Michtom School of Computer Science
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Kenneth Lai

Education

2017–present **Doctor of Philosophy (in progress)**, *Brandeis University*
Computer Science
Advisor: James Pustejovsky

2014 **Master of Arts**, *Brandeis University*
Computational Linguistics
Advisor: James Pustejovsky
Thesis: Global Index Languages with Regular Base

2012 **Bachelor of Arts**, *Dartmouth College*, *magna cum laude*
Chemistry and Linguistics

Research Experience

2017–present **Research Assistant**, *Brandeis University*
Advisor: James Pustejovsky
Research projects include:
- Extending graph-based meaning representations to:
  - Describe modes of communication beyond language (e.g., gesture), and actions in general
  - Support logical inference using continuations and explicit marking of scope
- Annotating modal expressions and speech acts in human-robot dialogues
- Developing a modal logic for causal models and counterfactual sentences

2014–present **Applications Analyst I**, *Mass General Brigham*
Principal Investigator: Li Zhou
Research projects include:
- Medication reconciliation between structured electronic health record data and clinical notes
- Management of patient allergy information in the electronic health record
- Prediction of hospital readmission from risk factors found in notes
- Automated coding of medical malpractice claims
- Detecting and correcting errors in medical speech recognition

Teaching Experience

as Instructor

Fall 2022 Computational Semantics (COSI 135B), *Brandeis University*

as Teaching Assistant *(at Brandeis University)*

Spring 2018–Spring 2023 Fundamentals of Natural Language Processing II (COSI 114B)

Fall 2020 Discourse and Dialog (COSI 233A)

Fall 2019 Computational Semantics (COSI 135B)

Fall 2018 Modal, Temporal, and Spatial Logic for Language (COSI 112A)

Fall 2017 Automated Speech Recognition (COSI 136A)

Fall 2013 Historical Linguistics and Language Change (LING 190B)

Spring 2013 Phonological Theory (LING 110A)

Awards and Grants

2023 **Rose Schlow Award**, *Brandeis University*
Given "to a student or students who by thoughtfulness and kindness to others has contributed to the well-being of their fellow students"

2021–2022 **Trainee Grant**, *NSF AI Institute for Student-AI Teaming*
with Richard Brutti and Lucia Donatelli
Project name: Towards Situated AMR: Creating a Corpus of Multimodal AMR
Grant amount: $2,490

2021 **Outstanding Graduate Teaching Award**, *Brandeis University*

2016 **Second Place, VA Care Coordination for Improved Outcomes Challenge**, *U.S. Department of Veterans Affairs*
with Maxim Topaz, Li Zhou, Warren Acker, Sarah Collins, and Kira Tsivkin
Project name: Caredinator
Award amount: $50,000

Service

Organizing Committee: MMSR 2021, WeSSLLI Virtual Student Session 2020

Reviewer for Conferences: *SEM 2023, ACL 2023, COLING 2022, AMIA Annual Symposium 2015–2022, DMR 2020

Reviewer for Journals: Clinical and Translational Allergy (2021), Journal of Biomedical Informatics (2018–2021), BMC Medical Informatics and Decision Making (2016)

Publications

[1] Christopher Tam, Richard Brutti, Kenneth Lai, and James Pustejovsky. Annotating situated actions in dialogue. In *Proceedings of the Fourth International Workshop on Designing Meaning Representations*, Nancy, France, June 2023.

[2] Qi Wang, Kenneth H. Lai, and Chunlei Tang. Solving combinatorial optimization problems over graphs with BERT-based deep reinforcement learning. *Information Sciences*, 619:930–946, 2023.

[3] Mariah Bradford, Paige Hansen, Kenneth Lai, Richard Brutti, Rachel Dickler, Leanne M. Hirshfield, James Pustejovsky, Nathaniel Blanchard, and Nikhil Krishnaswamy. Challenges and opportunities in annotating a multimodal collaborative problem solving task. In *Proceedings of the AIED 2022 Workshop - Interdisciplinary Approaches to Getting AI Experts and Education Stakeholders Talking*, Durham, United Kingdom, July 2022.

[4] Lucia Donatelli, Kenneth Lai, Richard Brutti, and James Pustejovsky. Towards situated AMR: Creating a corpus of gesture AMR. In Vincent G. Duffy, editor, *Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management. Health, Operations Management, and Design*, pages 293–312, Cham, 2022. Springer International Publishing.

[5] Richard Brutti, Lucia Donatelli, Kenneth Lai, and James Pustejovsky. Abstract Meaning Representation for gesture. In *Proceedings of the Thirteenth Language Resources and Evaluation Conference*, pages 1576–1583, Marseille, France, June 2022. European Language Resources Association.

[6] Jens E. L. Van Gysel, Meagan Vigus, Jayeol Chun, Kenneth Lai, Sarah Moeller, Jiarui Yao, Tim O'Gorman, Andrew Cowell, William Croft, Chu-Ren Huang, Jan Hajič, James H. Martin, Stephan Oepen, Martha Palmer, James Pustejovsky, Rosa Vallejos, and Nianwen Xue. Designing a uniform meaning representation for natural language processing. *KI - Künstliche Intelligenz*, 35(3):343–360, November 2021.

[7] Kenneth Lai, Lucia Donatelli, and James Pustejovsky. A continuation semantics for Abstract Meaning Representation. In *Proceedings of the Second International Workshop on Designing Meaning Representations*, pages 1–12, Barcelona, Spain (online), December 2020. Association for Computational Linguistics.

[8] Lucia Donatelli, Kenneth Lai, and James Pustejovsky. A two-level interpretation of modality in human-robot dialogue. In *Proceedings of the 28th International Conference on Computational Linguistics*, pages 4222–4238, Barcelona, Spain (online), December 2020. International Committee on Computational Linguistics.

[9] Aleena Banerji, Kenneth H. Lai, Yu Li, Rebecca R. Saff, Carlos A. Camargo, Kimberly G. Blumenthal, and Li Zhou. Natural language processing combined with ICD-9-CM codes as a novel method to study the epidemiology of allergic drug reactions. *The Journal of Allergy and Clinical Immunology: In Practice*, 8(3):1032–1038.e1, 2020.

[10] James Pustejovsky, Nianwen Xue, and Kenneth Lai. Modeling quantification and scope in Abstract Meaning Representations. In *Proceedings of the First International Workshop on Designing Meaning Representations*, pages 28–33, Florence, Italy, August 2019. Association for Computational Linguistics.

[11] Francis Deng, Matthew D. Li, Adrian Wong, Leigh T. Kowalski, Kenneth H. Lai, Subba R. Digumarthy, and Li Zhou. Quality of documentation of contrast agent allergies in electronic health records. *Journal of the American College of Radiology*, 16(8):1027–1035, 2019.

[12] Alejandra Salazar, Samuel J Karmiy, Katherine J Forsythe, Mary G Amato, Adam Wright, Kenneth H Lai, Bruce L Lambert, David M Liebovitz, Tewodros Eguale, Lynn A Volk, and Gordon D Schiff. How often do prescribers include indications in drug orders? Analysis of 4 million outpatient prescriptions. *American Journal of Health-System Pharmacy*, 76(13):970–979, June 2019.

[13] Kenneth Lai and James Pustejovsky. A dynamic semantics for causal counterfactuals. In *Proceedings of the 13th International Conference on Computational Semantics - Student Papers*, pages 1–8, Gothenburg, Sweden, May 2019. Association for Computational Linguistics.

[14] Adrian Wong, Diane L. Seger, Kenneth H. Lai, Foster R. Goss, Kimberly G. Blumenthal, and Li Zhou. Drug hypersensitivity reactions documented in electronic health records within a large health system. *The Journal of Allergy and Clinical Immunology: In Practice*, 7(4):1253–1260.e3, 2019.

[15] Maxim Topaz, Adam Schaffer, Kenneth H. Lai, Zfania Tom Korach, Jonathan Einbinder, and Li Zhou. Medical malpractice trends: Errors in automated speech recognition. *Journal of Medical Systems*, 42(8):153, July 2018.

[16] Maxim Topaz, Adam Schaffer, Kenneth Lai, Zfania Tom Korach, Jonathan Einbinder, and Li Zhou. Malpractice cases involving allergy information in electronic health records: Implications for safer systems. *Perspectives in Health Information Management*, Summer 2018:1–19, 2018.

[17] Foster R Goss, Kenneth H Lai, Maxim Topaz, Warren W Acker, Leigh Kowalski, Joseph M Plasek, Kimberly G Blumenthal, Diane L Seger, Sarah P Slight, Kin Wah Fung, Frank Y Chang, David W Bates, and Li Zhou. A value set for documenting adverse reactions in electronic health records. *Journal of the American Medical Informatics Association*, 25(6):661–669, June 2018.

[18] Warren W. Acker, Joseph M. Plasek, Kimberly G. Blumenthal, Kenneth H. Lai, Maxim Topaz, Diane L. Seger, Foster R. Goss, Sarah P. Slight, David W. Bates, and Li Zhou. Prevalence of food allergies and intolerances documented in electronic health records. *The Journal of Allergy and Clinical Immunology*, 140(6):1587–1591.e1, 2017.

[19] Chunlei Tang, Haohan Zhang, Kenneth H. Lai, Yuxuan She, Yun Xiong, and Li Zhou. Developing a regional classifier to track patient needs in medical literature using spiral timelines on a geographical map. In *2017 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, pages 874–879, 2017.

[20] Kenneth H. Lai, Suzanne V. Blackley, and Li Zhou. Using mutual information clustering to discover food allergen cross-reactivity. In *2017 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, pages 732–735, 2017.

[21] Aleena Banerji, Kimberly G. Blumenthal, Kenneth H. Lai, and Li Zhou. Epidemiology of ACE inhibitor angioedema utilizing a large electronic health record. *The Journal of Allergy and Clinical Immunology: In Practice*, 5(3):744–749, 2017.

[22] Kimberly G. Blumenthal, Kenneth H. Lai, Mingshu Huang, Zachary S. Wallace, Paige G. Wickner, and Li Zhou. Adverse and hypersensitivity reactions to prescription nonsteroidal anti-inflammatory agents in a large health care system. *The Journal of Allergy and Clinical Immunology: In Practice*, 5(3):737–743.e3, 2017.

[23] Maxim Topaz, Foster Goss, Kimberly Blumenthal, Kenneth Lai, Diane L. Seger, Sarah P. Slight, Paige G. Wickner, George A. Robinson, Kin Wah Fung, Robert C. McClure, Shelly Spiro, Warren W. Acker, David W. Bates, and Li Zhou. Towards improved drug allergy alerts: Multidisciplinary expert recommendations. *International Journal of Medical Informatics*, 97:353–355, 2017.

[24] Maxim Topaz, Kavita Radhakrishnan, Suzanne Blackley, Victor Lei, Kenneth Lai, and Li Zhou. Studying associations between heart failure self-management and rehospitalizations using natural language processing. *Western Journal of Nursing Research*, 39(1):147–165, 2017.

[25] Maxim Topaz, Kenneth Lai, Dawn Dowding, Victor J. Lei, Anna Zisberg, Kathryn H. Bowles, and Li Zhou. Automated identification of wound information in clinical notes of patients with heart diseases: Developing and validating a natural language processing application. *International Journal of Nursing Studies*, 64:25–31, 2016.

[26] Maxim Topaz, Diane L Seger, Sarah P Slight, Foster Goss, Kenneth Lai, Paige G Wickner, Kimberly Blumenthal, Neil Dhopeshwarkar, Frank Chang, David W Bates, and Li Zhou. Rising drug allergy alert overrides in electronic health records: an observational retrospective study of a decade of experience. *Journal of the American Medical Informatics Association*, 23(3):601–608, May 2016.

[27] Joseph M. Plasek, Foster R. Goss, Kenneth H. Lai, Jason J. Lau, Diane L. Seger, Kimberly G. Blumenthal, Paige G. Wickner, Sarah P. Slight, Frank Y. Chang, Maxim Topaz, David W. Bates, and Li Zhou. Food entries in a large allergy data repository. *Journal of the American Medical Informatics Association*, 23(e1):e79–e87, April 2016.

[28] Maxim Topaz, Kenneth Lai, Neil Dhopeshwarkar, Diane L. Seger, Roee Sa'adon, Foster Goss, Ronen Rozenblum, and Li Zhou. Clinicians' reports in electronic health records versus patients' concerns in social media: A pilot study of adverse drug reactions of aspirin and atorvastatin. *Drug Safety*, 39(3):241–250, March 2016.

[29] Maxim Topaz, Diane L. Seger, Foster Goss, Kenneth Lai, Sarah P. Slight, Jason J. Lau, Hari Nandigam, and Li Zhou. Standard information models for representing adverse sensitivity information in clinical documents. *Methods of Information in Medicine*, 55(2):151–157, 2016.

[30] Maxim Topaz, Diane L. Seger, Kenneth Lai, Paige G. Wickner, Foster Goss, Neil Dhopeshwarkar, Frank Chang, David W. Bates, and Li Zhou. High override rate for opioid drug-allergy interaction alerts: Current trends and recommendations for future. In *MEDINFO 2015: eHealth-enabled Health*, pages 242–246, Sao Paulo, Brazil, August 2015.

[31] Li Zhou, Amy W. Baughman, Victor J. Lei, Kenneth H. Lai, Amol S. Navathe, Frank Chang, Margarita Sordo, Maxim Topaz, Feiran Zhong, Madhavan Murrali, Shamkant Navathe, and Roberto A. Rocha. Identifying patients with depression using free-text clinical documents. In *MEDINFO 2015: eHealth-enabled Health*, pages 629–633, Sao Paulo, Brazil, August 2015.

[32] Kenneth H. Lai, Maxim Topaz, Foster R. Goss, and Li Zhou. Automated misspelling detection and correction in clinical free-text records. *Journal of Biomedical Informatics*, 55:188–195, 2015.

Other Presentations and Posters

[1] Kenneth Lai and James Pustejovsky. Causal models and possible worlds. In *3rd Context, Cognition, and Communication Conference*, Warsaw, Poland, September 2022.

[2] Kenneth Lai, Richard Brutti, Lucia Donatelli, and James Pustejovsky. Situated UMR for multimodal interactions. In *25th Workshop on the Semantics and Pragmatics of Dialogue*, Potsdam, Germany (online), September 2021.

[3] Kenneth Lai and James Pustejovsky. A dynamic semantics for causal counterfactuals. In *16th Formal Epistemology Workshop*, Turin, Italy, June 2019.

[4] Kenneth Lai and James Pustejovsky. Towards a modal logic of causal counterfactuals. In *Beyond Curve Fitting: Causation, Counterfactuals, and Imagination-Based AI*, Stanford, CA, March 2019.

[5] Kenneth H. Lai, Clay S. Riley, Suzanne V. Blackley, and Li Zhou. Automated classification of symptom severity in initial psychiatric evaluations. In *2016 CEGS N-GRID Shared-Tasks and Workshop on Challenges in Natural Language Processing for Clinical Data*, Chicago, IL, November 2016.

Skills

Programming and Scripting Languages: Python, Haskell, Java, Scheme, SQL, C#, HTML, CSS, C, Matlab, XQuery

Toolkits: PyTorch, NumPy, SciPy, Pandas, Keras, TensorFlow, Scikit-learn, NLTK, Weka, KNIME, Django

Operating Systems: Linux, Windows, macOS