

# CONNOR PRYOR

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## Goal and Experience Statement

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My name is Connor Pryor, and I am a graduating Ph.D. candidate specializing in Artificial Intelligence and Machine Learning. Throughout my academic journey, I have worked in various research areas, including inference and learning over graphs, object navigation, detection, time-series modeling, entity resolution, various dialog problems, explainability, online learning, event detection in autonomous driving, and more. My research is inherently multidisciplinary, involving extensive collaborations with industry and academic partners. I have led projects for companies in anomaly detection in routers, emotion recognition in conversation, enhancing large language model reasoning, and entity resolution. While in academia, I have worked on earth sciences and marine biology projects, including weather forecasting using relational geographical information, demand forecasting using seasonal information, and shark identification using images of the primary dorsal fin. My primary objective is to secure a role that contributes meaningfully to machine learning research, striving to create innovative and efficient models that address complex real-world problems.

## Education

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### Ph.D. in Computer Science:

University of California, Santa Cruz - Santa Cruz, California

Fall 2018 — Present

### Bachelor of Science in Computer Science:

University of California, Santa Cruz - Santa Cruz, California

Fall 2013 — Fall 2017

### Bachelor of Science in Mathematics:

University of California, Santa Cruz - Santa Cruz, California

Fall 2013 — Fall 2017

## Research Experience

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### Ph.D. Graduate Researcher | University of California, Santa Cruz under Dr. Lise Getoor

Fall 2018 — Present

During my graduate studies, I had the privilege of collaborating with Dr. Getoor in the LINQS machine learning lab, where I delved into various machine learning techniques and topics. My research spanned neuro-symbolic reasoning, structure prediction, computer vision, natural language processing, graph sampling/generation, and more. Throughout my exploration of these topics, I employed various cutting-edge machine learning tools, such as TensorFlow, PyTorch, Deep Graph Library, and Open Graph Benchmark. Notably, I played a key role in advancing the development of an open-source, scalable, probabilistic relational learning framework known as Probabilistic Soft Logic (PSL) ([psl.linqs.org](http://psl.linqs.org)). Within this framework, my focus was on investigating the seamless integration of Probabilistic Soft Logic with deep learning models. Through this, I helped spearhead the introduction to the theory and implementation of Neural Probabilistic Soft Logic (NeuPSL), which integrated any neural backend (PyTorch, TensorFlow, etc.) with the state-of-the-art symbolic inference in PSL.

### Google Research Intern | Google with the Drake team

Summer 2020 — Fall 2021

I worked with the Drake team under Tania Bedrax-Wiss, Deepak Ramachandran, Mehran Kazemi, and Jeremiah Liu on joint neural symbolic semi-supervised dialog structure learning using hinge-loss Markov random field constraints. This experience taught me how to work in an industry environment, work with a large-scale codebase with code reviews, and an introduction to scalable machine learning.

- Internship Summer 2021 — Fall 2021: Developed the theory for joint decoding and learning and implemented an end-to-end joint approach built within TensorFlow v2.0.
- Student Researcher Fall 2020 — Spring 2021: Expanded the implementation of neural symbolic reasoning for dialog structure induction to facilitate robust learning in the presence of noisy or limited data.
- Internship Summer 2020 — Fall 2020: Explored unsupervised neural approaches with common sense dialog rules to create interpretable dialog structures to aid downstream tasks such as dialog policy learning.

**Undergraduate Researcher** | University of California, Santa Cruz under Dr. Lise Getoor Spring 2017 — Fall 2017

Worked with Dr. Getoor's Lab in collaboration with several industry partners on projects that include developing a new data sampling technique now deployed on millions of routers, creating models for real-time prediction using sparsely labeled heterogeneous data sources, analyzing different sampling techniques over very large graphs, and studied a variety of metrics comparing the graphs.

## Projects

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**PSL** | University of California, Santa Cruz Winter 2019 — Present

I contributed to expanding the open-source Probabilistic Soft Logic (PSL) directory, a machine-learning framework known for its ease of use and speed in developing probabilistic models. PSL employs a straightforward logical syntax and solves models through fast convex optimization, achieving state-of-the-art results in various fields such as natural language processing, social network analysis, knowledge graphs, recommender systems, and computational biology. My primary contributions included integrating PSL with any neural backend (PyTorch, TensorFlow, JAX, DL4J, etc.) and expanding it into an online system ([github.com/linqs/psl](https://github.com/linqs/psl)).

**Applications in NeuPSL** | University of California, Santa Cruz Winter 2019 — Present

In addition to advancing the theory and overseeing the general implementation of NeuPSL ([github.com/linqs/psl](https://github.com/linqs/psl)), I took a lead role in exploring its applications within neuro-symbolic (NeSy) computing. This endeavor encompassed a thorough investigation into the effectiveness of NeuPSL across established NeSy evaluation tasks, including MNIST-Addition, Visual Sudoku, and Citation Network Node Classification ([github.com/linqs/neupsl-ijcai23](https://github.com/linqs/neupsl-ijcai23) and [github.com/linqs/vspc-nesy22](https://github.com/linqs/vspc-nesy22)). Furthermore, I spearheaded NeuPSL's applicability to complex natural language processing projects such as dialog structure induction ([github.com/google/uncertainty-baselines](https://github.com/google/uncertainty-baselines)) and computer vision projects such as ROad event Awareness Dataset with logical Requirements (ROAD-R) ([github.com/linqs/RoadRNeuPSL](https://github.com/linqs/RoadRNeuPSL)) and Exploration with Soft Commonsense Constraints for Zero-shot Object Navigation ([sites.google.com/ucsc.edu/escnav/home](https://sites.google.com/ucsc.edu/escnav/home)).

**Applications in Online PSL** | University of California, Santa Cruz Winter 2019 — Present

Along with the implementation of online PSL ([github.com/linqs/psl](https://github.com/linqs/psl)), I helped develop three online tasks ([github.com/linqs/dickens-icml21](https://github.com/linqs/dickens-icml21)): trust-prediction (epinions), demand forecasting (bikeshare), and recommender systems (MovieLens 1 Million).

**Shark Identification** | University of California, Santa Cruz Summer 2023 — Present

In collaboration with Dr. Lise Getoor from UC Santa Cruz, Dr. Barbara A. Block from Stanford, and their research teams, I developed a shark identification software that matches images of sharks' primary dorsal fins with an existing historical database. This project is broken into three tasks: detection, image retrieval, and entity resolution. Furthermore, these tasks had the challenge of low image quality, a few-shot data, and a temporal database. I build an end-to-end pipeline that processes the data, applies data augmentation, and trains using SimCLR, a zero-shot learning pipeline.

**pacai** | University of California, Santa Cruz Winter 2019 — Present

Redesigned and implemented an educational Pacman project aimed at teaching new students Artificial Intelligence through the creation of agents. This project initially started at Berkeley and now has over 1000 repositories on GitHub. — [github.com/linqs/pacman](https://github.com/linqs/pacman)

**Chess-ER** | University of California, Santa Cruz Summer 2018 — Present

Created a relational chess data set for entity resolution, studied behavioral modeling for entity identification, and developed a scalable entity resolution framework that combines local information, relational information, gameplay data, behavioral data, and temporal information. — [github.com/cfprry/er-chess](https://github.com/cfprry/er-chess)

**Twitter Approval** | University of California, Santa Cruz Winter 2019 — Spring 2019

I used Tweets to predict the approval rating of influential people. I combined traditional semantic analysis tools and graph structure to aid prediction in this project. — [github.com/cfprry/twitter-semantic-analysis](https://github.com/cfprry/twitter-semantic-analysis)

# Teaching and Leadership Experience

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## **Google-Focused Research Project** | University of California, Santa Cruz

Spring 2019 — Present

Lead projects, discussions, and presentations on multi-university collaboration with Google – group size of ~15 experts. These endeavors were part of a collaborative effort across multiple universities to develop a unified reasoning and discovery framework for recommender dialogs utilizing Probabilistic Soft Logic (PSL).

## **Teaching Assistant** | University of California, Santa Cruz

Spring 2019 — Present

Introduction to Artificial Intelligence — class size of ~100 students. Here, I led discussion sections covering theoretical concepts of AI, redesigned all class materials in alignment with modern techniques, lectured classes, created exams, answered questions, mentored new TAs, and graded.

# Publications

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## NeuPSL: Neural Probabilistic Soft Logic

**Connor Pryor\***, Charles Dickens\*, Eriq Augustine, Alon Albalak, William Wang, and Lise Getoor (IJCAI). 2023\*.

## Using Commonsense to Guide Dialog Structure Induction via Neural Probabilistic Soft Logic

**Connor Pryor**, Quan Yuan, Jeremiah Zhe Liu, Seyed Mehran Kazemi, Deepak Ramachandran, Tania Bedrax-Weiss, Lise Getoor. Association for Computational Linguistics Rolling Reviews (ACL). 2022.

## ESC: Exploration with Soft Commonsense Constraints for Zero-shot Object Navigation

Kaiwen Zhou, Kaizhi Zheng, **Connor Pryor**, Yilin Shen, Hongxia Jin, Lise Getoor, Xin Eric Wang. International Conference on Machine Learning (ICML). 2023.

## Visual Sudoku Puzzle Classification: A Suite of Collective Neuro-Symbolic Tasks.

Eriq Augustine, **Connor Pryor**, Charles Dickens, Jay Pujara, William Yang Wang, Lise Getoor. Workshop on Neural-Symbolic Learning and Reasoning (NeSy). 2022.

## FETA: A Benchmark for Few-Sample Task Transfer in Open-Domain Dialogue

Alon Albalak, Yi-Lin Tuan, Pegah Jandaghi, **Connor Pryor**, Luke Yoffe, Deepak Ramachandran, Lise Getoor, Jay Pujara, William Yang Wang. Conference on Empirical Methods in Natural Language Processing (EMNLP). 2022.

## Local Explanation of Dialogue Response Generation

Yi-Lin Tuan, **Connor Pryor**, Wenhui Chen, Lise Getoor, William Yang Wang. Advances in Neural Information Processing Systems (NeurIPS). 2021.

## Context-Aware Online Collective Inference for Templated Graphical Models

Charles Dickens\*, **Connor Pryor\***, Eriq Augustine, Alex Miller, Lise Getoor. International Conference on Machine Learning (ICML). 2021.

## Negative Weights in Hinge-Loss Markov Random Fields

Charles Dickens, Eriq Augustine, **Connor Pryor**, Lise Getoor. Workshop on Tractable Probabilistic Modeling (TPM). 2021.

# Skills

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## **Machine Learning Packages**

## **Areas of Computer Science:**

## **Programming Languages:**

## **Operating Systems and Environments:**

## **Tools:**

Tensorflow, Pytorch, Deep Graph Library (DGL), Open Graph Benchmark (OGB)

Machine Learning, Artificial Intelligence, Data Mining, Data Science, Natural Language Processing, Computer Vision, and Algorithm Design

Python, Java, C, C++, HTML, R, and Javascript

Linux/Unix, Mac, Windows, Office Tools, and Spreadsheets

git, ssh, vim, bash, curl, grep