

## Education

<b>Stanford University</b> M.S. Computer Science Advisor: Chelsea Finn	2022–2024
<b>Stanford University</b> B.S. Mathematics, With Distinction	2019–2023

## Publications & Patents

**Caroline Choi\***, Yoonho Lee\*, Annie Chen, Allan Zhou, Aditi Raghunathan, Chelsea Finn. Auto-FT: Robust Fine-Tuning by Optimizing Hyperparameters on Out-of-Distribution Data. *NeurIPS DistShift 2023*. Submitted to CVPR 2024.

**Caroline Choi\***, Fahim Tajwar\*, Yoonho Lee\*, Ananya Kumar, Huaxiu Yao, Chelsea Finn. Conservative Prediction via Data-Driven Confidence Minimization. *Submitted to ICLR 2024*.

Huaxiu Yao\*, **Caroline Choi\***, Bochuan Cao, Yoonho Lee, Pang Wei Koh, Chelsea Finn. Wild-Time: A Benchmark of in-the-Wild Distribution Shift Over Time. *NeurIPS 2022*.

Mateo Attanasio\*, **Caroline Choi\***, Andrei Mandelshtam\*, Charlotte Ure\*. Symbol Length in Brauer Groups of Elliptic Curves. *Proceedings of the American Mathematical Society*, 151 (2023): 5031-5046.

Talia Blum\*, **Caroline Choi\***, Alexandra Hoey\*, Jonas Iskander\*, Kaya Lakein\*, Thomas Martinez\*. On Class Numbers, Torsion Subgroups, and Quadratic Twists of Elliptic Curves. *Transactions of the American Mathematical Society* 375, no. 1 (2022): 351-368.

Aman Agrawal\*, **Caroline Choi\***, Nathan Sun\*. On Permutation Weights and  $q$ -Eulerian Polynomials. *Annals of Combinatorics* 24, no. 2 (2020): 363–378.

**Caroline Choi**. Method for Diagnosing, Predicting, Determining Prognosis, Monitoring, or Staging Disease Based on Vascularization Patterns. *U.S. Patent 11,200,666, issued December 14, 2021*.

## Research Experience

<b>Stanford Artificial Intelligence Laboratory (SAIL)   IRIS Lab</b> Advised by Prof. Chelsea Finn	1/2022—Present
<ul style="list-style-type: none"> <li>Developing robust and trustworthy machine learning.</li> <li>Led one project and co-led a second. Developed core approaches, initiated &amp; executed experiments, analyzed results, presented progress at weekly meetings, and created paper figures and presentations.</li> <li>Advised by Prof. Chelsea Finn. Collaborated with Prof. Aditi Raghunathan. Mentored by Yoonho Lee and Prof. Huaxiu Yao.</li> <li>Published one paper in NeurIPS 2022. Submitted one paper to ICLR 2024 and one paper to CVPR 2024.</li> </ul>	
<b>University of Virginia REU in Number Theory</b> Advised by Prof. Charlotte Ure	06/2021—07/2021
<ul style="list-style-type: none"> <li>Proved a bound on the symbol length of Brauer groups of elliptic curves, revealing insights on the structure of elliptic curves.</li> <li>Implemented toy experiments to explicitly compute symbol length.</li> <li>Formulated and proved conjectures, contributed to paper writing, and led the journal submission process.</li> </ul>	
<b>University of Virginia REU in Number Theory</b> Advised by Prof. Ken Ono	06/2020—07/2020
<ul style="list-style-type: none"> <li>Improved existing bounds on the class number – a problem first posed by Gauss in 1801 – using elliptic curves, while drawing connections between two areas of number theory.</li> <li>Implemented initial toy experiments, formulated conjectures, and contributed to theorem proofs and paper writing.</li> <li>Published in a top-20 peer-reviewed mathematics journal. Presented work at the largest math conference in the US.</li> </ul>	
<b>Program in Mathematics for Young Scientists (PROMYS)</b> Advised by Dr. Roger Van Peski and Prof. Paul Gunnells	06/2018—07/2019

- Conducted combinatorics research on new permutation statistics known as weights.
- Developed theory to characterize permutation weights and proved an open conjecture by Gunnells et al.
- Implemented initial toy experiments, conjectured, and proved main theorems. Led the paper writing and journal submission process.

## Selected Projects

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### **AutoFT: Robust Fine-Tuning via Hyperparameter Optimization on OOD Data** 5/2023—Present

*Advised by Prof. Chelsea Finn, Prof. Aditi Raghunathan, and Yoonho Lee*

- Developed AutoFT, a data-driven approach for fine-tuning foundation models to enhance OOD generalization.
- Initiated and executed experiments to make design decisions. Evaluated on several large-scale vision benchmarks, including ImageNet and WILDS datasets, in distribution shift, transfer learning, and few-shot settings.
- Implemented code to perform distributed fine-tuning of CLIP Vision Transformers on TPUs.
- Led weekly meetings, contributed to paper writing, and created paper figures.

### **Conservative Prediction via Data-Driven Confidence Minimization** 10/2022—5/2023

*Advised by Prof. Chelsea Finn and Yoonho Lee*

- Developed a framework, Data-Driven Confidence Minimization (DCM; under review at ICLR 2024), for producing *conservative models* capable of detecting and abstaining from predictions on “unknown” inputs by minimizing confidence on an *uncertainty dataset*.
- Theoretically analyzed the effect of the uncertainty dataset within this framework to develop an approach that provably detects “unknown” inputs.
- Conducted initial toy experiments to identify important design choices, such as random augmentations to prevent overfitting with confidence minimization.
- Led selective classification experiments: developed and implemented our core algorithm and baselines.
- Contributed to paper writing and revisions, rebuttals, and poster design.

### **A Benchmark for In-the-Wild Distribution Shift Over Time** 10/2022—5/2023

*Advised by Prof. Chelsea Finn and Prof. Huaxiu Yao*

- Developed Wild-Time (NeurIPS 2022), a benchmark for real-world distribution shifts over time, spanning diverse applications and data modalities, including image, text, and tabular data.
- Designed an extensive, modular codebase to load datasets and implemented 13 representative methods from the domain generalization and continual learning literature.
- Conducted comprehensive experiments to benchmark existing approaches.
- Contributed to problem formulation and evaluation design.
- Wrote portions of the paper and drafted some rebuttal responses.

## Awards and Honors

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### **Sterling Award** 2023

Awarded to the top 25 graduating seniors in the Stanford School of Humanities and Sciences.

### **Phi Beta Kappa** 2023

One of 120 graduating seniors elected to Phi Beta Kappa for academic excellence in the major and across a broad range of fields.

### **Computing Research Association (CRA) Outstanding Undergraduate Researcher Nominee** 2022

One of four undergraduates nominated by the Stanford Computer Science Department for the Computing Research Association (CRA) Outstanding Undergraduate Researcher award.

### **Tau Beta Pi** 2022

Awarded to the top 12.5% of juniors in the Stanford School of Engineering.

### **Joint Mathematics Meetings Outstanding Poster Award** 2021

Awarded to the top 10% of presenters in the undergraduate poster session.

### **Dingwall Korean Ancestry Grant** 2019

Awarded to one outstanding undergraduate of Korean ancestry per year. Provides up to four years of merit-based scholarship.

## Industry Experience

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### Snap

6/2022—9/2022

*Machine Learning Engineer Intern — Perception*

- Extended the object detection model in Screenshop to detect new fashion categories using weakly semi-supervised object detection (PyTorch, Python, BigQuery).
- Improved detection by 1.1 mAP using only image-level annotations compared to a box-supervised baseline.
- Wrote the design doc, initiated experiments, and presented progress in team-wide meetings.

### Meta

8/2021—11/2021

*Software Engineer Intern — AI Infra Privacy & Security*

- Developed an MVP of an automated data lineage discovery tool for machine learning workflows (MySQL, Presto, Hive, Python). Wrote, tested, and shipped 7,000 lines of industry-quality code.
- Improved data lineage accuracy by 30× on test pipelines.
- Consulted with stakeholders to make design decisions and wrote the design doc.

## Leadership

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### Tau Beta Pi (Engineering Honor Society)

9/2022—6/2023

*Professional Development Chair*

- Proposed and launched the Tau Beta Pi mentoring program. Worked with other board members to organize the program, pairing underclassmen interested in engineering with upperclassmen mentors.
- Arranged and facilitated group dinners with CEOs, CTOs, and founders from tech companies like Snorkel AI, Databricks, and Applied Intuition.
- Cold-messaged dozens of CEOs and founders, prepared relevant topics and questions, and facilitated discussions.
- Organized a distinguished speaker series on AI for healthcare.

## Selected Coursework

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**Computer Science:** Deep Multi-task and Meta Learning<sup>†</sup>, Reinforcement Learning<sup>†</sup>, Natural Language Processing<sup>†</sup>, Deep Learning for Computer Vision<sup>†</sup>, Machine Learning<sup>†</sup>, Artificial Intelligence<sup>†</sup>, Computer Systems, Algorithms

**Mathematics:** Stochastic Processes, Complex Analysis, Real Analysis, Measure Theory, Probability Theory, Discrete Probabilistic Methods, Differential Equations, Linear Algebra & Matrix Theory, Abstract Algebra, Galois Theory, Number Theory, Graph Theory

<sup>†</sup> indicates graduate-level coursework