ATHARVA SEHGAL

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EDUCATION

University of Texas, Austin   August 2021 - Present

PhD in Computer Science (Advised by Swarat Chaudhuri)

University of Illinois, Urbana Champaign   August 2017 - May, 2021

B.S. in Computer Science w/ high honors; Minor in Linguistics; James Scholar

PUBLICATIONS

Neurosymbolic Programming for Science   NeurIPS AI4Science Workshop, 2022
Jennifer J. Sun*, Megan Tjandrasuwita*, Atharva Sehgal*, Armando Solar-Lezama, Swarat Chaudhuri, Yisong Yue, Omar Costilla-Reyes

Composing Neural Learning and Symbolic Reasoning with an Application to Visual Discrimination   IJCAI-ECAI, 2022
Adithya Murali, Atharva Sehgal, Paul Krogmeier, Madhusudan Parthasarathy

Statheros: A Compiler for Efficient Low-Precision Probabilistic Programming DAC, 2021
Jacob Laurel, Rem Yang, Atharva Sehgal, Shubham Ugare, Sasa Misailovic

EXPERIENCE

Trishul Lab, UT Austin   June 2021 - Present
Graduate Researcher

· Developing neuro-symbolic techniques for interpretable programmatic generation of mice behaviors. (neurosymbolic.org/cognitive.html).

Madhusudhan Parthasarathy's Research Group, UIUC   August 2020 - May 2021
Undergraduate Researcher

· Developed a synthetic dataset of visual discrimination puzzles (VDPs). Developed novel neuro-symbolic and neural architectures for solving VDPs.
· This necessitated developing and testing multiple novel CV models for few-shot classification including a scene-graph generator (Mask RCNN backbone), an object detector (YOLO backbone), a VAE based prototypical network, and a triplet loss deep ranking network.

Sasa Misailovic's Research Group, UIUC   February 2020 - December 2021
Undergraduate Researcher

· Helped formulate and engineer a compiler for efficient low-precision probabilistic programming in C++17.
· Developed the experiments for the paper. Built a testbench that measured power usage, accuracy, and runtime on ARM based Arduino Due, Raspberry Pi 3b+, and PocketBeagle.

TECHNICAL STRENGTHS (IN ORDER OF PROFICIENCY)

Computer Languages	Python, C, C++14, Haskell, JavaScript, OCaml
Frameworks	PyTorch, Tensorflow, Pyro, Z3, Pandas/Dask, NetworkX

PROJECTS

Neural Distillation of Transformers   December, 2022

· "Thinking like Transformers" (Weiss et al., 2021) posits a programming language that can be used to make transformers. In this project, I designed and engineered an algorithm for automatically synthesizing a program given any reference transformer implementation. I used library learning (Ellis, 2021) to discover common programs and Stitch (Bowers et al., 2023) to construct program abstractions. The whitesheet report is available here: `blog.atharvas.net/synthesizing_transformers`

Programmatic Structured Pruning of CNNs   May, 2022

· Convolutional neural networks use learnable kernels for feature extraction from images. In this project, I made a tensor programming language that describes any CNN network and designed a novel synthesis mechanism to hierarchically distill a CNN into an executable program. Experiments on VGG-16 yield a compression ratio of 98% and an accuracy drop of 1% on CoCo dataset. A poster is available here: `atharvas.net/static/cnndistillationposter.pdf`

EuclidTrainer   December, 2021

· We use Euclidean geometry to calculate precise 3D pose estimations from a 2D pose estimation model (AlphaPose) for static videos. This was applied to make a weight training recommendation algorithm. Code is available here: `github.com/coreykarnei/EuclidTrainer`

TEACHING

TPEI (Preparation for College Mathematics) Co-instructor in Fall 2022. Designed and developed a curriculum to teach an accelerated mathematics class up to the Pre-Calculus level at the Coleman State Prison.

CS 225H (Honors:Algorithms for String Processing) Undergraduate Teaching Assistant in Fall 2020, Spring 2021. Helped students review and debug their code in office hours and helped develop course material.

CS 225H (Honors:Embedded Systems) Undergraduate Teaching Assistant in Spring 2020. Developed course material and capstone project (Available here: `github.com/atharvas/audio-visualizer`).

CS 225 (Data Structures and Algorithms) Undergraduate Teaching Assistant in Fall 2019, Spring 2020, Fall 2020, Spring 2021. Helped students review and debug C++ code and helped develop course material.

CS 173 (Discrete Mathematics) Undergraduate Teaching Assistant in Fall 2020. Conducted office hours and graded assignments.

CS 125 (Introduction to Computer Science) Undergraduate Teaching Assistant in Fall 2018.

RELEVANT COURSEWORK

Computer Science	Computer Vision, Robot Learning, Program Synthesis,
	Data Driven Algorithm Design, Programming Languages, Trustworthy ML