Ellis L. Brown, II

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Interests

I am primarily interested in artificial intelligence and reinforcement learning. Recently, I am particularly excited about generalization, exploration, and model-based/unsupervised/meta learning. I am also generally interested in drawing inspiration from intelligence in humans and nature. 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   **Pittsburgh, PA**
M.S., Computer Science   *(expected) Dec. 2022*
Coursework: 10-703: Deep Reinforcement Learning & Control; 10-715: Advanced Intro Machine Learning; 10-721: Philosophical Foundations of Machine Intelligence; 16-811: Math Fundamentals for Robotics

Stanford University   **Palo Alto, CA**
Non-Degree Graduate Student, Computer Science   *Jun. 2020*
Coursework: CS361: Engineering Design Optimization

Columbia University   **New York, NY**
Non-Degree Graduate Student, Computer Science   *May 2019*
Coursework: EECS E6699: Mathematics of Deep Learning

Vanderbilt University   **Nashville, TN**
B.S., Computer Science; B.A., Mathematics   *May 2017*
Relevant Coursework: CS3250: Algorithms; CS3270: Prog Languages; CS3892: Big Data; CS4260: Artificial Intelligence; MA2175: Multiv Calc; MA2198: Diff Eqns; MA2218: Prob/Math Stats; MA2410: Lin Algebra; MA3320: Error-Correcting Codes; MA3800: Number Theory

Experience

Industry

BlackRock AI Labs
- Founding team member and culture carrier. Launched bi-weekly internal reading group. Co-launched the team's website.
- Advised by and worked closely with Mykel Kochenderfer, Stephen Boyd, and Trevor Hastie.

Research Engineer | Palo Alto, CA   *2020–2021*
- Co-authored and open-sourced two Julia packages for separable optimization problems, presented at JuliaCon 2021. [blog, talk]
- Formulated the securities lending process as a Markov decision process, allowing for optimization of lending policies. Designed and prototyped a multi-agent lending market simulator; showed that learned policies improve over existing rule-based policy.
- Created a causal model to forecast the effect of a fee change on inflows for iShares ETFs using GLMNet. Built and deployed a Streamlit webapp to visualize causal predictions that is currently in use by the pricing team.

Machine Learning Engineer | New York, NY   *2018–2019*
- Developed a logistic model to assign decomposable daily operational "risk" scores to portfolios. Built an ETL pipeline in Spark to extract 3k+ features from various portfolio management systems and output daily predictions. Project presented to CEO.
- Developed a text classifier to identify compliance rules in Investment Management Agreements using OCR and SpaCy.

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.

Research

Artificial Intelligence and Visual Analogical Systems Lab   Vanderbilt University
Research Assistant, Professor Maithilee Kunda's group   *2016–2018*
- Developed a computational cognitive architecture used to model and understand human visual attention in the context of visual search for a spatiotemporal target (MATLAB).
- Contributed to the development of the Toybox Dataset for small sample learning and hand object scene interaction.

Teaching

Department of Electrical Engineering and 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.

Publications

Working (titles and authors may change)

2021   Aaron M. Roth, **Ellis Brown**. *Interpretable Reinforcement Learning in Complex Environments via Decision-Tree Policies.*

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]

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. [paper]

Reports

2020   **Ellis Brown**. Securities Lending Policy Optimization. Department of Computer Science, Stanford University, Palo Alto, CA. [paper, 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. (*equal contribution) [paper, slides]

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]

Open-Source Projects

JuliaFirstOrder/{ **PiecewiseQuadratics.jl**, **SeparableOptimization.jl** } *2021*
Co-authored two Julia packages for solving the problem of minimizing a sum of piecewise-quadratic functions subject to affine equality constraints by applying the Alternating Direction Method of Multipliers (ADMM).

amdegroot/**ssd.pytorch** ★ 4.5k ⑂ 1.7k *2017*
Co-authored the de facto PyTorch implementation of the Single Shot MultiBox Detector, a real-time object detection framework using a single network, shortly after PyTorch's alpha release.

ellisbrown/**name2gender** *2017*
Implemented Naive Bayes & Char-RNN (PyTorch) approaches to inferring gender from character sequences in multinational first names. Wrote a blog post that was pusblished by *Towards Data Science*.

Awards and Honors

- *Scholar*, Lighting the Pathways to Faculty Careers for Natives in STEM, AISES   2021
- *Scholar*, Computer Science Research Mentorship Program, Google Research   2021
- Intel Growing the Legacy Graduate Scholarship   2021
- *3rd Place,* Graduate Student Research Competition, AISES National Conference   *2019*
- *1st Place*, BlackRock Intern Hackathon   *2016*
- Osage Nation Higher Education Scholarship   *2013–2017*
- (2x) *Academic All-American*, USA Water Polo   *2012, 2013*

Extracurricular Activities

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*
- Provided assistance with weekly lessons and advice to an underprivileged high school student interested in CS.

Vanderbilt Admissions
Tour Guide *2014–2016*
- Led weekly campus tours to groups of 10-50+ prospective students.

Kappa Sigma Fraternity (Kappa Chapter)
Social Chairman *2014–2016*
- Managed $90k annual social budget; served on Executive Council.

Water Polo
Captain & President, Vanderbilt club team (2014 SEC Champions) *2014–2016*
- Led tri-weekly practices, coordinated travel to tournaments, interfaced with university administration.

Participant, USA Olympic Development Program *2010–2013*
- Trained in the National Team Pipeline program. Competed in Junior Olympics.