Brandon Amos

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bamos • Last updated on July 28, 2022

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

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 Conter for Academic Excellence, VT Pamplin Leader, VT Benjamin F. Bock, VT Gay B. Shober, VT I. Luck Gravett

Publications [Google Scholar; 5041+ citations, h-index: 29+]

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
   arXiv 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
   arXiv 2022

5. *Meta Optimal Transport* [code]
   Brandon Amos, Samuel Cohen, Giulia Luise, and Ievgen Redko
   arXiv 2022

6. *Nocturne: a driving benchmark for multi-agent learning* [code]
   Eugene Vinitsky, Nathan Lichtlé, Xiaomeng Yang, **Brandon Amos**, and Jakob Foerster
   arXiv 2022

7. *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
   arXiv 2022

2021

8. *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)

9. *Riemannian Convex Potential Maps* [code] [slides]
   Samuel Cohen*, **Brandon Amos***, and Yaron Lipman
   ICML 2021

10. *CombOptNet: Fit the Right NP-Hard Problem by Learning Integer Programming Constraints* [code]
    Anselm Paulus, Michal Rolínek, Vít Musil, **Brandon Amos**, and Georg Martius
    ICML 2021

11. *Scalable Online Planning via Reinforcement Learning Fine-Tuning*
    Arnaud Fickinger, Hengyuan Hu, **Brandon Amos**, Stuart Russell, and Noam Brown
    NeurIPS 2021

12. *Aligning Time Series on Incomparable Spaces* [code] [slides]
    Samuel Cohen, Giulia Luise, Alexander Terenin, **Brandon Amos**, and Marc Peter Deisenroth
    AISTATS 2021

13. *Learning Neural Event Functions for Ordinary Differential Equations* [code]
    Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel
    ICLR 2021

14. *Neural Spatio-Temporal Point Processes* [code]
    Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel
    ICLR 2021

15. *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

16. *Neural Fixed-Point Acceleration for Convex Optimization* [code]
Shobha Venkataraman* and **Brandon Amos***
ICML AutoML Workshop 2021

17. *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

18. *Input Convex Gradient Networks*
Jack Richter-Powell, Jonathan Lorraine, and **Brandon Amos**
NeurIPS OTML Workshop 2021

19. *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

20. *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

21. *The Differentiable Cross-Entropy Method* [code] [slides]
Brandon Amos and Denis Yarats
ICML 2020

22. *Objective Mismatch in Model-based Reinforcement Learning*
Nathan Lambert, **Brandon Amos**, Omry Yadan, and Roberto Calandra
L4DC 2020

23. *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

24. *Neural Potts Model*
Tom Sercu, Robert Verkuil, Joshua Meier, **Brandon Amos**, Zeming Lin, Caroline Chen, Jason Liu, Yann LeCun, and Alexander Rives
MLCB 2020

25. *Deep Riemannian Manifold Learning*
Aaron Lou, Maximilian Nickel, and **Brandon Amos**
NeurIPS Geo4dl Workshop 2020

2019

26. *Differentiable Optimization-Based Modeling for Machine Learning* [code]
Brandon Amos
Ph.D. Thesis 2019

27. *Differentiable Convex Optimization Layers* [code]
Akshay Agrawal*, **Brandon Amos***, Shane Barratt*, Stephen Boyd*, Steven Diamond*, and J. Zico Kolter*
NeurIPS 2019

28. *The Limited Multi-Label Projection Layer* [code]
Brandon Amos, Vladlen Koltun, and J. Zico Kolter
arXiv 2019

29. *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

30. *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

31. *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

32. *Depth-Limited Solving for Imperfect-Information Games*
Noam Brown, Tuomas Sandholm, and **Brandon Amos**
NeurIPS 2018

33. *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

34. *OptNet: Differentiable Optimization as a Layer in Neural Networks* [code] [slides]
Brandon Amos and J. Zico Kolter
ICML 2017

35. *Input Convex Neural Networks* [code] [slides]
Brandon Amos, Lei Xu, and J. Zico Kolter
ICML 2017

36. *Task-based End-to-end Model Learning* [code]
Priya L. Donti, **Brandon Amos**, and J. Zico Kolter
NeurIPS 2017

37. *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

38. *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

39. *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**, Guanhang Wu, Kiryong Ha, Khalid Elgazzar, Padmanabhan Pillai, Roberta Klatzky, Daniel Siewiorek, and Mahadev Satyanarayanan
SEC 2017

40. *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

41. *OpenFace: A general-purpose face recognition library with mobile applications* [code]
Brandon Amos, Bartosz Ludwiczuk, and Mahadev Satyanarayanan
CMU 2016

42. *Collapsed Variational Inference for Sum-Product Networks*
Han Zhao, Tameem Adel, Geoff Gordon, and **Brandon Amos**
ICML 2016

43. *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

44. *Privacy mediators: helping IoT cross the chasm*
Nigel Davies, Nina Taft, Mahadev Satyanarayanan, Sarah Clinch, and **Brandon Amos**
HotMobile 2016

2015 and earlier

45. *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

46. *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

47. *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

48. *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

49. *Are Cloudlets Necessary?*
Ying Gao, Wenlu Hu, Kiryong Ha, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan
CMU 2015

50. *Adaptive VM handoff across cloudlets*
Kiryong Ha, Yoshihisa Abe, Zhuo Chen, Wenlu Hu, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan
CMU 2015

51. *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

52. *Applying machine learning classifiers to dynamic Android malware detection at scale* [code]
Brandon Amos, Hamilton Turner, and Jules White
IWCMC 2013

Open Source Repositories

1. facebookresearch/amortized-optimization-tutorial | ★123 | *Tutorial on amortized optimization* 2022
2. facebookresearch/theseus | ★707 | *Differentiable non-linear optimization library* 2022
3. facebookresearch/meta-ot | ★67 | *Meta Optimal Transport* 2022
4. bamos/presentations | ★102 | *Source for my major presentations with a CC-BY license* 2022
5. facebookresearch/rcpm | ★57 | *Riemannian Convex Potential Maps* 2021
6. facebookresearch/svg | ★41 | *Model-based stochastic value gradient* 2021
7. facebookresearch/mbrl-lib | ★658 | *Model-based reinforcement learning library* 2021
8. facebookresearch/dcem | ★107 | *The Differentiable Cross-Entropy Method* 2020
9. facebookresearch/higher | ★1.4k | *PyTorch higher-order gradient and optimization library* 2019
10. bamos/thesis | ★275 | *Ph.D. Thesis LaTeX source code* 2019
11. cvxgrp/cvxpylayers | ★1.3k | *Differentiable Convex Optimization Layers* 2019
12. locuslab/lml | ★51 | *The Limited Multi-Label Projection Layer* 2019
13. locuslab/mpc.pytorch | ★579 | *Differentiable PyTorch Model Predictive Control library* 2018
14. locuslab/differentiable-mpc | ★124 | *Differentiable MPC experiments* 2018
15. locuslab/icnn | ★243 | *Input Convex Neural Network experiments* 2017
16. locuslab/optnet | ★394 | *OptNet experiments* 2017
17. locuslab/qpth | ★535 | *Differentiable PyTorch QP solver* 2017
18. bamos/densenet.pytorch | ★756 | *PyTorch DenseNet implementation* 2017
19. bamos/block | ★268 | *Intelligent block matrix constructions* 2017
20. bamos/setGPU | ★101 | *Automatically use the least-loaded GPU* 2017
21. bamos/dcgan-completion.tensorflow | ★1.3k | *Image completion with GANs* 2016
22. cmusatyalab/openface | ★14.5k | *Face recognition with deep neural networks* 2015
23. vtopt/qnstop | ★10 | *Fortran Quasi-newton stochastic optimization library* 2014
24. bamos/snowglobe | ★27 | *Haskell-driven, self-hosted web analytics with minimal configuration* 2014
25. bamos/zsh-history-analysis | ★184 | *Analyze and plot your zsh history* 2014
26. bamos/beamer-snippets | ★107 | *Beamer and TikZ snippets* 2014
27. bamos/latex-templates | ★357 | *LaTeX templates* 2013
28. cparse/cparse | ★254 | *C++ expression parser using Dijkstra's shunting-yard algorithm* 2013
29. bamos/cv | ★364 | *Source for this CV: Creates LaTeX/Markdown from YAML/BibTeX* 2013
30. bamos/python-scripts | ★195 | *Short and fun Python scripts* 2013
31. bamos/reading-list | ★187 | *YAML reading list and notes system* 2013
32. bamos/dotfiles | ★238 | ♥ *Linux, xmonad, emacs, vim, zsh, tmux* 2012

Invited Talks

Slides for my major presentations are open-sourced with a CC-BY license at bamos/presentations.

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

Interns and Students

Aaron Lou (visiting FAIR from Cornell and Stanford) 2020 – 2022
Eugene Vinitsky (visiting FAIR from Berkeley, now incoming professor at NYU) 2021 – 2022
Arnaud Fickinger (visiting FAIR from Berkeley) 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
IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
IEEE International Conference on Computer Vision (ICCV)
IEEE International Conference on Robotics and Automation (ICRA)
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