

# Rachel Ostrand, PhD

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## RESEARCH SCIENTIST – COMPUTATIONAL COGNITIVE SCIENCE

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Cognitive science researcher with interdisciplinary expertise in computational neuropsychology, digital health, natural language processing, and psycholinguistic tools and methodologies. 15 years of experience in conducting behavioral science and healthcare research, focused on human cognition and language production as a biomarker for neurodegenerative disorders, particularly dementia and cognitive decline. Specialties in computational linguistics, statistics and data analysis, and experimental design. Strong experience with science communication and outreach, mentorship of students, and presentation of research results to both technical and non-technical audiences.

## EDUCATION

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- **Ph.D.**, Cognitive Science: University of California, San Diego 06/2016
- **M.S.**, Cognitive Science: University of California, San Diego 06/2012
- **B.S. (with Honors)**, Cognitive Science: Brown University 05/2009

## PROFESSIONAL EXPERIENCE

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- **IBM Research, Yorktown Heights, NY** 2016 - 2025  
Staff Research Scientist (05/2022 - 12/2025)  
Research Scientist (09/2018 - 05/2022)  
Post-Doctoral Researcher (07/2016 - 09/2018)
  - Led research program in digital health and computational cognitive science, with a focus on language production as a cognitive biomarker for detecting and tracking neurodegenerative disease progression.
  - Developed linguistic feature sets capturing speech production changes associated with neurodegenerative disease, providing clinicians and researchers with behavioral indicators that support earlier detection and longitudinal monitoring of cognitive impairment.
  - Conducted computational cognitive science and psycholinguistic research on linguistic alignment, statistical language learning, and contextual adaptation in dialogue.
  - Designed experimental protocols, executed data collection, and conducted statistical analysis for longitudinal and cross-sectional behavioral health studies.
  - Collaborated on or led multiple large-scale patient studies and clinical trials, ranging from dozens to hundreds of participants.
  - Published findings in top journals in cognitive science, clinical neuropsychology, NLP, and AI, and presented research at dozens of international conferences and invited talks, to both scientific and non-scientific audiences.
  - Supervised and mentored students and junior researchers at IBM and across partnering institutions, with mentees' research accepted for publication in peer-reviewed journals and selected for presentation at international research conferences.
  - Wrote successful grant proposals to governmental and private funding agencies, totaling over \$18 million.
  - Won multiple awards for scientific excellence, both individual and project-based, as well as business impact, creating over \$100 million of impact.
- **Kent State University, Kent, OH** 2017 - 2022  
Adjunct Assistant Professor
  - Collaborated with faculty, graduate students, and clinical researchers to design and execute studies in computational neuropsychology, contributing to research examining cognitive aging, neurodegenerative disease, and computational linguistic markers of cognitive decline.
  - Applied expertise in psycholinguistics and computational language analysis to augment clinical investigations, integrating speech- and language-based measures as behavioral indicators of cognitive decline and supporting more nuanced characterization of neurodegenerative progression.
  - Conducted clinical neuropsychology research, including experimental design, data collection, and interpretation, that advanced understanding of cognitive aging and neurodegenerative disorders.

## PEER-REVIEWED PUBLICATIONS

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- [21] Flick, G. & Ostrand, R. (2025). **Automatically Calculated Context-Sensitive Features of Connected Speech Improve Prediction of Impairment in Alzheimer’s Disease.** *Journal of Speech, Language, and Hearing Research*, Vol. 68, Number 11, pp. 5341-5362.
- [20] Do, H.J., Ostrand, R., et al. (2025). **Highlight All the Phrases: Enhancing LLM Transparency Through Visual Factuality Indicators.** In *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society*, October 2025, Madrid, Spain.
- [19] Ostrand, R. & Berger, S.E. (2024). **Humans Linguistically Align to their Conversational Partners, and Language Models Should Too.** In *Workshop on Large Language Models and Cognition at International Conference of Machine Learning (ICML) 2024*, July 2024, Vienna, Austria.
- [18] Ostrand, R., et al. (2024). **Say what? Real-time linguistic guidance supports novices in writing utterances for conversational agent training.** In *Proceedings of the 6th ACM Conference on Conversational User Interfaces (CUI '24)*, July 2024, Luxembourg City, Luxembourg.
- [17] Piorkowski, D., Ostrand, R., et al. (2024). **Towards Interactive Guidance for Writing Training Utterances for Conversational Agents.** In *Proceedings of the 6th ACM Conference on Conversational User Interfaces (CUI '24)*. July 2024, Luxembourg City, Luxembourg. *Awarded Best Paper Honorable Mention*
- [16] Do, H.J., Ostrand, R., et al. (2024). **Facilitating Human-LLM Collaboration through Factuality Scores and Source Attributions.** In *Proceedings of Workshop on Trust and Reliance in Evolving Human-AI Workflows (TREW) at CHI 2024*. May 2024, Hawaii, USA.
- [15] Ostrand, R. et al. (2023). **Rapid Lexical Alignment to a Conversational Agent.** In *Proceedings of Interspeech 2023*, pp. 2653-2657. International Speech Communication Association. August 2023, Dublin, Ireland.
- [14] Hamrick, P. et al. (2023). **Lexical Speech Features of Spontaneous Speech in Older Persons With and Without Cognitive Impairment: Reliability Analysis.** *JMIR Aging*, 6:e46483.
- [13] Dorsi, J., Ostrand, R. & Rosenblum, L.D. (2023). **Semantic Priming from McGurk words: Priming depends on perception.** *Attention, Perception, & Psychophysics*, 85, pp. 1219-1237.
- [12] Piorkowski, D., Ostrand, R., et al. (2022). **Accuracy is Not All You Need.** *NeurIPS Workshop on Human-Centered AI*. December 2022, Virtual.
- [11] Kleinman, D. et al. (2022). **Lasting effects of the COVID-19 pandemic on language processing.** *PLoS ONE*, Vol. 17, Issue 6, e0269242.
- [10] Sanborn, V., Ostrand, R. et al. (2022). **Automated Assessment of Speech Production and Prediction of MCI in Older Adults.** *Applied Neurology: Adult*, Vol. 29, Issue 5, pp. 1250-1257.
- [9] Ostrand, R. & Chodroff, E. (2021). **It’s alignment all the way down, but not all the way up: Speakers align on some features but not others within a dialogue.** *Journal of Phonetics*, Vol. 88, 101074.
- [8] Abrami, A. et al. (2021). **Automated computer vision assessment of hypomimia in Parkinson’s disease.** *Journal of Medical Internet Research*, Vol. 23, Issue 2, e21037.
- [7] Ostrand, R. & Gunstad, J. (2021). **Using Automatic Assessment of Speech Production to Predict Current and Future Cognitive Function in Older Adults.** *Journal of Geriatric Psychiatry and Neurology*, Vol. 34, Issue 5, pp. 357-369.
- [6] Agurto, C. et al. (2020). **Detection of Acute 3,4-Methylenedioxymethamphetamine (MDMA) Effects Across Protocols Using Automated Natural Language Processing.** *Neuropsychopharmacology*, Vol. 45, pp. 823-832.
- [5] Ostrand, R. & Ferreira, V.S. (2019). **Repeat after us: Syntactic alignment is not partner-specific.** *Journal of Memory and Language*, Vol. 108, 104037.
- [4] Gruberg, N., Ostrand, R., et al. (2019). **Syntactic entrainment: The repetition of syntactic structures in event descriptions.** *Journal of Memory and Language*, Vol. 107, pp. 216-232.
- [3] Agurto, C. et al. (2017). **Phonological markers of Oxytocin and MDMA ingestion.** In *Proceedings of Interspeech 2017*, pp. 3142-3146. International Speech Communication Association. August 2017, Stockholm, Sweden.
- [2] Ostrand, R., et al. (2016). **What you see isn’t always what you get: Auditory word signals trump consciously perceived words in lexical access.** *Cognition*, Vol. 151, pp. 96-107.
- [1] Ostrand, R., et al. (2011). **When Hearing Lips and Seeing Voices Becomes Perceiving Speech: Auditory-Visual Integration in Lexical Access.** In L. Carlson, C. Hölscher, & T. Shipley (Eds.), *Proceedings of the 33rd Annual Conference of the Cognitive Science Society*, pp. 1376-1381. Cognitive Science Society. July 2011, Boston, MA, USA.

## GRANTS AND FELLOWSHIPS

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- **Center for Research and Education on Aging and Technology Enhancement (CREATE)** 2022 - 2027  
NIH National Institute on Aging P01 AG073090 (\$16,427,515)  
Role: Consultant
- **Spontaneous Speech and Health Disparities in Risk of Cognitive Decline: WHICAP Offspring Ancillary Study** 2020 - 2024  
NIH National Institute on Aging R01 AG065432 (\$2,577,738)  
Role: co-PI
- **How is the processing of ambiguous speech affected by a global pandemic?** 2020  
IBM Research Faculty Award (\$6,000)  
Role: co-I
- **Using automated speech analysis to predict cognitive decline and future Alzheimers Disease** 2019 - 2020  
Cleveland Brain Health Initiative Scholars Grant (\$20,000)  
Role: co-PI
- **Dwight David Eisenhower Graduate Fellowship** 2015 - 2016  
US Department of Transportation (\$35,500)  
Role: Graduate student grantee  
◦ #1 ranked recipient out of hundreds of applicants nationwide
- **Glushko Graduate Fellowship** 2010 - 2014  
Robert J. Glushko and Pamela Samuelson Foundation  
Role: Graduate student grantee

## INVITED TALKS (SELECTED)

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- **Linguistic Alignment: What is it Good For?** 05/2025  
*New York University (New York, NY)*
- **Keynote speaker at Workshop on Diversity in Large Speech and Language Models** 02/2025  
*Humboldt-Universität zu Berlin (Berlin, Germany)*
- **A Technological Approach to Automated Assessment of Spontaneous Speech to Predict Cognitive Impairment in Early-Stage Dementia** 01/2024  
*US-Africa Frontiers of Science, Engineering, & Medicine (Rabat, Morocco)*
- **Connected Speech Production can Predict Cognitive Decline, and Methodological Considerations for Collecting it from Older Adults** 12/2023  
*University of Illinois, Urbana-Champaign (Champaign, IL)*
- **Using Lexical and Contextual Features of Spontaneous Speech Production to Predict Cognitive Impairment in Early-Stage Dementia** 02/2023  
*UC San Diego Center for Research in Language (San Diego, CA)*
- **Automated Assessment of Spontaneous Speech Production as a Predictive Marker of Cognitive Decline** 02/2022  
*Haskins Laboratories (New Haven, CT)*
- **Spontaneous Speech Production as a Predictive Marker of Cognitive Decline in Alzheimer's and Other Dementias** 12/2021  
*FOQUS Aphasia (Virtual)*
- **Spontaneous Speech Production as a Diagnostic Marker of Dementia** 11/2021  
*National Academy of Engineering, Frontiers of Education Scholars (Virtual)*
- **The Future of Psycholinguistics** 08/2021  
*Whats Next in AI Workshop Series, IBM Research (Virtual)*
- **Thinking About Thinking: Neuroethics and Why You Should Care** 04/2021  
*IBM Research Horizons (Virtual)*
- **Using speech production to detect dementia and cognitive decline** 03/2020  
*IBM Research Horizons Science Slam (Yorktown Heights, NY)*
- **Computational Psychiatry as a Diagnostic Tool** 09/2017  
*IBM Board of Directors Annual Strategy Meeting (Armonk, NY)*
- **Linguistic Alignment in Dialogue and Cognitive Disorders** 03/2017  
*Educational Testing Service (Princeton, NJ)*

## PATENTS

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- [13] **Assessing and predicting digital addiction using AI agents.** *(filed)*
- [12] **Detecting deceptive practices associated with tasks using models executing on agents.** *(filed)*
- [11] **Automatic real-time determination of cause of user feedback in a conversation between a user and a conversational agent.** *(filed)*
- [10] **Detecting bias and cultural insensitivities in large language model responses.** *(filed)*
- [9] **Generative artificial intelligence robustness to unstructured prompts.** *(filed)*
- [8] **Coordinating a conversational agent with a large language model for conversation repair.** US20250240351A1. *(filed)*
- [7] **Adaptive, personalized management system for training compliance.** US20240265318A1. *(filed)*
- [6] **Generating interview questions based on semantic relationships.** US20220391849A1. *(filed)*
- [5] **Monitoring and querying autobiographical events.** US12245865B2. *(granted)*
- [4] **Speaker-specific voice amplification.** US12148443B2. *(granted)*
- [3] **Acoustic analysis of crowd sounds.** US11996121B2. *(granted)*
- [2] **Automatically detecting need for breakout virtual meeting.** US11816311B2. *(granted)*
- [1] **Real-time discussion relevance feedback interface.** US11488585B2. *(granted)*

## HONORS AND AWARDS (SELECTED)

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### *Scientific Recognition:*

- **Invited Participant at US-Africa Frontiers of Science, Engineering, and Medicine Symposium** 2024  
*US National Academy of Sciences*
  - The U.S.-Africa program brings together outstanding young scientists, engineers, and medical professionals from the United States and the member countries of the African Union for a series of symposia to discuss exciting advances and opportunities in their fields.
- **IBM Research Honor Roll: Early Career Award** 2024  
*IBM Research*
- **Fellow** 2023  
*Psychonomic Society*
  - Fellows of the Psychonomic Society program demonstrate clear evidence of independent scholarship, active engagement in methodologically rigorous and theoretically interesting high level research, and indications of an imminent national/international reputation for excellence in the psychological sciences.
- **Frontiers of Engineering Fellow** 2021  
*US National Academy of Engineering*
  - Fellows are the most promising early career engineers from the US and EU, brought together for a symposium to discuss cutting-edge developments in Technologies for the Detection and Treatment of Dementia.
- **Graduate Excellence Award** 2011  
*Cognitive Science Department, UC San Diego*

### *Research and Business Impact:*

- **Outstanding Research Accomplishment: "AI Governance Innovations"** 2025  
*IBM Research*
  - Outstanding Research Accomplishments celebrate projects that demonstrated exemplary teamwork, reuse and technical excellence, leading to at least \$100 million of business impact and significant scientific impact.
  - Awarded for "Advances in AI governance, delivering key technologies through watsonx.gov and open source, establishing IBM as an industry leader. These capabilities have driven multi-million-dollar client engagements and influenced major deals. This work sets the standard for safe, reliable, and responsible AI deployment."
- **Outstanding Research Accomplishment: "The Engagement Catalysts"** 2023  
*IBM Research*
  - Awarded for "Amplifying Research's impact by creating a vibrant workplace where everyone feels connected and valued... for the benefit of society."

- **Outstanding Research Accomplishment: "Scientific Discoveries on Disease Progression"** 2021  
*IBM Research*
  - Awarded for "Impactful innovation on early detection, prediction and risk-stratification of multiple diseases through applied machine-learning and advanced analytics."
- **Research Accomplishment: "Measuring Chronic Pain"** 2021  
*IBM Research*
  - Awarded for "Significant advancement in the fundamental understanding of the disease by defining the first quantitative pain assessment, validating it with several hundred patients, and developing technological innovations."

#### *Fellowships and Awards:*

- **Patent Recognition Award** 2023  
*Society of Women Engineers*
- **IBM Eminence & Excellence Award** 2020  
*IBM Research*
- **Dwight David Eisenhower Graduate Fellowship** 2015  
*US Department of Transportation*
  - #1 ranked recipient out of hundreds of applicants nationwide

### **COMMUNITY DEVELOPMENT & SCIENCE OUTREACH EXPERIENCE**

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- **Women in Cognitive Science Leadership Team** 2024 - present
- **Westchester Science & Engineering Fair (WESEF) Expert Judge** 2024 - present  
*Regeneron WESEF*
- **Family Science Saturday Class Instructor** 2018 - present  
*IBM Research*
- **THINK Lab Science Communications Rotation** 2021 - 2022  
*IBM Research*
- **Girls & Boys Go Tech Know STEM Camp Instructor** 2017 - 2020  
*IBM Research*
- **Science Outreach Coordinator** 2015 - 2016  
*Fleet Science Center*
- **Gallery Facilitator / Mentor / Hands-on Science Demonstrator / Science Club for Girls Educational Assistant / Tinkering Studio Facilitator** 2013 - 2016  
*Fleet Science Center*
- **Organizing Committee, Pint of Science Festival** 2014 - 2015  
*San Diego, CA*

### **MENTORSHIP EXPERIENCE**

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- **Mentor for NYC community college students** 2020 - present  
*City Tutors*
- **Mentor for graduate students at conference mentoring events** 2019 - present  
*Women in Cognitive Science; Academy of Aphasia; Human Sentence Processing Conference; Psychonomic Society Conference*
- **Mentor/Project supervisor for high school science research students** 2018 - present  
*Yorktown Heights High School; Chappaqua High School*
- **Intern/Project Supervisor for undergraduate and graduate students** 2012 - present  
*IBM Research; University of California, San Diego; University of Texas, El Paso; Kent State University*
- **IBM-Yorktown Heights New Hire Network Coordinator** 2017 - 2020  
*IBM Research*
- **Cognitive Science department graduate liaison to undergraduates** 2011 - 2016  
*University of California, San Diego*
- **Graduate Advisor on undergraduate honors thesis committees** 2011 - 2013  
*University of California, San Diego*

## SKILLS & TECHNICAL EXPERTISE

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- **Experimental Design & Behavioral Research:** Behavioral Experimentation | Experimental Design | A/B Testing | Human-Human & Human-AI Dialogue Experiments | Cognitive Modeling | Psycholinguistic Experimentation | Longitudinal Study Design | Counterbalancing
- **Computational Linguistics:** NLP (Natural Language Processing) | Speech Feature Extraction | Free-Speech Analysis Pipelines | Linguistic Alignment Metrics | Lexical Frequency Analysis | Linguistic Surprisal | Part-of-Speech Tagging | Lexical Diversity Metrics | Dialogue System Evaluation
- **Statistics & Quantitative Methods:** Mixed-Effects Modeling | Linear & Logistic Regression | ANOVA | Quantitative Analysis | Predictive Modeling | Statistical Modeling | Data Visualization (ggplot, matplotlib) | Hypothesis Testing
- **Machine Learning (ML):** Machine Learning for Language | Statistical Language Learning | Automated Feature Extraction | Computational Modeling
- **Human-AI Interaction & Dialogue:** Conversational AI | Human-AI Interaction | Dialogue Behavior Modeling
- **Programming & Computational Tools:** Python | R | NumPy | NLTK | Jupyter | RStudio
- **Natural Languages:** English: native | French: high proficiency | Spanish: moderate proficiency

## PROFESSIONAL ASSOCIATIONS

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Psychonomic Society • Association for Computing Machinery (ACM) • Women in Cognitive Science

## AD HOC REVIEWING

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### *Journals:*

Attention, Perception, & Psychophysics • Clinical Linguistics & Phonetics • Cortex • Discourse Processes • Frontiers in Communication • Frontiers in Psychology • Language, Cognition, & Neuroscience • PLoS ONE • Psychonomic Bulletin & Review

### *Conferences:*

Architectures and Mechanisms in Language Processing (*AMLaP*) • Conference on Human Sentence Processing (*HSP*, formerly *CUNY*) • ACM Conference on Computer-Supported Cooperative Work and Social Computing (*CSCW*) • ACM Conference on Conversational User Interfaces (*CUI*) • NeurIPS Workshop on Behavioral Machine Learning

### *Book proposals and funding agencies:*

National Science Foundation (NSF) • Leverhulme Trust • Elsevier • SAGE