# **Brandon Amos**

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### **Current Position**

Research Scientist, Facebook AI, New York City 2019 – Present

#### **Education**

Ph.D. in Computer Science, Carnegie Mellon University (0.00/0.00)	2014 - 2019
Differentiable Optimization-Based Modeling for Machine Learning Advisors: J. Zico Kolter (2016 – 2019), Mahadev Satyanarayanan (2014 – 2016)	
B.S. in Computer Science, Virginia Tech (3.99/4.00)	2011 – 2014

### **Research Internships**

Intel Labs, Santa Clara (Host: Vladlen Koltun)	2018
Google DeepMind, London (Hosts: Misha Denil and Nando de Freitas)	2017
Adobe Research, San Jose (Host: David Tompkins)	2014

### **Honors & Awards**

NSF Graduate Research Fellowship
Nine undergraduate scholarships
2016 – 2019
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 ID: d8gdZR4AAAAJ

#### 2021

- 1. 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)
- 2. Riemannian Convex Potential Maps [code] [slides]
  Samuel Cohen\*, Brandon Amos\*, and Yaron Lipman
  ICML 2021
- 3. 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
- Neural Fixed-Point Acceleration for Convex Optimization [code] Shobha Venkataraman\* and Brandon Amos\* ICML AutoML 2021
- Aligning Time Series on Incomparable Spaces [code] [slides]
   Samuel Cohen, Giulia Luise, Alexander Terenin, Brandon Amos, and Marc Peter Deisenroth AISTATS 2021
- Learning Neural Event Functions for Ordinary Differential Equations [code] Ricky T. Q. Chen, Brandon Amos, and Maximilian Nickel ICLR 2021

- Neural Spatio-Temporal Point Processes [code]
   Ricky T. Q. Chen, Brandon Amos, and Maximilian Nickel ICLR 2021
- 8. 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
- 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.

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

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

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

Deep Riemannian Manifold Learning
 Aaron Lou, Maximilian Nickel, and Brandon Amos
 NeurlPS Geo4dl 2020

#### 2019

- 15. Differentiable Optimization-Based Modeling for Machine Learning [code]

  Brandon Amos
  Ph.D. Thesis 2019
- 16. Differentiable Convex Optimization Layers [code]
  Akshay Agrawal\*, Brandon Amos\*, Shane Barratt\*, Stephen Boyd\*, Steven Diamond\*, and
  J. Zico Kolter\*
  NeurlPS 2019
- 17. The Limited Multi-Label Projection Layer [code]

  Brandon Amos, Vladlen Koltun, and J. Zico Kolter
  arXiv 2019
- 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...

19. 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

20. 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

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

22. 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

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

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

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

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

27. 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

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

29. 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

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

- 31. Collapsed Variational Inference for Sum-Product Networks
  Han Zhao, Tameem Adel, Geoff Gordon, and **Brandon Amos**ICML 2016
- 32. 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
- Privacy mediators: helping IoT cross the chasm
   Nigel Davies, Nina Taft, Mahadev Satyanarayanan, Sarah Clinch, and Brandon Amos HotMobile 2016

#### 2015 and earlier

34. 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

- 35. 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
- 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
- 37. 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

38. Are Cloudlets Necessary?

Ying Gao, Wenlu Hu, Kiryong Ha, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan CMU 2015

39. Adaptive VM handoff across cloudlets

Kiryong Ha, Yoshihisa Abe, Zhuo Chen, Wenlu Hu, **Brandon Amos**, Padmanabhan Pillai, and Mahadev Satyanarayanan CMU 2015

40. 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

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

# Repositories

facebookresearch/mbrl-lib   $\star$ 453   Model-based reinforcement learning library facebookresearch/dcem   $\star$ 92   The Differentiable Cross-Entropy Method facebookresearch/higher   $\star$ 1.2k   PyTorch higher-order gradient and optimization library bamos/thesis   $\star$ 255   Ph.D. Thesis LaTeX source code cvxgrp/cvxpylayers   $\star$ 1.1k   Differentiable Convex Optimization Layers locuslab/mpc.pytorch   $\star$ 475   Differentiable Model-Predictive Control locuslab/icnn   $\star$ 228   Input Convex Neural Networks locuslab/optnet   $\star$ 369   OptNet experiments locuslab/optnet   $\star$ 369   OptNet experiments locuslab/qpth   $\star$ 490   Differentiable PyTorch QP solver bamos/densenet.pytorch   $\star$ 706   PyTorch DenseNet implementation bamos/block   $\star$ 258   Intelligent block matrix constructions bamos/setGPU   $\star$ 97   Automatically use the least-loaded GPU bamos/dcgan-completion.tensorflow   $\star$ 1.3k   Image completion with GANs cmusatyalab/openface   $\star$ 14.1k   Face recognition with deep neural networks bamos/zsh-history-analysis   $\star$ 161   Analyze and plot your zsh history bamos/cv   $\star$ 323   Source for this CV: Creates LaTeX/Markdown from YAML/BibTeX bamos/dotfiles   $\star$ 229   Linux, mutt, xmonad, i3, vim, emacs, zsh	2021 2020 2019 2019 2019 2018 2017 2017 2017 2017 2017 2016 2015 2014 2013 2012
Invited Talks	
Columbia University IBM Research Max Planck Institute for Intelligent Systems (Tübingen) Seminar Montreal Institute for Learning Algorithms Seminar ECCV Deep Declarative Networks Tutorial CVPR Deep Declarative Networks Workshop Caltech CS 159, Guest Lecture SIAM MDS Minisymposium on Learning Parameterized Energy Minimization Models New York University CILVR Seminar INFORMS Session on Prediction and Optimization Facebook AI Research ISMP Session on Machine Learning and Optimization Google Brain Bosch Center for AI Waymo Research Tesla AI NVIDIA Robotics Salesforce Research OpenAI NNAISENSE UC Berkeley	2021 2020 2020 2020 2020 2020 2019 2019
Interns and Students  Samuel Cohen (visiting FAIR from UCL) Eugene Vinitsky (visiting FAIR from Berkeley) Arnaud Fickinger (visiting FAIR from Berkeley) Aaron Lou (visiting FAIR from Cornell, now: Ph.D. student at Stanford) Ricky Chen (visiting FAIR from Toronto, now: scientist at FAIR) Paul Liang (visiting FAIR from CMU) Phillip Wang (at CMU, now: CEO at Gather)	2021 2021 2021 2020 2020 2020 2018

# **Professional Activities**

Reviewing: AAAI, ICML, NeurIPS, ICLR*, ICCV, CVPR, ICRA *Outstanding reviewer	
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

# **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 Tools Linux, emacs, vim, evil, org, mu4e, xmonad, i3, git, tmux, zsh