

Brandon Amos

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Current Position

Research Scientist, *Meta AI, Fundamental AI Research (FAIR)*, New York City 2019 – Present

Education

Ph.D. in Computer Science, *Carnegie Mellon University* (0.00/0.00) 2014 – 2019
Thesis: *Differentiable Optimization-Based Modeling for Machine Learning*
Advisor: [J. Zico Kolter](#)

B.S. in Computer Science, *Virginia Tech* (3.99/4.00) 2011 – 2014

Previous Positions

Research Assistant, *Carnegie Mellon University* (with [J. Zico Kolter](#) on ML and optimization) 2016 – 2019
Research Intern, *Intel Labs*, Santa Clara (with [Vladlen Koltun](#) on computer vision) 2018
Research Intern, *Google DeepMind*, London (with [Nando de Freitas](#) and [Misha Denil](#) on RL) 2017
Research Assistant, *Carnegie Mellon University* (with [Mahadev Satyanarayanan](#) on mobile systems) 2014 – 2016
Research Intern, *Adobe Research*, San Jose (with [David Tompkins](#) on distributed systems) 2014
Research Assistant, *Virginia Tech* (with [Layne Watson](#) and [David Easterling](#) on optimization) 2013 – 2014
Research Assistant, *Virginia Tech* (with [Jules White](#) and [Hamilton Turner](#) on mobile systems) 2012 – 2014
Research Assistant, *Virginia Tech* (with [Binoy Ravindran](#) and [Alastair Murray](#) on compilers) 2012 – 2014
Software Intern, *Snowplow* (Scala development) 2013 – 2014
Software Intern, *Qualcomm*, San Diego (Python and C++ development) 2013
Software Intern, *Phoenix Integration*, Virginia (C++, C#, and Java development) 2012
Network Administrator Intern, *Sunapsys*, Virginia 2011

Honors & Awards

NeurIPS Top Reviewer 2022
ICML Outstanding Reviewer 2022
ICLR Outstanding Reviewer 2019
NSF Graduate Research Fellowship 2016 – 2019
Nine undergraduate scholarships 2011 – 2014
Roanoke County Public Schools Engineering, Salem–Roanoke County Chamber of Commerce, Papa John's, Scottish Rite of Freemasonry, VT Intelligence Community Center for Academic Excellence, VT Pamplin Leader, VT Benjamin F. Bock, VT Gay B. Shober, VT I. Luck Gravett

Publications [Google Scholar: 5.6k citations and an h-index of 31]

Representative publications that I am a primary author on are **highlighted**.

2022.....

1. *Tutorial on amortized optimization for learning to optimize over continuous domains* [code]
Brandon Amos
Foundations and Trends in Machine Learning (to appear) 2022
2. *Cross-Domain Imitation Learning via Optimal Transport* [code]
[Arnaud Fickinger](#), [Samuel Cohen](#), [Stuart Russell](#), and **Brandon Amos**
ICLR 2022

3. *Matching Normalizing Flows and Probability Paths on Manifolds* [code]
Heli Ben-Hamu*, Samuel Cohen*, Joey Bose, **Brandon Amos**, Aditya Grover, Maximilian Nickel, Ricky T. Q. Chen, and Yaron Lipman
ICML 2022
4. *Semi-Discrete Normalizing Flows through Differentiable Tessellation*
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel
NeurIPS 2022
5. *Theseus: A Library for Differentiable Nonlinear Optimization* [code]
Luis Pineda, Taosha Fan, Maurizio Monge, Shobha Venkataraman, Paloma Sodhi, Ricky Chen, Joseph Ortiz, Daniel DeTone, Austin Wang, Stuart Anderson, Jing Dong, **Brandon Amos**, and Mustafa Mukadam
NeurIPS 2022
6. *Nocturne: a driving benchmark for multi-agent learning* [code]
Eugene Vinitzky, Nathan Lichtlé, Xiaomeng Yang, **Brandon Amos**, and Jakob Foerster
NeurIPS Datasets and Benchmarks Track 2022
7. *Semi-Supervised Offline Reinforcement Learning with Action-Free Trajectories*
Qinqing Zheng, Mikael Henaff, **Brandon Amos**, and Aditya Grover
arXiv 2022
8. *Meta Optimal Transport* [code]
Brandon Amos, Samuel Cohen, Giulia Luise, and levgen Redko
arXiv 2022
9. *On amortizing convex conjugates for optimal transport* [code]
Brandon Amos
arXiv 2022
10. *End-to-End Learning to Warm-Start for Real-Time Quadratic Optimization*
Rajiv Sambharya, Georgina Hall, **Brandon Amos**, and Bartolomeo Stellato
arXiv 2022

2021

11. *On the model-based stochastic value gradient for continuous reinforcement learning* [code] [slides]
Brandon Amos, Samuel Stanton, Denis Yarats, and Andrew Gordon Wilson
L4DC 2021 (Oral)
12. *Riemannian Convex Potential Maps* [code] [slides]
Samuel Cohen*, **Brandon Amos***, and Yaron Lipman
ICML 2021
13. *CombOptNet: Fit the Right NP-Hard Problem by Learning Integer Programming Constraints* [code]
Anselm Paulus, Michal Rolínek, Vit Musil, **Brandon Amos**, and Georg Martius
ICML 2021
14. *Scalable Online Planning via Reinforcement Learning Fine-Tuning*
Arnaud Fickinger, Hengyuan Hu, **Brandon Amos**, Stuart Russell, and Noam Brown
NeurIPS 2021
15. *Aligning Time Series on Incomparable Spaces* [code] [slides]
Samuel Cohen, Giulia Luise, Alexander Terenin, **Brandon Amos**, and Marc Peter Deisenroth
AISTATS 2021

16. [Learning Neural Event Functions for Ordinary Differential Equations](#) [code]
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel
ICLR 2021
 17. [Neural Spatio-Temporal Point Processes](#) [code]
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel
ICLR 2021
 18. [Improving Sample Efficiency in Model-Free Reinforcement Learning from Images](#) [code]
Denis Yarats, Amy Zhang, Ilya Kostrikov, **Brandon Amos**, Joelle Pineau, and Rob Fergus
AAAI 2021
 19. [Neural Fixed-Point Acceleration for Convex Optimization](#) [code]
Shobha Venkataraman* and **Brandon Amos***
ICML AutoML Workshop 2021
 20. [Sliced Multi-Marginal Optimal Transport](#)
Samuel Cohen, Alexander Terenin, Yannik Pitcan, **Brandon Amos**, Marc Peter Deisenroth, and K S Sesh Kumar
NeurIPS OTML Workshop 2021
 21. [Input Convex Gradient Networks](#)
Jack Richter-Powell, Jonathan Lorraine, and **Brandon Amos**
NeurIPS OTML Workshop 2021
 22. [Imitation Learning from Pixel Observations for Continuous Control](#)
Samuel Cohen, **Brandon Amos**, Marc Peter Deisenroth, Mikael Henaff, Eugene Vinitsky, and Denis Yarats
NeurIPS DeepRL Workshop 2021
 23. [MBRL-Lib: A Modular Library for Model-based Reinforcement Learning](#) [code]
Luis Pineda, **Brandon Amos**, Amy Zhang, Nathan Lambert, and Roberto Calandra
arXiv 2021
- 2020.....
24. [The Differentiable Cross-Entropy Method](#) [code] [slides]
Brandon Amos and Denis Yarats
ICML 2020
 25. [Objective Mismatch in Model-based Reinforcement Learning](#)
Nathan Lambert, **Brandon Amos**, Omry Yadan, and Roberto Calandra
L4DC 2020
 26. [QNSTOP: Quasi-Newton Algorithm for Stochastic Optimization](#) [code]
Brandon Amos, David Easterling, Layne T. Watson, William Thacker, Brent Castle, and Michael Trosset
ACM TOMS 2020
 27. [Neural Potts Model](#)
Tom Sercu, Robert Verkuil, Joshua Meier, **Brandon Amos**, Zeming Lin, Caroline Chen, Jason Liu, Yann LeCun, and Alexander Rives
MLCB 2020
 28. [Deep Riemannian Manifold Learning](#)
Aaron Lou, Maximilian Nickel, and **Brandon Amos**
NeurIPS Geo4dl Workshop 2020

2019.....

29. *Differentiable Optimization-Based Modeling for Machine Learning* [code]
Brandon Amos
Ph.D. Thesis 2019
30. *Differentiable Convex Optimization Layers* [code]
Akshay Agrawal*, **Brandon Amos***, Shane Barratt*, Stephen Boyd*, Steven Diamond*, and J. Zico Kolter*
NeurIPS 2019
31. *The Limited Multi-Label Projection Layer* [code]
Brandon Amos, Vladlen Koltun, and J. Zico Kolter
arXiv 2019
32. *Generalized Inner Loop Meta-Learning* [code]
Edward Grefenstette, **Brandon Amos**, Denis Yarats, Phu Mon Htut, Artem Molchanov, Franziska Meier, Douwe Kiela, Kyunghyun Cho, and Soumith Chintala
arXiv 2019

2018.....

33. *Learning Awareness Models*
Brandon Amos, Laurent Dinh, Serkan Cabi, Thomas Rothörl, Sergio Gómez Colmenarejo, Alistair Muldal, Tom Erez, Yuval Tassa, Nando de Freitas, and Misha Denil
ICLR 2018
34. *Differentiable MPC for End-to-end Planning and Control* [code]
Brandon Amos, Ivan Dario Jimenez Rodriguez, Jacob Sacks, Byron Boots, and J. Zico Kolter
NeurIPS 2018
35. *Depth-Limited Solving for Imperfect-Information Games*
Noam Brown, Tuomas Sandholm, and **Brandon Amos**
NeurIPS 2018
36. *Enabling Live Video Analytics with a Scalable and Privacy-Aware Framework*
Junjue Wang, **Brandon Amos**, Anupam Das, Padmanabhan Pillai, Norman Sadeh, and Mahadev Satyanarayanan
ACM TOMM 2018

2017.....

37. *OptNet: Differentiable Optimization as a Layer in Neural Networks* [code] [slides]
Brandon Amos and J. Zico Kolter
ICML 2017
38. *Input Convex Neural Networks* [code] [slides]
Brandon Amos, Lei Xu, and J. Zico Kolter
ICML 2017
39. *Task-based End-to-end Model Learning* [code]
Priya L. Donti, **Brandon Amos**, and J. Zico Kolter
NeurIPS 2017

40. *Quasi-Newton Stochastic Optimization Algorithm for Parameter Estimation of a Stochastic Model of the Budding Yeast Cell Cycle*
Minghan Chen, **Brandon Amos**, Layne T. Watson, John Tyson, Yang Cao, Cliff Shaffer, Michael Trosset, Cihan Oguz, and Gisella Kakoti
IEEE/ACM TCBB 2017
 41. *You can teach elephants to dance: agile VM handoff for edge computing*
Kiryong Ha, Yoshihisa Abe, Thomas Eiszler, Zhuo Chen, Wenlu Hu, **Brandon Amos**, Rohit Upadhyaya, Padmanabhan Pillai, and Mahadev Satyanarayanan
SEC 2017
 42. *An Empirical Study of Latency in an Emerging Class of Edge Computing Applications for Wearable Cognitive Assistance*
Zhuo Chen, Wenlu Hu, Junjue Wang, Siyan Zhao, **Brandon Amos**, Guanhong Wu, Kiryong Ha, Khalid Elgazzar, Padmanabhan Pillai, Roberta Klatzky, Daniel Siewiorek, and Mahadev Satyanarayanan
SEC 2017
 43. *A Scalable and Privacy-Aware IoT Service for Live Video Analytics* [code]
Junjue Wang, **Brandon Amos**, Anupam Das, Padmanabhan Pillai, Norman Sadeh, and Mahadev Satyanarayanan
ACM MMSys 2017 (Best Paper)
- 2016.....
44. *OpenFace: A general-purpose face recognition library with mobile applications* [code]
Brandon Amos, Bartosz Ludwiczuk, and Mahadev Satyanarayanan
CMU 2016
 45. *Collapsed Variational Inference for Sum-Product Networks*
Han Zhao, Tameem Adel, Geoff Gordon, and **Brandon Amos**
ICML 2016
 46. *Quantifying the impact of edge computing on mobile applications*
Wenlu Hu, Ying Gao, Kiryong Ha, Junjue Wang, **Brandon Amos**, Zhuo Chen, Padmanabhan Pillai, and Mahadev Satyanarayanan
ACM SIGOPS 2016
 47. *Privacy mediators: helping IoT cross the chasm*
Nigel Davies, Nina Taft, Mahadev Satyanarayanan, Sarah Clinch, and **Brandon Amos**
HotMobile 2016
- 2015 and earlier.....
48. *Edge Analytics in the Internet of Things*
Mahadev Satyanarayanan, Pieter Simoens, Yu Xiao, Padmanabhan Pillai, Zhuo Chen, Kiryong Ha, Wenlu Hu, and **Brandon Amos**
IEEE Pervasive Computing 2015
 49. *Bad Parts: Are Our Manufacturing Systems at Risk of Silent Cyberattacks?*
Hamilton Turner, Jules White, Jaime A. Camelio, Christopher Williams, **Brandon Amos**, and Robert Parker
IEEE Security & Privacy 2015

50. [Early Implementation Experience with Wearable Cognitive Assistance Applications](#)
Zhuo Chen, Lu Jiang, Wenlu Hu, Kiryong Ha, **Brandon Amos**, Padmanabhan Pillai, Alex Hauptmann, and Mahadev Satyanarayanan
WearSys 2015
51. [The Case for Offload Shaping](#)
Wenlu Hu, **Brandon Amos**, Zhuo Chen, Kiryong Ha, Wolfgang Richter, Padmanabhan Pillai, Benjamin Gilbert, Jan Harkes, and Mahadev Satyanarayanan
HotMobile 2015
52. [Are Cloudlets Necessary?](#)
Ying Gao, Wenlu Hu, Kiryong Ha, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan
CMU 2015
53. [Adaptive VM handoff across cloudlets](#)
Kiryong Ha, Yoshihisa Abe, Zhuo Chen, Wenlu Hu, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan
CMU 2015
54. [Global Parameter Estimation for a Eukaryotic Cell Cycle Model in Systems Biology](#)
Tricity Andrew, **Brandon Amos**, David Easterling, Cihan Oguz, William Baumann, John Tyson, and Layne T. Watson
SummerSim 2014
55. [Applying machine learning classifiers to dynamic Android malware detection at scale](#) [code]
Brandon Amos, Hamilton Turner, and Jules White
IWCMC 2013

Open Source Repositories

26.7k GitHub stars across all repositories.

1. facebookresearch/amortized-optimization-tutorial ★142 <i>Tutorial on amortized optimization</i>	2022
2. facebookresearch/theseus ★1.1k <i>Differentiable non-linear optimization library</i>	2022
3. facebookresearch/meta-ot ★81 <i>Meta Optimal Transport</i>	2022
4. facebookresearch/w2ot ★31 <i>Wasserstein-2 optimal transport in JAX</i>	2022
5. bamos/presentations ★107 <i>Source for my major presentations with a CC-BY license</i>	2022
6. facebookresearch/rcpm ★61 <i>Riemannian Convex Potential Maps</i>	2021
7. facebookresearch/svg ★46 <i>Model-based stochastic value gradient</i>	2021
8. facebookresearch/mbrl-lib ★721 <i>Model-based reinforcement learning library</i>	2021
9. facebookresearch/dcem ★114 <i>The Differentiable Cross-Entropy Method</i>	2020
10. facebookresearch/higher ★1.5k <i>PyTorch higher-order gradient and optimization library</i>	2019
11. bamos/thesis ★292 <i>Ph.D. Thesis LaTeX source code</i>	2019
12. cvxgrp/cvxpylayers ★1.4k <i>Differentiable Convex Optimization Layers</i>	2019
13. locuslab/lml ★56 <i>The Limited Multi-Label Projection Layer</i>	2019
14. locuslab/mpc.pytorch ★628 <i>Differentiable PyTorch Model Predictive Control library</i>	2018
15. locuslab/differentiable-mpc ★132 <i>Differentiable MPC experiments</i>	2018
16. locuslab/icnn ★250 <i>Input Convex Neural Network experiments</i>	2017
17. locuslab/optnet ★427 <i>OptNet experiments</i>	2017
18. locuslab/qpth ★560 <i>Differentiable PyTorch QP solver</i>	2017
19. bamos/densenet.pytorch ★771 <i>PyTorch DenseNet implementation</i>	2017
20. bamos/block ★283 <i>Intelligent block matrix constructions</i>	2017
21. bamos/setGPU ★102 <i>Automatically use the least-loaded GPU</i>	2017
22. bamos/dcgan-completion.tensorflow ★1.3k <i>Image completion with GANs</i>	2016

23. cmusatyalab/openface ★14.6k <i>Face recognition with deep neural networks</i>	2015
24. vtopt/qnstop ★10 <i>Fortran Quasi-newton stochastic optimization library</i>	2014
25. bamos/snowglobe ★27 <i>Haskell-driven, self-hosted web analytics with minimal configuration</i>	2014
26. bamos/zsh-history-analysis ★192 <i>Analyze and plot your zsh history</i>	2014
27. bamos/beamer-snippets ★108 <i>Beamer and TikZ snippets</i>	2014
28. bamos/latex-templates ★359 <i>LaTeX templates</i>	2013
29. cparse/cparse ★295 <i>C++ expression parser using Dijkstra's shunting-yard algorithm</i>	2013
30. bamos/cv ★374 <i>Source for this CV: Creates LaTeX/Markdown from YAML/BibTeX</i>	2013
31. bamos/python-scripts ★197 <i>Short and fun Python scripts</i>	2013
32. bamos/reading-list ★188 <i>YAML reading list and notes system</i>	2013
33. bamos/dotfiles ★235 ♥ <i>Linux, xmonad, emacs, vim, zsh, tmux</i>	2012

Invited Talks

Slides for my major presentations are open-sourced with a CC-BY license at [bamos/presentations](#).

1. <i>Theseus: A library for differentiable nonlinear optimization</i> , NYU	2022
2. <i>Theseus: A library for differentiable nonlinear optimization</i> , University of Zurich	2022
3. <i>Differentiable optimization-based modeling for machine learning</i> , Colorado Mines AMS Colloquium	2022
4. <i>Differentiable optimization</i> , IJCAI Tutorial	2022
5. <i>Differentiable optimization for control and RL</i> , ICML Workshop on Decision Awareness in RL	2022
6. <i>Differentiable optimization-based modeling for machine learning</i> , CPAIOR Master Class	2022
7. <i>Tutorial on amortized optimization</i> , ICCOPT	2022
8. <i>Differentiable optimization for control and RL</i> , Gridmatic	2022
9. <i>Learning for control with differentiable optimization and ODEs</i> , Columbia University	2021
10. <i>Differentiable optimization-based modeling for machine learning</i> , IBM Research	2021
11. <i>Differentiable optimization for control</i> , Max Planck Institute (Tübingen)	2020
12. <i>Differentiable optimization-based modeling for machine learning</i> , Mila Seminar	2020
13. <i>Deep Declarative Networks</i> , ECCV Tutorial	2020
14. <i>On differentiable optimization for control and vision</i> , CVPR Deep Declarative Networks Workshop	2020
15. <i>Differentiable optimization-based modeling for machine learning</i> , Caltech CS 159 (Guest Lecture)	2020
16. <i>Unrolled optimization for learning deep energy models</i> , SIAM MDS Minisymposium	2020
17. <i>Differentiable optimization-based modeling for machine learning</i> , NYU CILVR Seminar	2019
18. <i>Differentiable optimization-based modeling for machine learning</i> , INFORMS	2019
19. <i>Differentiable optimization-based modeling for machine learning</i> , Facebook AI Research	2019
20. <i>Differentiable optimization-based modeling for machine learning</i> , ISMP	2018
21. <i>Differentiable optimization-based modeling for machine learning</i> , Google Brain	2018
22. <i>Differentiable optimization-based modeling for machine learning</i> , Bosch Center for AI	2018
23. <i>Differentiable optimization-based modeling for machine learning</i> , Waymo Research	2018
24. <i>Differentiable optimization-based modeling for machine learning</i> , Tesla AI	2018
25. <i>Differentiable optimization-based modeling for machine learning</i> , NVIDIA Robotics	2018
26. <i>Differentiable optimization-based modeling for machine learning</i> , Salesforce Research	2018
27. <i>Differentiable optimization-based modeling for machine learning</i> , OpenAI	2018
28. <i>Differentiable optimization-based modeling for machine learning</i> , NNAISENSE	2018
29. <i>Differentiable optimization and control</i> , UC Berkeley	2018

Interns and Students

Aram-Alexandre Pooladian (visiting FAIR from NYU)	2022 – present
Carles Domingo-Enrich (visiting FAIR from NYU)	2022 – present
Sanae Lotfi (visiting FAIR from NYU)	2022 – present

Dishank Bansal (AI resident at FAIR)	2022 – present
Aaron Lou (visiting FAIR from Cornell and Stanford)	2020 – present
Arnaud Fickinger (visiting FAIR from Berkeley)	2021 – present
Eugene Vinitzky (visiting FAIR from Berkeley, now incoming professor at NYU)	2021 – 2022
Samuel Cohen (visiting FAIR from UCL, now CEO at FairGen)	2021 – 2022
Ricky Chen (visiting FAIR from Toronto, now scientist at FAIR)	2020
Paul Liang (visiting FAIR from CMU)	2020
Phillip Wang (at CMU, now CEO at Gather)	2018

Professional Activities

AAAI Senior Program Committee	2023
NeurIPS Learning Meets Combinatorial Optimization Workshop Organizer	2020
CVPR Deep Declarative Networks Workshop Organizer	2020
ECCV Deep Declarative Networks Tutorial Organizer	2020
CMU CSD MS Admissions	2014 – 2015

Reviewing.....

AAAI Conference on Artificial Intelligence
 American Controls Conference (ACC)
 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
 IEEE Control Systems Letters (L-CSS)
 IEEE International Conference on Computer Vision (ICCV)
 IEEE International Conference on Robotics and Automation (ICRA)
 International Conference on the Constraint Programming, AI, and Operations Research (CPAIOR)
 International Conference on Learning Representations (ICLR)
 International Conference on Machine Learning (ICML)
 Journal of Machine Learning Research (JMLR)
 Mathematical Programming Computation (MPC)
 Neural Information Processing Systems (NeurIPS)
 Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track
 Neural Information Processing Systems (NeurIPS) OPT Workshop
 Neural Information Processing Systems (NeurIPS) DiffCVGP Workshop
 Neural Information Processing Systems (NeurIPS) Deep RL Workshop
 Optimization Letters

Teaching

Graduate AI (CMU 15-780), TA	S2017
Distributed Systems (CMU 15-440/640), TA	S2016
Software Design and Data Structures (VT CS2114), TA	S2013

Skills

Programming	C, C++, Fortran, Haskell, Java, Lua, Make, Mathematica, Python, R, Scala
Frameworks	JAX, NumPy, Pandas, PyTorch, SciPy, TensorFlow, Torch7
Toolbox	Linux, emacs, vim, evil, org, mu4e, xmonad, git, tmux, zsh