Benjamin Kane

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EDUCATION

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

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**
- Develop Eta, a dialogue manager capable of holding a spatial question-answering dialogue with a human about physical blocks which can be freely arranged on a table. Created a semantic parser capable of processing a wide range of spatial questions into unscoped logical form (ULF) representations using hierarchical pattern transduction trees.
- Work on modelling context, improving coreference, and registering/remembering speaker identity in the Eta dialogue manager.

Department of Computer Science, University of Rochester — Rochester, NY
Undergraduate Research Assistant — **May 2017 – May 2019**
- Assist 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.
- Work 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.
- Annotate varied database of sentences with unscoped logical form (ULF) representations, create code to generate natural inferences from the ULF-coded sentences for various implicative and factive verbs.
- Aid in task of modeling spatial relations from natural speech in "blocks world" and "room world" domains, with goal of using 3D models in commonsense reasoning and story understanding.

PUBLICATIONS & PRESENTATIONS

Conference
- 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.

HONORS AND AWARDS

NSF Research Traineeship — **Aug 2019 – May 2020**
- 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, Machine Learning, Natural Language Processing, Knowledge Representation & Reasoning in AI, 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.
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.

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 (moderator team)