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Roberto Pieraccini



Roberto Pieraccini Curriculum Vitae

Born in Genova (Italy). November 15, 1955.

Italian and U.S. Citizenship

Email:

Web:

Wikipedia:

EDUCATION:

University of Pisa, Pisa, Italy

September 1974 – December 1980

Dr. Ing. Degree in Electronic Engineering from the "Universita' degli Studi di Pisa," Pisa, Italy (December 1980)

Thesis: "Studio di Realizzazione per Mezzo di un Microprocessore di un Equalizzatore Adattativo nel Dominio delle Frequenze Discrete" (A Microprocessor Realization of an Adaptive Equalizer in the Discrete-Frequency Domain) - Advisor: Prof. Giancarlo Prati.

BIOGRAPHY

Roberto Pieraccini dedicated more than 30 years of his career to the fields of conversational AI and machine learning. He is mostly known for his pioneering work on statistical machine learning systems for learning natural language understanding and dialog.

After his graduation in electrical Engineering at the University of Pisa, he started his career in 1981 as a researcher at CSELT (the research center of the Italian Telephone operating company, later known as Telecom-Italia Labs) in Turin, Italy. In 1990 he joined AT&T Bell Laboratories in Murray Hill, NJ as a research member of technical staff in Larry Rabiner's team, and then AT&T Labs in Florham Park, NJ.

In 1999 he joined SpeechWorks International (currently known as Nuance) as their Director of R&D for Dialog Technologies. There he created and led the Natural Dialog Group, devoted to the advancement of spoken natural language and multimodal interaction technology.

In 2003, he joined IBM T.J. Watson Research, where he led a team of researchers focused on the commercialization of advanced components for multi-lingual search, machine translation, and multi-lingual information extraction. He then became the manager

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of the Advanced Conversational Technologies department, where he was responsible for the advancement of speech interactive services based on IBM speech and natural language processing technology.

In August 2005 he took the position of Chief Technology Officer at SpeechCycle, a NYC-based company specializing in advanced spoken and multi-modal dialog systems for customer care.

In January 2012 he became the CEO and Technical Director of the International Computer Science Institute (ICSI) at Berkeley, CA, an independent research organization affiliated with the University of California at Berkeley. Among his achievement at ICSI he successfully spun off Broala (now known as CoreLight), a company based on ICSI's IP on cybersecurity. There he managed an organization of about 100 researchers in fields as diverse as AI, cybersecurity, computer networking, theoretical computer science, computer vision, multimedia recognition and interpretation, computational genetics, and computer-brain research.

He joined Jibo, Inc. as its Director of Advanced Conversational Technology in February 2014 to help create the first consumer social robot for the home. Jibo received funds in excess of \$50M, and started shipping in September 2017.

On March 2018 he joined Google Switzerland, in Zurich to lead the effort on the "Personal Assistant" in the Google Assistant organization.

Roberto Pieraccini is the author or co-author of more than 130 papers, book chapters and several patents. He is the author of the first and only general audience book on the history of speech recognition understanding technology (*The Voice in the Machine: Building Computers that Understand Speech*), which was published by MIT Press in March 2012.

Since the beginning of his career Roberto Pieraccini has been assuming an increasingly active role within the international scientific and technical communities. He was a member of the IEEE Speech and Language Technical Committee (SLTC) for two four-year terms, and was elected as its Chair for the 2007-2008 term. He was a member of the editorial boards of the IEEE Signal Processing Magazine and of Springer's International Journal of Speech Technology, a member of the board of the Speech Technology Consortium (STC), and a member of the advisory board of the International Speech Communication Association (ISCA). He is currently a member of the board of directors of the Applied Voice Input-Output Society (AVIOS), and serves as an advisor for a few high-tech companies. Roberto Pieraccini is an ISCA (International Speech Communication Association) and IEEE Fellow; he is also the recipient of the prestigious "Primi Dieci" award for 2016, recognizing the 10 most prominent and successful Italian-Americans in the fields of science, technology, and art.

PROFESSIONAL EXPERIENCE:

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Google Switzerland, Zurich. March 2018, current

Position: Director of Engineering for the Google Assistant

Jibo, Inc. February 2014 – December 2017

Position: Director of Advanced Conversational Technology

Responsibilities

Help design and realize the first prototype of Jibo and support the fund raising process during the early stages of the company.

- Create and manage a team of specialists to develop multimodal conversational capabilities within a commercial social robot. That will include speech recognition, natural language understanding and multi-modal dialog, gesture and emotion recognition, text-to-speech, language generation, and robot animation.
- Push the envelope of vision for human-machine interaction and AI in Jibo. Work in team with the CTO for the realization of the next generation platform for Jibo.

California College of the Arts, San Francisco. August 2015, December 2015 (fall semester)

Position: Adjunct Professor

Class on Interaction Design for Master's Students

Leave of absence: October 2013 – January 2014

I left the job at ICSI at the end of September 2013, and took a few months of unpaid leave of absence before joining Jibo on February 2014.

International Computer Science Institute (ICSI) (Berkeley, CA), January 2012 – September 2013

Position: Director and CEO

Responsibilities

- Manage the Institute administration and research units (~120 people, \$12.5M yearly revenue)
- Create and execute a vision for the growth of the institute with respect to its research activities and industrial and international sponsorship.
- Grow the International Exchange Program as one of the key missions of the institute

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- Create an entrepreneurship school within the Institute accessible to foreign visitors.
- Foster the relationship with the University of California at Berkeley and the federal sponsors.
- Expand the visibility and branding of the institute.
- Create opportunities for spin offs

Selected Achievement

- Renewed international visitor program with the German ministry of Education and Research and DAAD (German funding agency) for a 10 year term and a total of \$5M
- Renewed international visitor program with the Aalto University (Helsinki, Finland) and Tekes (Finnish funding agency) for a 5 year term and a total of \$1.25M
- Successfully spun off Broala, a cybersecurity company based on ICSI's proprietary software (Bro), for which ICSI had a substantial equity participation. The company is today known as Corelight.

SpeechCycle (New York, NY), August 2005 – December 2011

Position: Chief Technology Officer and Executive Vice President

Responsibilities

- Define the core competencies of the company and its strategic technology focus.
- Create and protect intellectual property by managing the company patent strategy.
- Establish a structure and a process that would allow effective application of the company business model to an increasing number of customers.
- Management of Engineering, Voice User Interface, Product, and Speech Science departments; drive and overview the evolution of product and platform roadmaps.
- Manage directly an advanced R&D team to prototype innovation which will be productized by the engineering team (SpeechCycle Labs).
- Establish and maintain strategic relationships with commercial partners and with academic institutions, both national and international.
- Evangelize the company's technological innovation and advancement and provide company visibility at international conferences, trade-shows, and on magazines, journals, and the press.
- Help extend the business to the international market, either directly or through strategic partnerships.
- Actively participate as a company executive to the budget creation and revision, and annual revenue forecast activities
- Contribute to the personnel performance and salary review.
- Interact and maintain relationships with C- or VP levels of high level customers and partner companies

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- Continue to pursue his research interest and disseminate innovation by writing papers, articles, book chapters, and giving talks targeted to international academic conferences and venues.

Selected achievements

- Created and refined the application development process and led a team to create a completely automatic application monitoring and improvement process based on automatic data acquisition and machine learning.
- Create a machine learning paradigm for commercial dialog systems, based on which the deployed systems undergo continuous automatic improvement. The paradigm, known as “contender”, is the only known large scale, live, implementation of the reinforcement learning approach (developed by Pieraccini in 2001) for spoken dialog systems.
- Attracted and hired a small team of world-class researchers who produced several patent applications and published many papers at international conferences and book chapters. Because of that, SpeechCycle is one of the few (if not the only) commercial venue in the field which is always represented at the major research conferences in the field.
- Found and helped closing the first company’s international deal (More than \$3M) with one of the largest Australian telecommunication operators.
- Helped defining and refining the company’s business model and pricing policy.

IBM T.J. Watson Research Center (Yorktown Heights, NY), September 2003 – August 2005.

Position: (1) Research Staff Member (RSM), Team Lead, Natural Language Technologies – (2) Manager, Advanced Conversational Technologies.

Responsibilities:

- Lead the commercialization of natural language research technology and its deployment in first-of-a-kind customer applications.
- Provide strategic research and market directions in the field of commercial spoken dialog systems.
- Lead the implementation of best practices and tools for the realization of commercial high-quality conversational applications from research to service and development organization within IBM.
- Lead the creation of a framework for data driven voice user interface research and its use for reducing the cost of speech solutions.

Selected achievements

- Created a Finite State Transducer (FST) framework for performing morphological segmentation of languages such as Arabic, Farsi, Russian, and word segmentation

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for Chinese. The framework is currently being used by IBM in commercial first-of-a-kind applications for multilingual search and information extraction.

- Established the foundation for an IBM conversational application lifecycle and development process.
- Helped create tools and a large-scale repository of information (RELICS) that would allow optimization and tuning of spoken language applications..
- Created a team, project plan, and initial prototype of the first internal IBM large-scale conversational Help-Desk application.

SpeechWorks International (New York, NY), November 1999 – August 2003

Position: Director, Natural Dialog Technology

Responsibilities:

- Lead advanced technology R&D projects and contribute to the definition of the company strategy for natural language processing, interaction management, and multimodal systems.
- Drive the standardization activity for multimodal interaction systems.
- Pursue externally funded research within the R&D strategic interests of the company.
- Act as point of contact for dialog and multimodal advanced technology for external customers and partners.

Selected achievements:

- Created a world class team of natural language and dialog scientists and engineers to drive dialog technology R&D. The team was largely supported with funds from DARPA and the EU.
- Led the development of the first SpeechWorks' spoken dialog application development tool (OSAF) based on J2EE technology.
- Initiated the development of advanced multi-modal technology with funds from DARPA.
- Participated with his team to the "Fasil" project funded by the EU. Fasil was one of the largest projects of EU's 5th framework.
- Led the development of a multi-modal conversational system that was integrated in the 2003 Ford Concept Car and was first shown at the 2003 North American International Auto Show in Detroit

AT&T Shannon Labs (Florham Park, NJ), January 1996 – October 1999

Position: Principal Technical Staff Member

Responsibilities:

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- Research in the field of natural language and dialog systems.
- Principal investigator for the DARPA Communicator project
- Mentoring of junior researchers.

Selected Achievements:

- Developed the first AT&T framework for automatic spoken dialog systems (AMICA).
- Developed a natural language interface for video indexing systems.
- Developed a scripting language (DMD) for authoring distributed dialog systems both for speech and text.
- Introduced the use of reinforcement learning and Markov Decision Processes (MDP) for the learning and adaptation of human-machine dialog systems and wrote first seminal papers.
- Raised and managed DARPA funds for advanced research in dialog systems.

AT&T Bell Laboratories (Murray Hill, NJ), January 1990 - December 1995

Position: Member of Technical Staff:

Responsibilities:

- Research in the fields of speech recognition and natural language understanding
- Principal investigator for the DARPA ATIS project

Selected Achievements:

- Introduced the use of stochastic models for natural language understanding and wrote first seminal papers.
- Led the development of CHRONUS, a statistical natural language understanding system that attained the highest performance at the final DARPA ATIS evaluation.
- Extended the use of Hidden Markov Models from speech recognition to optical character recognition (Planar HMMs)
- Developed the first AT&T large vocabulary sub-word based continuous speech recognizer.

CSELT - Centro Studi e Laboratori Telecomunicazioni, Torino, Italy (currently known as Telecom Italia Labs), May 1981 - December 1989

NOTE: while working at CSELT, I spent 1 year of internship as a visiting scientist at Bell Laboratory between March 1988 and February 1989.

Position: Researcher

Responsibilities:

- Research in the field of speech recognition.

Selected Achievements:

- Developed the first CSELT real time isolated words speech recognition system which received national press and TV attention.
- Developed the first CSELT continuous speech recognition system.
- Led the development of an early spoken dialog system within an international project funded by the European Community.
- Carried on fundamental research on very large vocabulary speech recognition.
- Contributed to the dissemination and awareness of the speech recognition discipline with a first article on the topic published by "Le Scienze," the Italian issue of Scientific American.

INVOLVEMENT IN THE PROFESSIONAL COMMUNITY

- Active member of the W3C Multi-modal Interaction Working Group on behalf of SpeechWorks. Lead editor of the first draft of EMMA (Extensible Multi-Modal Annotation markup language) for the representation of semantics in multimodal systems. (2001-2003). EMMA became a standard recommendation in February 2009.
- Reviewer for NSF, DARPA and SBIR projects.
- Reviewer for several journals and conferences, including Speech Communication Magazine, IEEE Transaction on Audio Speech and Language Processing, ICASSP, Interspeech, International Conference on Multimodal Interaction, the Conference of the Association for Computational Linguistics, etc.
- Member of the DARPA Communicator Advisory Committee (1996 - 2000)
- Elected member of the IEEE Speech and Language Technical Committee (SLTC). (1998-2002, 2003-2006)
- Elected Chair of the IEEE Speech and Language Technical Committee (SLTC) (2007-2008)
- Member of the editorial board of Springer's International Journal of Speech Technology since 2008.
- Member of the editorial board of IEEE Signal Processing Magazine since 2008.
- Member of the Applied Voice Input/Output Society (AVIOS) board since 2010.
- Member of the Speech Technology Consortium (STC) board of directors. (STC is an organization which has been recently created to promote innovation and growth in the speech industry.)
- Member of the ISCA Advisory Council since 2009.
- Member of the SIGDIAL board (2007-2009)
- Member of the organizing committee of several international conferences, such as HLT 2003 and Interspeech 2005.
- Regional Director at Large for IEEE Signal Processing Society (2011-2012)

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- Member of IEEE Signal Processing Society Industrial Relations Committee since 2010.
- General Co-Chair of the 1993 IEEE ASRU Workshop. Snowbird, Utah, Dec. 1993.
- Technical Program Co-Chair of the 2008 International Conference on Multimodal Interfaces (ICMI 2008), Chania, Crete, Greece, Oct. 2008.
- General Co-Chair of the 10th Annual SIGDIAL Meeting on Discourse and Dialogue (SIGDIAL 2009), London, UK, Sep. 2009.
- Technical Program Chair of Interspeech 2011 (Florence, August 2011)

HONORS

- ISCA (International Speech Communication Association) Fellow (2009) "For contributions in the area of statistical natural language understanding and spoken dialog management and learning."
- IEEE Fellow (2010) "For contributions to statistical natural language understanding and spoken dialog management and learning."
- Speech Technology Magazine "Speech Luminary Award" (2008)
- Speech Technology Magazine "Speech Luminary Award" (2012)
- "Primi Dieci" award, instituted by the Italian-American Chamber of Commerce and recognizing, every year, the 10 most prominent Italian-Americans in fields such as science, technology, and art (2016).

BOOKS AND SELECTED BOOK CHAPTERS

- Roberto Pieraccini, "The Voice in the Machine. Building Computers that Understand Speech" MIT Press, March 2012. A book on speech understanding and dialog for the general audience.
- Suendermann, D., Pieraccini, R., "*Crowdsourcing for Industrial Spoken Dialog Systems*", in *Crowdsourcing for Speech Processing*, (Wiley, 2013)
- Andre' E., Dybkjaer, L., Minker, W., Neumann, H., Pieraccini, R., Weber, M., (eds), "Perception in Multimodal Dialogue Systems: 4th IEEE Tutorial and Research Workshop on Perception and Interactive Technologies for Speech-Based Systems," *Lecture Notes in Artificial Intelligence*, (Springer, 2010)
- Schmidt A., Pieraccini, R., Polzehl, T., "*For Heaven's Sake, Give me a Live Person!*" *Designing Emotion-Detection Customer Care Voice Applications in Automated Call Centers*, in *Advances in Speech Recognition*, Amy Neustein, Editor, Springer, 2010, pp 191-220.
- Suendermann, D., Liscombe, J., Pieraccini, R., Evanini, K., "*How am I Doing?*": *A New Framework to Effectively Measure the Performance of Automated Cus-*

omer Care Contact Centers, in *Advances in Speech Recognition*, Amy Neustein, Editor, Springer, 2010, pp 155-180.

- Pieraccini, R., *The Industry of Spoken-Dialog Systems and the Third Generation of Interactive Applications*, in *Speech Technology, Theory and Applications*, Fang Cheng and Kristiina Jokinen, editors, Springer, July 22, 2010, pp 61-78.

RECENT PUBLICATIONS (full list available at <http://www.robertopieraccini.com>)

- Suendermann D., Pieraccini, R., *Crowdsourcing for Industrial Spoken Dialog Systems*. In *Crowdsourcing for Speech Processing: Applications to Data Collection, Transcription and Assessment*, Wiley, Hoboken, USA, May 2013.
- Pieraccini, R., Suendermann, R., *Data-Driven Methods in Industrial Spoken Dialog Systems*. In *Data-Driven Methods for Adaptive Spoken Dialogue Systems*, Springer, New York, USA, October 2012.
- Suendermann, D., Liscombe, J., Pieraccini, R., *How to Drink from a Fire Hose: One Person Can Annoscribe 693 Thousand Utterances in One Month*, SIGDIAL 2010, The 11th Annual SIGDIAL Meeting on Discourse and Dialogue, Sep 2010, Tokyo, Japan.
- Suendermann, D., Liscombe, J., Pieraccini, R., *Minimally Invasive Surgery for Spoken Dialog Systems*, Interspeech 2010, Sep. 26-30, Makuhari, Japan.
- Suendermann, D., Liscombe, J., Pieraccini, R., *Optimize the Obvious: Automatic Call Flow Generation*, 2010 IEEE International Conference on Acoustic, Speech, and Signal Processing (ICASSP 2010), March 2010, Dallas, TX.
- Pieraccini, R., Suendermann, D., Liscombe, J., Dayanidhi, K., *Are We There Yet? Research in Commercial Spoken Dialog Systems*, in *Text, Speech and Dialogue*, 12th International Conference, TSD 2009, Pilsen, Czech Republic, Sep. 2009, Vaclav Matousek and Pavel Mautner (Eds): pp. 3:13
- Suendermann, D., Liscombe, J., Dayanidhi, K., Pieraccini, R., *A Handsome Set of Metrics to Measure Utterance Classification Performance in Spoken Dialog Systems*, SIGDIAL 2009, The 10th Annual SIGDIAL Meeting on Discourse and Dialogue, London, UK, 11-12 September, 2009.
- Alabate, A., Suendermann, D., Pieraccini, R., Minker, W., *Machine Learning for Categorization of Speech Utterances*, in *Mathematical Analysis of Evolution, Information, and Complexity*. Edited by Wolfgang Arendt and Wolfgang P. Schleich., 2009 Wiley-VCH Verlag GmbH & Co. KGaA, pp. 219-241

SELECTED PUBLICATIONS (full list available at <http://www.robertopieraccini.com>)

- Suendermann, D., Liscombe, J., Bloom, J., Li, G., Pieraccini, R., Large-Scale Experiments on Data-Driven Design of Commercial Spoken Dialog Systems. In Proc. of the Interspeech 2011, 12th Annual Conference of the International Speech Communication Association, Florence, Italy, August 2011.
- Suendermann, D., Liscombe, J., Dayanidhi, K., Pieraccini, R., "Localization of Speech Recognition in Spoken Dialog Systems: How Machine Translation Can Make Our Lives Easier," Proceeding of the 2009 Interspeech Conference, 6-10 September 2009, Brighton, UK.
- Suendermann, D., Evanini, K., Liscombe, J., Hunter, P., Dayanidhi, K., Pieraccini, R., "From Rule-Based to Statistical Grammars: Continuous Improvement of Large-Scale Spoken Dialog Systems." Proceedings of the 2009 IEEE Conference on Acoustics, Speech and Signal Processing (ICASSP 2009), Taipei, Taiwan, April 19-24, 2009
- Suendermann, D., Liscombe, J., Evanini, K., Dayanidhi, K., Pieraccini, R., "C5." in Proc. of 2008 IEEE Workshop on Spoken Language Technology (SLT 08), December 15-18, 2008, Goa, India.
- Evanini, K., Hunter, P., Liscombe, J., Suendermann, D., Dayanidhi, K., Pieraccini, R., "Caller Experience: a Method for Evaluating Dialog Systems and its Automatic Prediction," 2008 IEEE Workshop on Spoken Language Technology, Goa, India, Dec. 2008.
- Evanini, K., Suendermann, D., Pieraccini, R., "Call Classification for Automated Troubleshooting on Large Corpora," ASRU 2007, Kyoto, Japan. December 9-13, 2007
- Acomb, K., Bloom, J., Dayanidhi, K., Hunter, P., Krogh, P., Levin, E., Pieraccini, R., "Technical Support Dialog Systems. Issues, Problems, and Solutions," HLT 2007 Workshop on "Bridging the Gap, Academic and Industrial Research in Dialog Technology," Rochester, NY, April. 26, 2007.
- Pieraccini, R. Huerta, J., "Where do we go from here? Research and Commercial Spoken Dialog Systems". Proc. of 6th SIGdial Workshop on Discourse and Dialog, Lisbon, Portugal, 2-3 September, 2005. pp. 1-10 (to appear "Recent Trends in Discourse and Dialogue," published by Springer-Verlag).
- Pieraccini R., Lubensky, D., "Spoken Language Communication with Machines: the Long and Winding Road from research to Business." in M. Ali and F. Esposito (Eds) : IEA/AIE 2005. LNAI 3533, pp 6-15, 2005. Springer-Verlag.

- Pieraccini, R., Carpenter, B., Woudenberg, E., Caskey, S., Springer, S., Bloom, J., Phillips, M., "Multi-modal Spoken Dialog with Wireless Devices." in *Spoken Multimodal Human-Computer Dialogue in Mobile Environments*, W. Minker, D. Bühler and L. Dybkjaer editors, Text. Speech and Language Technology, Springer, Dordrecht (The Netherlands), 2005
- Pieraccini, R., Dayandhi, K., Bloom, J., Dahan, J.-G., Phillips, M., Goodman, B. R., Prasad, K. V., "Multimodal Conversational Systems for Automobiles." *Communications of the ACM*, January 2004, Vol. 47, No. 1, pp. 47-49.
- Caskey S. P., Story, E., Pieraccini R., "Interactive Grammar Inference with Finite State Transducers, ASRU'03 Workshop on Automatic Speech Recognition and Understanding," St. Thomas, USVI, Nov 30-Dec 4, 2003, pp 572-575.
- Meng, H.M., Wai, C., Pieraccini, R., "The Use of Belief Networks for Mixed-Initiative Dialog Modeling," *IEEE Transactions on Speech and Audio Processing*, Vol. 11, N. 6, pp. 757-773, November 2003.
- Pieraccini, R., Dayanidhi K., Bloom, J., Dahan, J.G., Phillips, M., Goodman B.R., Prasad, K.V., "A Multimodal Conversational Interface for a Concept Vehicle.," *Eurospeech 2003.*, Geneva (Switzerland), September 2003
- Carpenter, B., Caskey, S., Dayanidhi, K., Drouin, C., Pieraccini, R., "A Portable, Server-Side Dialog Framework for VoiceXML," *Proc of ICSLP 2002*, Denver (CO), September 2002.
- Lee, C. M., Narayanan, S., Pieraccini, R., "Combining Acoustic and Language Information for Emotion Recognition. " *Proc of ICSLP 2002*. Denver (CO), September 2002.
- Pieraccini, R., Caskey, S., Dayanidhi, K., Carpenter, B., Phillips, M. "ETUDE, a Recursive Dialog Manager with Embedded User Interface Patterns." *Proc. of IEEE -ASRU01 Workshop*, Madonna di Campiglio, Italy, Dec. 2001.
- Wai, C., Pieraccini, R., Meng, H., "A Dynamic Semantic Model for Rescoring Recognition Hypothesis," *Proceedings of ICASSP*, May 2001
- Levin, E., Pieraccini, R., Eckert, W., "A Stochastic Model of Human-Machine Interaction for Learning Dialog Strategies, ", *IEEE Trans. on Speech and Audio Processing*. Vol. 8, No. 1, pp. 11-23, January 2000
- Gibbon, D., Basso, A., Civanlar, R., Huang, Q., Levin, E. and Pieraccini, R., "Browsing and retrieval of full broadcast-quality video." *Packet Video 99*, NY. 26-27 April 1999.

- Levin, E., Pieraccini, R. and Eckert, W., "Using Markov decision process for learning dialogue strategies," Proc. ICASSP 98. Seattle. WA, May, 1998.
- Pieraccini, R., Levin, E. and Eckert, W., "AMICA: the AT&T Mixed Initiative Conversational Architecture," Proc. of EUROSPEECH 97, Rhodes, Greece, Sept. 1997.
- Riccardi, G., Pieraccini, R. and Bocchieri, E., "Stochastic automata for language modeling," Computer Speech and Language, vol. 10(4), 1996, pp. 265-293.
- Bimbot, F., Pieraccini, R., Levin, E. and Atal, B., "Variable-length sequence modeling: Multigrams," IEEE Signal Proc. Letters, vol. 2, no. 6, June 1995.
- Vidal, E., Pieraccini, R. and Levin, E., "Learning associations between grammars: A new approach to natural language understanding," Proc. EUROSPEECH '93, Berlin, Germany, Sept. 1993, pp. 1187-1190.
- Pieraccini, R. and Levin, E., "A learning approach to natural language understanding." NATO-ASI, New Advances & Trends in Speech Recognition and Coding, Springer-Verlag, Bubion (Granada), Spain, 1993.
- Pieraccini, R., Lee, C-H., Giachin, E. P. and Rabiner, L. R., "An efficient structure for continuous speech recognition" in Speech Recognition and Understanding: Recent Advances. Trends & Applications. Laface, P. and DeMori, R. (Ed.), Springer-Verlag, Berlin, 1990, pp. 211-216.
- Fissore, L., Laface, P., Micca, G. and Pieraccini, R., "Lexical access to large vocabularies for speech recognition," IEEE Trans. on ASSP vol. ASSP-37, Aug. 1989.
- Pieraccini, R., "Pattern compression in isolated word recognition," IEEE Journal on Signal Processing, vol. 7, no. 1, Sept. 1984.

PUBLICATIONS OUTSIDE THE MAIN FIELD OF INTEREST:

- Gherardi, F., Pieraccini, R., "Using Information Theory to Assess Dynamics, Structure, and Organization of Crayfish Agonistic Repertoire," Behavioural Processes, 65 (2004), pp 163-178
- Levin, E. and Pieraccini, R., "Dynamic planar warping for optical character recognition," Proc. ICASSP '92, vol. 3, San Francisco, CA, March, 1992.

SELECTED PATENTS:

- **U.S. Patent 6,192,338:** Haszto; Edward Dennis (Basking Ridge, NJ); Levin; Esther (Livingston, NJ); Marcus; Stephen Michael (Atlantic Highlands, NJ); Pieraccini; Roberto (Millington, NJ), "Natural language knowledge servers as network resources."
- **U.S. Patent 6,173,279:** Levin; Esther (Livingston, NJ); Narayanan; Shrikanth Sambasivan (Riverside, CT); Pieraccini; Roberto (Millington, NJ); Zeljkovic; Ilija (Westfield, NJ), "Method of using a natural language interface to retrieve information from one or more data resources."
- **U.S. Patent 12/061,291:** Caskey, Sasha Porto (New York, NY), Huerta, Juan Manuel (Bronx, NY), Pieraccini, Roberto (Peekskill, NY); "Methods and Apparatus for Multiple Value Confirmation and Correction in Spoken Dialog System."

SELECTED INVITED TALKS

- *The Challenge of Conversational Machines: from MUSA to Jibo.* Invited keynote speech at the 2017 AVIOS HIT Annual Conference on "Community Interfacing Technologies. March 28, 2017, Holon Institute of Technology, Tel Aviv, Israel. <http://aviosisrael.hit.ac.il/2017>
- *Building Jibo, the First Social Robot for the Home.* Invited keynote speech at the IEEE Workshop on Spoken Language Technology, 13-16 December, 2016, San Diego, California. <http://www.slt2016.org/KeynoteTalks.asp>
- *Open the Pod-Bay Doors, Siri.* Invited keynote speech at the 2013 SpeechTek Conference. New York City, August 19-21, 2013. This talk was also given at other venues. Video: <http://www.youtube.com/watch?v=kbuncmBa8Gs>
- *Are We There Yet? Research in Commercial Spoken Dialog Systems.* Invited keynote speech at TSD 2009, the 12th International Conference on Text, Speech and Dialogue, September 13-18, 2009. Plzen, Czech Republic.
- *Speech Technology: from Research to the Industry of Human-Machine Communication.* Tutorial at ACL-08: HLT. Columbus, OH. June 15-20, 2008.
- *Where do we go from here? Research and Commercial Spoken Dialog Systems.* Invited keynote speech at the 6th SIGdial Workshop on Discourse and Dialog, Lisbon, Portugal, 2-3 September 2005.
- *Spoken Language Understanding—the Research/Industry Chasm.* Invited keynote speech at the "SLU for Conversational Systems" workshop. HLT conference. May 2004.

- *Spoken Language Technology—Lessons Learned*, Invited talk at the Conference for the Italian Association for Artificial Intelligence, Pisa, Italy, October 2003.
- *Multi-Modal Spoken Dialog with Wireless Devices* -- Tutorial and Research Workshop on Spoken Dialogue in Mobile Environments. June 2002. Kloster Irsee, Germany.
- *The Art and Science of Spoken Dialog Systems* – JHU’s Workshop 2002. NYU seminar 2002. University of Florence, October 2001
- *Spoken Dialog Systems: from research to Industry* – CAIP/Rutgers Nov 2002.
- *Natural Language, The Hype and the Reality* – Telephone Voice User Interface Conference, Scottsdale, AZ, February 2002
- *Multi-Modal Spoken Dialog with Wireless Devices* – Invited talk at the Workshop on Multimodal technology, University of Graz, Austria. October 2001.
- *The Technology of Spoken Dialog Systems – The Art and Science of Speech*, Invited Talk at the Heraeus seminar. Bad-Honef, Germany, April 2000.

