

# Brandon Amos

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## Current Position

**Research Scientist**, *Facebook AI Research (Meta)*, 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](#)) 2016 – 2019

**Research Intern**, *Intel Labs*, Santa Clara (with [Vladlen Koltun](#)) 2018

**Research Intern**, *Google DeepMind*, London (with [Nando de Freitas](#) and [Misha Denil](#)) 2017

**Research Assistant**, *Carnegie Mellon University* (with [Mahadev Satyanarayanan](#)) 2014 – 2016

**Data Scientist Intern**, *Adobe Research*, San Jose (with [David Tompkins](#)) 2014

**Research Assistant**, *Virginia Tech* (with [Layne Watson](#) and [David Easterling](#)) 2013 – 2014

**Research Assistant**, *Virginia Tech* (with [Jules White](#) and [Hamilton Turner](#)) 2012 – 2014

**Research Assistant**, *Virginia Tech* (with [Binoy Ravindran](#) and [Alastair Murray](#)) 2012 – 2014

**Software Intern**, *Snowplow*, Remote (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 (Bash development for Linux servers) 2011

## Honors & Awards

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 [\[Google Scholar\]](#)

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*  
[Arnaud Fickinger](#), [Samuel Cohen](#), [Stuart Russell](#), and **Brandon Amos**  
ICLR 2022

## 2021

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3. *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)
4. *Riemannian Convex Potential Maps* [code] [slides]  
Samuel Cohen\*, **Brandon Amos\***, and Yaron Lipman  
ICML 2021
5. *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
6. *Scalable Online Planning via Reinforcement Learning Fine-Tuning*  
Arnaud Fickinger, Hengyuan Hu, **Brandon Amos**, Stuart Russell, and Noam Brown  
NeurIPS 2021
7. *Aligning Time Series on Incomparable Spaces* [code] [slides]  
Samuel Cohen, Giulia Luise, Alexander Terenin, **Brandon Amos**, and Marc Peter Deisenroth  
AISTATS 2021
8. *Learning Neural Event Functions for Ordinary Differential Equations* [code]  
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel  
ICLR 2021
9. *Neural Spatio-Temporal Point Processes* [code]  
Ricky T. Q. Chen, **Brandon Amos**, and Maximilian Nickel  
ICLR 2021
10. *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
11. *Neural Fixed-Point Acceleration for Convex Optimization* [code]  
Shobha Venkataraman\* and **Brandon Amos\***  
ICML AutoML 2021
12. *Sliced Multi-Marginal Optimal Transport*  
Samuel Cohen, Alexander Terenin, Yannik Pitcan, **Brandon Amos**, Marc Peter Deisenroth, and K S Sesh Kumar  
NeurIPS OTML 2021
13. *Input Convex Gradient Networks*  
Jack Richter-Powell, Jonathan Lorraine, and **Brandon Amos**  
NeurIPS OTML 2021
14. *Imitation Learning from Pixel Observations for Continuous Control*  
Samuel Cohen, **Brandon Amos**, Marc Peter Deisenroth, Mikael Henaff, Eugene Vinitsky, and Denis Yarats  
NeurIPS DeepRL 2021
15. *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

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16. *The Differentiable Cross-Entropy Method* [code] [slides]  
**Brandon Amos** and Denis Yarats  
ICML 2020
17. *Objective Mismatch in Model-based Reinforcement Learning*  
Nathan Lambert, **Brandon Amos**, Omry Yadan, and Roberto Calandra  
L4DC 2020
18. *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
19. *Neural Potts Model*  
Tom Sercu, Robert Verkuil, Joshua Meier, **Brandon Amos**, Zeming Lin, Caroline Chen, Jason Liu, Yann LeCun, and Alexander Rives  
MLCB 2020
20. *Deep Riemannian Manifold Learning*  
Aaron Lou, Maximilian Nickel, and **Brandon Amos**  
NeurIPS Geo4dl 2020

## 2019

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21. *Differentiable Optimization-Based Modeling for Machine Learning* [code]  
**Brandon Amos**  
Ph.D. Thesis 2019
22. *Differentiable Convex Optimization Layers* [code]  
Akshay Agrawal\*, **Brandon Amos\***, Shane Barratt\*, Stephen Boyd\*, Steven Diamond\*, and J. Zico Kolter\*  
NeurIPS 2019
23. *The Limited Multi-Label Projection Layer* [code]  
**Brandon Amos**, Vladlen Koltun, and J. Zico Kolter  
arXiv 2019
24. *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

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25. *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
26. *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

27. *Depth-Limited Solving for Imperfect-Information Games*  
Noam Brown, Tuomas Sandholm, and **Brandon Amos**  
NeurIPS 2018
28. *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

29. *OptNet: Differentiable Optimization as a Layer in Neural Networks* [code] [slides]  
**Brandon Amos** and J. Zico Kolter  
ICML 2017
30. *Input Convex Neural Networks* [code] [slides]  
**Brandon Amos**, Lei Xu, and J. Zico Kolter  
ICML 2017
31. *Task-based End-to-end Model Learning* [code]  
Priya L. Donti, **Brandon Amos**, and J. Zico Kolter  
NeurIPS 2017
32. *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
33. *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
34. *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
35. *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

36. *OpenFace: A general-purpose face recognition library with mobile applications* [code]  
**Brandon Amos**, Bartosz Ludwiczuk, and Mahadev Satyanarayanan  
CMU 2016
37. *Collapsed Variational Inference for Sum-Product Networks*  
Han Zhao, Tameem Adel, Geoff Gordon, and **Brandon Amos**  
ICML 2016

38. *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
39. *Privacy mediators: helping IoT cross the chasm*  
Nigel Davies, Nina Taft, Mahadev Satyanarayanan, Sarah Clinch, and **Brandon Amos**  
HotMobile 2016

## 2015 and earlier.....

40. *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
41. *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
42. *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
43. *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
44. *Are Cloudlets Necessary?*  
Ying Gao, Wenlu Hu, Kiryong Ha, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan  
CMU 2015
45. *Adaptive VM handoff across cloudlets*  
Kiryong Ha, Yoshihisa Abe, Zhuo Chen, Wenlu Hu, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan  
CMU 2015
46. *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
47. *Applying machine learning classifiers to dynamic Android malware detection at scale* [code]  
**Brandon Amos**, Hamilton Turner, and Jules White  
IWCMC 2013

## Repositories

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<a href="#">facebookresearch/theseus</a>   ★210   <i>Differentiable non-linear optimization library</i>	2022
<a href="#">facebookresearch/mbrl-lib</a>   ★567   <i>Model-based reinforcement learning library</i>	2021
<a href="#">facebookresearch/dcem</a>   ★95   <i>The Differentiable Cross-Entropy Method</i>	2020
<a href="#">facebookresearch/higher</a>   ★1.3k   <i>PyTorch higher-order gradient and optimization library</i>	2019
<a href="#">bamos/thesis</a>   ★262   <i>Ph.D. Thesis LaTeX source code</i>	2019
<a href="#">cvxgrp/cvxpylayers</a>   ★1.2k   <i>Differentiable Convex Optimization Layers</i>	2019
<a href="#">locuslab/mpc.pytorch</a>   ★521   <i>Differentiable Model-Predictive Control</i>	2018
<a href="#">locuslab/icnn</a>   ★236   <i>Input Convex Neural Networks</i>	2017
<a href="#">locuslab/optnet</a>   ★381   <i>OptNet experiments</i>	2017
<a href="#">locuslab/qpth</a>   ★517   <i>Differentiable PyTorch QP solver</i>	2017
<a href="#">bamos/densenet.pytorch</a>   ★736   <i>PyTorch DenseNet implementation</i>	2017
<a href="#">bamos/block</a>   ★261   <i>Intelligent block matrix constructions</i>	2017
<a href="#">bamos/setGPU</a>   ★98   <i>Automatically use the least-loaded GPU</i>	2017
<a href="#">bamos/dcgan-completion.tensorflow</a>   ★1.3k   <i>Image completion with GANs</i>	2016
<a href="#">cmusatyalab/openface</a>   ★14.3k   <i>Face recognition with deep neural networks</i>	2015
<a href="#">bamos/zsh-history-analysis</a>   ★172   <i>Analyze and plot your zsh history</i>	2014
<a href="#">bamos/cv</a>   ★342   <i>Source for this CV: Creates LaTeX/Markdown from YAML/BibTeX</i>	2013
<a href="#">bamos/dotfiles</a>   ★234   <i>Linux, mutt, xmonad, vim, emacs, zsh</i>	2012

## Invited Talks

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Columbia University	2021
IBM Research	2021
Max Planck Institute for Intelligent Systems (Tübingen) Seminar	2020
Montreal Institute for Learning Algorithms Seminar	2020
<a href="#">ECCV Deep Declarative Networks Tutorial</a>	2020
<a href="#">CVPR Deep Declarative Networks Workshop</a>	2020
<a href="#">Caltech CS 159, Guest Lecture</a>	2020
SIAM MDS Minisymposium on Learning Parameterized Energy Minimization Models	2020
New York University CILVR Seminar	2019
INFORMS Session on Prediction and Optimization	2019
Facebook AI Research	2019
ISMP Session on Machine Learning and Optimization	2018
Google Brain	2018
Bosch Center for AI	2018
Waymo Research	2018
Tesla AI	2018
NVIDIA Robotics	2018
Salesforce Research	2018
OpenAI	2018
NNAISENSE	2018
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)	2021 – 2022
<a href="#">Arnaud Fickinger</a> (visiting FAIR from Berkeley)	2021 – 2022
<a href="#">Samuel Cohen</a> (visiting FAIR from UCL)	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 <a href="#">Gather</a> )	2018

## Professional Activities

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NeurIPS Learning Meets Combinatorial Optimization Workshop Organizer	2020
CVPR Deep Declarative Workshop Organizer	2020
ECCV Deep Declarative Tutorial Organizer	2020
CMU CSD MS Admissions	2014 – 2015

## Reviewing

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Neural Information Processing Systems (NeurIPS)  
International Conference on Machine Learning (ICML)  
International Conference on Learning Representations (ICLR)  
IEEE Conference on Computer Vision and Pattern Recognition (CVPR)  
IEEE International Conference on Computer Vision (ICCV)  
IEEE International Conference on Robotics and Automation (ICRA)  
AAAI Conference on Artificial Intelligence (AAAI)

## 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
Tools	Linux, emacs, vim, evil, org, mu4e, xmonad, git, tmux, zsh