

# 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**

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## 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

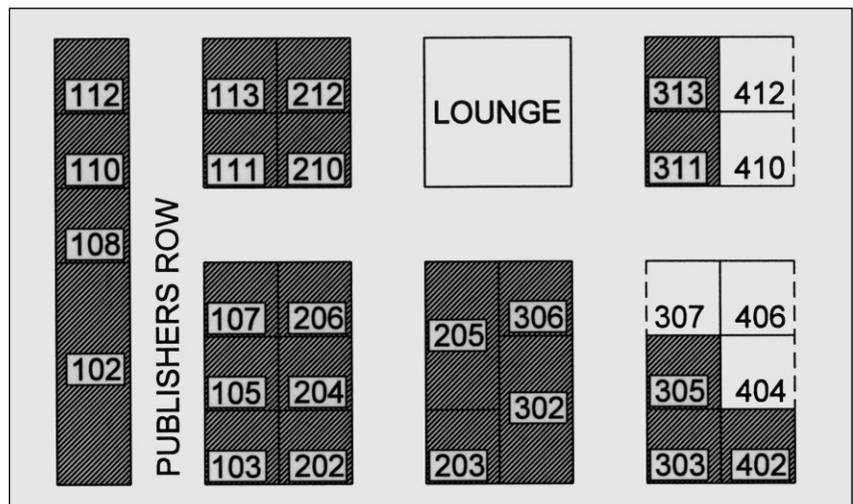
Volunteer Headquarters, located in Room C120 on the main level of Oregon Convention Center will be open from 8:00 AM–5:00 PM, Friday, August 2 through Thursday, August 8. All volunteers should plan to check in with the volunteer coordinator or his assistant prior to their shifts. The volunteer meeting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

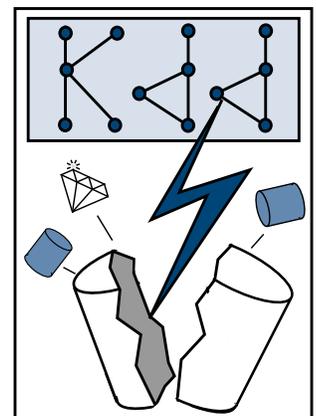
Mining Entity-Identification Rules for Database Integration

*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

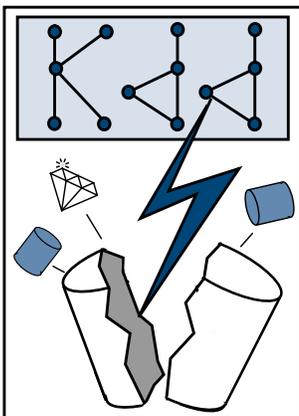
Room A105-106, Oregon Convention Center

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*

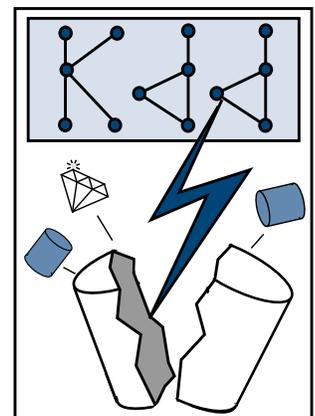
Evaluating the Interestingness of Characteristic Rules  
*Micheline Kamber, Simon Fraser University and Rajjan Shinghal, Concordia University, Canada*

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

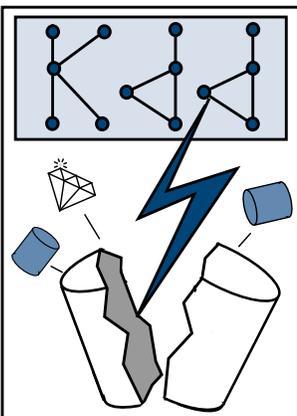
*Rakesh Agrawal, Manish Mehta, John Shafer, and Ramakrishnan Srikant, IBM Almaden Research Center; Andreas Arning and Toni Bollinger, IBM German Software Development Laboratory, Germany*

### 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

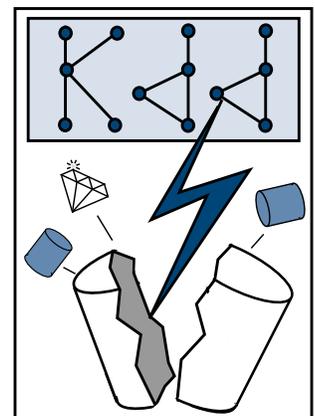
*Ronen Feldman, Bar-Ilan University, Israel and Haym Hirsh, Rutgers University*

#### 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)

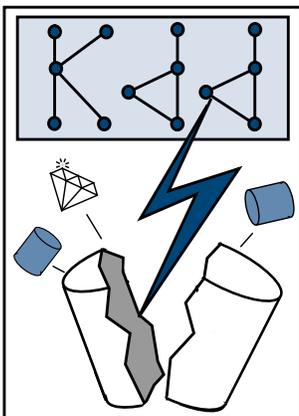
A Genetic Algorithm-Based Approach to Data Mining  
*Ian W. Flockhart, Quadstone Ltd. and Nicholas J. Radcliffe, Quadstone Ltd. and University of Edinburgh, United Kingdom*

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

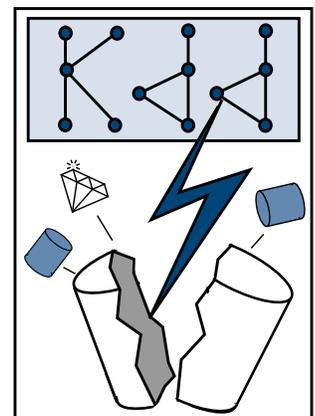
*Usama Fayyad, Microsoft Research; David Haussler, University of California, Santa Cruz; and Paul Stolorz, Jet Propulsion Laboratory, California Institute of Technology*

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

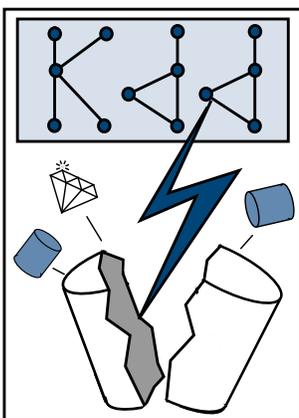
Room B113-116, Oregon Convention Center

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. Pfitzner, 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

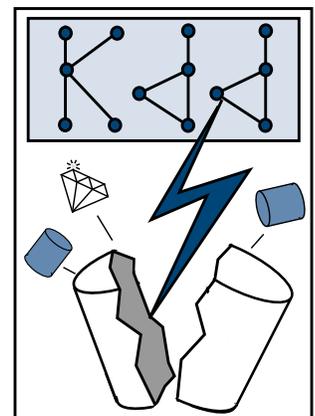
8:30 – 11:35 PM

## 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.

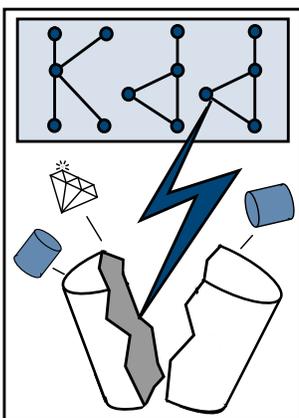
8:30 – 8:40 AM

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



# KDD Conference

8:40 – 10:00 AM	<b>Session 11: Learning, Probability, and Graphical Models I</b> 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	<b>Session 12: Learning, Probability, and Graphical Models II</b> 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— <i>(May overlap with Summary Panel Session)</i>
12:30 – 1:20 PM	<b>Summary Panel and Closing Remarks: “What Have We Discovered?”</b>
1:20 – 2:00 PM	<b>KDD Wrap-up Business Meeting</b>
2:00 PM	<b>Conference Adjourns</b>



## 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

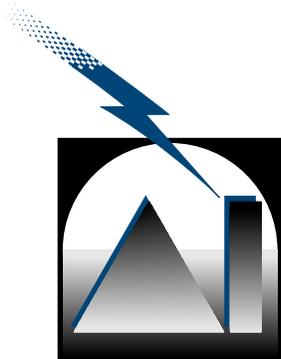
# IAAI Conference

## 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

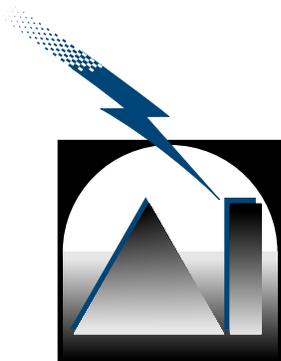
3:30–4:20 PM AI: What Works, and What Doesn't?  
*Frederick Hayes-Roth, Teknowledge*

## 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*

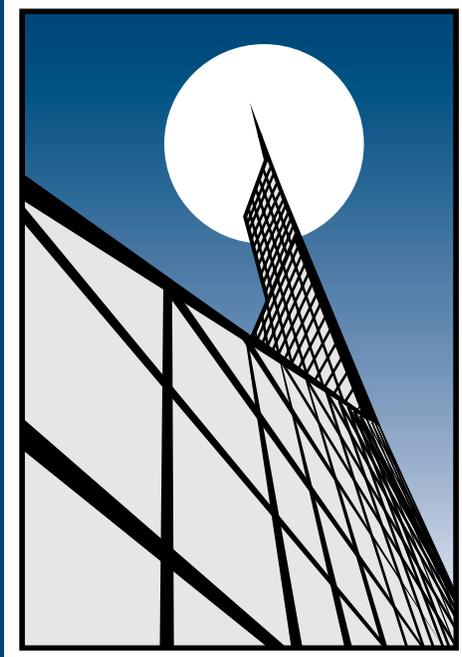
**Session 3: Planning 1: The Environment**  
*Chair: Leslie Kaelbling*  
Generalizing Indexical-Functional Reference by *Marcel Schoppers and Richard Shu*  
A Bias towards Relevance: Recognizing Plans where Goal Minimization Fails by *Abigail S. Gertner and Bonnie L. Webber*  
Opportunity Recognition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

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

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

Booth #102

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Booth #110

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Booth #305

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Booth #112

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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

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ALICE d'ISoft is a powerful and user-friendly decision tree based data mining tool that provides mainstream business users with easy access to critical information stored in

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Fax: (617) 253-1709  
Email: mitpress-ordering@mit.edu

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.

Booth #107

### Morgan Kaufmann Publishers, Inc.

340 Pine Street, Sixth Floor  
San Francisco, CA 94104-3205  
Tel: (415) 392-2665  
Fax: (415) 982-2665  
Email: mkp@mkp.com

Visit our booth for essential artificial intelligence references and 15% discount! This year we feature *Elements of Machine Learning* by Pat Langley; *Introduction to Knowledge Systems*, by Mark Stefik; *Journal of Artificial Research*, edited by Steven Minton; and new proceedings from the 1996 Image Understanding, Message Understanding and Uncertainty in Artificial Intelligence conferences. Recent proceedings from the International Joint Conference on Artificial Intelligence and the International Conference on Genetic Algorithms will also be on display, along with latest *Foundations of Genetic Algorithms*, edited by L. Darrell Whitley and Michael D. Vose. Back issues of most proceedings are available.

Booth #212

### Nomadic Technologies

2133 Leghorn Street  
Mountain View, CA 94943-1605  
Tel: (415) 988-7200  
Fax: (415) 988-7201  
Email: nomad@robots.com  
<http://www.robots.com>

Nomadic Technologies designs, develops and manufactures mobile robot products. Its products include the industry standard Nomad 200 and its family of related products: mobile manipulators, sensors, controllers, wireless communications, and software development environments. Nomadic will also be showing its

next generation robot concept the Nomad S8. It employs unparalleled advances in mobility, sensing, and multiprocessor networks. Nomadic Technologies products provide comprehensive solutions to your robotics needs. These products combined with excellent customer service have made the Nomad family of products the most popular in the world. Visit our booth to get the "Big Picture."

Booth 204

### Northwest AI Forum

Post Office Box 181  
Bellevue, OR 98009-0181  
Tel: (206) 820-4051  
<http://www.halcyon.com/popper/naif.htm>

Booth #206

### PC AI Magazine

Post Office Box 30130  
Phoenix, AZ 85023-0130  
Tel: (602) 971-1869  
Fax: (602) 971-2321  
Email: info@pcai.com  
<http://www.pcai.com/pcai/>

*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.

Booth #105

### Prentice Hall

One Lake Street  
Upper Saddle River, NJ 07458  
Tel: (201) 236-7283  
Fax: (201) 236-7210

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

# Exhibit Program

# Exhibit Program

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

Booth #313

## **Real World Interface/ActivMedia, Inc.**

32 Fitzgerald Drive  
Post Office Box 375  
Jaffrey, NH 03452  
Tel: (603) 532-6900  
Toll Free: (800) 639-9481  
Fax: (603) 532-6900

We have been a leader in mobile robotic platforms for over 10 years. This year, we're taking the initiative in robotics software and applications. Visit us and see what's new in our B14, B21 and Pioneer mobile systems and how you might become a part of our advanced robotics applications initiative (ARIA). For instance, see how we've expanded our low-priced, high-performance, SRI Saphira™-driven Pioneer with Newton Labs' Fast Track Vision System™. Rod Brooks' MARS/L™ system for Pioneer is another example, as is Bonn University's Rhino Commander™ for the B21. There's lots more, too. Let us discover how our mobile platforms and RAI software can become the foundation of your advanced robotics applications.

Booth #111

## **Springer-Verlag New York, Inc.**

175 Fifth Avenue  
New York, NY 10010  
Tel: (212) 460-1500  
Toll Free: (800) SPRINGER  
Fax: (212) 473-6272

Springer-Verlag is a world-renowned international scientific publisher of books and journals. Our publications in computer science cover technical books intended for the working professional, textbooks for undergraduate and graduate students, and lecture note volumes and monographs for researchers. We continue our tradition of excellence in AI with a new edition of the *Artificial Intelligence Handbook* and Mark Watson's *Programming in Scheme* with applications from AI. Stop by this year and take advantage of our 20% discount.

Booth #402

## **Talarian Corporation**

444 Castro Street, Suite 140  
Mountain View, CA 94041  
Tel: (415) 965-8050  
Fax: (415) 965-9077  
Email: info@talarian.com  
<http://www.talarian.com>

The RTie expert system builder and inference engine enables developers to effectively represent knowledge and execute decisions quickly

and reliably. RTie offers the productivity of rule based systems and the performance necessary to meet the requirements of time-critical applications. Its unique ability to process thousands of rules per second allows RTie to analyze data from multiple data sources and make lightning-quick decisions. This process is further enhanced by the ability to perform temporal reasoning. Other features include a motif-based graphical environment to easily construct a knowledge-base, debugging and graphical browsers, and a robust and extensible API.

Booth #205

## **Triodyne, Inc.**

5950 W. Touhy  
Niles, Illinois 60714  
Tel: (847) 677-4730  
Fax: (847) 647-2047

The US Department of Energy's (DOE) Office of Science and Technology (OST) is responsible for managing a national program of research, development, demonstration, testing and evaluation for environmental clean-up, waste management and related technologies. Often, new technology presents the best hope for reduction in risk to the environment and improved public-worker safety.

Booth #203

## **WizSoft**

3 Beit Hillel Street  
Tel Aviv 67017 ISRAEL  
Tel: 011-972-3-5631919  
Fax: 011-972-3-5611945  
*USA Office:*  
6800 Jericho Turnpike, Suite 120W  
Jericho, NY 11791  
Tel: (516) 393-5841

WizWhy presents an innovative approach in the fields of data mining and machine learning. WizWhy reads the database and within an astoundingly short time reveals all the if-then rules and the mathematical formulas that relate to the dependent variable. When the data of new cases is entered, WizWhy applies the discovered rules and predicts the values of the dependent variable for the new cases. In practical terms, WizWhy was found to be faster and more accurate than both neural networks and decision trees. A working demonstration diskette will be available at the WizSoft booth No. 203.

# 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 Vilarama, 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

