

Lucas Saldyt

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Education

Arizona State University

Tempe, Arizona

Ph.D. in Computer Science GPA: 3.83
Bachelor of Science in Computer Science GPA: 3.71

Aug. 2021 – May 2025
Aug. 2017 – May 2021

Experience

NASA/Caltech Jet Propulsion Laboratory

Pasadena, California

Graduate Intern, Section 347

Official Start Jan 9th 2023

- Will use the Ingenuity helicopter's snapdragon CPU to run advanced planning, localization, and machine learning algorithms for the Mars Perseverance Rover

ARM, planning, ML

Arizona State University

Tempe, Arizona

Graduate Researcher

Sep. 2021 – Present

- Modelled robot learning as differentiable program induction emphasizing planning, long-horizon learning, interpretability, and compositional generalization
- Created a hybrid function acquisition architecture enabling modular & fully differentiable modelling of planning over learned hierarchical skills.

(Python, jax)

- Published "Synthesized Differentiable Programs: Algorithmic Priors for Neural Network Initialization" which combines program synthesis with neural compilation to initialize neural networks to template algorithms that are close to desired programs

(NeurIPS 2022 NCSI Workshop)

PathAI

Boston, Massachusetts

Machine Learning Engineering Intern

Jun. 2020 – Aug. 2020

- Converted cloud-based research code into a profitable real-world medical device by translating kubernetes infrastructure into an efficient medical lab setup

(Python, Rust, tensorflow)

NASA Glenn Research Center

Cleveland, Ohio

Machine Learning Intern

Jan. 2020 – May 2020

- Designed & implemented a scalable data pipeline which aggregates and refines image, article, and taxonomy data on 1.9 million biological species.
- Created hierarchical EfficientNet biological taxonomy classifier (86% accuracy)
- Developed initial custom search engine based on original Google publications

(Python, neo4j)

(Python)

NASA Kennedy Space Center

Cape Canaveral, Florida

Software Engineering Intern

Jun. 2019 – Aug. 2019

- Benchmarked and developed class A, safety-critical, human-rated spaceflight ground control software for the Artemis lunar exploration missions
- Efficiently processed rocket telemetry containing 185,000+ measurements, benchmarked network performance and verified/validated software correctness

(C++, Agile)

(C++)

ASU Complex Systems Research Group

Tempe, Arizona

Mathematics Research Assistant

Oct. 2018 – Jun. 2019

- Analyzed agent-based models & co-wrote an ML/biology paper in Royal Society B

(Python, R, Diff. Eq.)

Sandia National Laboratories

Albuquerque, New Mexico

Quantum Computation Research Intern

Jun. 2016 – Sep. 2018

- Created distributed high-performance software for benchmarking & characterizing ion-trap quantum computers via gradient-based optimization
- Extensive software support maintaining and testing a 226,230 line codebase

(Python, numpy, SLURM)

Skills

Programming Languages: Python, Rust, Haskell, C++, Java, C, x86_64 Assembly, Clojure ...

Languages: English (fluent), Ukrainian (proficient), Spanish (basic)

Technologies: jax, pytorch, tensorflow, scikit-learn, numpy, pandas, opencv, plotly, seaborn, matplotlib, jupyter, Django, flask, websockets, neo4j, postgres, influx, SQL, HPC, linux, AWS, s3, kubernetes, Docker, git, Agile, L^AT_EX, cura, Autodesk Inventor, 3D-printing, robotics, electronics, Unreal Engine 5, ZeroMQ, ROS

Selected Publications & Presentations

<p>Synthesized Differentiable Programs: Algorithmic Priors for Neural Network Initialization NeurIPS NCSI Workshop</p> <ul style="list-style-type: none"> Created an algorithm which combines program synthesis and neural networks through neural compilation. A program synthesis algorithm generates template programs, and then neural compilation allows for syntactic computer programs to be compiled into the weights of a differentiable network. 	December 9th, 2022
<p>Environmental Learning for Robot Path-Planning Via Pareto Evolution Bachelors Thesis</p> <ul style="list-style-type: none"> Created "Pareto Evolution" algorithm from NSGA2. Showed that complexity is equivalent to Regularized Evolution, but accounts for multiple objectives Replicated AutoML-Zero, Regularized Evolution, NSGA2, LazySP, RRT*, AIT* ... Experimentation on high-dim. robots & large cities, emphasizing dynamics and env. 	May 5th, 2021 (Algorithms, Computational Complexity) (Planning, AutoML)
<p>Curiosity in Path-Planning: Synthesizing Path-Planners for Efficient Exploration ICRA "Towards Curious Robots" Workshop</p> <ul style="list-style-type: none"> Synthesized "curious" sampling-based path planners, which pre-compute environment specialized trees by balancing exploration & computation. Pre-computed trees often can instantly compute paths for a specific map, but incur a memory trade-off 	Apr. 15th, 2021 Virtual (Program Synthesis, Planning)
<p>Meta-Learning for Planning: Automatic Synthesis of Sampling-Based Path Planners ICLR Learning-to-Learn Workshop</p> <ul style="list-style-type: none"> Evolved Python robot path planning algorithms to find a Pareto-frontier of interpretable specialized algorithms for diverse environments. 	Mar. 26th, 2021 Virtual (Evolutionary Programming)
<p>Decoding alarm signal propagation of harvester ants with tracking and machine learning Royal Society B</p> <ul style="list-style-type: none"> Created network-model of agent-based communication, gave advice on machine learning approaches, created figures and performed data analysis 	Jan. 26th, 2022
<p>Curry, a Quantum Programming Language FOSDEM Quantum Computing Development Workshop</p> <ul style="list-style-type: none"> Created a novel quantum programming language emphasizing lightweight abstractions and functional composition, supported by QASM, open sourced 	Feb. 2019 Brussels, Belgium (Python, LISP)
Projects	
<p>Einstein Summations Are All You Need Independent Project (CSE 598: Biologically Inspired Artificial Intelligence)</p> <ul style="list-style-type: none"> Implemented backpropagation and autodifferentiation from scratch in pure numpy Used Einstein summations to implement attention and transformers from scratch 	Apr. 2022 Tempe, AZ
<p>Burgundy: A laser following robot quadruped Student Lead (CSE 598: Advances in Robot Learning)</p> <ul style="list-style-type: none"> Built and improved a 3D-printed robot quadruped from an open-source design Utilized proximal policy optimization to teach a quadruped to stand & walk Collected 3,840 images using custom IMU-based automatic labelling device Led team to develop neural networks for laser following via EfficientNet2 Wrote bluetooth and microcontroller code to operate the physical robot at >160hz 	Feb. 2021 – May 2021 Tempe, AZ (AutoDesk Inventor, Cura) (Reinforcement Learning) (pytorch) (Python, Arduino, C++)
<p>ASU/NASA JPL DORA CubeSat Ground Software Engineering Student Lead</p> <ul style="list-style-type: none"> Led development of robust ground station software for the DORA satellite, including radio communications, integration testing, and real-time user interface 	Aug. 2020 – Feb. 2021 Tempe, AZ (Rust, Python, KubOS)
<p>PlantSitter: A flexible robotic agriculture platform Independent Project (CSE 486)</p> <ul style="list-style-type: none"> Designed a 3D-printed robotic watering arm from scratch, adding inverse kinematics Created a real-time dashboard with automatic plant-watering capability Created websockets-based interface with an average frequency of 561hz and latency of 1.2ms by separating control, monitoring, and data processing via multiprocessing 	Feb. 2021 – May 2021 Tempe, AZ (AutoDesk Inventor) (Plotly, InfluxDB, MongoDB) (websockets, multiprocessing)