

**31st  
Annual Meeting  
of the  
Association for  
Computational Linguistics**

**Proceedings of the Conference**

**22-26 June 1993  
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## PREFACE

This volume contains the papers prepared for the 31st Annual Meeting of the Association for Computational Linguistics, held 22-26 June 1993 at The Ohio State University in Columbus, Ohio. The cluster of papers in the final section stems from the student session, featured at the meeting for the 3rd successive year and testifying to the vigor of this emerging tradition.

The number and quality of submitted papers was again gratifying, and all authors deserve our collective plaudits for the efforts they invested despite the well-known risks of submitting to a highly selective conference. It was their efforts that once again ensured a Meeting (and Proceedings) reflecting the highest standards in computational linguistics, offering a tour of some of the most significant recent advances and most lively research frontiers.

Special thanks go to our invited speakers, Wolfgang Wahlster, Geoff Nunberg and Barbara Partee, for contributing their insights and panache to the conference; to Philip Cohen for concocting and coordinating a varied and relevant tutorial program, and to Helen Gigley, Steve Small, Alexis Manaster Ramer, Wlodek Zadrozny, Kent Wittenburg, David D. Lewis, and Elizabeth D. Liddy for offering the tutorials; to Linda Suri and Sandra Carberry for very effectively co-organizing the program for the student sessions (see the separate preface for the student session papers); to Terry Patten for directing local arrangements, and to Robert Kasper for helping with local arrangements and coordinating exhibits and demonstrations.

In an effort to increase the fairness of reviewing, we opted for "blind" reviewing this year. Also, to reduce the load upon program committee members to a more humanly manageable level, to curtail frantic last-minute searches for specialist reviewers, and to allow more methodical, uniform, interactive reviewing of submissions, the size of the program committee was expanded this year to include 22 members besides the chair. The load was still heavy, but the committee members performed their duties in an exemplary fashion; in the five-week reviewing period which culminated in the one-day program committee meeting, they spared no efforts to arrive at detailed, accurate and principled assessments, and at the best possible program for the Meeting. Their heroic service is hereby acknowledged:

Robert Carpenter, *Carnegie Mellon University*; Garrison Cottrell, *University of California at San Diego*; Robert Dale, *University of Edinburgh*; Bonnie Dorr, *University of Maryland*; Julia Hirschberg, *AT&T Bell Labs*; Paul Jacobs, *General Electric Corporate R&D*; Robert Kasper, *Ohio State U*; Slava Katz, *IBM TJ Watson Research Center*; Judith Klavans, *Columbia U*; Bernard Lang, *INRIA*; Diane Litman, *AT&T Bell Laboratories*; Mitch Marcus, *University of Pennsylvania*; Kathleen McCoy, *University of Delaware*; Marc Moens, *University of Edinburgh*; Johanna Moore, *University of Pittsburgh*; John Nerbonne, *German Research Center for AI*; James Pustejovsky, *Brandeis University*; Uwe Reyle, *University of Stuttgart*; Richard Sproat, *AT&T Bell Laboratories*; Jun-ichi Tsujii, *University of Manchester Institute of Science and Technology*; Gregory Ward, *Northwestern University*; Janyce Wiebe, *New Mexico State University*.

At this point it is also appropriate for me to convey my appreciation and gratitude to Peggy Meeker, who handled the flood of regular and email correspondence, the massive record-keeping and accounting, and the arrangement of meetings in connection with the activities of the program committee. She helped expertly and unstintingly, despite all her other duties, and usually had things done by the time I thought of doing them. Many thanks also to the Computer Science Department at Rochester for accommodating the extra load created by the reviewing and program planning process.

Throughout the entire planning for the meeting, starting well before the formation of the program committee, the ACL executive provided continuous and invaluable help in the committee search and on many matters of policy and logistics. If the meeting was a success, it was very much through their guidance. One of the mainstays of that committee is, of course, Don Walker. I now know that the effusive tributes I had noticed in previous Proceedings to Don's manifold and essential role are more than deserved. He is indeed the cohesive force, the publicist, the keeper and provider of records, traditions and standards for ACL, and most of all an ever-ready, ever-effective helper and advisor. My heartfelt thanks to him as well as to Betty Walker who as ever put her shoulder to the wheel alongside his.

Lenhart Schubert, *University of Rochester*  
Chair, Program Committee

## **SPECIALIST REVIEWERS**

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Clare Voss, *University of Maryland*  
Amy Weinberg, *University of Maryland*

# CONFERENCE PROGRAM

## TUESDAY, 22 JUNE – FAWCETT CENTER

### 2:00–5:30 TUTORIAL SESSIONS

*Brain and Language*

Helen Gigley and Steve Small

*Mathematics of Language: How to Measure the Complexity of Natural Languages*

Alexis Manaster Ramer and Wlodek Zadrozny

## WEDNESDAY, 23 JUNE – FAWCETT CENTER

### 9:00–12:30 TUTORIAL SESSIONS

*Multimedia and Multimodal Parsing*

Kent Wittenburg

*Natural Language Processing and Information Retrieval*

David D. Lewis and Elizabeth D. Liddy

## WEDNESDAY, 23 JUNE – FAWCETT AUDITORIUM

### 1:30–1:45 OPENING REMARKS AND ANNOUNCEMENTS

1:45–2:10 *Char\_align: A Program for Aligning Parallel Texts at the Character Level*

Kenneth Ward Church

2:10–2:35 *Aligning Sentences in Bilingual Corpora Using Lexical Information*

Stanley Chen

2:35–3:00 *An Algorithm for Finding Noun Phrase Correspondences in Bilingual Corpora*

Julian Kupiec

3:30–3:55 *Structural Matching of Parallel Texts*

Yuji Matsumoto, Hiroyuki Ishimoto, Takehito Utsuro, & Makoto Nagao

3:55–4:20 *Towards History-Based Grammars: Using Richer Models for Probabilistic Parsing*

Ezra Black, Fred Jelinek, John Lafferty, David M. Magerman, Robert Mercer, & Salim Roukos

4:20–4:45 *Using Bracketed Parses to Evaluate a Grammar Checking Application*

Richard H. Wojcik, Philip Harrison, & John Bremer

5:15–5:40 *A Speech-First Model for Repair Detection & Correction*

Christine Nakatani & Julia Hirschberg

5:40–6:05 *Gemini: A Natural Language System for Spoken-Language Understanding*

John Dowding, Jean Mark Gawron, Doug Appelt, John Bear, Lynn Cherny, Robert Moore,  
& Douglas Moran

## THURSDAY, 24 JUNE – FAWCETT AUDITORIUM

9:00–9:25 *The Effect of Establishing Coherence in Ellipsis and Anaphora Resolution*

Andrew Kehler

9:25–9:50 *Temporal Centering*

Megumi Kameyama, Rebecca Passonneau, & Massimo Poesio

- 9:50–10:15 *Assigning a Semantic Scope to Operators*  
Massimo Poesio
- 10:45–11:10 *Two Kinds of Metonymy*  
David Stallard
- 11:10–12:15 **Planning Multimodal Discourse \*\*\*INVITED TALK\*\*\***  
**Wolfgang Wahlster**, German Research Center for AI
- 1:45–2:10 *A Unification-Based Parser for Relational Grammar*  
David E. Johnson, Adam Meyers, & Lawrence S. Moss
- 2:10–2:35 *Parsing Free Word Order Languages in the Paninian Framework*  
Akshar Bharati & Rajeev Sangal
- 2:35–3:00 *Principle-Based Parsing without Overgeneration*  
Dekang Lin
- 3:30–3:55 *Lexicalized Context-Free Grammars*  
Yves Schabes & Richard C. Waters
- 3:55–4:20 *Parallel Multiple Context-Free Grammars, Finite-State Translation Systems, and Polynomial-Time Recognizable Subclasses of Lexical-Functional Grammars*  
Hiroyuki Seki, Ryuichi Nakanishi, Yuichi Kaji, Sachiko Ando, & Tadao Kasami
- 4:20–4:45 *Feature-Based Allomorphy*  
Hans-Ulrich Krieger, Hannes Pirker, & John Nerbonne
- 5:15–5:40 *Intention-Based Segmentation: Human Reliability and Correlation with Linguistic Cues*  
Rebecca J. Passonneau & Diane J. Litman
- 5:40–6:05 *Language-Independent Anaphora Resolution System for Understanding Multilingual Texts*  
Chinatsu Aone & Doug McKee

#### FRIDAY, 25 JUNE – FAWCETT AUDITORIUM

- 9:00–9:25 *Contextual Word Similarity and Estimation from Sparse Data*  
Ido Dagan, Shaul Marcus, & Shaul Markovitch
- 9:25–9:50 *Towards the Automatic Identification of Adjectival Scales: Clustering of Adjectives According to Meaning*  
Vasileios Hatzivassiloglou & Kathleen R. McKeown
- 9:50–10:15 *Distributional Clustering of English Words*  
Fernando Pereira, Naftali Tishby, & Lillian Lee
- 10:40–11:45 **Transfers of Meaning \*\*\*INVITED TALK\*\*\***  
**Geoff Nunberg**, Xerox PARC
- 2:10–5:58 **STUDENT SESSIONS**
- 2:10–2:28 *A Flexible Approach to Cooperative Response Generation in Information-Seeking Dialogues*  
Liliana Ardissono, Alessandro Lombardo, & Dario Sestero, *University of Torino*
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James A. Rosenblum, *University of Pittsburgh*
- 2:46–3:04 *Responding to User Queries in a Collaborative Environment*  
Jennifer Chu, *University of Delaware*
- 3:04–3:22 *The Imperfective Paradox and Trajectory-of-Motion Events*  
Michael White, *University of Pennsylvania*
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Hideki Kozima, *University of Electro-Communications*

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David J. Hutches, University of California, San Diego
- 4:46–5:04 *Guiding an HPSG Parser using Semantic and Pragmatic Expectations*  
Jim Skon, Ohio State University
- 5:04–5:22 *The Formal Consequence of Using Variables in CCG Categories*  
Beryl Hoffman, University of Pennsylvania
- 5:22–5:40 *Integrating Word Boundary Identification with Sentence Understanding*  
Kok Wee Gan, National University of Singapore
- 5:40–5:58 *Extending Kimmo's Two-Level Model of Morphology*  
Anoop Sarkar, C-DAC, Pune University Campus

### SATURDAY, 26 JUNE – FAWCETT AUDITORIUM

- 9:00–9:25 *A Complete and Recursive Feature Theory*  
Rolf Backofen & Gert Smolka
- 9:25–9:50 *On the Decidability of Functional Uncertainty*  
Rolf Backofen
- 9:50–10:15 *A Logical Semantics for Nonmonotonic Sorts*  
Mark A. Young & Bill Rounds
- 10:45–11:10 *F-PATR: Functional Constraints for Unification-Based Grammars*  
Kent Wittenburg
- 11:10–12:15 **Quantificational Domains and Recursive Contexts \*\*\*INVITED TALK \*\*\***  
**Barbara Partee**, University of Massachusetts
- 1:45–2:10 *Tailoring Lexical Choice to the User's Vocabulary in Multimedia Explanation Generation*  
Kathleen McKeown, Jacques Robin, & Michael Tanenblatt
- 2:10–2:35 *Automatic Acquisition of a Large Subcategorization Dictionary from Corpora*  
Christopher D. Manning
- 2:35–3:00 *An Empirical Study on Thematic Knowledge Acquisition Based on Syntactic Clues and Heuristics*  
Rey-Long Liu & Von-Wun Soo
- 3:30–3:55 *Part-of-Speech Induction from Scratch*  
Hinrich Schütze
- 3:55–4:20 *Automatic Grammar Induction and Parsing Free Text: A Transformation-Based Approach*  
Eric Brill
- 4:20–4:45 *A Competition-Based Explanation of Syntactic Attachment Preferences and Garden Path Phenomena*  
Suzanne Stevenson

# TUTORIALS

## **Brain and Language**

Helen Gigley, *Naval Research Laboratory*

Steve Small, *University of Pittsburgh*

Human language performance results from complex computations within a unique machine architecture. While neither this brain hardware nor the specific computations for producing and comprehending language are well understood, certain facts are available and a number of well supported hypotheses are under investigation. It is our view that the study of language performance has a potentially large role to play in computational linguistics, and that the study of brain mechanisms underlying this performance may yield insights into issues of importance for construction of artificial systems that process natural language.

This tutorial is organized into two sections. The first part describes the functional neuroanatomy of the brain, with greatest emphasis on methods of testing language function in the brain, the sorts of results that have been obtained, and what these imply for the structure of brain computations and for the nature of human language. Demonstrations of people with language impairments (live or on videotape) as well as example computed tomographic and/or magnetic resonance images will supplement descriptive material.

The second part of the tutorial will discuss two broad computational subjects, cognitive modelling and practical natural language processing. A number of researchers are constructing computer models of cognitive neuropsychological phenomena, many involving language, using both symbolic and connectionist methods. Several examples of such models and the neurobiological and psychological data that constrain their processing architectures will be discussed. While certain aspects of linguistic data and theory have been successfully applied to the construction of practical NLP systems, theoretical notions from neurobiology have not played much role. This topic will be discussed with practical suggestions on using data and theory from cognitive neuroscience to construct new NLP systems or to improve existing ones.

## **Mathematics of Language: How to Measure the Complexity of Natural Languages**

Alexis Manaster Ramer, *Wayne State University*

Wlodek Zadrozny, *IBM T.J. Watson Research Center*

This tutorial will survey the uses of formal language, automata, and complexity theory in computational linguistics, seeking to answer such questions as whether natural languages are, for example, context-free or parsable in deterministic polynomial time. More generally, we will consider the question of how these formal theories can best be applied to NLP in a computational setting, focusing on such issues as the properties of constructions vs. those of languages, the formalization and computational uses of Chomsky's intuitions about "E-" vs. "I-language", the relative power of different models of NL, the formal treatment of computational models of "performance", and, finally, some startling new results about the power of models of semantics.

## **Multimedia and Multimodal Parsing**

Kent Wittenburg, *Bellcore*

As new information channels and input devices arrive on the scene, the spectrum of possibilities and challenges for interpretation increases beyond single-channel text or speech. First, there is integration of more than one modality -- speech and simultaneous pointing being a paramount example. Second, characterizing and processing expressions in nonlinear input media requires extensions to the usual linear, string-based methods. Examples of nonlinear input include static figures and diagrams; interactive gesturing, writing, and drawing; live cameras and stored video; and data from eye-tracking hardware and 3D devices such as spaceballs or datagloves.

This tutorial is directed towards ACL members who would like to be made aware of current research in parsing and interpretation of such media. The focus will be on identifying problems for which extensions to grammatical representation and parsing methods already in common practice in computational linguistics may provide solutions. We will consider the problem of characterizing multidimensional expressions separately and concurrently as languages and then survey techniques for parsing and interpreting them. The tutorial will initially include a brief characterization of current research and practice in interpreting nonlinear and multimodal input along these lines. Then it will highlight some of the more interesting grammatical frameworks, with a brief overview of graph grammars as well as an introduction to current research from the visual languages community. We will close with a detailed example using Relational Grammars, a framework for multidimensional languages that cuts across several of the current proposals for constraint-based grammars and parsing methods.

## **Natural Language Processing and Information Retrieval**

David D. Lewis, *AT&T Bell Laboratories*

Elizabeth D. Liddy, *Syracuse University*

This tutorial will discuss the application of natural language processing methods to support more effective text retrieval and text categorization. We will present a comprehensive discussion of the use of NLP methods to address particular characteristics of human language that make these tasks difficult. In parallel, we will also consider more traditional "non-NLP" methods for addressing the same problems, and discuss the tradeoffs for each. One theme of the tutorial is that the line between NLP and non-NLP methods in IR is becoming quite fuzzy, with the increasing use of statistical and other robust techniques in NLP. Linguistic examples will be drawn primarily from English, plus some from Japanese and other languages.



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## PREFACE TO THE STUDENT SESSION PAPERS

These proceedings include the papers presented at the Student Sessions of the *31st Annual Meeting of the Association for Computational Linguistics*. The goal of the Student Sessions is to provide a forum for student members to present work in progress, rather than completed work, and receive feedback from other members of the computational linguistics community, particularly from senior researchers. The response to the ACL students sessions held in 1991 and 1992 was very positive. The student authors reported that they found the Student Sessions valuable, and the response at the conferences suggested that the audiences found the sessions interesting and of high quality.

This year, there were thirty submissions to the ACL Student Sessions. While this represents a decrease in submissions from last year, we believe it reflects a fluctuation in the number of graduate students currently at the appropriate stage of graduate study for submitting to the Student Sessions. We thank all the authors for their papers.

We also thank the members of the ACL 1993 Student Sessions Planning Committee who helped plan and organize the Student Sessions: Tilman Becker, *University of Saarbrücken*; Beth Ann Hockey, *University of Pennsylvania*; David Hutches, *University of California, San Diego*; Andrew Kehler, *Harvard University*; Vibhu O. Mittal, *University of Southern California/Information Sciences Institute*; Sheila Rock, *University of Edinburgh*; Cameron Shelley, *University of Waterloo*; James Skon, *Ohio State University*; and Keith Vander Linden, *University of Colorado*. We appreciate the support of the 1992 and 1993 ACL Executive Committees, and the 1993 Program and Local Arrangements Committee. We are also grateful to David Traum and Don Walker for their advice and guidance.

We thank the reviewers for providing providing helpful, detailed reviews of the submissions, and for completing the reviews promptly. The careful thought that went into their review comments was obvious and impressive, and we are sure the student authors found the reviews beneficial. The Program Committee included the members of the Planning Committee and the following non-student members: Mary Dalrymple, *Xerox Palo Alto Research Center*; Chrysanne DiMarco, *University of Waterloo*; Robert Ingria, *BBN Systems & Technologies*; Donald Hindle, *AT&T Bell Laboratories*; John Lafferty, *IBM TJ Watson Research Center*; Cecile Paris, *University of Southern California/Information Sciences Institute*; Rebecca Passonneau, *Columbia University*; Donia Scott, *Brighton Polytechnic University*; Karen Sparck Jones, *University of Cambridge*; Hans Uszkoreit, *University of Saarbrücken*; Peter Van Beek, *University of Alberta*; David Weir, *University of Sussex*. We are grateful to Christina Tortora, *University of Delaware*, and Philip Resnik, *University of Pennsylvania*, for providing additional reviews upon our request.

Linda Z. Suri and Sandra Carberry, *University of Delaware*  
Student Sessions Co-Chairs

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