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* with application to *robot learning & RL*. I am keen to draw inspiration from intelligence in nature/humans. My goal is to develop agents that use common sense to efficiently *generalize* to the complexities of the real world.

Education

Carnegie Mellon University — **Pittsburgh, PA**
M.S., Computer Science; Advised by Professors Deepak Pathak and Alexei Efros — *(expected) May 2023*

Stanford University — **Palo Alto, CA**
Non-Degree Graduate Student, Computer Science — *Jun. 2020*

Columbia University — **New York, NY**
Non-Degree Graduate Student, Computer Science — *May 2019*

Vanderbilt University — **Nashville, TN**
B.S., Computer Science; B.A., Mathematics; Advised by Professor Maithilee Kunda — *May 2017*

Publications

2023 A. Li*, **E. Brown***, A. Efros, D. Pathak. *Internet Explorer: Representation Learning on the Open Web. CVPR 2023* (under review)

2022 A. Li*, **E. Brown***, A. Efros, D. Pathak. *Internet Curiosity: Directed Unsupervised Learning on Uncurated Internet Data. ECCV 2022, Workshop on "Self Supervised Learning: What is Next?"* Tel Aviv, Isr. (Poster)

2018 **E. Brown**, S. Park, N. Warford, A. Seiffert, K. Kawamura, J. Lappin, and M. Kunda. An Architecture for Spatiotemporal Template-Based Search. *Advances in Cognitive Systems, Volume 6*, 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. *Sixth Annual Conference on Advances in Cognitive Systems*, Stanford, CA. (Oral)

*equal contribution

Awards and Honors

- *Scholar*, Lighting the Pathways to Faculty Careers for Natives in STEM, AISES — *2021–Pres.*
- Intel Growing the Legacy Graduate Scholarship — *2021; 2022*
- *Scholar*, Computer Science Research Mentorship Program, Google Research — *2021*
- *3rd Place*, Graduate Student Research Competition, AISES National Conference — *2019*
- Osage Nation Higher Education Scholarship — *2013–2017; 2021–Pres.*
- (2x) *Academic All-American*, USA Water Polo — *2012, 2013*

Experience

Robotics Institute, Carnegie Mellon University
Graduate Student Researcher, Advised by Professors Deepak Pathak and Alexei Efros — *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 progamming 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 Salience (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.