ILONA DEMLER

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EDUCATION

Harvard University   *Cambridge, MA*
B.A. Candidate in physics, secondary in computer science. GPA 3.91.   *May 2023*

- <u>CS coursework:</u> Machine Learning, Computer Vision, Inverse Graphics, Algorithms, Data Science

- <u>Phys/Math coursework:</u> Statistical Mechanics, Quantum Mechanics, Quantum Info, Electrodynamics, Solid State, Waves, Mechanics and Special Relativity, Statistics, Linear Algebra and Real Analysis

Boston University Academy   *Boston, MA*
High School Diploma Summa Cum Laude.   *May 2018*

- <u>University Coursework:</u> Python I, Computer Systems, Linear Algebra, Differential Equations, Multivariable Calculus. (Dual enrollment at Boston University).

SKILLS / INTERESTS

- **Research Interests:** Computer vision, human-computer interaction, biomedical devices, secure ML
- **Computer Languages:** Python, C++, C, JavaScript, Mathematica
- **Computer Tools:** Git, Pytorch, Pytorch lightning, Tensorflow, JAX, Ray, Qiskit, SQL, gstreamer

EXPERIENCE

Brenner Lab *Student Researcher*   *Harvard University* June-Aug 2022
Pose-tracking device for running clinical trials from home

- Together with physicians at Boston Children's Hospital, prototyped device for running clinical trials from patients' homes, set to be used in a funded trial for a neurodegenerative disease starting Nov 2022.
- Built a continuous pose detection and data saving pipeline that identifies patients, extracts key biometrics, and stores them in a cloud server, thus preserving patient privacy.
- Developed and implemented a solution to synchronize 2D device data with 3D motion capture lab data by transfer learning of PoseNet, MoveNet models.

Disney Research *Intern*   *Zurich, Switzerland* June-Aug 2022
Machine learning and data intelligence group

- Implemented method of forward gradients, in which a network is trained on the forward pass (with no backpropagation) using autograd gradient estimation.
- Implemented the method of synthetic gradients, in which a model is broken into independent pieces that can be trained asynchronously, without sharing knowledge of original input data or loss function.
- Built a proof-of-concept of Fully Homomorphic Encryption on image-based neural networks (containing CNNs and MLPs) in Python using Microsoft's C++ SEAL library.

Dreams-AI *Software Engineering Intern*   *Cambridge, UK* Apr - Aug 2021
Odds estimation and crypto for online gaming

- Designed cryptocurrency holding platform using a hierarchical deterministic wallet setup compatible with Ethereum and Binance Smart chains. Created frontend for a working demo on an accelerated timeline.
- Promoted to project leader and headed team of three software engineers developing a horserace betting model. Held weekly team meetings, improved web-scraping and feature engineering pipeline. Increased model profits by 20 percent and sped up data saving process by 2x.
- Promoted to higher-level leadership role, writing a 6-month company-wide report to investors.

Acronis *AI Intern* *Remote* Jan - Apr 2021
Basketball pose analysis.

- Built demo that detects and analyzes basketball free throws using Detectron2 and OpenPose, calculating elbow, knee, hip, and shoulder release angles, and whether player scores or misses.

Cadence Design Systems *Software Engineering Intern* *Remote* May 2020 - Dec 2020
Power supply circuit simulation

- Built models of SPICE data-driven circuit outputs, aiming to make power supply circuit simulation faster and more convergent. Implemented Ray library for parallelization and parameter tuning to easily add/remove computing nodes.
- Reduced training from 1 week to under 2 hours. Presented results at quarterly R&D teams meeting.

Ni Ultracold Chemistry Lab *PRISE Research Fellow* *Harvard University* Jun 2019 - Dec 2019
Atomic and molecular optics research under Professor Kang-Kuen Ni

- Built and tested robust optical tweezer transport system from scratch, with an active temperature control routine using a tunable lens. Programmed hardware to temperature correct and demonstrated efficiency over current setups.
- Presented results at joint group meeting with the Doyle and Lukin labs.

COURSE PROJECTS

Imaging Black Holes From VLBI Data *(MIT 6.819: Computer Vision)* May 2022

- Reconstructed images of black holes from VLBI data (sparsely sampled frequencies in the Fourier domain) collected by the Event Horizon Telescope, replicating the results from the Bouman et al. 2017 paper.
- Implemented two algorithms: CLEAN and RML (regularized maximum likelihood), and demonstrated that using closure phase data with a total variation denoising regularizer yields optimal results.

Predicting Expolanets from Light Curves *(APMTH 216: Inverse Problems)* May 2022

- Built a model that can identify expolanets in astrophysical light curves using both local view and global view data, replicating the results from the Shallue and Vanderburg 2018 paper.

Predicting Playlist Popularity from Spotify Data *(CS109a: Data Science I)* Dec 2021

- Used Spotify playlist data to build a model that predicts playlist popularity in terms of likes and streams.

CNN for Quantum Error Correction *(Physics 160: Quantum Information)* May 2020

- Built a convolutional neural network to optimize quantum error correction algorithms for storing memory on 9 qubit systems, focusing on bit and phase flip errors.
- Tested our algorithm on IBM quantum computers, showing improvement over current methods.

ACTIVITIES

Harvard Women in Physics (WiP) *Chair* *September 2021 - present*

- Building an inclusive, welcoming community for undergraduate WiPs. Organize events with faculty, lab tours, and collaborate with graduate WiP for mentorship and research opportunities.

Harvard Radio Broadcasting *Station Programmer* *September 2019 - present*

- Give weekly radio broadcasts specializing in hip hop, rhythm and blues, and rap music. Interview artists and write reviews of local shows, published on radio website (whrb.org).

Harvard International Program of Negotiation *First author* *January 2019 - December 2021*

- Together with four other students, co-created a curriculum on negotiation theory under Harvard Law School's Professor Shapiro

- Book launch event in October 2022, date of publication set for November 2022.

Small Claims Advisory Service (SCAS) *Volunteer*   *January 2019 - December 2021*

- Studied Massachusetts small-claims court laws.

- Help socioeconomically disadvantaged people going through small claims court.

Harvard Modern Dance Company *member*   *September 2019 - December 2020*

- Choreograph and perform in semesterly showcases.

AWARDS

- John Harvard Scholar

- KERNEL fellowship

- PRISE fellowship

- Dartmouth Book Award

- National Latin Exam Maxima Cum Laude

- World Ballet Competition finalist; Youth America Grand Prix top 24 and finalist

HOBBIES / NON-ACADEMIC INTERESTS

Ballet: Harvard Modern Dance Company, High School Student at Bolshoi Ballet Academy in Moscow, Clara in Jose Matteo Ballet Theater Nutcracker, accepted to Boston Ballet Pre-Professional Program

Tennis: High school varisty team captain and league MVP

Languages: English (native), Russian (native)