

# Brandon Amos

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🌐 [amos](https://amos.github.io) • Last updated on July 14, 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 Center for Academic Excellence, VT Pamplin Leader, VT Benjamin F. Bock, VT Gay B. Shober, VT I. Luck Gravett

## Publications [[Google Scholar](#); 4963+ 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 Vinitisky, Nathan Lichtlé, Xiaomeng Yang, **Brandon Amos**, and Jakob Foerster  
arXiv 2022

## 2021

7. *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)
8. *Riemannian Convex Potential Maps* [code] [slides]  
Samuel Cohen\*, **Brandon Amos\***, and Yaron Lipman  
ICML 2021
9. *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
10. *Scalable Online Planning via Reinforcement Learning Fine-Tuning*  
Arnaud Fickinger, Hengyuan Hu, **Brandon Amos**, Stuart Russell, and Noam Brown  
NeurIPS 2021
11. *Aligning Time Series on Incomparable Spaces* [code] [slides]  
Samuel Cohen, Giulia Luise, Alexander Terenin, **Brandon Amos**, and Marc Peter Deisenroth  
AISTATS 2021
12. *Learning Neural Event Functions for Ordinary Differential Equations* [code]  
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel  
ICLR 2021
13. *Neural Spatio-Temporal Point Processes* [code]  
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel  
ICLR 2021
14. *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
15. *Neural Fixed-Point Acceleration for Convex Optimization* [code]  
Shobha Venkataraman\* and **Brandon Amos\***  
ICML AutoML Workshop 2021

16. *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
17. *Input Convex Gradient Networks*  
Jack Richter-Powell, Jonathan Lorraine, and **Brandon Amos**  
NeurIPS OTML Workshop 2021
18. *Imitation Learning from Pixel Observations for Continuous Control*  
Samuel Cohen, **Brandon Amos**, Marc Peter Deisenroth, Mikael Henaff, Eugene Vinitisky, and Denis Yarats  
NeurIPS DeepRL Workshop 2021
19. *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

20. *The Differentiable Cross-Entropy Method* [code] [slides]  
**Brandon Amos** and Denis Yarats  
ICML 2020
21. *Objective Mismatch in Model-based Reinforcement Learning*  
Nathan Lambert, **Brandon Amos**, Omry Yadan, and Roberto Calandra  
L4DC 2020
22. *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
23. *Neural Potts Model*  
Tom Sercu, Robert Verkuil, Joshua Meier, **Brandon Amos**, Zeming Lin, Caroline Chen, Jason Liu, Yann LeCun, and Alexander Rives  
MLCB 2020
24. *Deep Riemannian Manifold Learning*  
Aaron Lou, Maximilian Nickel, and **Brandon Amos**  
NeurIPS Geo4dl Workshop 2020

## 2019

25. *Differentiable Optimization-Based Modeling for Machine Learning* [code]  
**Brandon Amos**  
Ph.D. Thesis 2019
26. *Differentiable Convex Optimization Layers* [code]  
Akshay Agrawal\*, **Brandon Amos\***, Shane Barratt\*, Stephen Boyd\*, Steven Diamond\*, and J. Zico Kolter\*  
NeurIPS 2019
27. *The Limited Multi-Label Projection Layer* [code]  
**Brandon Amos**, Vladlen Koltun, and J. Zico Kolter  
arXiv 2019

28. *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

29. *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
30. *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
31. *Depth-Limited Solving for Imperfect-Information Games*  
Noam Brown, Tuomas Sandholm, and **Brandon Amos**  
NeurIPS 2018
32. *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

33. *OptNet: Differentiable Optimization as a Layer in Neural Networks* [code] [slides]  
**Brandon Amos** and J. Zico Kolter  
ICML 2017
34. *Input Convex Neural Networks* [code] [slides]  
**Brandon Amos**, Lei Xu, and J. Zico Kolter  
ICML 2017
35. *Task-based End-to-end Model Learning* [code]  
Priya L. Donti, **Brandon Amos**, and J. Zico Kolter  
NeurIPS 2017
36. *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
37. *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
38. *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

39. *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

40. *OpenFace: A general-purpose face recognition library with mobile applications* [code]  
**Brandon Amos**, Bartosz Ludwiczuk, and Mahadev Satyanarayanan  
CMU 2016
41. *Collapsed Variational Inference for Sum-Product Networks*  
Han Zhao, Tameem Adel, Geoff Gordon, and **Brandon Amos**  
ICML 2016
42. *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
43. *Privacy mediators: helping IoT cross the chasm*  
Nigel Davies, Nina Taft, Mahadev Satyanarayanan, Sarah Clinch, and **Brandon Amos**  
HotMobile 2016

## 2015 and earlier

44. *Edge Analytics in the Internet of Things*  
Mahadev Satyanarayanan, Pieter Simoons, Yu Xiao, Padmanabhan Pillai, Zhuo Chen, Kiryong Ha, Wenlu Hu, and **Brandon Amos**  
IEEE Pervasive Computing 2015
45. *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
46. *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
47. *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
48. *Are Cloudlets Necessary?*  
Ying Gao, Wenlu Hu, Kiryong Ha, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan  
CMU 2015
49. *Adaptive VM handoff across cloudlets*  
Kiryong Ha, Yoshihisa Abe, Zhuo Chen, Wenlu Hu, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan  
CMU 2015

50. [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
51. [Applying machine learning classifiers to dynamic Android malware detection at scale](#) [code]  
**Brandon Amos**, Hamilton Turner, and Jules White  
IWCMC 2013

## Open Source Repositories

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1. <a href="#">facebookresearch/amortized-optimization-tutorial</a>   ★122   <i>Tutorial on amortized optimization</i>	2022
2. <a href="#">facebookresearch/theseus</a>   ★272   <i>Differentiable non-linear optimization library</i>	2022
3. <a href="#">facebookresearch/meta-ot</a>   ★65   <i>Meta Optimal Transport</i>	2022
4. <a href="#">bamos/presentations</a>   ★102   <i>Source for my major presentations with a CC-BY license</i>	2022
5. <a href="#">facebookresearch/rcpm</a>   ★56   <i>Riemannian Convex Potential Maps</i>	2021
6. <a href="#">facebookresearch/svg</a>   ★41   <i>Model-based stochastic value gradient</i>	2021
7. <a href="#">facebookresearch/mbrl-lib</a>   ★652   <i>Model-based reinforcement learning library</i>	2021
8. <a href="#">facebookresearch/dcem</a>   ★105   <i>The Differentiable Cross-Entropy Method</i>	2020
9. <a href="#">facebookresearch/higher</a>   ★1.4k   <i>PyTorch higher-order gradient and optimization library</i>	2019
10. <a href="#">bamos/thesis</a>   ★273   <i>Ph.D. Thesis LaTeX source code</i>	2019
11. <a href="#">cvxgrp/cvxpylayers</a>   ★1.3k   <i>Differentiable Convex Optimization Layers</i>	2019
12. <a href="#">locuslab/lml</a>   ★50   <i>The Limited Multi-Label Projection Layer</i>	2019
13. <a href="#">locuslab/mpc.pytorch</a>   ★575   <i>Differentiable PyTorch Model Predictive Control library</i>	2018
14. <a href="#">locuslab/differentiable-mpc</a>   ★124   <i>Differentiable MPC experiments</i>	2018
15. <a href="#">locuslab/icnn</a>   ★243   <i>Input Convex Neural Network experiments</i>	2017
16. <a href="#">locuslab/optnet</a>   ★394   <i>OptNet experiments</i>	2017
17. <a href="#">locuslab/qpth</a>   ★533   <i>Differentiable PyTorch QP solver</i>	2017
18. <a href="#">bamos/densenet.pytorch</a>   ★756   <i>PyTorch DenseNet implementation</i>	2017
19. <a href="#">bamos/block</a>   ★268   <i>Intelligent block matrix constructions</i>	2017
20. <a href="#">bamos/setGPU</a>   ★101   <i>Automatically use the least-loaded GPU</i>	2017
21. <a href="#">bamos/dcgan-completion.tensorflow</a>   ★1.3k   <i>Image completion with GANs</i>	2016
22. <a href="#">cmusatyalab/openface</a>   ★14.4k   <i>Face recognition with deep neural networks</i>	2015
23. <a href="#">vtopt/qnstop</a>   ★10   <i>Fortran Quasi-newton stochastic optimization library</i>	2014
24. <a href="#">bamos/snowglobe</a>   ★27   <i>Haskell-driven, self-hosted web analytics with minimal configuration</i>	2014
25. <a href="#">bamos/zsh-history-analysis</a>   ★184   <i>Analyze and plot your zsh history</i>	2014
26. <a href="#">bamos/beamer-snippets</a>   ★106   <i>Beamer and TikZ snippets</i>	2014
27. <a href="#">bamos/latex-templates</a>   ★357   <i>LaTeX templates</i>	2013
28. <a href="#">cparse/cparse</a>   ★250   <i>C++ expression parser using Dijkstra's shunting-yard algorithm</i>	2013
29. <a href="#">bamos/cv</a>   ★365   <i>Source for this CV: Creates LaTeX/Markdown from YAML/BibTeX</i>	2013
30. <a href="#">bamos/python-scripts</a>   ★196   <i>Short and fun Python scripts</i>	2013
31. <a href="#">bamos/reading-list</a>   ★186   <i>YAML reading list and notes system</i>	2013
32. <a href="#">bamos/dotfiles</a>   ★238   ♥ <i>Linux, xmonad, emacs, vim, zsh, tmux</i>	2012

## Invited Talks

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

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|--|------|
| 1. <i>Differentiable optimization</i> , <a href="#">IJCAI Tutorial</a>   | 2022 |
| 2. <i>Differentiable optimization for control and RL</i> , <a href="#">ICML Workshop on Decision Awareness in RL</a> | 2022 |
| 3. <i>Differentiable optimization-based modeling for machine learning</i> , <a href="#">CPAIOR Master Class</a>      | 2022 |
| 4. <i>Amortized optimization and learning to optimize</i> , <a href="#">ICCOPT</a>                                   | 2022 |

5. <i>Modeling and learning paradigms for learning to optimize</i> , SIAM MDS Minisymposium	2022
6. <i>Learning for control with differentiable optimization and ODEs</i> , Columbia University	2021
7. <i>Differentiable optimization-based modeling for machine learning</i> , IBM Research	2021
8. <i>Differentiable optimization for control</i> , Max Planck Institute (Tübingen)	2020
9. <i>Differentiable optimization-based modeling for machine learning</i> , Mila Seminar	2020
10. <i>Deep Declarative Networks</i> , <a href="#">ECCV Tutorial</a>	2020
11. <i>On differentiable optimization for control and vision</i> , <a href="#">CVPR Deep Declarative Networks Workshop</a>	2020
12. <i>Differentiable optimization-based modeling for machine learning</i> , <a href="#">Caltech CS 159 (Guest Lecture)</a>	2020
13. <i>Unrolled optimization for learning deep energy models</i> , <a href="#">SIAM MDS Minisymposium</a>	2020
14. <i>Differentiable optimization-based modeling for machine learning</i> , NYU CILVR Seminar	2019
15. <i>Differentiable optimization-based modeling for machine learning</i> , INFORMS	2019
16. <i>Differentiable optimization-based modeling for machine learning</i> , Facebook AI Research	2019
17. <i>Differentiable optimization-based modeling for machine learning</i> , ISMP	2018
18. <i>Differentiable optimization-based modeling for machine learning</i> , Google Brain	2018
19. <i>Differentiable optimization-based modeling for machine learning</i> , Bosch Center for AI	2018
20. <i>Differentiable optimization-based modeling for machine learning</i> , Waymo Research	2018
21. <i>Differentiable optimization-based modeling for machine learning</i> , Tesla AI	2018
22. <i>Differentiable optimization-based modeling for machine learning</i> , NVIDIA Robotics	2018
23. <i>Differentiable optimization-based modeling for machine learning</i> , Salesforce Research	2018
24. <i>Differentiable optimization-based modeling for machine learning</i> , OpenAI	2018
25. <i>Differentiable optimization-based modeling for machine learning</i> , NNAISENSE	2018
26. <i>Differentiable optimization and control</i> , UC Berkeley	2018

## Interns and Students

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<a href="#">Aaron Lou</a> (visiting FAIR from Cornell and Stanford)	2020 – 2022
<a href="#">Eugene Vinitzky</a> (visiting FAIR from Berkeley, now incoming professor at NYU)	2021 – 2022
<a href="#">Arnaud Fickinger</a> (visiting FAIR from Berkeley)	2021 – 2022
<a href="#">Samuel Cohen</a> (visiting FAIR from UCL, now CEO at FairGen)	2021 – 2022
<a href="#">Ricky Chen</a> (visiting FAIR from Toronto, now scientist at FAIR)	2020
<a href="#">Paul Liang</a> (visiting FAIR from CMU)	2020
<a href="#">Phillip Wang</a> (at CMU, now CEO at <a href="#">Gather</a> )	2018

## Professional Activities

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AAAI Senior Program Committee	2023
<a href="#">NeurIPS Learning Meets Combinatorial Optimization Workshop Organizer</a>	2020
<a href="#">CVPR Deep Declarative Networks Workshop Organizer</a>	2020
<a href="#">ECCV Deep Declarative Networks Tutorial Organizer</a>	2020
CMU CSD MS Admissions	2014 – 2015

## Reviewing

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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)  
Optimization Letters

## Teaching

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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

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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