business Center in the Oregon Convention Center.

Dining

A Portland dining guide is available in the registration area. The Visitor Information Center in the MLK Jr. Lobby can provide further information on Portland dining. Their hours are 10:00 AM–3:00 PM daily. Concessions will be open in Exhibition Hall B during exhibit hours. Food and coffee carts are located in the MLK Jr. Lobby and Holladay Lobby, street level, which will be open during registration hours.

Fax Machine

Fax service is available at the Oregon Convention Center Business Center, located in the MLK Jr. Lobby. Hours are 8:00 AM–5:00 PM every day during the AAAI-96/IAAI-96/KDD-96 conferences.

Handicapped Facilities

The Oregon Convention Center, the Red Lion Lloyd Center, the Holiday Inn Portland Downtown, the Best Western Inn at the Convention Center, the Best Western Rose Garden Hotel, the Travelodge Hotel and the Vagabond Inn are all equipped with handicapped facilities.

Housing

For information regarding hotel reservations, please contact the hotels directly. For student housing reservations assistance, please contact the AAAI Registrar in the registration area. Students requiring assistance after hours should refer to the contact information provided in their dorm packets, received upon arrival.

Information Desk

An information desk/message desk will be staffed during registration hours, Friday through Thursday, August 2-8. It is located in the registration area, Concourse A, on the main level of the Oregon Convention Center. Messages will be posted on the message boards adjacent to the desk. The telephone number for leaving messages only is 503-731-7981. Paging attendees is not possible.

Internet

AAAI, in cooperation with Microsoft Corporation, will be providing internet access in Room C121-122 on the main level of the Oregon Convention Center. The internet room will be open during registration hours. As a courtesy, please limit your access time to 5–10 minutes if others are waiting to use the service.

List of Attendees

A list of preregistered attendees of the conference will be available for review at the AAAI Desk in the registration area, main level of the Oregon Convention Center. Attendee lists will not be distributed.

Message Center

See Information Desk.

Parking

There is outdoor parking available at the Oregon Convention Center. The daily rate is \$5.00/day.

Press

All members of the media are requested to register in the Press Room on the main level of the Oregon Convention Center, Room A103. Press badges will only be issued to individuals with approved credentials. The Press Room will be open for advance registration on Friday, August 2 at 8:00 AM. During the conference the Press Room will be open during the following hours:

Friday, August 2	8:00 AM–5:00 PM
Saturday, August 3	8:00 AM–5:00 PM
Sunday, August 4	8:00 AM–5:00 PM

Monday, August 5 8:00 AM–5:00 PM
Tuesday, August 6 8:00 AM–5:00 PM
Wednesday, August 7 8:00 AM–5:00 PM
Thursday, August 8 8:00 AM–12:00 PM
An AAAI-96 volunteer will be on duty during press room hours to assist the members of the press and media.

Printed Materials

Display tables for the distribution of promotional and informational materials of interest to conference attendees will be located in Concourse A, main level, Oregon Convention Center.

Proceedings

Each registrant for the AAAI-96/IAAI-96 technical program or KDD-96 will receive a ticket for one copy of the appropriate conference proceedings. During registration hours on Friday, August 2 – Monday, August 5, and on Tuesday, August 6 until 12:00 PM, proceedings tickets can be redeemed at the AAAI Press Proceedings booth, located in Concourse A, main level of the Oregon Convention Center. After 12:00 PM on Tuesday, the AAAI-96/IAAI-96 Proceedings ticket may be redeemed at the MIT Press booth # 102, located in Exhibit Hall B, during exhibit hours, and the KDD-96 Proceedings ticket may be redeemed at onsite registration. Extra proceedings may be purchased at the conference site at the above locations. Thursday, August 8, will be the last day to purchase extra copies of the proceedings.

The AAAI-96/IAAI-96 Proceedings can also be redeemed by mailing the ticket with your name, shipping and email address, and postage payment to:

The MIT Press
55 Hayward
Cambridge, MA 02142

The KDD-96 Proceedings can also be redeemed by mailing the ticket with your name, shipping address, and postage payment to:

AAAI Press
445 Burgess Drive
Menlo Park, CA 94025

Proceedings Shipping

See Business Center.

Recording

No audio or video recording is allowed in the Tutorial Forum sessions. Audiotapes of the plenary sessions, invited talks and panels, IAAI sessions, and KDD sessions will be for sale in the registration area, Concourse A, main level of the Oregon Convention Center. A representative from Audio Archives will be available to take your order during registration hours, beginning Friday, August 2. Order forms are included with registration materials. Tapes may also be ordered by mail from:

Audio Archives International, Inc.
3043 Foothill Blvd, Suite 2
La Crescenta, CA 91214
Phone: 818-957-0874
Fax: 818-957-0876

Registration

Conference registration will take place in Concourse A, main level, Oregon Convention Center, beginning Friday, August 2. Registration hours are:

Friday, August 2	7:30 AM–6:00 PM
Saturday, August 3	7:30 AM–6:00 PM
Sunday, August 4	7:30 AM–6:00 PM
Monday, August 5	7:30 AM–6:00 PM
Tuesday, August 6	7:30 AM–6:00 PM
Wednesday, August 7	7:30 AM–6:00 PM
Thursday, August 8	8:00 AM–5:00 PM

Only checks drawn on US banks, VISA, Mastercard, American Express, government purchase orders, traveler's checks, and US currency will be accepted. We cannot accept foreign currency or checks drawn on foreign banks.

Registration Fees

AAAI-96/IAAI-96 Technical Program

Your AAAI-96 program registration includes admission to all technical paper sessions, invited talks and panels, the AAAI-96 Exhibition, the AAAI-96 Opening Reception, the IAAI-96 sessions and the AAAI-96/IAAI-96 Conference Proceedings. Note: A student registration must be accompanied by proof of full-time student status. Onsite technical program fees are:

Regular Member	\$495
Regular Nonmember	\$550
Student Member	\$170
Student Nonmember	\$215

General Information

KDD-96 Program Registration

Your KDD-96 program registration includes admission to the KDD sessions, KDD invited talks, AAAI-96 Exhibition, the KDD-96 Opening Reception, and the KDD-96 Conference Proceedings. Onsite KDD-96 registration fees are:

Regular Member	\$295
Regular Nonmember	\$355
Student Member	\$135
Student Nonmember	\$165

Tutorial Forum

Your tutorial forum registration includes admission to no more than four consecutive tutorials plus the syllabus from one of the selected tutorials. A maximum of four consecutive tutorials may be taken due to parallel schedules. If you wish to obtain the syllabi from any other tutorials that you attend, you may purchase them separately for \$15.00 per syllabus. Your tutorial program registration also includes admission to the AAAI-96 Exhibition. Onsite Tutorial Forum registration fees are:

Regular Member	\$210
Regular Nonmember	\$280
Student Member	\$125
Student Nonmember	\$155

Workshop Program

Workshop registration is limited to those active participants determined by the organizer prior to the conference. Individuals attending workshops who are not registered for the AAAI-96 technical program must pay a \$125.00 per workshop registration fee.

Speaker Ready Room

The Speaker Ready Room will be located in Room A104 on the main level of the Oregon Convention Center. This room has audio-visual equipment to assist speakers with their preparations. It is important that speakers visit this room to organize their materials. The room will be open from 8:00 AM–5:00 PM Friday, August 2, through Thursday, August 8.

Invited Speakers are asked to come to Room A104 one day prior to their speech. Representatives from AV Headquarters will be available each day from 9:00 AM–5:00 PM to confirm your audiovisual needs, and assist with the preparation of your materials, if necessary.

Telephones

Public telephones are located throughout the Oregon Convention Center on all floors.

Transportation

Air & Car Rental

The American Association for Artificial Intelligence has selected United Airlines and Alaska Airlines as the official co-carriers and Alamo Rent A Car as the official car rental agency for AAAI-96, IAAI-96 and KDD-96. If you need to change your airline or car rental reservations, please call Conventions in America, our official travel agency at 1-800-929-4242 and ask for Group #428. Internet: flycia@balboa.com.

Ground

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

Metropolitan Airport Shuttle

Phone: 800-817-1885 or 503-331-2335

Fax: 503-282-9854

24-hour shuttle service, by reservation. All major credit cards accepted.

Fare: \$20 from downtown to Portland International Airport.

Raz Transportation Co.

Phone: 503-246-3301 or 800-666-3301

Fax: 503-246-9791

Raz Transportation Dash Airporter between Portland Airport and downtown hotels. Reservations not necessary. Cash only.

Daily: 5:50 AM–11:50 PM, every 30 minutes.

Fare: \$8.50 one way; round trip: \$15.50

Broadway Cab Inc.

Phone: 503-227-1234

24-hour service. Amex, Visa Mastercard and Discover cards accepted. From downtown to Portland International Airport.

Fare: Approximately: \$21.00 + tip.

Radio Cab Co.

Phone: 503-227-1212, *Fax:* 503-227-4220

24-hour service. Amex, Visa and Mastercard cards accepted. From downtown to Portland International Airport.

Fare: Approximately: \$21.00 + tip.

Greyhound Bus

The Portland Greyhound terminal/Union Station is located at 550 NW 6th. For information on fares and scheduling, call 800-231-2222 or 503-243-2357.

General Information

Amtrak

The Amtrak station is located at 800 NW 6th, Union Station. For general information and ticketing, call 800-872-7245 or 503-273-4865.

City Transit System

Tri-Met bus system and MAX light rail are easy to use, offer an inexpensive and convenient way to get around Portland, and are wheelchair accessible. Ride a Tri-Met bus or MAX light rail for free through a 300-block downtown area known as Fareless Square. Outside this area, the basic fare is \$1.00. Longer rides cost \$1.30. Day passes are available for \$3.25. For help with routes and schedules, call Tri-Met's Customer Assistance office at 503-238-RIDE, weekdays between 7:30 AM and 5:30 PM.

Tutorial Syllabi

Extra copies of AAAI-96 tutorial syllabi will be available for purchase in the registration area, Concourse A, beginning Tuesday, August 6. Supplies are limited. Cost is \$15.00 per syllabus. Preregistration tutorial syllabi tickets may be redeemed in the registration area.

Visitor Information Center

The Visitor Information Center, located in the Oregon Convention Center is open 10:00 AM–3:00 PM daily. It is located in the Martin Luther King Jr. Lobby. There is also a Visitor Information Center in downtown Portland, with maps and brochures on shopping, restaurants, outdoor activities, parks, and tours, as well as the Ticketmaster Ticket Center for local events.

Portland Oregon Visitors Association
 Downtown Visitor Information Center
 Two World Trade Center
 SW Front Ave at Salmon Street
 Portland, OR 97204
 Phone: 503-222-2223 or 800-962-3700

Volunteer Room

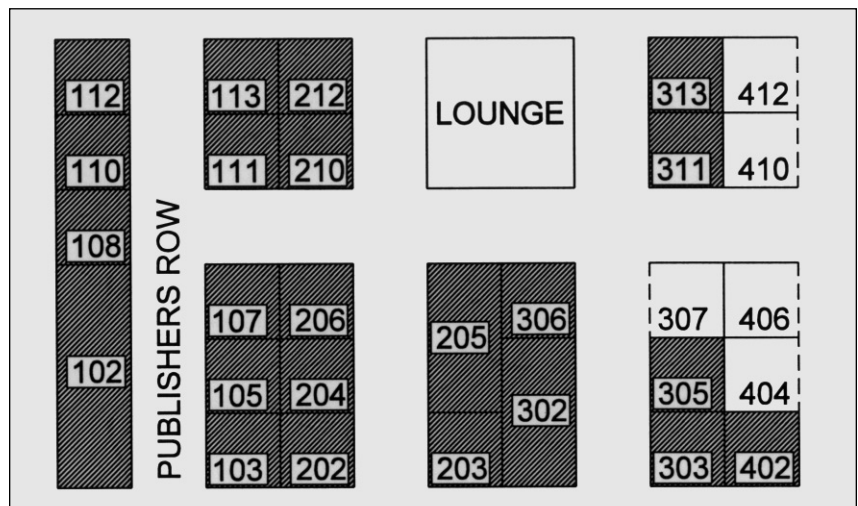
Volunteer Headquarters, located in Room C120 on the main level of Oregon Convention Center will be open from 8:00 AM–5:00 PM, Friday, August 2 through Thursday, August 8. All volunteers should plan to check in with the volunteer coordinator or his assistant prior to their shifts. The volunteer meeting will be held

Saturday, August 3 at 5:00 PM in Room B112, main level, Oregon Convention Center.

Disclaimer

In offering American Airlines, Alaska Airlines, Alamo Rent A Car, Care Givers Placement Agency, Inc., Lewis and Clark College, Red Lion Lloyd Center, Best Western Inn at the Convention Center, Best Western Rose Garden, Holiday Inn Portland Downtown, Travelodge Hotel, Vagabond Inn, Raz Transportation Company, GES Exposition Services and all other service providers (hereinafter referred to as "Supplier(s)") for the National Conference on Artificial Intelligence, the Innovative Applications Conference, and the Conference on Knowledge Discovery and Data Mining), AAAI acts only in the capacity of agent for the Suppliers which are the providers of the service. Because AAAI has no control over the personnel, equipment or operations of providers of accommodations or other services included as part of the AAAI-96, IAAI-96 or KDD-96 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.

Exhibit Map



Conference at a Glance

	Morning	Afternoon	Evening
Friday, August 2	Registration KDD-96		KDD Opening Reception & Posters
Saturday, August 3	Registration KDD-96		KDD-96 Banquet
Sunday, August 4	Registration KDD-96 Workshops and Tutorials		
Monday, August 5	Registration Workshops and Tutorials IAAI-96		AAAI Fellows Dinner
Tuesday, August 6	Registration AAAI-96 Technical Program Invited Presentations/Keynote Address IAAI-96		AAAI-96 Opening Reception
Wednesday, August 7	Registration AAAI-96 Technical Program Invited Presentations/Presidential Address IAAI-96 Exhibition Robot Competition	Exhibition Robot Competition	AAAI Student Abstract Posters SIGART/AAAI DC Posters AAAI-96 Program Committee Dinner
Thursday, August 8	Registration AAAI-96 Technical Program Invited Presentations Exhibition and Robot Forum		

The Second International Conference on Knowledge Discovery and Data Mining (KDD-96)

Friday August 2

8:30 – 9:45 AM

Plenary Session

Room B113-116, Oregon Convention Center

Welcome and Introduction

Evangelos Simoudis, KDD-96 Program Cochair

Invited Talk

Harnessing the Human in Knowledge Discovery

Georges G. Grinstein, University of Massachusetts at Lowell and The MITRE Corporation

Knowledge, the primary goal of data analysis and exploration, is most often discovered by generating information (structure) from data, and then abstracting non-trivial patterns (rules or associations for example) from the information. The discovery process can be done using visualization, data mining, statistics, neural networks, or mathematical modeling and simulation. Visualization is different from the rest, however, in that it is also the actual mechanism by which the analyses and their results can be presented to the user. We will present a brief history of alternative visualizations and how they have been applied to various data visualization problems. The emphasis will be on how exploratory visualization can support the knowledge discovery process, including concept development for database management, database visualizations, and minimally structured dataset visualizations.

9:45 – 10:00 AM

Coffee Break

10:00 – 11:00 AM

Plenary Session

Room B113-116, Oregon Convention Center

10:00 – 10:10 AM

Technology Spotlight T1 (Posters)

Mining Associations in Text in the Presence of Background Knowledge

Ronen Feldman, Bar-Ilan University, Israel and Haym Hirsh, Rutgers University

Undiscovered Public Knowledge: A Ten-Year Update

Don R. Swanson and Neil R. Smalheiser, University of Chicago

Developing Tightly-Coupled Data Mining Applications on a Relational Database System

Rakesh Agrawal and Kyuseok Shim, IBM Almaden Research Center

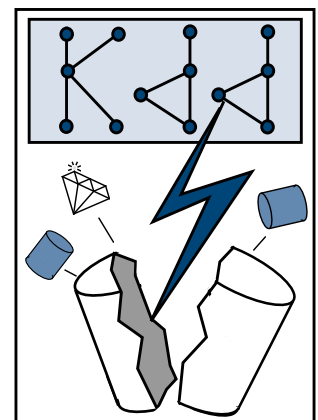
Mining Entity-Identification Rules for Database Integration

M. Ganesh and Jaideep Srivastava, University of Minnesota; Travis Richardson, Apertus Technologies, Inc.

Static Versus Dynamic Sampling for Data Mining

George H. John and Pat Langley, Stanford University

KDD Conference



KDD Conference

10:10 – 10:50 AM

Paper Session 1: Scalable Data Mining Systems

An Overview of Issues in Developing Industrial Data Mining and Knowledge Discovery Applications

Gregory Piatetsky-Shapiro, GTE Laboratories; Ron Brachman, AT&T Research; Tom Khabaza, ISL, United Kingdom; Willi Kloesgen, GMD, Germany; and Evangelos Simoudis, IBM Almaden Research Center

Quakefinder: A Scalable Data Mining System for Detecting Earthquakes from Space

Paul Stolorz and Christopher Dean, Jet Propulsion Laboratory, California Institute of Technology

10:50 – 11:00 AM

Technology Spotlight T2 (Posters)

Induction of Condensed Determinations

Pat Langley, Stanford University

Data Mining with Sparse and Simplified Interaction Selection

Gerald Fahner, International Computer Science Institute

Extraction of Spatial Proximity Patterns by Concept Generalization

Edwin M. Knorr and Raymond T. Ng, University of British Columbia, Canada

Pattern Discovery in Temporal Databases: A Temporal Logic Approach

Balaji Padmanabhan and Alexander Tuzhilin, New York University

Reverse Engineering Databases for Knowledge Discovery

Stephen Mc Kearney, Bournemouth University and Huw Roberts, BT Laboratories, United Kingdom

11:00 AM – 12:00 PM

Two Parallel Sessions

Paper Session 2A: Scalability and Extensibility

Room B113-116, Oregon Convention Center

Extensibility in Data Mining Systems

Stefan Wrobel, Dietrich Wettschereck, Edgar Sommer, and Werner Emde, GMD, FIT.KI, Germany

Scaling Up the Accuracy of Naive-Bayes Classifiers: A Decision-Tree Hybrid

Ron Kohavi, Silicon Graphics, Inc.

Data Mining and Model Simplicity: A Case Study in Diagnosis

Gregory M. Provan, Rockwell Science Center and Moninder Singh, University of Pennsylvania

Paper Session 2B: Applications I

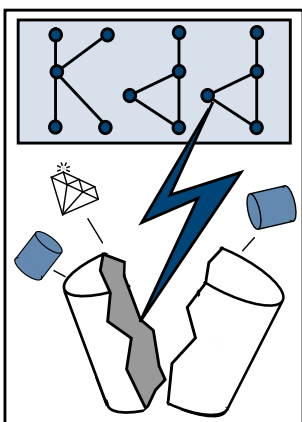
Room A105-106, Oregon Convention Center

Automated Discovery of Active Motifs in Multiple RNA Secondary Structures

Jason T. L. Wang, New Jersey Institute of Technology; Bruce A. Shapiro, National Institutes of Health; Dennis Shasha, New York University; Kaizhong Zhang, The University of Western Ontario, Canada; and Chia-Yo Chang, New Jersey Institute of Technology

Using a Hybrid Neural/Expert System for Data Base Mining in Market Survey Data

Victor Ciesielski and Gregory Palstra, Royal Melbourne Institute of Technology, Australia



Automated Discovery of Medical Expert System Rules from Clinical Databases Based on Rough Sets
Shusaku Tsumoto and Hiroshi Tanaka, Tokyo Medical and Dental University, Japan

12:00 – 1:30 PM

Lunch

1:30 – 2:30 PM

Plenary Session

Room B113-116, Oregon Convention Center

Invited Talk

Efficient Implementation of Data Cubes Via Materialized Views

Jeffrey D. Ullman, Stanford University

Data warehouses are collections of materialized views of source data. The optimal set of views to materialize depends on the assumed distribution of queries that will be posed about the data. Given a query distribution, a “greedy” approach to selecting materialized views picks a sequence of views, each of which provides the maximum “benefit” (reduction in average query cost), given the set of views previously chosen for materialization. Under a variety of assumptions about the way possible views relate to one another, greedy approaches are guaranteed to come within 63% of the optimum benefit. In fact, in some of these cases, such as the important case of a “data cube” storing multidimensional data, it can be shown that no polynomial algorithm can be guaranteed to come closer than 63%.

2:30 – 3:30 PM

Plenary Session

Room B113-116, Oregon Convention Center

2:30 – 2:40 PM

Technology Spotlight T3 (Posters)

Exploiting Background Knowledge in Automated Discovery

John M. Aronis, University of Pittsburgh; Foster J. Provost, NYNEX Science & Technology; and Bruce G. Buchanan, University of Pittsburgh

Maintenance of Discovered Knowledge: A Case in Multi-Level Association Rules

David W. Cheung, University of Hong Kong; Vincent T. Ng, Hong Kong Polytechnic University; and Benjamin W. Tam, The University of Hong Kong

Analysing Binary Associations

Arno J. Knobbe and Pieter W. Adriaans, Syllogic, The Netherlands

Evaluating the Interestingness of Characteristic Rules

Micheline Kamber, Simon Fraser University and Rajjan Shinghal, Concordia University, Canada

Exceptional Knowledge Discovery in Databases Based on Information Theory

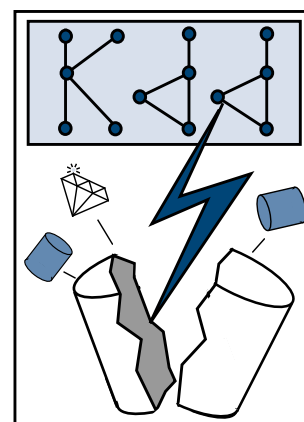
Einoshin Suzuki, Yokohama National University and Masamichi Shimura, Tokyo Institute of Technology, Japan

2:40 – 3:20 PM

Paper Session 3: Spatial and Text Data Mining

A Density-Based Algorithm for Discovering Clusters in Large Spatial Databases with Noise

Martin Ester, Hans-Peter Kriegel, Jörg Sander, and Xiaowei Xu, University of Munich, Germany



KDD Conference

3:20 – 3:30 PM

Technology Spotlight T4 (Posters)

RITIO - Rule Induction Two In One

David Urpani, CSIRO; Xindong Wu, Monash University; and Jim Sykes, Swinburne University of Technology, Australia

Growing Simpler Decision Trees to Facilitate Knowledge Discovery

Kevin J. Cherkauer and Jude W. Shavlik, University of Wisconsin

Data Mining and Tree-Based Optimization

Robert Grossman, Magnify, Inc. and University of Illinois; Haim Bodek and Dave Northcutt, Magnify, Inc.; Vince Poor, Princeton University

SE-Trees Outperform Decision Trees in Noisy Domains

Ron Rymon, University of Pittsburgh

Efficient Specific-to-General Rule Induction

Pedro Domingos, University of California, Irvine

3:30 – 3:50 PM

Coffee Break

3:50 – 4:50 PM

Two Parallel Sessions

Paper Session 4A: Decision-Tree and Rule Induction

Room B113-116, Oregon Convention Center

Error-Based and Entropy-Based Discretization of Continuous Features

Ron Kohavi, Silicon Graphics, Inc. and Mehran Sahami, Stanford University

Discovery of Relevant New Features by Generating Non-Linear Decision Trees

Andreas Ittner, Chemnitz University of Technology and Michael Schlosser, Fachhochschule Koblenz, Germany

Linear-Time Rule Induction

Pedro Domingos, University of California, Irvine

Special Paper Session 4B: Systems for Mining Large Databases

A105-106, Oregon Convention Center

The Quest Data Mining System

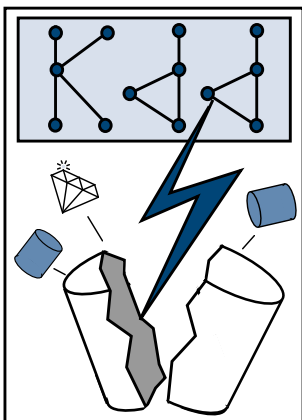
Rakesh Agrawal, Manish Mehta, John Shafer, and Ramakrishnan Srikant, IBM Almaden Research Center; Andreas Arning and Toni Bollinger, IBM German Software Development Laboratory, Germany

DataMine: Application Programming Interface and Query Language for Database Mining

Tomasz Imielinski, Aashu Virmani, and Amin Abdulghani, Rutgers University

DBMiner: A System for Mining Knowledge in Large Relational Databases

Jiawei Han, Yongjian Fu, Wei Wang, Jenny Chiang, Wan Gong, Krzysztof Koperski, Deyi Li, Yijun Lu, Amynmohamed Rajan, Nebojsa Stefanovic, Betty Xia, and Osmar R. Zaiane, Simon Fraser University, Canada



4:50 – 5:30 PM

Two Parallel Sessions

Paper Session 5A: Mining with Noise and Missing Data

Room B113-116, Oregon Convention Center

Imputation of Missing Data Using Machine Learning Techniques

Kamakshi Lakshminarayan, Steven A. Harp, Robert Goldman, and Tariq Samad, Honeywell Technology Center

Discovering Generalized Episodes Using Minimal Occurrences

Heikki Mannila and Hannu Toivonen, University of Helsinki, Finland

Session 5B: Panel Discussion: Systems for Mining Large Databases

A105-106, Oregon Convention Center

6:00 – 8:00 PM

Opening Reception & Poster and Demonstration Session

Room C123-124, Oregon Convention Center

Demonstrations

DBMiner: A System for Mining Knowledge in Large Relational Databases

Jiawei Han, Yongjian Fu, Wei Wang, Jenny Chiang, Wan Gong, Krzysztof Koperski, Deyi Li, Yijun Lu, Aymymohamed Rajan, Nebojsa Stefanovic, Betty Xia, and Osmar R. Zaiane, Simon Fraser University, Canada

Kepler: Extensibility in Data Mining Systems

Stefan Wrobel, Dietrich Wettschereck, Edgar Sommer, and Werner Emde, GMD, FIT.KI, Germany

Webfind: Mining External Sources To Guide WWW Discovery.

Alvaro E. Monge and Charles P. Elkan, University of California, San Diego

MM – Mining with Maps

Raymond T. Ng, University of British Columbia, Canada

Decisionhouse

Nicholas J. Radcliffe, Quadstone Ltd., United Kingdom

STARC - A New Data Mining Tool

Damir Gainanow, Andre Matweew, and Michael Thess, DATA-Center Ltd., Russia and Scholz & Thess Software GbR, Germany

D-SIDE: A probabilistic Decision Endorsement Environment

Petri Kontkanen, Petri Myllymaki, and Henry Tirri, University of Helsinki, Finland

Optimization Related Data Mining Using the PATTERN System

H. Bodek, R. L. Grossman, D. Northcutt, and H. V. Poor, Magnify, Inc. and Princeton University

Clementine Data Mining System

Colin Shearer, Integral Solutions Ltd., United Kingdom

MineSet

Steven Reiss and Mario Schkolnick, Silicon Graphics, Inc.

FACT: Finding Associations in Collections of Text

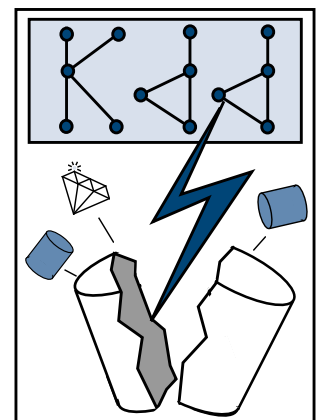
Ronen Feldman, Bar-Ilan University, Israel and Haym Hirsh, Rutgers University

DataMine: An Integrated Knowledge Discovery Environment

Tomasz Imielinski and Aashu Virmani, Rutgers University

Data Surveyor

M. Holsheimer, F. Kwakkel, D. Kwakkel, and P. Boncs, Data Distilleries, The Netherlands



KDD Conference

Management Discovery Tool
Ken O'Flaherty, NCR Corporation

WEBSOM – Interactive Exploration of Document Collections
Krista Lagus, Timo Honkela, Samuel Kaski, and Teuvo Kohonen, Helsinki University of Technology, Finland

IBM Data Mining Tools
Julio Ortega, Kamal Ali, Stefanos Manganaris, and George John, IBM Almaden Research Center

Geomarketing Decision Support System
Cyril Way, Hugues Marty, and Thierry Marie Victoire, ISoft

Ac2: Advanced Decision Tree Based Data Mining
Cyril Way, Hugues Marty, and Thierry Marie Victoire, ISoft

Saturday August 3

8:30 – 9:30 AM

Plenary Session

Room B113-116, Oregon Convention Center

Invited Talk

Small Sample Size Paradigm in Statistical Inference
Vladimir Vapnik, AT&T Research Laboratories

Vladimir Vapnik will describe (from both the theoretical and the applied point of view) a new approach to statistical inference that is based on the minimization of the guaranteed risk for a fixed sample size, which provides a high level of generalization ability and in many cases contradicts the existing classical paradigms.

9:30 – 9:45 AM

Coffee Break

9:45 – 11:05 AM

Plenary Session

Room B113-116, Oregon Convention Center

9:45 – 9:55 AM

Technology Spotlight T5 (Posters)

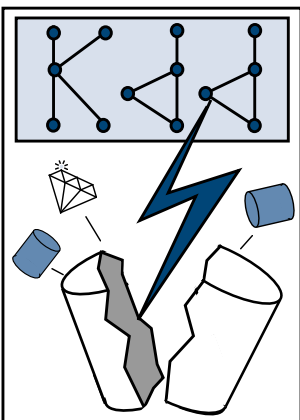
A Genetic Algorithm-Based Approach to Data Mining
Ian W. Flockhart, Quadstone Ltd. and Nicholas J. Radcliffe, Quadstone Ltd. and University of Edinburgh, United Kingdom

Deriving Queries from Results Using Genetic Programming
Tae-Wan Ryu and Christoph F. Eick, University of Houston

Discovering Classification Knowledge in Databases Using Rough Sets
Ning Shan, Wojciech Ziarko, Howard J. Hamilton, and Nick Cercone, University of Regina, Canada

Representing Discovered Patterns Using Attributed Hypergraph
Yang Wang and Andrew K.C. Wong, University of Waterloo, Canada

Interactive Knowledge Discovery from Marketing Questionnaire Using Simulated Breeding and Inductive Learning Methods
Takao Terano, The University Tsukuba, Tokyo and Yoko Ishino, The University of Tokyo, Japan



9:55 – 10:55 AM

Paper Session 6: Prediction and Deviation

A Comparison of Approaches for Maximizing the Business Payoff of Prediction Models

Brij Masand and Gregory Piatetsky-Shapiro, GTE Laboratories

A Linear Method for Deviation Detection in Large Databases

Andreas Arning, IBM German Software Development Laboratory, Germany; Rakesh Agrawal and Prabhakar Raghavan, IBM Almaden Research Center

Multiple Uses of Frequent Sets and Condensed Representations

Heikki Mannila and Hannu Toivonen, University of Helsinki, Finland

10:55 – 11:05 AM

Technology Spotlight T6 (Posters)

Learning Limited Dependence Bayesian Classifiers

Mehran Sahami, Stanford University

The Field Matching Problem: Algorithms and Applications

Alvaro E. Monge and Charles P. Elkan, University of California, San Diego

Performing Effective Feature Selection by Investigating the Deep Structure of the Data

Marco Richeldi and Pier Luca Lanzi, CSELT, Italy

Inferring Hierarchical Clustering Structures by Deterministic Annealing

Thomas Hofmann and Joachim M. Buhmann, Rheinische Friedrich-Wilhelms-Universität, Germany

Efficient Search for Strong Partial Determinations

Stefan Kramer and Bernhard Pfahringer, Austrian Research Institute for Artificial Intelligence, Austria

11:05 AM – 12:05 PM

Two Parallel Sessions

Paper Session 7A: Prediction

B113-116, Oregon Convention Center

Predictive Data Mining with Finite Mixtures

Petri Kontkanen, Petri Myllymäki, and Henry Tirri, University of Helsinki

An Empirical Test of the Weighted Effect Approach to Generalized Prediction Using Recursive Neural Nets

Rense Lange, University of Illinois at Springfield

Planning Tasks for Knowledge Discovery in Databases; Performing Task-Oriented User-Guidance

Robert Engels, University of Karlsruhe, Germany

Paper Session 7B: Applications II

Room A105-106, Oregon Convention Center

KDD for Science Data Analysis: Issues and Examples

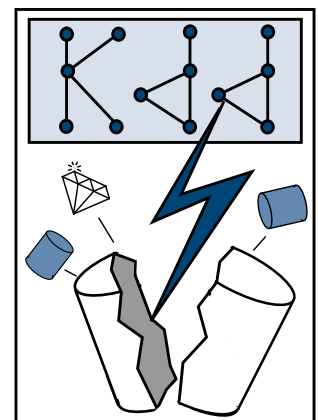
Usama Fayyad, Microsoft Research; David Haussler, University of California, Santa Cruz; and Paul Stolorz, Jet Propulsion Laboratory, California Institute of Technology

Detecting Early Indicator Cars in an Automotive Database: A Multi-Strategy Approach

Ruediger Wirth and Thomas P. Reinartz, Daimler-Benz AG, Germany

Discovering Knowledge in Commercial Databases Using Modern Heuristic Techniques

B. de la Iglesia, J. C. W. Debusse, and V. J. Rayward-Smith, University of East Anglia, United Kingdom



KDD Conference

12:05 – 1:30 PM

Lunch

1:30 – 2:30 PM

Plenary Session

B113-116, Oregon Convention Center

Invited Talk

Data Integration and Analysis in a Client Server Environment: The Sara Lee Meat Experience

Perry K. Youngs, Sara Lee Corporation

The role of marketing research is currently going through dramatic changes in the United States as census based syndicated scanner data is becoming available to retailers and manufacturers. This change is being led by ECR and category management initiatives that are removing costs from distribution channels. In an attempt to manage the ever increasing amounts of information needed for this endeavor, client server based information systems are being developed with new data warehousing technology.

Sara Lee Meats has just successfully implemented the conversion of a main frame based system to a client server based system using a three tier object technology from Information Advantage, Inc. and data warehousing technology from Red Brick Systems, Inc. Youngs will discuss Sara Lee Meat's experiences relating to data integration and analysis in a client-server environment.

2:30 – 3:30 PM

Plenary Session

B113-116, Oregon Convention Center

Paper Session 8: Combining Data Mining and Machine Learning

Combining Data Mining and Machine Learning for Effective User Profiling

Tom Fawcett and Foster Provost, NYNEX Science and Technology

Sharing Learned Models among Remote Database Partitions by Local Meta-Learning

Philip K. Chan, Florida Institute of Technology and Salvatore J. Stolfo, Columbia University

Local Induction of Decision Trees: Towards Interactive Data Mining

Truxton Fulton, Simon Kasif, and Steven Salzberg, Johns Hopkins University; David Waltz, NEC Research Institute

3:30 – 3:50 PM

Coffee Break

3:50 – 4:50 PM

Three Parallel Sessions

Poster Session II

Room C123, Oregon Convention Center

Paper Session 9A: Approaches to Numeric Data

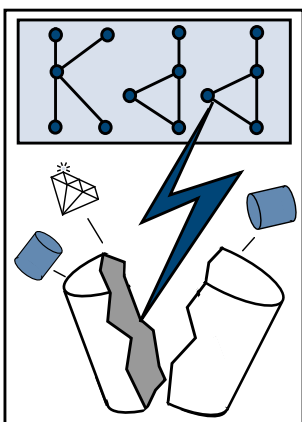
Room B113-116, Oregon Convention Center

Mining Knowledge in Noisy Audio Data

Andrzej Czyzewski, Technical University of Gdansk, Poland

A Method for Reasoning with Structured and Continuous Attributes in the INLEN-2 Multistrategy Knowledge Discovery System

Kenneth A. Kaufman, George Mason University and Ryszard S. Michalski, George Mason University and Polish Academy of Sciences, Poland



KDD Conference

Learning from Biased Data Using Mixture Models
A.J. Feelders, Data Distilleries Ltd., The Netherlands

Special Paper Session 9B: Scalable and Distributed Applications of KDD
Room A105-106, Oregon Convention Center

Parallel Halo Finding in N-body Cosmology Simulations
David W. Pfizner, Mount Stromlo Observatory, Australia and John K. Salmon, California Institute of Technology

Scalable Exploratory Data Mining of Distributed Geoscientific Data
Eddie C. Shek, University of California, Los Angeles and Hughes Research Laboratories; Richard R. Muntz, Edmond Mesrobian, and Kenneth Ng, University of California, Los Angeles

Knowledge Discovery in RNA Sequence Families of HIV Using Scalable Computers
Ivo L. Hofacker, University of Illinois; Martijn A. Huynen, Los Alamos National Laboratory and Santa Fe Institute; Peter F. Stadler, University of Vienna and Santa Fe Institute; Paul E. Stolorz, Jet Propulsion Laboratory, California Institute of Technology

4:50 – 5:30 PM

Two Parallel Sessions

Paper Session 10A: Pattern-Oriented Data Mining
Room B113-116, Oregon Convention Center

Metapattern Generation for Integrated Data Mining
Wei-Min Shen, University of Southern California and Bing Leng, Inference Corporation

Automated Pattern Mining with a Scale Dimension
Jan M. Zytkow, Wichita State University and Polish Academy of Sciences, Poland; Robert Zembowicz, Wichita State University

Session 10B: Panel Discussion
Room A105-106, Oregon Convention Center

Scalable and Distributed Applications of KDD
The Promise and Challenge of Data Mining with High Performance Computers

7:00 PM

KDD-96 Conference Banquet
Benson Hotel

Invited Talk

Advanced Scout: Data Mining and Knowledge Discovery in NBA Data
Inderpal Bhandari, IBM T. J. Watson Research Center

Sunday August 4

All sessions will be held in Room B114-116, Oregon Convention Center

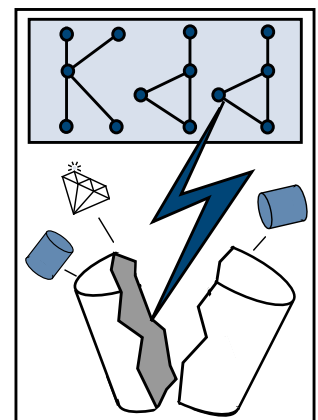
8:30 – 11:35 PM

Joint UAI-96/KDD-96 Plenary Sessions

Selected talks on learning graphical models from the UAI-96 and KDD-96 proceedings. UAI-96 badges will be honored at the Oregon Convention Center for the joint session.

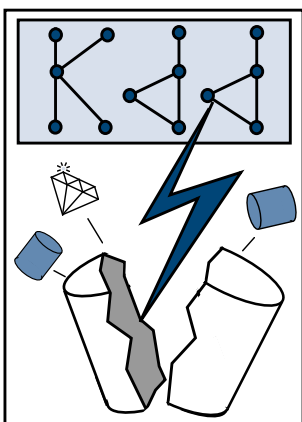
8:30 – 8:40 AM

Introductory Remarks: UAI Meets KDD
Usama Fayyad and Eric Horvitz, Microsoft Research



KDD Conference

8:40 – 10:00 AM	Session 11: Learning, Probability, and Graphical Models I KDD-96: Knowledge Discovery and Data Mining: Towards a Unifying Framework <i>Usama Fayyad, Microsoft Research; Gregory Piatetsky-Shapiro, GTE Laboratories; and Padhraic Smyth, University of California, Irvine</i> UAI-96: Efficient Approximations for the Marginal Likelihood of Incomplete Data Given a Bayesian Network <i>D. Chickering, University of California, Los Angeles and D. Heckerman, Microsoft Research</i> KDD-96: Clustering Using Monte Carlo Cross-Validation <i>Padhraic Smyth, University of California, Irvine</i> UAI-96: Learning Equivalence Classes of Bayesian Network Structures <i>D. Chickering, University of California, Los Angeles</i>
10:00 – 10:15 AM	Coffee Break
10:15 – 11:35 AM	Session 12: Learning, Probability, and Graphical Models II UAI-96: Learning Bayesian Networks with Local Structure <i>N. Friedman, Stanford University and M. Goldszmidt, SRI International</i> KDD-96: Rethinking the Learning of Belief Network Probabilities <i>Ron Musick, Lawrence Livermore National Laboratory</i> UAI-96: Bayesian Learning of Loglinear Models for Neural Connectivity <i>K. Laskey and L. Martignon</i> KDD-96: Harnessing Graphical Structure in Markov Chain Monte Carlo Learning <i>Paul E. Stolorz, Jet Propulsion Laboratory, California Institute of Technology and Philip C. Chew, University of Pennsylvania</i>
11:35 AM – 12:30 PM	Box Lunch will be served— (May overlap with Summary Panel Session)
12:30 – 1:20 PM	Summary Panel and Closing Remarks: “What Have We Discovered?”
1:20 – 2:00 PM	KDD Wrap-up Business Meeting
2:00 PM	Conference Adjourns



Workshop Program

Attendance at the workshops is limited, and participation is by invitation only. All workshop participants must register for the AAAI-96 technical program or pay a \$125.00 fee per workshop. Registration onsite for a workshop is possible with the prior permission of the corresponding workshop organizer. All workshops will begin at 8:30 AM and conclude at 6:00 PM, unless otherwise noted below.

Sunday, August 4

W1 Agent Modeling

Organizers: Milind Tambe and Piotr Gmytrasiewicz
Room B117, Oregon Convention Center

W2 AI in Business: AI in Electronic Commerce and Reengineering

Organizer: Dan O'Leary
Room B118, Oregon Convention Center

W4 Detecting, Repairing, and Preventing Human-Machine Miscommunication

Organizer: Susan McRoy
Room B110, Oregon Convention Center

W5 Entertainment and AI/Alife

Organizer: Hiroaki Kitano
Room A109, Oregon Convention Center

W6 Integrating Multiple Learned Models for Improving and Scaling Machine Learning Algorithms

(two-day workshop)
Organizer: Sal Stolfo
Room B117, Oregon Convention Center

W7 Intelligent Adaptive Agents

Organizer: Ibrahim Imam
Room A108, Oregon Convention Center

W10 Modeling and Reasoning with Function

Organizer: James K. McDowell
Room A107, Oregon Convention Center

W11 Spatial and Temporal Reasoning

Organizer: Frank Anger
Room B111, Oregon Convention Center

W13 Theories of Action, Planning, and Robot Control: Bridging the Gap (two-day workshop)

Organizer: Chitta Baral
Room B119, Oregon Convention Center

Monday, August 5

W3 Computational Cognitive Modeling

Organizers: Charles Ling and Ron Sun
Room A108, Oregon Convention Center

W8 Internet-Based Information Systems

Organizer: Alex Franz
Room B118, Oregon Convention Center

W12 Structural Issues in Planning and Temporal Reasoning

Organizer: Tom Dean
Room B110, Oregon Convention Center

W14 Verification and Validation of Knowledge Based Systems and Subsystems

Organizers: Jim Schmolze and Anca I. Vermesan
Room B111, Oregon Convention Center

Tutorial Forum

Tutorial Forum

Tutorial program registration includes admission to up to four tutorials, plus the syllabus from one of the selected tutorials. A maximum of four consecutive tutorials may be taken due to parallel schedules. Tutorial attendees must check in at tutorial rooms for admittance. If you wish to obtain the syllabi from any other tutorials that you attend, you may purchase them separately for \$15.00 per syllabus at onsite registration. Preregistration tutorial syllabi tickets may be redeemed at onsite registration.

There are four different tracks for the Tutorial Forum. You may sign up for tutorials from different tracks. They are:

- *Track One:* Knowledge Acquisition and Information Gathering: SA1, SP1, MA1, MP1
- *Track Two:* Computation and Adaptation: SA2, SP2, MA2, MP2
- *Track Three:* Constraints, Logics, and Defaults: SA3, SP3, MA3, MP3
- *Track Four:* Synthesizing Behavior: SP4, MA4, MP4

Sunday Morning Tutorials, August 4

9:00 AM–1:00 PM

Ontologies: Principles, Applications and Opportunities (SA1)

Michael Gruninger and Mike Uschold
Room A106, Oregon Convention Center

Locally Weighted Learning: Algorithms and Applications for Robot and Process Control (SA2)

Andrew Moore, Stefan Schaal, and Jeff Schneider
Room A105, Oregon Convention Center

New Methods for Solving Large Constraint and Reasoning Problems (SA3)

James Crawford and Bart Selman
Room C123, Oregon Convention Center

Sunday Afternoon Tutorials, August 4

2:00–6:00 PM

Information Gathering and Integration (SP1)

Craig Knoblock and Alon Levy
Room A106, Oregon Convention Center

Quantum Computing (SP2)

Colin P. Williams
Room A105, Oregon Convention Center

Pragmatics of Nonmonotonic Reasoning (SP3)

Grigoris Antoniou and Mirosław Truszczyński
Room C123, Oregon Convention Center

Knowledge Based Software Engineering (SP4)

Lewis Johnson and Michael Lowry
Room C124, Oregon Convention Center

Monday Morning Tutorials, August 5

9:00 AM–1:00 PM

Case-Based Reasoning: Issues and Applications (MA1)

Evangelos Simoudis and Kevin Ashley
Room A106, Oregon Convention Center

Designing Computational Markets and Multiagent Organizations (MA2)

Michael Wellman and Tad Hogg
Room A105, Oregon Convention Center

Temporal Reasoning and Its Applications in Artificial Intelligence (MA3)

Lluís Vila, Mark Boddy, and Eddie Schwalb
Room C123, Oregon Convention Center

Learning and Solving Partially Observable Markov Decision Process (MA4)

Thomas L. Dean and Leslie Pack Kaelbling
Room C124, Oregon Convention Center

Monday Afternoon Tutorials, August 5

2:00–6:00 PM

Knowledge Discovery and Data Mining (MP1)

Usama Fayyad and Evangelos Simoudis
Room A106, Oregon Convention Center

Genetic Programming (MP2)

John Koza and David Andre
Room A105, Oregon Convention Center

Default Reasoning Between Logic and Probabilities: Concepts, Models and Algorithms (MP3)

Hector Geffner
Room C123, Oregon Convention Center

Practical Planning Systems (MP4)

Steve Chien and Brian Drabble
Room C124, Oregon Convention Center

IAAI Conference

IAAI Conference Schedule

All IAAI-96 sessions will be held in Room B113-114, main level, Oregon Convention Center.

Monday, August 5

- 8:30–8:55 AM **Opening Remarks**
Howard E. Shrobe, IAAI-96 Program Chair
- Telecommunication Applications**
- 8:55–9:20 AM Localization of Troubles in Telephone Cable Networks
Chuxin Chen, Pacific Bell; Teresa L. Hollidge, TIBCO, Inc.; and DD Sharma, Pacific Bell
- 9:20–9:45 AM Supporting Performance and Configuration Management of GTE Cellular Networks
Ming Tan, Carol Lafond, and Gabriel Jakobson, GTE Laboratories, Inc.; Gary Young, GTE Mobilnet
- 9:45–10:10 AM SSCFI: Autonomous Fault Isolation in Communications Circuits
Ralph Worrest, Roland Zito-Wolf, Hongbin Wang and Shri Goyal, GTE Laboratories, Inc.
- 10:10–10:30 AM Break
- Engineering Applications**
- 10:30–10:55 AM Near Optimal Objects Packing through Dimensional Unfolding
Emilio Bertolotti, Enrico Castaldo and Gino Giannone, BULL HN, Italy
- 10:55–11:20 AM Using Artificial Neural Networks to Predict the Quality and Performance of Oilfield Cements
P.V. Coveney and T.L. Hughes, Schlumberger Cambridge Research Ltd.; P. Fletcher, Schlumberger Dowell, United Kingdom
- Invited Talk**
- 11:20 AM–12:10 PM The BOEING 777—Concurrent Engineering and Digital Pre-Assembly
Robert Abarbanel, Boeing Information and Support Services
- The processes created on the 777 for checking designs were called “digital pre-assembly”. Using FlyThru™, a spin-off of a Boeing advanced computing research project, engineers were able to view up to 1500 models (15000 solids) in 3d traversing that data at high speed. FlyThru™ was rapidly deployed in 1991 to meet the needs of the 777 for large scale product visualization and verification. The digital pre-assembly process has had fantastic results. The 777 has had far fewer assembly and systems problems compared to previous airplane programs. Today, FlyThru™ is installed on hundreds of workstations on almost every airplane program, and is being used on Space Station, F22, AWACS, and other defense projects. Its applications have gone far beyond just design review. In many ways, FlyThru is a data warehouse supported by advanced tools for analysis. It is today being integrated with knowledge based engineering geometry generation tools.
- 12:10–1:30 PM Lunch



Knowledge and Information Management Applications

- 1:30–1:55 PM Diagnosing Delivery Problems in the White House Information Distribution System
Mark Nahabedian and Howard Shrobe, MIT Artificial Intelligence Laboratory
- 1:55–2:20 PM EZ Reader: Embedded AI for Automatic Electronic Mail Interpretation and Routing
Amy Rice and Julie Hsu, Brightware, Inc.; Anthony Angotti and Rosanna Piccolo, Chase Manhattan Bank, N.A.
- 2:20–2:45 PM Developing and Deploying Knowledge on a Global Scale
James Borron and David Morales, Reuters America; Philip Klahr, Inference Corporation
- 2:45–3:10 PM KARMA: Managing Business Rules from Specification to Implementation
Jacqueline Sobieski, Fannie Mae; Srinivas Krovvidy, Brightware, Inc.; Colleen McClintock and Margaret Thorpe, Tangram, Inc.

3:10–3:30 PM

Break

Looking Back & Forward

- 3:30–3:55 PM AdjudiPro®2.0
David Williams, Bradley C. Simons, and Joe Connolly, United HealthCare Corporation
- 3:55–4:20 PM Monitoring Frog Communities: An Application of Machine Learning
Andrew Taylor, University of New South Wales; Graeme Watson, University of Melbourne; Gordon Grigg and Hamish McCallum, University of Queensland, Australia

Invited Talk

- 4:20–5:10 PM AI in Software Engineering
Douglas R. Smith, Kestrel Institute

Knowledge-based tools to support software engineering offer the potential to increase programmer productivity and to improve software quality and efficiency. Progress in this field has been slow but steady. Recently, several research groups have produced software nearing deployment through the use of knowledge-based tools. This talk will review some of the history of knowledge-based software engineering, and its current status and future prospects.

Tuesday, August 6

Finance Applications

- 10:30–10:55 AM Settlement Analysis Expert (SAX) – Modeling Complex Business Logic in the Development of Enterprise Solutions
John C. Ownby, Frito-Lay, Inc.
- 10:55–11:20 AM Comet: An Application of Model-Based Reasoning to Accounting Systems
Robert Nado, Melanie Chams, Jeff Delisio and Walter Hamscher, Price Waterhouse Technology Centre



IAAI Conference

11:20–11:45 AM An Intelligent System for Asset and Liability Assessment
Urs Bühler and Luca Bosatta, Swiss Bank Corporation; Lawrence Poynter, Inference (CSE) GmbH, Germany

11:45 AM–12:10 PM EASy: Expert Authorizations System
Jonathan Altfeld, Brightware, Inc.; Douglas E. Landon and Charles J. Daniels, Equifax Check Services

12:10–1:30 PM Lunch

Invited Talk

1:30–2:20 PM Speech
George Doddington, National Security Agency/SRI International

Invited Talk

2:20–3:10 PM Constraint-Based Scheduling in the Real World: What Works, What Does Not, and Why
Mark Boddy, Honeywell Technology Center

The day-to-day operations of large-scale enterprises give rise to a wide variety of scheduling problems in such areas as manufacturing, logistics and transportation, and spacecraft operations. To an increasing extent, these problems are being modelled, analyzed, and manipulated using techniques drawn from work in the AI and Operations Research communities on constraint satisfaction and constrained optimization. This modelling choice has several advantages, including the separation (to some extent) of problem representation from problem solution, and the potential applicability of a broad range of research results.

In this talk, Boddy will present a set of requirements for modelling and solving scheduling problems, including a somewhat unconventional definition of the term “solution.” These requirements, distilled from our experience implementing and fielding scheduling systems in a wide variety of domains, strongly constrain the nature of a useful scheduling system. Some of these constraints are based on structural properties of the problems being solved, some on teleology—specifically, on how schedules are used by organizations. Boddy will characterize recent results in terms of their relevance given these constraints, and point out places where further development is needed.

3:10–3:30 PM Break

AAAI-96/IAAI-96 Joint Invited Talk

3:30–4:20 PM AI: What Works, and What Doesn't?
Frederick Hayes-Roth, Teknowledge

Wednesday, August 7

Invited Talk

10:30–11:20 AM AI and Molecular Biology: Three Case Studies
Richard H. Lathrop, UC Irvine

In recent years artificial intelligence has found a rich application domain in molecular biology. The domain offers large on-line databases, interested and supportive domain practitioners, an accessible domain theory



and vocabulary, and a great many difficult and important problems. In this talk Lathrop will survey the domain and its opportunities for AI, discuss three case studies in AI and molecular biology that he has been involved with, and make suggestions for AI practitioners interested in working in this fascinating area.

Business Operations Applications

11:20–11:45 AM Intelligent Retail Logistics Scheduling
John Rowe and Keith Jewers, J. Sainsbury plc; Andrew Codd and Andrew Alcock, Inference Corporation, United Kingdom

11:45 AM–12:10 PM The SIGNAL Expert System
Rolf Struve, SIGNAL Versicherungen, Germany

12:10–1:30 PM Lunch

1:30–1:55 PM The NASA Personnel Security Processing Expert System
David Silberberg, The Johns Hopkins University Applied Physics Laboratory and Robert Thomas, NASA Headquarters

Invited Talk

1:55–2:45 PM Data Mining in the Cosmos: Applications in Astronomy and Planetary Science
Usama M. Fayyad, Microsoft Research

Knowledge discovery in databases (KDD) and data mining are concerned with the extraction of high-level information (knowledge) from low-level data (usually stored in large databases). KDD is a new and rapidly growing research area at the intersection of fields including: AI, statistics, pattern recognition, databases, visualization, and high-performance and parallel computing. KDD has been gaining attention because it holds promise for dealing with data overload in modern society. After a brief overview of this field, and in order to make the power of these techniques more concrete, the talk will focus on two applications at JPL in science data analysis.

Today's science instruments are capable of gathering huge amounts of data, making traditional human-based comprehensive analysis an unfeasible endeavor. Fayyad describes efforts to develop a new generation of data mining systems where users specify what to search for simply by providing the system with training examples, and letting the system automatically learn what to do to automatically sift through the data and catalog objects of interest. The first application targets automating the cataloging of sky objects in a sky survey consisting of three terabytes of image data containing about two billion sky objects. The talk also covers some recent results in automated discovery, resulting in the discovery of twenty new high-redshift quasars in the Universe: some of the furthest and oldest objects detectable. The second part of the talk will cover JAR-tool (JPL Adaptive Recognition Tool), targeting the detection and cataloging of over one million small volcanoes visible in the Magellan SAR database of over 30,000 images of Venus.



Invited Presentations

Invited Presentations

All invited presentations will be given in Ballroom 201–203, second level, Oregon Convention Center. They are listed below in chronological order.

Tuesday, August 6

Keynote Address: What Have We Learned about Learning?

Tom Mitchell, Carnegie Mellon University
Introduction by Bruce G. Buchanan
9:00 AM–10:10 AM

The past decade has produced real progress toward understanding how to make machines learn. In ten years we have gone from algorithms that were laboratory curiosities to robust methods with significant commercial value. Machine learning algorithms now learn to control vehicles to drive autonomously on public highways at 70 mph, learn to detect credit card fraud by mining data on past transactions, and learn your reading interests in order to assemble a personally customized electronic newspaper. At the same time, new theoretical results shed light on fundamental issues such as the tradeoff among the number of training examples available, the number of hypotheses considered, and the likely accuracy of the learned hypothesis. And work on integrated learning architectures is beginning to explore issues such as long-term learning of new representations, cumulative learning, and learning to learn.

Where is all this headed? This talk will examine recent progress and open questions in machine learning, suggest some Ph.D. dissertation topics that we should begin on now, and give one person's view on where machine learning might be headed over the next decade.

The Database Approach to Knowledge Representation

Jeffrey D. Ullman, Stanford University
Introduction by Alon Levy
10:30 AM – 11:20 AM

Several ideas from database theory are beginning to have some impact on problems of integrating information. The theory of conjunctive queries has been extended significantly to support the processing and optimization of queries

to global (mediated) views that are expressed logically in terms of existing information sources. Likewise, the theory of acyclic hypergraphs has found new applications guiding the joining of incomplete sources of information.

Boosting Theory Towards Practice: Recent Developments in Decision Tree Induction and the Weak Learning Framework

Michael Kearns, AT&T Research
Introduction by Tom Dietterich
11:20 AM – 12:10 PM

In the theoretical machine learning framework known as weak learning (also called boosting), we require that a learning algorithm amplify slight predictive advantages over random guessing into arbitrarily accurate hypotheses. This framework has recently led to several results of interest to machine learning experimentalists, including a proof that top-down decision tree learning algorithms such as C4.5 and CART are in fact boosting algorithms, and the introduction of a new learning algorithm whose empirical performance appears at least competitive with the standard heuristics. In this talk, I will survey these developments, and argue that the weak learning framework may provide fertile ground for interaction between experiment and theory on the topic of practical learning algorithm design and analysis — a topic that has been notoriously elusive for many standard learning models.

Brain Dynamics in the Genesis of Trust as the Basis for Communication by Representations

Walter J. Freeman, University of California, Berkeley
Introduction by Bill Clancey
1:30 PM – 2:40 PM

A theory of brain dynamics is proposed according to which brains construct representation by actions into the world for communication. The brain patterns constitute meanings, not representations of meanings. Representations have no meaning. They are shaped by meaning in transmitting brains and elicit meaning in receiving brains, if trust has been established.

AAAI-96/IAAI-96 Joint Invited Talk:

AI: What Works, and What Doesn't?

Frederick Hayes-Roth, Teknowledge

Introduction by Howard Shrobe

3:30 PM – 4:20 PM

AI has been well supported by government R&D dollars for decades now, and people are beginning to ask hard questions: What really works? What are the limits? What doesn't work as advertised? What isn't likely to work? What isn't affordable? This talk will try to hold a mirror up to the community, both to provide feedback and also stimulate more self-assessment.

Science Policy and Politics: Revolution or Evolution

Rick Weingarten, Computing Research Association

Introduction by Howard Shrobe

4:20 PM–5:10 PM

Federal support of science has come under severe scrutiny in recent years. The assumptions and processes for deciding priorities are shifting dramatically. These shifts are changing the way the entire scientific research community deals with federal funding issues. Computing research is doubly affected, because these changes are occurring at a time when this field is moving to the forefront in the dialogue. So computing research not only needs to react to the changing political climate, it also needs to assume increasing leadership in overall science policy. But past operating styles, the role model offered by physics, for instance, may not be a good guide to the future. Do we need to become more overtly political? Should the research agenda tie itself more closely to social outcomes? To what extent do we have a special concern with helping develop the research and educational infrastructure—encouraging the creation of the networks, digital libraries, and computational facilities of the future. Should we be speaking out more on information policies that affect how technology is deployed and used? Weingarten will discuss the changing environment and policy roles for the research community, and pose some of these difficult decisions the field will face because of them.

Wednesday, August 7

Presidential Address

Randall Davis, Massachusetts Institute of Technology

Introduction by Daniel G. Bobrow

9:00 AM – 10:10 AM

The Embodied Mind

George Lakoff, University of California, Berkeley

Introduction by Bill Clancey

10:30 AM – 11:40 AM

This talk surveys broadly the current state of empirical research on embodied cognition, which provides overwhelming evidence against the view that human reason can be characterized adequately by logiclike representations. Real human conceptual systems use basic-level concepts, image-schemas, conceptual metaphors and metonymies, conceptual blending, and so on. This requires a cognitive approach to language beyond anything in the range of classical AI models or Chomskyan linguistic theories. An adequate theory of how concepts arise from the body requires a unification of neuroscience and cognitive science. The Berkeley L-zero group at ICSI is attempting the first stage of such a unification using structured connectionist models with temporal binding. Recent work covers the learning of spatial relations terms and concepts, motor terms and concepts, and the modeling of inferences using conceptual metaphor.

Moving Up the Information Food Chain: Deploying Softbots on the World Wide Web

Oren Etzioni, University of Washington

Introduction by Tom Mitchell

1:30 PM – 2:20 PM

The maze of pages and hyperlinks known as the world wide web is the very bottom of the information food chain. The WebCrawlers and Alta Vistas of the world are information herbivores. They graze on Web pages and regurgitate them as searchable indices. My talk focuses on softbots as information carnivores that intelligently hunt and feast on web herbivores.

Invited Presentations

WebSeer: An Image Search Engine for the World Wide Web

Michael Swain, University of Chicago
Introduction by Leslie Kaelbling
2:20 PM – 3:10 PM

Many of the content-based indexing into image databases systems to date rely solely on image content for indexing, and emphasize retrieving perceptually similar images. However, in domains like the world wide web there is contextual information that can complement image content analysis to produce powerful search engines—HTML structural and textual cues can complement image content analysis. In place of image similarity, I've found face detection, image classification and specialized region detection algorithms to be the most useful for complementing the information obtained from the HTML cues. I'll show these techniques in use in an image search engine called WebSeer.

Refinement Planning: Status and Prospectus

Subbarao Kambhampati, Arizona State University
Introduction by Dana Nau
3:30 PM – 4:20 PM

Most current-day AI planning systems operate by iteratively refining a partial plan until it meets the goal requirements. In the past five years, significant progress has been made in our understanding of the spectrum and capabilities of such refinement planners. In this talk, Kambhampati will summarize our understanding in terms of a unified framework for refinement planning and discuss several current research directions.

Using Multi-Agent Systems to Represent Uncertainty

Joseph Y. Halpern, IBM Almaden Research Center
Introduction by Hector Levesque
4:20 – 5:10 PM

In order to reason about uncertainty, we need to have the tools to represent it well. Halpern will discuss one general framework, that incorporates knowledge, time, and probability. This powerful representation tool will be shown to give insight into a wide range of problems, from coordination to knowledge base queries to puzzles like the Monty Hall puzzle.

Thursday, August 8

The Cultural Context of Cognition and Computation

Edwin Hutchins, University of California, San Diego
Introduction by Bill Clancey
8:30 AM – 9:40 AM

Where does human intelligence reside? Traditionally we have located it within individual human minds. An examination of a culturally-supported, socially-distributed computational system shows that human intelligence involves processes that transcend the boundaries of the individual. Symbolic AI successfully models this distributed intelligence, but may be ill-suited for the problem of modeling individual minds.

Panel: Challenge Problems for Artificial Intelligence

Bart Selman, AT&T Laboratories, Moderator
Panelists: Rodney A. Brooks, Massachusetts Institute of Technology; Thomas Dean, Brown University; Eric Horvitz, Microsoft Corporation; Tom M. Mitchell, Carnegie Mellon University; and Nils J. Nilsson, Stanford University
10:30 AM – 12:10 PM

AI papers and textbooks often discuss the “big questions,” such as “how to reason with uncertainty,” “how to reason efficiently,” or “how to improve performance through learning.” It is more difficult, however, to find descriptions of concrete problems or challenges that are still ambitious and interesting, yet not so open-ended.

The goal of this panel is to formulate a set of such challenge problems for the field. Each panelist was asked to formulate one or more challenges. The emphasis is on problems for which there is a good chance that they will be resolved within the next five to ten years.

Invited Presentations

Robots with AI: A Retrospective on the AAAI Robot Competitions and Exhibitions

R. Peter Bonasso, NASA Johnson Space Center and Thomas L. Dean, Brown University

Introduction by Michael Swain
1:30 PM – 2:20 PM

There have been five years of robot competitions and exhibitions since the inception of this annual event in 1992. Since that first show we have seen 30 different teams compete and almost that many more exhibit their robots in the annual event. These teams ranged from universities to industry and government research labs to one or two inventors working out of garages. Their composition ranged from seasoned AI researchers to eager undergraduates, and they hailed from the US, Canada, Europe, and Asia. Despite the concerns of some about the relevance and even the appropriateness of such an event, the robots have become a key attraction of the national and international conferences. In this talk, we look back on the form and function of the five years of exhibitions and competitions and attempt to draw some lessons in retrospect as well as future implications for the AI community and our society at large.

“No Hands Across America” - A Chronicle of Recent Progress in Intelligent Vehicles

Dean Pomerleau, Carnegie Mellon University
Introduction by Michael Swain

2:20 PM – 3:10 PM

This talk will focus on progress towards self driving cars, with particular emphasis on a new adaptive vision system for autonomous steering, called RALPH (Rapidly Adapting Lateral Position Handler). On a recent trip, RALPH was able to drive CMU's testbed vehicle 98.2% of the 2850 miles from Washington, DC to San Diego, California.

Experimental Analysis of Algorithms: The Good, the Bad, and the Ugly

David S. Johnson, AT&T Research
Introduction by Bart Selman

3:30 PM – 4:40 PM

Implementation and experimentation have long been an important part of computer science, but based on the literature it would seem that there is little common agreement on what constitutes good experimental research. This talk will propose some guiding principles, illustrating them (both positively and negatively) with examples from the AI and optimization literature.

Special Events & Programs

Special Events & Programs

AAAI-96 Opening Reception

The AAAI-96 Opening Reception will be held in the Oregon Museum for Science and Industry (OMSI) on Tuesday, August 6 from 7:30–10:00 PM. Admittance to the reception is included in the AAAI-96 technical registration. A \$20.00 per person fee will be charged for guests, spouses, children, and other nontechnical conference registrants. Guest tickets are available in onsite registration. Shuttles will be provided from the Oregon Convention Center to the OMSI.

AAAI-96 Student Abstract Poster Program

Students whose abstracts were chosen for inclusion in the *AAAI-96 Conference Proceedings* will display their work at the Student Abstract Poster Session in Ballroom 204, Oregon Convention Center, on Wednesday, August 7 from 5:30–6:30 PM. In addition, participants in the SIGART/AAAI Doctoral Consortium will display their poster presentations during this session. All students will be available for questions. Light refreshments will be served.

KDD-96 Conference Banquet

The KDD-96 Conference Banquet will be held in the Crystal Ballroom of the Benson Hotel in downtown Portland on Saturday, August 3 from 7:00–10:00 PM. The hotel is located at 309 SW Broadway, and is a short walk from the light rail. An invited talk, entitled “Advanced Scout: Data Mining and Knowledge Discovery in NBA Data,” will be given by Inderpal Bhandari of the IBM T. J. Watson Research Center. Tickets are \$55.00 and must be purchased in advance. No tickets will be sold at the door.

KDD-96 Opening Reception

The KDD-96 Opening Reception will be held Friday, August 2 from 6:00–8:00 PM in room C123-124, main level, Oregon Convention Center in conjunction with a poster session and computer demonstrations. Admittance to the reception is included in the KDD-96 registration.

SIGART/AAAI Doctoral Consortium

The SIGART/AAAI Doctoral Consortium program will be held Sunday, August 4 and Monday, August 5 from 8:30 AM–6:00 PM in Room B112, Oregon Convention Center. This small, focused gathering will allow selected students to present their work to a faculty panel, who will provide feedback on participants’ current research and guidance on future research directions. All participants in the AAAI-96 Abstract and Poster Program are invited to attend these panel discussions.

Special Meetings

AAAI Annual Business Meeting

The Annual Business Meeting will be held Thursday, August 8, 12:30–1:00 PM, Room A105, Oregon Convention Center.

AAAI Conference Committee Meeting

The AAAI Conference Committee Meeting will be held Thursday, August 8, from 7:30–9:00 AM in the Three Sisters Room, Red Lion Lloyd Center.

AAAI Executive Council Meeting

The AAAI Executive Council Meeting will be held Sunday, August 4, from 9:00 AM – 5:00 PM in the Three Sisters Room, Red Lion Lloyd Center. Continental breakfast will be available at 8:30 AM.

AAAI 1996 Fellows Recognition Dinner

The 1996 Fellows Recognition Dinner will be held Monday, August 5, from 6:00–10:00 PM at the Red Lion Lloyd Center. A reception will begin at 6:00 PM, followed by dinner at 7:00 PM in the Pacific Northwest Ballroom.

AAAI Press Editorial Board Meeting

The AAAI Press Editorial Board Meeting will be held Wednesday, August 7, from 12:30–1:30 PM in the Three Sisters Room, Red Lion Lloyd Center.

AAAI Publications Committee Meeting

The AAAI Publication Committee breakfast meeting will be held Tuesday, August 6, from 7:30–9:00 AM in the Three Sisters Room, Red Lion Lloyd Center.

AAAI-96 Program Committee Dinner

The AAAI-96 Program Committee Dinner will be held Wednesday, August 7, from 7:00–10:30 PM in the Holladay Ballroom, Red Lion Lloyd Center.

AI Journal Editorial Board Meeting

The *Artificial Intelligence Journal* Editorial Board Meeting will be held Tuesday, August 6, in the Three Sisters Room, Red Lion Lloyd Center. Lunch will be served at 12:00 PM. The meeting will adjourn at 2:00 PM.

KDD-96 Program Committee Luncheon

The KDD-96 Program Committee Luncheon will be held Saturday, August 3, from 12:05–1:30 PM in Room C124, Oregon Convention Center.

SIGART Annual Business Meeting

The SIGART Annual Business Meeting will be held Tuesday, August 6, from 12:15–1:15 PM in Room A105, Oregon Convention Center.

8/6

9:00 AM – 10:10 AM

Ballroom
201–203

Plenary Session: Keynote Address
What Have We Learned about Learning? by *Tom Mitchell, Carnegie Mellon University*
Introduction by Bruce G. Buchanan

10:30 AM – 12:10 PM

Invited Talk
The Database Approach to Knowledge Representation by *Jeffrey D. Ullman, Stanford University*
Introduction by Alon Levy

Invited Talk
Boosting Theory Towards Practice: Recent Developments in Decision Tree Induction and the Weak Learning Framework by *Michael Kearns, AT&T Research*
Introduction by Tom Dietterich

Session 1: Constraint Satisfaction 1: Game-Tree Search.
Chair: David E. Smith
Forward Estimation for Game-Tree Search by *Weixiong Zhang*
Searching Game Trees Under Memory Constraints by *Subir Bhattachary and Amitava Bagachi*
Exploiting Graph Properties of Game Trees by *Aske Plaat, Jonathan Schaefer, Wim Pijls, and Arie de Bruin*
Partition Search by *Matthew L. Ginsberg*

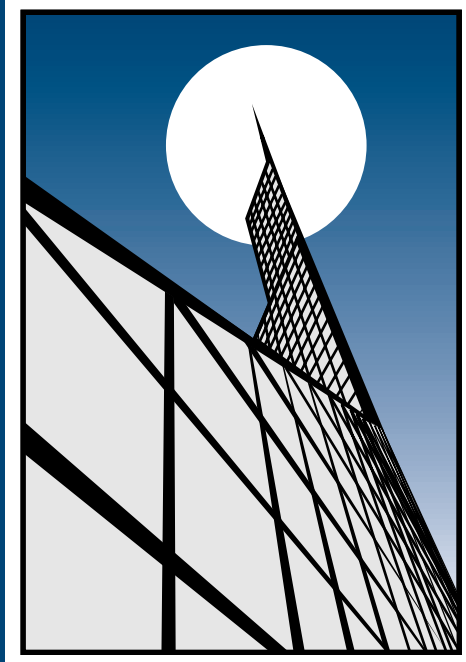
Session 3: Planning 1: The Environment
Chair: Leslie Kaelbling
Generalizing Indexical-Functional Reference by *Marcel Schoppers and Richard Shu*
A Bias towards Relevance: Recognizing Plans where Goal Minimization Fails by *Abigail S. Gertner and Bonnie L. Webber*
Opportunity Recognition in Complex Environments by *Louise Pryor*
What Is Planning in the Presence of Sensing? by *Hector J. Levesque*

Session 2: Learning 1: Discovery
Chair: Usama Fayyad
Incremental Discovery of Hidden Structure: Application in Theory of Elementary Particles by *Jan M. Zytkow and Paul J. Fischer*
Using a Hybrid Genetic Algorithm and Fuzzy Logic for Metabolic Modeling by *John Yen, Bogju Lee and James C. Liao*
The Discovery of the Causes of Leprosy: A Computational Analysis by *Vincent Corruble and Jean-Gabriel Ganascia*
Machine Discovery Based on Numerical Data Generated in Computer Experiments by *Tsuyoshi Murata and Masamichi Shimura*

Session 4: Uncertainty 1: Foundations
Chair: Eric Horvitz
Plausibility Measures and Default Reasoning by *Nir Friedman and Joseph Y. Halpern*
First-Order Conditional Logic Revisited by *Nir Friedman, Joseph Y. Halpern, and Daphne Koller*
On the Foundations of Qualitative Decision Theory by *Ronen I. Brafman and Moshe Tennenholtz*
A Counterexample to Theorems of Cox and Fine by *Joseph Y. Halpern*

Session 5: Natural Language 1: Learning
Chair: Claire Cardie
Tree-Bank Grammars by *Eugene Charniak*
Automatically Generating Extraction Patterns from Untagged Text by *Ellen Riloff*
Learning to Parse Database Queries Using Inductive Logic Programming by *John M. Zelle and Raymond J. Mooney*
Left-Corner Unification-Based Natural Language Processing by *Steven L. Lytinen and Noriko Tomuro*

AAAI Technical Program
(All technical paper presentations are 25 minutes each)



Room
A105

Room
A106

Room
B115–116

Room
C123

Room
C124

Tuesday, August 6
10:10 – 10:30 Coffee Break

1:30 PM – 3:10 PM

Invited Talk

Brain Dynamics in the Genesis of Trust as the Basis for Communication by Representations by *Walter J. Freeman, University of California, Berkeley*
 Introduction by Bill Clancey
(Talk ends at 2:40 PM)

Session 6: Constraint Satisfaction 2: Temporal Reasoning

Chair: Luís Vila

A New Proof of Tractability for ORD-Horn Relations by *Gérard Ligozat*
Maximal Tractable Subclasses of Allen's Interval Algebra: Preliminary Report by *Thomas Drakengren and Peter Jonsson*
A Simple Way to Improve Path Consistency Processing in Interval Algebra Networks by *Christian Bessière*
A Representation for Efficient Temporal Reasoning by *James P. Delgrande and Arvind Gupta*

Session 7: Learning 2: Planning

Chair: Jonathan Gratch

Design and Implementation of a Replay Framework Based on a Partial Order Planner by *Laurie H. Ilhig and Subbarao Kambhampati*
Multi-Strategy Learning of Search Control for Partial-Order Planning by *Tara A. Estlin and Raymond J. Mooney*
Searching for Planning Operators with Context-Dependent and Probabilistic Effects by *Tim Oates and Paul R. Cohen*
Is There Any Need for Domain-Dependent Control Information?: A Reply by *Steven Minton*

Session 8: Agents 1: Internet Agents

Chair: Oren Etzioni

Planning to Gather Information by *Chung T. Kwok and Daniel S. Weld*
Query-Answering Algorithms for Information Agents by *Alon Y. Levy, Anand Rajaraman, and Joann J. Ordille*
Syskill & Webert: Identifying Interesting Web Sites by *Michael J. Pazzani, Jack Muramatsu and Daniel Billsus*
Hybrid Hill-Climbing and Knowledge-Based Methods for Intelligent News Filtering by *Kenrick J. Mock*

Session 10: AI in Art and Entertainment

Chair: Beverly Woolf

Video: Coping with Temporal Constraints in Multimedia Presentation Planning by *Élisabeth André and Thomas Rist*
A Framework for Plot Control in Interactive Story Systems by *N. M. Sgouros, G. Papakonstantinou, and P. Tsanakas*
A Model of Poetic Comprehension by *Kenneth Haase*
Video: Declarative Camera Control for Automatic Cinematography by *David B. Christianson, Sean E. Anderson, Li-Wei He, David H. Salesin, Daniel S. Weld, and Michael F. Cohen*

Session 9: Model-Based Reasoning 1

Chair: Eric Horvitz

A Model-Based Approach to Blame Assignment: Revising the Reasoning Steps of Problem Solvers by *Eleni Stroulia and Ashok K. Goel*
A Model-Based Approach to Reactive Self-Configuring Systems by *Brian C. Williams and P. Pandurang Nayak*
Improving Model-Based Diagnosis through Algebraic Analysis: The Petri Net Challenge by *Luigi Portinale*
Qualitative Multiple-Fault Diagnosis of Continuous Dynamic Systems Using Behavioral Modes by *Siddharth Subramanian and Raymond J. Mooney*

3:30 PM – 5:10 PM

AAAI-96/IAAI-96 Joint Invited Talk

AI: What Works, and What Doesn't? by *Frederick Hayes-Roth, Teknowledge*
 Introduction by Howard Shrobe

Invited Talk

Science Policy and Politics: Revolution or Evolution by *Rick Weingarten, Computing Research Association*
 Introduction by Howard Shrobe

Session 11: Constraint Satisfaction 3: Data Consistency

Chair: James Crawford

Generalized Arc Consistency for Global Cardinality Constraint by *Jean-Charles Régin*
Lazy Arc-Consistency by *Thomas Schiex, Jean-Charles Régin, Christine Gaspin, and Gérard Verfaillie*
Neighborhood Inverse Consistency Preprocessing by *Eugene C. Freuder and Charles D. Elfe*
Path-Consistency : When Space Misses Time by *Assef Chmeiss and Philippe Jégou*

Session 13: Planning 2: Handling Uncertainty

Chair: Leslie Kaelbling

Computing Optimal Policies for Partially Observable Decision Processes Using Compact Representations by *Craig Boutilier and David Poole*
Rewarding Behaviors by *Fahiem Bacchus, Craig Boutilier, and Adam Grove*
A Qualitative Model for Temporal Reasoning with Incomplete Information by *Hector Geffner*
On the Size of Reactive Plans by *Peter Jonsson and Christer Bäckström*

Session 12: Learning 3: Case-Based Reasoning

Chair: Eric Domeshek

Source Selection for Analogical Reasoning: An Empirical Approach by *William A. Stubblefield and George F. Luger*
Improving Case Retrieval by Remembering Questions by *Richard Alterman and Daniel Griffin*
Acquiring Case Adaptation Knowledge: A Hybrid Approach by *David B. Leake, Andrew Kinley, and David Wilson*
Detecting Discontinuities in Case-Bases by *Hideo Shimazu and Yosuke Takashima*

Session 14: Knowledge Representation 1: Belief & Belief Revision

Chair: Fahiem Bacchus

What Is Believed Is What Is Explained (Sometimes) by *Renwei Li and Luís Moniz Pereira*
The Complexity of Model Checking for Belief Revision and Update by *Paolo Liberatore and Marco Schaerf*
A Semantic Characterization of an Algorithm for Estimating Others' Beliefs from Observation by *Hideki Isozaki and Hirofumi Katsuno*
Updating Knowledge Bases with Disjunctive Information by *Yan Zhang and Norman Y. Foo*

Session 15: Mobile Robots 1

Chair: David Musliner

GARGOYLE: An Environment for Real-Time, Context-Sensitive Active Vision by *Peter N. Prokopowicz, Michael J. Swain, R. James Firby, and Roger E. Kahn*
Estimating the Absolute Position of a Mobile Robot Using Position Probability Grids by *Wolfram Burgard, Dieter Fox, Daniel Hennig, and Timo Schmidt*
Guaranteeing Safety in Spatially Situated Agents by *Robert C. Kohout, James A. Hendler, and David J. Musliner*
Classifying and Recovering from Sensing Failures in Autonomous Mobile Robots by *Robin R. Murphy and David Hershberger*

8/7	9:00 AM – 10:10 AM		10:30 AM – 12:10 PM
Ballroom 201–203	Plenary Session Presidential Address by <i>Randall Davis, Massachusetts Institute of Technology</i> Introduction by Daniel G. Bobrow		Invited Talk The Embodied Mind by <i>George Lakoff, University of California, Berkeley</i> Introduction by Bill Clancey <i>(Talk ends at 11:40 AM)</i>
Room A105		10:10 – 10:30 Coffee Break Wednesday, August 7	Session 16: Constraint Satisfaction 4: Search Control <i>Chair: Stephen Smith</i> Efficient Goal-Directed Exploration by <i>Yury Smirnov, Sven Koenig, Manuela M. Veloso and Reid G. Simmons</i> Easy and Hard Testbeds for Real-Time Search Algorithms by <i>Sven Koenig and Reid G. Simmons</i> Improved Limited Discrepancy Search by <i>Richard E. Korf</i> Heuristic-Biased Stochastic Sampling by <i>John L. Bresina</i>
Room A106			Session 18: Planning 3: Cost, Time, & SAT Compilation <i>Chair: Daphne Koller</i> A Cost-Directed Planner: Preliminary Report by <i>Eithan Ephrati, Martha E. Pollack, and Marina Milshstein</i> Monitoring the Progress of Anytime Problem-Solving by <i>Eric A. Hansen and Shlomo Zilberstein</i> Pushing the Envelope: Planning, Propositional Logic, and Stochastic Search by <i>Henry Kautz and Bart Selman</i> A Linear-Programming Approach to Temporal Reasoning by <i>Peter Jonsson and Christer Bäckström</i>
Room B115–116			Session 17: Learning 4: Reinforcement Learning <i>Chair: Jude Shavlik</i> Video: Evolution-Based Discovery of Hierarchical Behaviors by <i>Justinian P. Rosca and Dana H. Ballard</i> Auto-Exploratory Average Reward Reinforcement Learning by <i>DoKyeong Ok and Prasad Tadepalli</i> Learning Robust Plans for Mobile Robots from a Single Trial by <i>Sean P. Engelson</i> An Average-Reward Reinforcement Learning Algorithm for Computing Bias-Optimal Policies by <i>Sridhar Mahadevan</i>
Room C123			Session 19: Knowledge Representation 2: Non-Monotonic Reasoning <i>Chair: James Delgrande</i> Reasoning about Continuous Processes by <i>Christoph S. Herrmann and Michael Thielscher</i> Toward Efficient Default Reasoning by <i>David W. Etherington and James M. Crawford</i> Splitting a Default Theory by <i>Hudson Turner</i> Situation Calculus on a Dense Flow of Time by <i>Akira Fusaoka</i>
Room C124			Session 20: Perception 1: Vision <i>Chair: Aaron Bobick</i> Using Elimination Methods to Compute Thermophysical Algebraic Invariants from Infrared Imagery by <i>J. D. Michel, N. Nandhakumar, Tushar Saxena and Deepak Kapur</i> Integrating Visual Information across Camera Movements with a Visual-Motor Calibration Map by <i>Peter N. Prokopowicz and Paul R. Cooper</i> A Hybrid Learning Approach for Better Recognition of Visual Objects by Ibrahim E. Imam and Srinivas Gutta Video: Approximate World Models: Incorporating Qualitative and Linguistic Information into Vision Systems by <i>Claudio S. Pinhanez and Aaron F. Bobick</i>

1:30 PM – 3:10 PM

Invited Talk

Moving Up the Information Food Chain: Deploying Softbots on the World Wide Web by *Oren Etzioni, University of Washington*
Introduction by Tom Mitchell

Invited Talk

Real-Time Human Gesture Interpretation by *Michael Swain, University of Chicago*
Introduction by Leslie Kaelbling

Session 21: Constraint Satisfaction 5: Search & Learning

Chair: James Crawford

Dynamic Improvements of Heuristic Evaluations during Search by *Gerhard Kainz and Hermann Kaindl*

A Complexity Analysis of Space-Bounded Learning Algorithms for the Constraint Satisfaction Problem by *Roberto J. Bayardo, Jr. and Daniel P. Miranker*

Inference-Based Constraint Satisfaction Supports Explanation by *Mohammed H. Sqalli and Eugene C. Freuder*

Improving the Learning Efficiencies of Realtime Search by *Toru Ishida and Masashi Shimbo*

Session 23: Agents 2: Multiagent Problem Solving

Chair: Milind Tambe

The Use of Artificially Intelligent Agents with Bounded Rationality in the Study of Economic Markets by *Vijay Rajan and James R. Slagle*

Analysis of Utility-Theoretic Heuristics for Intelligent Adaptive Network Routing by *Armin R. Mikler, Vasant Honavar and Johnny S.K. Wong*

Total-Order Multi-Agent Task-Network Planning for Contract Bridge by *S. J. J. Smith, D. S. Nau, and T. A. Throop*

Nearly Monotonic Problems: A Key to Effective FA/C Distributed Sensor Interpretation? by *Norman Carver, Victor Lesser and Robert Whitehair*

Session 22: Learning 5: Decision Trees

Chair: Tom Dietterich

Learning Trees and Rules with Set-Valued Features by *William W. Cohen*
Bagging, Boosting, and C4.5 by *J. R. Quinlan*

Lazy Decision Trees by *Jerome H. Friedman, Ron Kohavi, and Yeogirl Yun*

An Efficient Algorithm for Finding Optimal Gain-Ratio Multiple-Split Tests on Hierarchical Attributes in Decision Tree Learning by *Hussein Almuallim, Yasuhiro Akiba and Shigeo Kaneda*

Session 24: Uncertainty 2: Bayesian Networks

Chair: Michael Wellman

Generalized Queries on Probabilistic Context-Free Grammars by *David V. Pynadath and Michael P. Wellman*

A Clinician's Tool for Analyzing Non-Compliance by *David Maxwell Chickering and Judea Pearl*

Goal Oriented Symbolic Propagation in Bayesian Networks by *Enrique Castillo, José Manuel Gutiérrez, and Ali S. Hádi*

Building Classifiers Using Bayesian Networks by *Nir Friedman and Moises Goldszmidt*

Session 25: Knowledge Compilation

Chair: Bart Selman

Compilation for Critically Constrained Knowledge Bases by *Robert Schrag*
Approximate Knowledge Compilation: The First Order Case by *Alvaro del Val*

A New Algorithm for Computing Theory Prime Implicates Compilations by *Pierre Marquis and Samira Sadaoui*

Path-Based Rules in Object-Oriented Programming by *James M. Crawford, Daniel Dvorak, Diane Litman, Anil Mishra and Peter F. Patel-Schneider*

3:30 PM – 5:10 PM

Invited Talk

Refinement Planning: Status and Prospectus by *Subbarao Kambhampati, Arizona State University*
Introduction by Dana Nau

Invited Talk

Using Multi-Agent Systems to Represent Uncertainty by *Joseph Y. Halpern, IBM Almaden Research Center*
Introduction by Hector Levesque

Session 26: Constraint Satisfaction 6

Chair: Stephen Smith

Mixed Constraint Satisfaction: A Framework for Decision Problems under Incomplete Knowledge by *Hélène Fargier, Jérôme Lang, and Thomas Schiex*

Approximate Resolution of Hard Numbering Problems by *Olivier Bailleux and Jean-Jacques Chabrier*

Russian Doll Search for Solving Constraint Optimization Problems by *Gérard Verfaillie, Michel Lemaître, and Thomas Schiex*

Enhancements of Branch and Bound Methods for the Maximal Constraint Satisfaction Problem by *Richard J. Wallace*

Session 27: Knowledge-Based Systems

Chair: Ashok Goel

CommonKADS Models for Knowledge-Based Planning by *John Kingston, Nigel Shadbolt, and Austin Tate*

Detecting Knowledge Base Inconsistencies Using Automated Generation of Text and Examples by *Vibhu O. Mittal and Johanna D. Moore*

Explicit Representations of Problem-Solving Strategies to Support Knowledge Acquisition by *Yolanda Gil and Eric Melz*

Knowledge-Based Navigation of Complex Information Spaces by *Robin D. Burke, Kristian J. Hammond and Benjamin C. Young*

Session 28: Agents 3: Interaction

Chair: Oren Etzioni

The ContactFinder Agent: Answering Bulletin Board Questions with Referrals by *Bruce Krulwich and Chad Burke*

Toward a Semantics for an Agent Communications Language Based on Speech-Acts by *Ira A. Smith and Philip R. Cohen*

Agent Amplified Communication by *Henry Kautz, Bart Selman and Al Milewski*

Deciding to Remind during Collaborative Problem Solving: Empirical Evidence for Agent Strategies by *Pamela W. Jordan and Marilyn A. Walker*

Session 29: Knowledge Representation 3: Abstraction

Chair: Pandurang Nayak

Computing Abstraction Hierarchies by Numerical Simulation by *Alan Bundy, Fausto Giunchiglia, Roberto Sebastiani, and Toby Walsh*

Hierarchical A*: Searching Abstraction Hierarchies Efficiently by *Robert C. Holte, M. B. Perez, R. M. Zimmer and A. J. MacDonald*

Spatial Aggregation: Language and Applications by *Christopher Bailey-Kellogg, Feng Zhao, and Kenneth Yip*

Commitment Strategies in Hierarchical Task Network Planning by *Reiko Tsuneto, Kutluhan Erol, James Hendler and Dana Nau*

Session 30: Natural Language 2: Semantics & Discourse

Chair: Stephen Soderland

HUNTER-GATHERER: Three Search Techniques Integrated for Natural Language Semantics by *Stephen Beale, Sergei Nirenburg, and Kavi Mahesh*

Semantic Interpretation of Nominalizations by *Richard D. Hull and Fernando Gomez*

Using Plan Reasoning in the Generation of Plan Descriptions by *R. Michael Young*

Building Up Rhetorical Structure Trees by *Daniel Marcu*

8/8	8:30 AM – 10:10 AM	10:30 AM – 12:10 PM
Ballroom 201–203	Invited Talk <i>Edwin Hutchins, University of California, San Diego</i> The Cultural Context of Cognition and Computation Introduction by Bill Clancey <i>(Talk ends at 9:40 AM)</i>	Invited Panel Challenge Problems for Artificial Intelligence by <i>Bart Selman, AT&T Laboratories, Moderator</i> Panelists: <i>Rodney A. Brooks, Massachusetts Institute of Technology; Thomas Dean, Brown University; Eric Horvitz, Microsoft Corporation; Tom Mitchell, Carnegie Mellon University; and Nils Nilsson, Stanford University</i>
Room A105	Session 31: Constraint Satisfaction 7: Phase Transition <i>Chair: Eric Horvitz</i> The Very Particular Structure of the Very Hard Instances by <i>Dan R. Vlasie</i> The Constrainedness of Search by <i>Ian P. Gent, Ewan MacIntyre, Patrick Prosser, and Toby Walsh</i> A Second Order Parameter for 3SAT by <i>Tuomas W. Sandholm</i> Exploiting a Theory of Phase Transitions in Solutions to Three-Satisfiability Problems by <i>David M. Pennock and Quentin F. Stout</i>	Session 36: Constraint Satisfaction 8: Stochastic Search I <i>Chair: Tuomas Sandholm</i> Tabu Search Techniques for Large High-School Timetabling Problems by <i>Andrea Schaerf</i> Tuning Local Search for Satisfiability Testing by <i>Andrew J. Parkes and Joachim P. Walser</i> Adding New Clauses for Faster Local Search by <i>Byungki Cha and Kazuo Iwama</i> Duplication of Coding Segments in Genetic Programming by <i>Thomas Haynes</i>
Room A106	Session 33: Agents 4: Negotiation & Coalition <i>Chair: Mike Williamson</i> Advantages of a Leveled Commitment Contracting Protocol by <i>Tuomas W. Sandholm and Victor R. Lesser</i> A Kernel-Oriented Model for Coalition-Formation in General Environments: Implementation and Results by <i>Onn Shehory and Sarit Kraus</i> Incorporating Opponent Models into Adversary Search by <i>David Carmel and Shaul Markovitch</i> Learning Other Agents' Preferences in Multiagent Negotiation by <i>H. H. Bui, D. Kieronska and S. Venkatesh</i>	Session 38: Planning 4: Constraint Methods & Search <i>Chair: Dan Roth</i> Is "Early Commitment" in Plan Generation Ever a Good Idea? by <i>David Joslin and Martha E. Pollack</i> Planning for Temporally Extended Goals by <i>Fahiem Bacchus and Froduald Kabanza</i> Finding Optimal Solutions to the Twenty-Four Puzzle by <i>Richard E. Korf and Larry A. Taylor</i> Linear Time Near-Optimal Planning in the Blocks World by <i>John Slaney and Sylvie Thiébaux</i>
Room B115–116	Session 32: Learning 6: Knowledge Bases <i>Chair: Raymond Mooney</i> Discovering Robust Knowledge from Dynamic Closed-World Data by <i>Chun-Nan Hsu and Craig A. Knoblock</i> Post-Analysis of Learned Rules by <i>Bing Liu and Wynne Hsu</i> KI: A Tool For Knowledge Integration by <i>Kenneth S. Murray</i>	Session 37: Learning 7: Enhancing Efficiency <i>Chair: Raymond Mooney</i> Formalizing Dependency Directed Backtracking and Explanation Based Learning in Refinement Search by <i>Subbarao Kambhampati</i> Learning Efficient Rules by Maintaining the Explanation Structure by <i>Ji-hie Kim and Paul S. Rosenbloom</i> Compilation of Non-Contemporaneous Constraints by <i>Robert E. Wray III, John E. Laird and Randolph M. Jones</i>
Room C123	Session 34: Knowledge Representation 4: Knowledge Bases & Context <i>Chair: Feng Zhao</i> Contextual Reasoning Is NP-Complete by <i>Fabio Massacci</i> Scaling up Logic-Based Truth Maintenance Systems via Fact Garbage Collection by <i>John O. Everett and Kenneth D. Forbus</i> Utilizing Knowledge Base Semantics in Graph-Based Algorithms by <i>Adnan Darwiche</i> Quantificational Logic of Context by <i>Sasa Buvac</i>	Session 39: Model-Based Reasoning 2: Qualitative Physics <i>Chair: Pandurang Nayak</i> Building Steady-State Simulators via Hierarchical Feedback Decomposition by <i>Nicolas F. Rouquette</i> Managing Occurrence Branching in Qualitative Simulation by <i>Lance Tokuda</i> A Formal Hybrid Modeling Scheme for Handling Discontinuities in Physical System Models by <i>Pieter J. Mosterman and Gautam Biswas</i> Trajectory Constraints in Qualitative Simulation by <i>Giorgio Brajnik and Daniel J. Clancy</i>
Room C124	Session 35: Mobile Robots 2 <i>Chair: Leslie Kaelbling</i> Video: Recognizing and Interpreting Gestures on a Mobile Robot by <i>David Kortenkamp, Eric Huber, and R. Peter Bonasso</i> Navigation for Everyday Life by <i>Daniel D. Fu, Kristian J. Hammond and Michael J. Swain</i> Robot Navigation Using Image Sequences by <i>Christopher Rasmussen and Greg D. Hager</i> Integrating Grid-Based and Topological Maps for Mobile Robot Navigation by <i>Sebastian Thrun and Arno Bücken</i>	Session 40: Information Retrieval & Natural Language Processing <i>Chair: Ellen Riloff</i> Significant Lexical Relationships by <i>Ted Pedersen, Mehmet Kayaalp and Rebecca Bruce</i> Learning Word Meanings by Instruction by <i>Kevin Knight</i> Machine Learning of User Profiles: Representational Issues by <i>Eric Bloedorn, Inderjeet Mani and T. Richard MacMillan</i> Interactive Information Retrieval Systems with Minimalist Representation by <i>Eric Domeshek, Smadar Kedar and Andrew Gordon</i>

10:10 – 10:30 Coffee Break

Thursday, August 8

1:30 PM – 3:10 PM

Invited Talk

Robots with AI: A Retrospective on the AAAI Robot Competitions and Exhibitions by *R. Peter Bonasso, NASA Johnson Space Center and Thomas L. Dean, Brown University*

Introduction by Michael Swain

Invited Talk

“No Hands Across America”— A Chronicle of Recent Progress in Intelligent Vehicles by *Dean Pomerleau, Carnegie Mellon University*

Introduction by Michael Swain

Session 41: Constraint Satisfaction 9: Stochastic Search II

Chair: Bart Selman

A Graph-Based Method for Improving GSAT by *Kalev Kask and Rina Dechter*

Weighting for Godot: Learning Heuristics for GSAT by *Jeremy Frank*

Constraint Satisfaction Using a Hybrid Evolutionary Hill-Climbing Algorithm that Performs Opportunistic Arc and Path Revision by *James Bowen and Gerry Dozier*

Combining Local Search and Backtracking Techniques for Constraint Satisfaction by *Jian Zhang and Hantao Zhang*

Session 44: Knowledge Representation 5: Description Logics & Probabilistic Reasoning

Chair: Eric Horvitz

The Limits on Combining Recursive Horn Rules with Description Logics by *Alon Y. Levy and Marie-Christine Rousset*

Verification of Knowledge Bases Based on Containment Checking by *Alon Y. Levy and Marie-Christine Rousset*

Closed Terminologies in Description Logics by *Robert A. Weida*

Irrelevance and Conditioning in First-Order Probabilistic Logic by *Daphne Koller and Joseph Y. Halpern*

Session 42: Learning 8: Fundamental Issues

Chair: Leslie Kaelbling

Sequential Inductive Learning by *Jonathan Gratch*

Learning to Take Actions by *Roni Khardon*

Testing the Robustness of the Genetic Algorithm on the Floating Building Block Representation by *Robert K. Lindsay and Annie S. Wu*

Session 43: Agents 5: Multi-Agent Learning

Chair: Jude Shavlik

Tracking Dynamic Team Activity by *Milind Tambe*

Learning Models of Intelligent Agents by *David Carmel and Shaul Markovitch*

Scaling Up: Distributed Machine Learning with Cooperation by *Foster John Provost and Daniel N. Hennessy*

Cooperative Learning over Composite Search Spaces: Experiences with a Multi-Agent Design System by *M V Nagendra Prasad, Susan E. Lander, and Victor R. Lesser*

Session 45: Education

Chair: Beverly Woolf

Video: A Simulation-Based Tutor that Reasons about Multiple Agents by *Christopher Rhodes Eliot III and Beverly Park Woolf*

A Novel Application of Theory Refinement to Student Modeling by *Paul T. Baffes and Raymond J. Mooney*

Dynamically Sequencing an Animated Pedagogical Agent by *Brian A. Stone and James C. Lester*

Scaling Up Explanation Generation: Large-Scale Knowledge Bases and Empirical Studies by *James C. Lester and Bruce W. Porter*

3:30 PM – 5:10 PM

Invited Talk

Experimental Analysis of Algorithms: The Good, the Bad, and the Ugly by *David S. Johnson, AT&T Research*

Introduction by Bart Selman

(Talk ends at 4:40 PM)

Session 46: Rule-Based Reasoning & Connectionism

Chair: Sebastian Thrun

Production Systems Need Negation as Failure by *Phan Minh Dung and Paolo Mancarella*

Using Constraints to Model Disjunctions in Rule-Based Reasoning by *Bing Liu and Joxan Jaffar*

A Connectionist Framework for Reasoning: Reasoning with Examples by *Dan Roth*

Session 49: Model-Based Reasoning 3: Spatial & Functional Reasoning

Chair: James McDowell

Generating Multiple New Designs from a Sketch by *Thomas F. Stahovich, Randall Davis and Howard Shrobe*

A Qualitative Model of Physical Fields by *Monika Lundell*

Diagrammatic Reasoning and Cases by *Michael Anderson and Robert McCartney*

Augmenting the Diagnostic Power of Flow-Based Approaches to Functional Reasoning by *Luca Chittaro and Roberto Ranon*

Session 47: Learning 9: Inductive Learning

Chair: Tom Dietterich

Generation of Attributes for Learning Algorithms by *Yuh-Jyh Hu and Dennis Kibler*

Structural Regression Trees by *Stefan Kramer*

Identifying and Eliminating Mislabeled Training Instances by *Carla E. Brodley and Mark A. Friedl*

Session 50: Perception 2

Chair: Michael Swain

Motion and Color Analysis for Animat Perception by *Tamer F. Rabie and Demetri Terzopoulos*

Interfacing Sound Stream Segregation to Automatic Speech Recognition — Preliminary Results on Listening to Several Sounds Simultaneously by *Hiroshi G. Okuno, Tomohiro Nakatani and Takeshi Kawabata*

Noise and the Common Sense Informatic Situation for a Mobile Robot by *Murray Shanahan*

Session 48: Knowledge Representation 6: Reasoning about Action

Chair: Mark Peot

Reasoning about Nondeterministic and Concurrent Actions: A Process Algebra Approach by *Guiseppe De Giacomo and Xiao Jun Chen*

On the Range of Applicability of Baker's Approach to the Frame Problem by *G. Neelakantan Kartha*

Formalizing Narratives Using Nested Circumscription by *Chitta Baral, Alfredo Gabaldon, and Alessandro Provetti*

Embracing Causality in Specifying the Indeterminate Effects of Actions by *Fangzhen Lin*

Exhibit Program

AAAI-96 Exhibition

The AAAI-96 Exhibition will be held in Exhibit Hall B, Oregon Convention Center, Tuesday, August 6 through Thursday, August 8. Admittance is restricted to badged conference attendees. Vendor-issued guest passes must be redeemed at the Guest Pass Desk, Concourse A, main level, Oregon Convention Center. Further information regarding access to the Exhibition can be obtained from the Exhibitor Registration Desk, Concourse A.

Exhibit Hours:

Tuesday, August 6	12:00 AM–5:00 PM
Wednesday, August 7	10:00 AM–5:00 PM
Thursday, August 8	10:00 AM–5:00 PM

Exhibitors

102	AAAI Press
110	Academia Book Exhibits
305	ACM SIGART
112	AK Peters Ltd.
306	ANGOSS Software International Ltd.
210	Attar Software USA
113	Elsevier Science Publishers
302	Franz, Inc.
202	Harlequin, Inc.
303	Intelligent Automation Inc.
311	ISoft SA
108	Kluwer Academic Publishers
103	Lawrence Erlbaum Associates
102	The MIT Press
107	Morgan Kaufmann Publishers, Inc.
212	Nomadic Technologies
204	Northwest AI Forum
206	PC AI Magazine
105	Prentice Hall
313	Real World Interface/ ActivMedia, Inc.
111	Springer-Verlag New York, Inc.
402	Talarian Corporation
205	Triodyne Inc.
203	WizSoft

A map of the exhibits appears at the end of General Information.

Booth #102

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Online Catalog: <http://www.aaai.org/Publications/Press/Catalog/bookcatalog.html>

Booth #110

Academia Book Exhibits

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Academia arranges combined book and journal displays at scientific meetings and congresses. Please stop by our booth to see titles from Cambridge University Press, Plenum Publishing, and Taylor & Francis.

Booth #305

ACM SIGART

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<http://sigart.acm.org>

ACM SIGART is the Association for Computing Machinery's Special Interest Group on Artificial Intelligence. We publish the *SIGART Bulletin*, and operate the most active AI web page, with up to date conference and other AI information. SIGART is also cosponsoring the Doctoral Consortium at AAAI this year.

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We continue to build upon our tradition of excellence in sci-tech publishing, rapidly expanding into the realm of robotics and AI. Come see the antics of muscle-wire driven robots, ultra-small machines, and "Rug Warrior" created from the Mobile Robot Kit which is designed to complement the book *Mobile Robots: Inspiration to Implementation* by Jones and Flynn. Also featured will be the critically acclaimed *Sensors for Mobile Robots* by H. R. Everett. *Algorithmic Foundations of Robotics* by Goldberg et al., and *Navigating Mobile Robots* by Borenstein et al.

Booth #306

ANGOSS Software International

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Exhibit Program

Exhibit Program

brought together some of the world's leading experts in contemporary artificial intelligence. This group covers the fields of intelligent agent technology, modern decision theory, operational research, learning, and Bayesian inferring technology. A wide range of consulting services are offered to solve complex problems.

Booth #303

Intelligent Automation Inc. (IAI)

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IAI is a woman-owned, small business providing consulting/contracting R&D services and products for AI applications such as planning, scheduling, manufacturing, robot/realtime control, electromechanical devices, hybrid circuit fault diagnosis, and education software, utilizing autonomous agents, expert systems, neural nets, fuzzy logic, and custom designed hardware. IAI's products include: Cybelle, a high-performance agent infrastructure for rapid distributed system development; Rotoscan, a ballistic analysis system in use by the FBI; ASAT, an automated qualitative tool for administering/scoring psychological interviews; MIDIS, a concurrent engineering tool for designing testable/diagnosable electronic circuits; Inchworm-II, an ultrahigh precision linear actuator; RPMS, for 3D real-time human and robot motion tracking/measurement; MDSP-200, a 1Gflop DSP system for adaptive/neural network control; QCB, a data acquisition component to RS232 links.

Booth #311

ISoft SA

Chemin de Moulon
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Booth #108

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The MIT Press publishes books on computer science, artificial intelligence, and cognitive science. New titles include: *Models of My Life* and *Sciences of the Artificial, 3rd Edition* both by Herbert A. Simon; *Nonmonotonic Reasoning* by Grigoris Antoniou; and from AAAI Press, *Advances In Knowledge Discovery and Data Mining* edited by Fayyad, Piatetsky-Shapiro, Smyth, and Uthurusamy, and *Case-Based Reasoning: Experiences, Lessons, & Future Directions*, edited by David B. Leake.

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Booth #212

Nomadic Technologies

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Mountain View, CA 94943-1605
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Booth 204

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Booth #206

PC AI Magazine

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PC AI Magazine provides the information necessary to help managers, programmers, executives, and other professionals understand the quickly unfolding realm of artificial intelligence (AI) and intelligent applications (IA). *PC AI* addresses the entire range of personal computers including the Mac, IBM PC, NeXT, Apollo, and more. *PC AI* is an application-oriented magazine designed to give readers useful "hands-on" information. *PC AI* features developments in expert systems, neural networks, object oriented development, and all other areas of artificial intelligence. Feature articles, product reviews, real-world application stories, and a buyer's guide present a wide range of topics in each issue.

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Prentice Hall is the leading publisher of computer science textbooks in the world. We publish best-selling texts in courses ranging from artificial intelligence to x-windows systems. We are proud to serve the artificial intelligence community with our most current publications – Russell/Norvig, *Artificial Intelligence: A Modern Approach* (1995) and Graham, *ANSI Common Lisp* (1996). All current users of Russell/Norvig are invited to join us for a roundtable discussion of the proposed second

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edition of the text. Please stop by the Prentice Hall booth for information on day and time.

Booth #313

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Booth #203

WizSoft

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Fax: 011-972-3-5611945
USA Office:
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Robot Competition & Exhibition

Fifth Annual AAAI Robot Competition and Exhibition

The Robot Competition and Exhibition will be held in Exhibit Hall B, Oregon Convention Center, and will be open to registered conference attendees on:

Tuesday, August 6 12:00 AM–5:00 PM

Wednesday, August 7 10:00 AM–5:00 PM

Admittance is through the main exhibition in Exhibit Hall B.

Contest Rules

Following in a long tradition of mobile robot competitions, this year's competition will provide conference attendees with a first hand look at progress in the fields of artificial intelligence and robotics. The competition will consist of two events, one focusing on office navigation and the other on perception and manipulation. There will also be an exhibition in which robots will display skills that are not highlighted in the competition events.

Event 1: Call a Meeting

Wonderful news, the research grant has been approved! The Director would like to schedule a meeting with Professor G. and Professor S. Please check which conference room is free and inform the three of us: (1) which room is free, and (2) at what time the meeting will start. Please schedule the meeting for as soon as possible.

The robot's first task is to go from the start room (the Director's office) to one of the two conference rooms and detect whether the room is occupied or not. If it is occupied, the robot should check to see if the second conference room is available. If the second conference room is also occupied, schedule the meeting in the Director's office.

The robot must inform each of the Professors and the Director which room the meeting will take place in, and at what time. The best meeting start time is 1 minute after the last person has been informed about the meeting. This requires the robot to predict, as accurately as possible, at what time it will be able to arrive at the third person's office to inform them.

Specifics

This event will take place within an office-buildinglike environment. The layout will be similar to a real office environment with straight hallways, rooms at semi-regular intervals, and realistic obstacles including real furniture, trash cans, etc. Doorways will be the size of a typical office door, approximately 110 cm, although there will not actually be doors. Hallways will be the size of typical hallways (approximately 150 cm wide). The total extent of the environment will be between 15m and 20m on a side.

The robot will start in a specific room, which will have only one exit. The robots will be given a topological map indicating the hallways and offices. The map will also include approximate distance information. (We will try to be reasonably accurate, probably within a foot, 30 cm, or so). The Director's office (start room), the two conference rooms and the two professor's offices will be marked on the map. We will distribute a sample map in advance, which will be roughly equivalent to the actual arena. The official competition map will not be distributed until the robots arrive at Portland.

For this event robots must determine if the conference rooms are empty or full. Teams are encouraged to be innovative in this area. Voice recognition, motion detection (take into account the presence of an audience outside of the arena), covering a camera with your hand, etc. are all acceptable. The more natural the means of detection the more points the robot will be awarded for this aspect of the competition. Virtual detection (i.e., someone telling the robot via it's keyboard the status of the room) will be allowed, but will not receive any points.

There will also be people moving about the hallways. These people will not harass the robot in any way. They will simply either: 1) walk past the robot; or 2) stand stationary in the hallway. They will not block hallways completely. They may block doorways (not to the goal rooms, however).

Scoring

Robots will get points for achieving each part of the task (e.g., leaving the first office, navigating to the first conference room, navigating to the second conference room, navigating to each professor's office, and then back to the director). Robots will get points for detecting empty or occupied conference rooms. Robots will also get bonus points based on their time to completion relative to the other robots.

Robot Competition & Exhibition

Robots that effectively communicate with the audience (using voice or other) will receive bonus points.

Robots will be penalized points for several things. Collisions with walls, furniture or people. Marking the environment with tags on doorways (1 pt for each tag, 2 points for reflective markers). Robots will also be penalized for incorrectly estimating their finish time or for taking a route that is not the shortest route.

If a robot becomes lost, teams can elect to communicate to the robot its position and orientation at a penalty. If a robot becomes lost and asks for help, teams can communicate with it at a lesser penalty than if they initiate the communication. All restarts will continue from where the robot stopped.

Event 2: Clean up the Tennis Court

The robot will be placed in a closed room. In the room with the robot will be a small number of tennis balls and one powered "Squiggle" ball that will be moving around. In one corner of the room will be a pen with two gates. Inside the pen will be another powered "Squiggle" ball. The object is to place all of the tennis balls and the moving ball into the pen.

Specifics

Dimensions of the room and location of the pen will be given to the contestants well ahead of time. Teams will be allowed to design their own gate for the pen. This can be a simple gate that swings inward when pushed, an electronically controlled gate with a radio transmitter on the robot, or teams can elect not to have a gate at all (with the risk that the second Squiggle ball will escape). Please discuss the workings of your gate with the judges ahead of time. Teams can supply their own tennis balls of any color they choose, as long as those balls are used unaltered. Using altered tennis balls will result in a penalty. Teams can also use their own Squiggle ball and can passively (i.e., nothing reflective or emitting) mark it in any way they choose.

Scoring

Points will be awarded for the number of tennis balls that remain in the pen at the end of the time limit. A much larger number of points will be given for the number of squiggle balls in the pen at the end of the game. Partial points will be given for capturing a Squiggle ball (only the first time). Judges will also award

points for robots that clearly demonstrate that they are tracking the squiggle ball and for robots that clearly and intentionally touch the squiggle ball (again, only once). Teams can mark the pen gates at no penalty. Teams that elect not to have a gate can mark a spot next to the gate at no penalty. Teams can use their own tennis balls as long as they are used unaltered. Teams can mark their tennis balls at a penalty.

Robot Exhibition

The robot exhibition this year will focus on robots interacting with the general conference audience outside of the arena and in an unconstrained manner. This may be as simple as allowing the robot to wander (supervised) around the lobby of the convention center and avoid collisions with attendees. Other robots may wish to distribute some literature or approach people and begin talking. The idea is to get the robots outside of the arena and in amongst people to show that they are safe, robust and autonomous. A special prize will be awarded to the robot that demonstrates the most interesting, unconstrained interaction with conference attendees outside of the arena.

Schedule

In order to complete all robot events, some preliminaries are held prior to the opening of the exhibit.

Tuesday, August 6

12:00–1:00 PM	Exhibition 1
1:00–5:00 PM	Event 2: Preliminaries 2

Wednesday, August 7

10:00 AM–12:00 PM	Event 1: Finals
12:00–1:00 PM	Exhibition 2
1:00–3:00 PM	Event 2: Finals
3:00–4:00 PM	Exhibition 3
4:00–5:00 PM	Awards/Robot parade

Thursday, August 8, 1996

10:30 AM–12:30 PM	Robot Forum
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(Room A 107–108, Robot Competition participants only)

Robot Competition Judges

David Kortenkamp, *NASA Johnson Space Center*
David Hinkle, *Lockheed AI Center*
Illah Nourbakhsh, *Stanford University*

Robot Teams

Many robot teams submitted abstracts for inclusion in the AAAI-96 Proceedings. Additional abstracts are included below.

Angelus Research Corporation

Robots: Advanced Whiskers/The Navigator & MR-1

Team Leader: Don Golding

Team Members: George Ronnquist and Jesse Jackson

Advanced Whiskers/The Navigator has two networked intelligent computers: the base computer performs real-time collision avoidance while the head processor performs the navigation function. The operating system and software was designed by Angelus Research Corporation. It uses a unique three level architecture based on the human brain. The base has four independent optical sensors, two whiskers (tactile), and independent motor load monitoring. The head has a single long range sonar developed by the company. It also includes three optical sensor arrays in the collar and a single optical sensor in the movable head. This is a product that can be purchased for less than \$2000.

The MR-1 research platform is a prototype of a new research robot designed for the robotics researcher community. It has two networked intelligent computers for collision avoidance and navigation. The MR-1 also has an onboard 486 66mhz PC compatible with 8 megs of ram and a 500 MB hard drive. The PC computer is mainly used for speech recognition and synthesis. In the future, it will be used for vision also.

Carnegie Mellon University

Robot: Amelia

Team Leader: Shyjan Mahamud

Team Members: Greg Armstrong, Richard Goodwin, Karen Haigh, Sven Koenig, Daniel Nikovski, Joseph O'Sullivan, Reid Simmons, and Sebastian Thrun

Colorado School of Mines

Robot: Clementine

Team Advisor: Robin Murphy

Team Members: Chris Colborn, Rob Deis, Russ Miller, Charlie Ozinga, and Tonya Reed

Dartmouth College

Robot: Serial Killer

Team Advisors: Daniela Rus and Keith Kotay

Team 1 Leader: Jonathan Howell

Team 1 Members: Artyom Lifshits, David Vil-larama, and David Zipkin

Serial Killer's hardware began as the A. K. Peters Rug Warrior kit. The team added a sonar transducer, an ultrasonic motion detector, and a stepper motor for aiming these additional sensors. The software is built around a worldview comprised of a matrix in SE(2). Odometry adjusts the worldview incrementally, and wheel controller software using feedback and feedforward parameter estimation enables the robot to pursue straight paths and make rolling turns. Other spatial sensors, such as sonar, infrared, and bump switches also make corrections to the worldview as they determine the robot's position in a symbolic map. Using sonar with odometry allows the robot to use wall-following to periodically correct systematic odometry error. Serial Killer uses a motion sensor to determine whether a room is empty or not.

Dartmouth College

Robot: eSPAM

Team Advisors: Daniela Rus and Keith Kotay

Team 2 Leader: Peter deSantis

Team 2 Members: Simon Holmes A. Court, Ed Fein, and Marjorie Lathrop

eSPAM is a modified version of the commercial Rug Warrior platform. Hardware modifications include improved odometry, additional IR sensors, a rotating sonar apparatus, basic speech processing, and an electronic compass. The robot navigates by using the feedback from the sonar unit, IR, and compass. The robot follows walls and detects doors using the sonar. The robot starts a dialogue to determine if a room is empty or not, using the speech functions.

Iowa State University

Robot: Cybot

Team Advisors: Vasant Honavar and Pat Patterson

Team Members: Chad Bouton, Richard Cockrum, Deven Hubbard, Brian Miller, Kelly Rowles, and Sophia Thrall

Cybot is a 6 ft. tall, 200 lb. autonomous mobile robot constructed at Iowa State University. In 1991, the design and construction was initiated by Chad Bouton, an undergraduate in Electrical Engineering, who coined "Cybot" after the Iowa State "Cyclones!" Features include:

Robot Competition & Exhibition

A 6 DOF manipulator, voice recognition, speech synthesis, sonar, infrared sensors, and a moving head. Electrical engineering and computer engineering/science students design, construct, and further develop Cybot's various systems and software. Also, AI routines are being developed that will allow Cybot to learn how to move its manipulator in linear patterns.

Kansas State University

Robot: Willie

Team Advisor: David A. Gustafson

Team 1 Leader: Tom Peterson

Team 1 Members: Mike Burgoon and John Pruner

Team 2 Leader: Brian Van Doren

Team 2 Members: Darrell Fossett and Michael Novak

Team 3 Leader: Pawel Osiczko

Team 3 Member: Todd Prater

The Software Control Laboratory in the Department of Computing and Information Sciences at Kansas State University, Manhattan, KS has two Nomad200 robots from Nomadic Technologies, Inc. These robots are used for an implementation project in a senior-level software engineering sequence. The students are divided into teams that are tasked with developing control software for tasks which are similar to the tasks required in the AAI Robot Competition.

The teams use standard software engineering practices to specify requirements, design and implement a solution. The students are encouraged to use techniques such as threads for multiprocessing and subsumption architecture for structuring. The teams also had the option of using vision as well as sonar and infrared for identification of features and obstacles. Three of eleven teams in the course were able to participate in the AAI Robot Competition.

McGill University Research Center

Team Advisor: Gregory Dudek

Team Members: Michael Daum and Nicholas Roy

McMaster University

Team Advisor: W.F.S. Poehlman

Team Leader: Andrew Dawes

Team Member: Mark Bentley

Newton Research Labs

Team Members: Bill Bailey, Jeremy Brown, Randy Sargent, Carl Witty, and Anne Wright

North Carolina State University

Robot: Lola

Team Advisor: Ren C. Luo

Team Leader: Ricardo Gutierrez

Team Members: Jason A. Janet and Daniel S. Schudel

Real World Interface, Inc

Team Member: Grinnell More

SRI International

Team Leader: Kurt Konolige

Team Members: Didier Guzzoni, Adam Cheyer, and Luc Julia

Stanford University

Robot: InductoBeast

Team Advisor: Illah R. Nourbakhsh

Team Members: Thomas Willeke and Clayton Kunz

InductoBeast is a robot capable of intelligent exploration and navigation in indoor environments with no a priori domain specific information or human guidance. InductoBeast also demonstrates inductive learning during its map-building process. The robot performs nonmonotonic inductive leaps, hypothesizing the existence of hallways based on knowledge of office building symmetry and alignment, and tests its hypotheses for validity.

The capabilities of InductoBeast will be demonstrated on the simulated office building for the first robot contest. This is a floorplan which InductoBeast did not see during development. Members of the audience will be invited to interact with InductoBeast during the demonstration.

University of Chicago

Robot: Chip

Team Leader: David Franklin

Team Member: Peter Prokopowicz

Chip is a robot testbed for our laboratory's animate agent architecture, a system designed to take advantage of task and environmental constraints and to be flexible enough to respond to changing situations and failed expectations. The architecture consists of reactive action packages (RAPs), reactive skills, and visual routines which, together, control Chip, a mobile robot with stereo cameras and a three degree of freedom arm with a gripper. Chip has been programmed to reliably accomplish a variety of tasks including the AAI "Clean up the office" task.

Robot Competition & Exhibition

University of Michigan

Team Member: Rich Simpson

University of Minnesota

Robot: Multiple mini-robots

Team Advisor: Maria Gini

Team Members: Dirk Edmonds, John Fischer, and Paul Rybski

University of New Mexico

Robot: LOBOTomous

Team Advisor: Greg Heileman

Team Leader: Ray Byrne

Team Members: Chaouki Abdallah, John Garcia, Dave Hickerson, Ales Hvezda, Dave Mattes, and Eddie Tunstel

The University of New Mexico's entry in this year's AAAI Mobile Robot competition is LOBOTomous. LOBOTomous was constructed from scratch by UNM engineering students in a senior level design class. Hardware for the project was loaned by Sandia National Laboratories.

The mobile base is driven by two DC gear motors, which are controlled by HCTL-1100 motion control chips. An STD-Bus 286 compatible computer is the main on-board computer system. A ring of ultrasonic sensors are used for obstacle detection and position estimation. Capacitive sensors are used for low-level collision avoidance. A spread spectrum RF-modem provides communications between the mobile robot and the base station. High level path planning is performed at the base station, while low level trajectory following calculations are executed on the robot. Voice generation and recognition are performed on board the robot with a dedicated PC-104 386-compatible computer.

University of Stuttgart

Robots: CoMRoS "Musketees"

Team Leader: Thomas Bräunl

Team Members: Martin Kalbacher, Paul Levi, and Günter Mamier

University of Texas at El Paso

Team Advisor: Chitta Baral

Team Leaders: David Morales and Tran Son

Team Members: Luis Floriano, Alfredo Gabaldon, Glen Hutton, Monica Nogueira, and Richard Watson

University of Utah

Robot: EGOR

Team Advisor and Leader: Tom Henderson

Team Members: Mohamed Dekhil, Alyosha Efras, Frans Groen, Peter Jensen, and Kem Mason

Logical behavior systems are used to define independent, elemental behaviors. A behavior is any process which maps information abstracted from (logical) sensors to state transitions which may be mapped onto (logical) actuators. A semantic network represents physical entities and relations are geometric. Behind each node is a logical sensor which embodies a recognition and/or pose recovery strategy for that object. A goal for the robot is defined by adding a node representing the robot itself and relations are added as requirements. The goal is satisfied by satisfy the asserted relations between the robot and other objects.

USC/Information Sciences Institute

Robot: YODA

Team Advisor and Leader: Wei-Min Shen

Team Members: Jafar Adibi, Bonghan Cho, Gal Kaminka, Jihie Kim, Behnam Salemi, and Sheila Tejada

Convention Center Map

