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Caleb Schultz Kisby
Neuro-Symbolic AI Researcher

GitHub: ais-climber
LinkedIn: [Link]

EDUCATION

Ph.D. Candidate, Computer Science (in progress)   Fall 2018 – Present
Indiana University   GPA: 3.75
Concentration: Neuro-Symbolic AI

B.S. Computer Science and Mathematics   Spring 2018
University of South Carolina   GPA: 3.97

EXPERIENCE

Research Assistant   Spring 2022 – Present
Indiana University   Fall 2018 – Spring 2019
∘ See Projects below. Supported by a DoD Trusted AI grant for which I co-wrote the grant proposal.

Teaching Assistant   Summer 2019 – Fall 2021
Indiana University
∘ Planned and taught recitations for Theory of Computation, Honors Discrete Math, and Intro to Programming

PROJECTS

à la Mode: Neural Network Model Checking & Building   [GitHub]
∘ Independently developed a suite for checking and building neural networks from symbolic constraints (using Tensorflow).
∘ Proved that the neuro-symbolic translation at the heart of the program is formally sound (see FLAIRS paper below).

Notakto Player   [GitHub][Report]
∘ Supplemented the AlphaZero CNN with light knowledge-based features to better play Thane Plambeck's Notakto
  (a game for which AlphaZero fails to learn a winning strategy — see the linked Report).
∘ Wrote testbed code (using Tensorflow) to compare the supplemented net against the original AlphaZero net.

An Efficient & Light Cardinality Reasoner   [GitHub]
∘ Proved completeness for a computationally light logic that reasons about cardinalities with intersection in polynomial time.
∘ Collaborated with co-authors on proof (see AAAI paper below); Independently implemented model-building in Python.

COBB: Case-Based Confidence for Black Box Predictions   [GitHub]
∘ Co-developed a hybrid neuro-symbolic system that uses a case-based reasoner to assess confidence and explain a neural
  network's predictions (using Scikit-Learn). Larry Gates and I divided all work evenly. (See ICCBR paper below.)

Sense-Able: Obstacle Sensor for Visually Impaired   [GitHub][Tutorial]
∘ Collaborated with a team to develop a proof-of-concept LIDAR sensor for our clients at P. B. Mumola, Ph.D., LLC.
∘ Wrote C++ code for object detection and the front-end (in Qt); Independently wrote a tutorial for the LIDAR SDK.

SKILLS

Machine Learning. Supervised & Reinforcement Learning, Tensorflow (Keras), Scikit-Learn, NLP (Word2Vec, NLTK)
Symbolic AI. Knowledge Representation & Reasoning, Model Building, First-Order & Modal Logics; Natural Language Semantics
Languages. Python, C++, C, Java, Agda, Lisp (Racket), miniKanren, Lean, Prolog, SQL (Postgres)
Other Tools. Git, LaTeX, TexMacs, Jupyter Notebook (Google Colab), Visual Studio Code, Emacs, Linux

PUBLICATIONS

FLAIRS 2022	**The Logic of Hebbian Learning** with Saúl A. Blanco and Lawrence Moss. Presented at FLAIRS 2022, Jensen Beach FL. *Nominated for Best Student Paper*.	[pdf]
AAAI 2020	**Logics for Sizes with Union or Intersection** with Saúl A. Blanco, Alex Kruckman, and Lawrence Moss. Presented at AAAI'20, New York NY	[pdf]
ICCBR 2019	**CBR Confidence as a Basis for Confidence in Black Box Systems** with Lawrence Gates and David Leake. Presented at ICCBR 2019, Otzenhausen Germany.	[pdf]