Benjamin Kane

585-748-7994 | bkane2@ur.rochester.edu | https://cs.rochester.edu/u/bkane2

EDUCATION

University of Rochester — Rochester, NY
PhD Student in Computer Science — **June 2019 – Present**
- Advisor: Lenhart Schubert
- Co-Advisor: Aaron Steven White

University of Rochester — Rochester, NY
BSc (Highest Distinction) in Computer Science, BA (Distinction) in Economics — **Aug 2015 – May 2019**
- Honors: *magna cum laude*, Dean's List (GPA: 3.92/4.00)
- Robotics Club, Undergraduate Finance & Economics Council
- Education Abroad: *University of Bristol* — Jan 2018 – Jun 2018

RESEARCH EXPERIENCE

Department of Computer Science, University of Rochester — Rochester, NY
Graduate Research Assistant — **June 2019 – Present**
- **Blocks World dialogue system:**
  - Creation of an end-to-end dialogue system capable of holding a spatial question-answering dialogue with a human about physical blocks which can be freely arranged on a table.
  - Designed a semantic parser capable of processing a wide range of spatial questions into unscoped logical form (ULF) representations using hierarchical pattern transduction trees.
  - Improved dialogue context and episodic memory in dialogue system to enable the system to answer questions about historical actions and relations.
- **SOPHIE (end-of-life communication dialogue system):**
  - Creation of a dialogue system and virtual human capable of acting as a cancer patient in practice doctor-patient dialogues.
  - Developed in conjunction with collaborators in the ROC HCI lab and the UR Medical Center (URMC), with the goal of helping doctors to improve communication in end-of-life dialogue scenarios (Paper currently under review).
- **Belief, Desire, and Fine-Grained Inference:**
  - Collection of lexical-scale human annotations targeting the belief & desire properties of different English verbs. Empirical analysis of the relations between these lexical semantic properties and the syntactic distributions of these verbs.
  - Creation of mixed-effects models that can be used above statistical NLI systems to model annotator differences.

Department of Computer Science, University of Rochester — Rochester, NY
Undergraduate Research Assistant — **May 2017 – May 2019**
- Assisted in development of LISSA Virtual Human, a schema-based dialogue agent used in studies on improving social interaction. Created Lisp code to extract context-independent "gist clauses" from user speech recognizer output, using feature-based pattern matching and transduction trees.
- Worked on training a turn-taking model for LISSA dialogues using various prosodic and linguistic features from annotated Wizard-of-Oz transcripts, using a mixture-of-experts classifier.
- Annotated varied database of sentences with unscoped logical form (ULF) representations.
- Created Lisp code to generate natural inferences from the ULF-coded sentences for various implicative and factive verbs.

PUBLICATIONS & PRESENTATIONS

Conference
- Gantt W.; Kane B.; White A. S. Natural Language Inference with Mixed Effects. *The 9th Joint Conference on Lexical and Computational Semantics (*SEM 2020)* (To Appear). December 12-13, 2020, Virtual.
- Kane B.; Platonov G.; Schubert L. K. Registering Historical Context for Question Answering in a Blocks World Dialogue System. *Text, Speech, and Dialogue*, September 8-11, 2020, Virtual.
- Platonov G.; Kane B.; Gindi A.; Schubert L. K. A Spoken Dialogue System for Spatial Question Answering in a Physical Blocks World. *SIGDIAL*, July 1-3, 2020, Virtual.

- Razavi S. Z.; Kane B.; Schubert L. K. Investigating Linguistic and Semantic Features for Turn-Taking Prediction in Open-Domain Human-Computer Conversation. *Interspeech*, September 15-19, 2019, Graz, Austria.

Workshop

- Kim G. L.; Kane B.; Duong V.; Mendiratta M.; McGuire G.; Sackstein S.; Platonov G.; Schubert L. K. Generating Discourse Inferences from Unscoped Episodic Logical Formulas. *1st Int. Workshop on Designing Meaning Representations (DMR), at the 57th Annual Meeting of the Association for Computational Linguistics (ACL 2019)*, Aug 1, 2019, Florence, Italy.
- Razavi S. Z.; Schubert L. K.; Kane B.; Rafayet Ali M.; Van Orden K. A.; Ma T. Dialogue Design and Management for Multi-Session Casual Conversation with Older Adults. *Workshop on User-Aware Conversational Agents (User2Agent), at the 24th Int. Conf. on Intelligent User Interfaces (ACM IUI 2019).* March 17-20, 2019, Los Angeles, USA.
- Kane B.; Luo, J. Do the Communities We Choose Shape our Political Beliefs? A Study of the Politicization of Topics in Online Social Groups. *Workshop on Big Social Media Data Management and Analysis (BSMDMA), at the IEEE International Conference on Big Data.* December 10-13, 2018, Seattle, USA.

Preprint

- Kane B.; Platonov G.; Schubert L. K. History-Aware Question Answering in a Blocks World Dialogue System. *arXiv:2005.12501*

HONORS AND AWARDS

NSF Research Traineeship **Aug 2019 – May 2021**

- Receive training and financial support for data-enabled research into human behavior and its cognitive and neural mechanisms (e.g. machine learning, data mining, statistics, cognitive modelling, computational neuroscience).

SELECTED COURSES

Computer Science: Statistical Speech & Language Processing, Sampling Algorithms, Machine Learning, Natural Language Processing, Knowledge Representation & Reasoning in AI, Machine Vision, Data Mining, Artificial Intelligence, Advanced Algorithms, Computer Networking, Computer Organization, Programming Language Design & Implementation, Theory of Computation, Web Technologies, Databases & Cloud Concepts, Data Structures and Algorithms.
Linguistics: Formal Semantics, Pragmatics
Economics, Physics, Mathematics: Game Theory, Behavioral Economics, Industrial Economics, Econometrics, Intermediate Microeconomics / Macroeconomics, Mechanics, Modern Physics, Statistics, Multidimensional Calculus, Linear Algebra.

ACADEMIC PROJECTS

- **Word2Vec Lisp Library (Lisp):** created a small Lisp library for learning word embeddings using a skip-gram architecture implemented natively, as well as for interfacing with Python Word2Vec libraries, to help with KRR in Lisp.
- **POS Tagger & Parser (Python):** implemented a part-of-speech tagger and a statistical parser from scratch using Hidden Markov Model (HMM) decoding and CYK decoding, respectively. Used perceptron algorithm to train both using data from Penn Treebank.
- **Planning Agent (Lisp):** created a simple planning agent for standard "blocks world" domain. Given a (virtual) table with blocks and a description of a goal structure, the agent stacks blocks on table to achieve the structure at the lowest cost.
- **Machine Learning Implementation (Python):** implemented multilayer neural network backpropagation, EM algorithm for an aspect model, and a Hidden Markov Model. Analyzed performance and results of algorithms across various real-world datasets.
- **Visulinga (Node.js):** developed prototype flashcard website aimed at helping individuals learn foreign languages through forming visual-semantic connections. Videos related to a word are generated automatically through web mining.

TEACHING EXPERIENCE

Department of Physics, University of Rochester Rochester, NY

Undergraduate Teaching Intern for Physics Mechanics **Aug 2016 – Dec 2016**

- Led weekly workshop in Classical Mechanics, teaching important physics concepts and essential problem-solving skills to group of 14 students. Provided feedback on homework assignments and held weekly office hours.

Undergraduate Teaching Assistant for Knowledge Representation & Reasoning in AI **Aug 2018 – Dec 2018**

- Supported students with complex topics in upper-level knowledge representation course, graded written homework assignments and Lisp programming assignments.

Undergraduate Teaching Assistant for Introduction to Artificial Intelligence **Jan 2019 – May 2019**

- Supported students in learning introductory concepts in AI. Graded exams and open-ended projects. Led workshop for unit on knowledge representation, reasoning, and inference.

Teaching Assistant for Knowledge Representation & Reasoning in AI **Aug 2019 – Dec 2019**

- Designed and lead workshops covering topics within first-order logic, formal semantics and proof theory. Held biweekly office hours. Graded written homework assignments and Lisp programming assignments.

Teaching Assistant for Natural Language Processing **Jan 2020 – May 2020**

- Designed and graded exam questions and created programming assignments related to various topics in natural language understanding. Held weekly office hours.

SKILLS AND INTERESTS

Computer Languages: Python, Common Lisp, Java, C, JavaScript/Node.js, SQL
Data Analysis: PyTorch, Numpy, Pandas, Scikit-learn, Matplotlib
Computer Tools: LaTeX, Photoshop, Git
Natural Languages: Spanish (limited working proficiency)
Interests: Isshin-ryū karate, Brazilian Jiu Jitsu, Music (flute, synthesizers), WesterosCraft (administration team & developer)