

# Ellis L. Brown, II

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## Interests

I am broadly interested in artificial intelligence and machine learning; recently, I am particularly excited about self-supervised learning, curiosity-based exploration, and leveraging internet-scale models and data. I am keen to draw inspiration from intelligence in humans and nature—especially as a goal-post rather than a blueprint. My long-term goal is to develop intelligent agents that can generalize and continually adapt as robustly and efficiently as humans do, allowing them to be *safely* deployed in the real world.

## Education

### Carnegie Mellon University

*M.S., Computer Science*

**Pittsburgh, PA**

*(expected) May 2023*

- Advised by Professors [Deepak Pathak](#) and [Alexei Efros](#)
- Coursework: Deep Reinforcement Learning for Robotics; Visual Learning & Recognition; Deep Reinforcement Learning & Control; Advanced Intro Machine Learning; Philosophical Foundations of Machine Intelligence; Math Fundamentals for Robotics; Distributed Systems; Intro to Computer Systems

### Stanford University

*Non-Degree Graduate Student, Computer Science*

**Palo Alto, CA**

*Jun. 2020*

- Coursework: Engineering Design Optimization

### Columbia University

*Non-Degree Graduate Student, Computer Science*

**New York, NY**

*May 2019*

- Coursework: Mathematics of Deep Learning

### Vanderbilt University

*B.S., Computer Science; B.A., Mathematics*

**Nashville, TN**

*May 2017*

- Advised by Professor [Maithilee Kunda](#)

## Experience

### Academia

#### Robotics Institute, Carnegie Mellon University

*Graduate Student Researcher*, Advised by Professors [Deepak Pathak](#) and [Alexei Efros](#)

*2022–Pres.*

- Researching self-supervised learning, curiosity-based exploration, and generalization.
- Led CMU's involvement in DARPA's [Machine Common Sense](#) program in collaboration with Computer and Cognitive Scientists from UC Berkeley and UMich. Developed embodied agents that solve a suite of interactive retrieval tasks; brought team "MESS" (Model-building, Exploratory, Social-learning Systems) first place in the fifth evaluation.

#### Department of Computer Science, Vanderbilt University

*Undergraduate Student Researcher*, Advised by Professor [Maithilee Kunda](#)

*2016–2018*

- Developed a computational cognitive architecture to model and understand human visual attention in the context of visual search for a spatiotemporal target.
- Contributed to the development of the [Toybox Dataset](#) for small sample learning and hand-object interaction.

### Industry

#### BlackRock AI Labs

Advised by Professors [Mykel Kochenderfer](#), [Stephen Boyd](#), and [Trevor Hastie](#).

Founding team member and culture carrier. Launched bi-weekly reading group. Co-launched external [website](#).

*Research Engineer* | Palo Alto, CA

*2020–2021*

- Formulated the securities lending process as a Markov decision process; designed and wrote a multi-agent lending market simulator for the learning and evaluation of policies; showed that learned policies outperform the rule-based policy used by the lending desk.

- Open-sourced two Julia packages for separable optimization problems. Presented at JuliaCon 2021. [[blog](#), [talk](#)]

*Machine Learning Engineer* | New York, NY 2018–2019

- Proposed a model of portfolio “operational risk”—decomposable into an interpretable set of factors. Built a Spark ETL pipeline that extracts 3k+ features from various portfolio management systems and outputs daily predictions for all portfolios in the firm.
- Designed a system to automatically identify and parse compliance rules in legal documents; previously performed by 30+ FTEs.

## BlackRock

*Software Engineer* | New York, NY 2017

- Built an ETL pipeline to ingest daily mutual fund reference data using Apache Storm.

*Software Engineering Intern* | New York, NY 2016

- Won intern hackathon with a NLP system to extract contract terms from legal documents during new client onboarding.

## Open-Source

JuliaFirstOrder/{ [PiecewiseQuadratics.jl](#), [SeparableOptimization.jl](#) } 2021

- Co-authored Julia packages for solving the problem of minimizing a sum of piecewise-quadratic functions subject to affine equality constraints via a derivative of the Alternating Direction Method of Multipliers (ADMM). Formed the [JuliaFirstOrder](#) organization.

[amdegroot/ssd.pytorch](#) ★ 4.7k 🍷 1.7k 2017

- Co-authored the canonical PyTorch implementation of the [Single Shot MultiBox Detector](#), a real-time object detection framework using a single network, 3 months after PyTorch's alpha release.

## Teaching

Department of Computer Science Vanderbilt University

*Teaching Assistant*, CS 2201: Program Design & Data Structures Fall 2015

- Held weekly office hours for class of 200+ students. Graded weekly programming assignments and exams.

## Publications

In Submission (titles and authors may change)

2022 Alexander Li\*, **Ellis Brown\***, Alyosha Efros, Deepak Pathak. *Internet Curiosity: Never-Ending Unsupervised Learning on Uncurated Internet Data*. ECCV 2022 Workshop, “Self Supervised Learning: What is Next?”

## Conference

2018 **Ellis Brown**, Soobeen Park, Noel Warford, Adriane Seiffert, Kazuhiko Kawamura, Joe Lappin, and Maithilee Kunda. SpatioTemporal Template-based Search: An Architecture for Spatiotemporal Template-Based Search. *Sixth Annual Conference on Advances in Cognitive Systems*, Stanford, CA.

## Journal

2018 **Ellis Brown**, Soobeen Park, Noel Warford, Adriane Seiffert, Kazuhiko Kawamura, Joe Lappin, and Maithilee Kunda. An Architecture for Spatiotemporal Template-Based Search. *Advances in Cognitive Systems*, Volume 6, 101-118. [[paper](#)]

## Reports

2022 Alvin Shek, **Ellis Brown**, Nilay Pande, David Noursi. Self-Supervised Representation Learning via Curiosity-Driven Exploration. Robotics Institute, Carnegie Mellon University, Pittsburgh, PA. [[report](#)]

2021 **Ellis Brown**, Aaron M. Roth. Scaling Interpretable Reinforcement Learning via Decision Trees to Minecraft. Robotics Institute, Carnegie Mellon University, Pittsburgh, PA. [[report](#)]

2020 **Ellis Brown**. Securities Lending Policy Optimization. Computer Science Department, Stanford University, Palo Alto, CA. [[report](#), [video](#)]

2019 **Ellis Brown\***, Melanie Manko\*, Ethan Matlin\*. Modeling Uncertainty in Bayesian Neural Networks with Dropout. Department of Electrical Engineering and Computer Science, Columbia University, New York, NY. [[report](#), [slides](#)]

\*equal contribution

## Talks

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- 2021 Linearly Constrained Separable Optimization (oral), *JuliaCon 2021 JuMP-dev track*. [[talk](#)]
- 2019 Modeling Uncertainty in Bayesian Neural Networks with Dropout: the effect of weight prior and network architecture selection (poster), *American Indian Science and Engineering Society National Conference 2019*, Madison, WI. [[poster](#)]
- 2018 SpatioTemporal Template-based Search: An Architecture for Spatiotemporal Template-Based Search (oral), *Sixth Annual Conference on Advances in Cognitive Systems*, Stanford, CA. [[slides](#)]
- 2017 Computational Cognitive Systems to Model Information Saliency (oral), *American Indian Science and Engineering Society National Conference 2017*, Denver, CO. [[slides](#), [link](#)]

## Awards and Honors

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- *Scholar*, Lighting the Pathways to Faculty Careers for Natives in STEM, AISES 2021–Pres.
- *Scholar*, Computer Science Research Mentorship Program, Google Research 2021
- *3<sup>rd</sup> Place*, Graduate Student Research Competition, AISES National Conference 2019
- *1<sup>st</sup> Place*, BlackRock Intern Hackathon 2016
- (2x) *Academic All-American*, USA Water Polo 2012, 2013

## Scholarships

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- Intel Growing the Legacy Graduate Scholarship 2021–Pres.
- Osage Nation Higher Education Graduate Scholarship 2021–Pres.
- Osage Nation Higher Education Scholarship 2013–2017

## Extracurricular Activities

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### American Indian Science & Engineering Society (AISES)

*Volunteer* 2019–2021

- Mentored a Native undergraduate student studying CS through the 2020–2021 Full Circle Mentorship Program.
- Reviewed scholarships for the 2020 AISES Undergraduate Scholarship.
- Judged posters for Undergraduate Student Research Competition at the 2019 National Conference.

### Code/Interactive

*Mentor* 2018

- Advised and tutored weekly an underprivileged high schooler interested in CS; helped prepare college applications.

### Vanderbilt Admissions

*Tour Guide* 2014–2016

- Led weekly campus tours to groups of 10-50+ prospective students and families.

### Kappa Sigma Fraternity (Kappa Chapter)

*Social Chairman* 2014–2016

- Managed \$90k annual budget; planned & executed dozens of large-scale events; served on Executive Council.

### Water Polo

*Captain & President*, Vanderbilt Club Team (2014 SEC Champions) 2014–2016

- Coordinated and led a team of 20+ players through a 10 week season with 2+ travel tournaments.

*Trainee*, USA Olympic Development Program

2010–2013

- Trained in the United States National Team Pipeline program. Competed in Junior Olympics.