

Ellis L. Brown, II

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Interests

My research interests lie at the intersection of deep learning, computer vision, and robotics. I am particularly interested in *self-supervised learning*, *representation learning*, and *open-ended/continual learning*. I am keen to draw inspiration from intelligence in nature/humans—especially as a goal-post not a blueprint. My goal is to develop agents that use common sense to efficiently *generalize* to the complexities of the real world.

Education

Carnegie Mellon University <i>M.S., Computer Science; Advised by Professors Deepak Pathak and Alexei Efros</i>	Pittsburgh, PA (expected) May 2023
Stanford University <i>Non-Degree Graduate Student, Computer Science</i>	Palo Alto, CA Jun. 2020
Columbia University <i>Non-Degree Graduate Student, Computer Science</i>	New York, NY May 2019
Vanderbilt University <i>B.S., Computer Science; B.A., Mathematics; Advised by Professor Maithilee Kunda</i>	Nashville, TN May 2017

Publications

2023	A. Li*, E. Brown* , A. Efros, D. Pathak. <i>Internet Explorer: Targeted Representation Learning on the Open Web</i> . <i>ICML 2023</i> (under review)
2022	A. Li*, E. Brown* , A. Efros, D. Pathak. <i>Internet Curiosity: Directed Unsupervised Learning on Uncurated Internet Data</i> . <i>ECCV 2022, Workshop on "Self Supervised Learning: What is Next?"</i> Tel Aviv, Isr.
2018	E. Brown , S. Park, N. Warford, A. Seiffert, K. Kawamura, J. Lappin, and M. Kunda. An Architecture for Spatiotemporal Template-Based Search. <i>Advances in Cognitive Systems, Volume 6</i> , 101-118.
2018	E. Brown , S. Park, N. Warford, A. Seiffert, K. Kawamura, J. Lappin, and M. Kunda. SpatioTemporal Template-based Search: An Architecture for Spatiotemporal Template-Based Search. <i>Sixth Annual Conference on Advances in Cognitive Systems</i> , Stanford, CA. (Oral)

*equal contribution

Awards and Honors

• GEM Full Fellowship, The National GEM Consortium & Adobe Research	2023–2028
• <i>Scholar</i> , Lighting the Pathways to Faculty Careers for Natives in STEM, AISES	2021–Pres.
• Intel Growing the Legacy Graduate Scholarship	2021; 2022
• <i>Scholar</i> , Computer Science Research Mentorship Program, Google Research	2021
• 3 rd Place, Graduate Student Research Competition, AISES National Conference	2019
• Osage Nation Higher Education Scholarship	2013–2017; 2021–Pres.
• (2x) <i>Academic All-American</i> , USA Water Polo	2012, 2013

Experience

Robotics Institute, Carnegie Mellon University <i>Graduate Student Researcher, Advised by Professors Deepak Pathak and Alexei Efros</i>	2022–Pres.
• Researching self-supervised learning, curiosity-driven exploration, and generalization.	
• Lead contributor to securing a \$30m cross-institutional DARPA Machine Common Sense grant for CMU, UC Berkeley, MIT, and UMich—team “MESS” (Model-building, Exploratory, Social-learning Systems).	
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 interpretable factors. Built a Spark ETL pipeline that extracts 3k+ features from systems across the firm and outputs daily predictions for every managed portfolio.
- Designed a system to automatically parse compliance rules from 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 NLP system to extract contract terms from legal documents during new client onboarding.

Department of Computer Science, Vanderbilt University

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

2016–2018

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

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.

Talks

- 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](#)]

Graduate Coursework

CMU: Deep RL for Robotics, Visual Learning & Recognition, Deep RL & Control, Advanced Intro ML, Philosophical Foundations of Machine Intelligence, Math Fundamentals for Robotics, Distributed Systems, Intro to Computer Systems

Stanford: Engineering Design Optimization **Columbia**: Mathematics of Deep Learning

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

Extracurricular Activities

American Indian Science & Engineering Society (AISES)

Volunteer

2019–2021

- Mentored an undergraduate AISES 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.