Brandon Amos

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I am a third-year Computer Science Ph.D. student at Carnegie Mellon University and am supported by an NSF graduate research fellowship. I spent the first two years of my Ph.D. working between mobile systems and applied machine learning and I now work with Zico Kolter on machine learning and optimization. I am particularly interested in improving our understanding of important modeling problems in computer vision, language, and reinforcement learning through the use of deep learning, optimization (sometimes convex), theory, and statistics.

As an example, we've recently been exploring the intersection of deep learning and convex optimization with input convex neural networks (ICNNs): neural networks that are convex with respect to some of the inputs. Our preprint is available at arXiv:1609.07152 and shows applications to multi-label classification, image completion, and continuous-action reinforcement learning.

I strongly believe in open science and reproducible research and actively publish code on my Github profile. I am also the author of OpenFace, which is an open source face recognition project that uses deep learning.

Education

- Ph.D. in Computer Science, Carnegie Mellon University — Aug 2014 – Present
- M.S. in Computer Science, Carnegie Mellon University — Aug 2014 – May 2016
- B.S. in Computer Science, Virginia Tech (3.99/4.00) — Aug 2011 – May 2014
- Northside High School (Roanoke, Virginia) — May 2011

Research Experience

- Carnegie Mellon University, Prof. Zico Kolter — Apr 2016 – Present
  - Machine learning and optimization
- Carnegie Mellon University, Prof. Mahadev Satyanarayanan — Aug 2014 – Apr 2016
  - Applied machine learning and mobile systems
- Virginia Tech, Prof. Jules White — May 2012 – May 2014
  - Mobile systems, cyber-physical systems, and security
- Virginia Tech, Prof. Layne Watson — Jan 2013 – May 2014
  - Scientific computing, global/stochastic optimization, and bioinformatics
- Virginia Tech, Prof. Binoy Ravindran — Nov 2012 – Mar 2014
  - Heterogeneous compilers

Selected Publications

Google Scholar ID: CZwrwHAAAAAJ

[1] **B. Amos**, L. Xu, J. Z. Kolter, "Input convex neural networks," *ArXiv preprint arXiv:1609.07152*, 2016. [Online]. Available: http://arxiv.org/abs/1609.07152.

[2] H. Zhao, T. Adel, G. Gordon, **B. Amos**, "Collapsed Variational Inference for Sum-Product Networks," in *ICML*, 2016. [Online]. Available: http://www.cs.cmu.edu/~hzhao1/papers/ICML2016/BL-SPN-main.pdf.

[3] **B. Amos**, B. Ludwiczuk, M. Satyanarayanan, "Openface: A general-purpose face recognition library with mobile applications," Technical Report CMU-CS-16-118, CMU School of Computer Science, Tech. Rep., 2016. [Online]. Available: http://reports-archive.adm.cs.cmu.edu/anon/anon/2016/CMU-CS-16-118.pdf.

[4] **B. Amos**, D. Easterling, L. Watson, W. Thacker, B. Castle, M. Trosset, "QNSTOP-QuasiNewton Algorithm for Stochastic Optimization," 2014. [Online]. Available: https://vtechworks.lib.vt.edu/bitstream/handle/10919/49672/qnTOMS14.pdf.

Teaching Experience

- Graduate AI (CMU 15-780), TA — S2017
- Distributed Systems (CMU 15-440/640), TA — S2016
- Software Design and Data Structures (VT CS 2114), TA — S2013

Industry Experience

- Data Scientist Intern, Adobe Research — May 2014 – Aug 2014
  - I built a web analytics processing engine using **Scala**, **Spark**, **Spray**, **Parquet**, and **HDFS**.
- Software Engineer Intern, Snowplow Analytics — Dec 2013 – Jan 2014
  - Open-source **Scala** development with a startup on the Snowplow analytics platform. My commits are online at https://github.com/snowplow/snowplow/commits?author=bamos.
  - Developed a new server using **Spray** and **Actors** to store **Thrift** events on **Amazon Kinesis**.
- Software Engineer Intern, Qualcomm — May 2013 – Aug 2013
  - I created a specification format language translator for fuzz testing with Python.
- Software Engineer Intern, Phoenix Integration — May 2012 – Aug 2012
  - I developed industry software for software integration and design process optimization in **VC++**, **VC#**, and **Java**.
- Network Administrator Intern, Sunapsys — Jan 2011 – Aug 2011
  - Internship in high school to replace Windows domain, mail, DHCP, and DNS servers with virtual **Linux** servers using **KVM** and **virsh**.

CMU Graduate Coursework

- Statistical Machine Learning (10-702, Au), L. Wasserman — S2017
- Deep Reinforcement Learning (10-703), R. Salakhutdinov and A. Fragkiadaki — S2017
- Intermediate Statistics (10-705, Au), L. Wasserman — F2016
- Topics in Deep Learning (10-807), R. Salakhutdinov — F2016
- Convex Optimization (10-725), R. J. Tibshirani — F2015
- Algorithms in the Real World (15-853), G. Blelloch and A. Gupta — F2015
- Semantics of Programming Languages (15-812), A. Platzer — S2015
- Optimizing Compilers for Modern Architecture (15-745), T. Mowry — S2015
- Advanced Operating and Distributed Systems (15-712), D. Andersen — F2014
- Mobile and Pervasive Computing (15-812), M. Satyanarayanan and D. Siewiorek — F2014

Honors & Awards

- NSF Graduate Research Fellowship 2016 – 2019
- 1st Place Undergraduate Senior Capstone Award, Virginia Tech Computer Science 2014
- David Heilman Research Award, Virginia Tech Computer Science 2014
- Senior Scholar Award, Virginia Tech Computer Science 2014
- Honorable Mention, CRA Outstanding Undergraduate Researcher Award 2014
- Awarded eight undergraduate merit scholarships 2011 – 2014

Skills

Languages	Bash, C, C++, CSS, Fortran, Haskell, HTML, Java, JavaScript, LaTeX, Lua, Make, *Mathematica*, Python, R, Scala
Frameworks	Akka, Android SDK/NDK, Caffe, Node.js, NumPy, TensorFlow, Torch7, Pandas, SciPy, scikit-learn, Spark, Spray
Systems	Linux, OSX

All Publications

Google Scholar ID: CZwrwHAAAAAJ

Conference Proceedings

[C1] H. Zhao, T. Adel, G. Gordon, **B. Amos**, "Collapsed Variational Inference for Sum-Product Networks," in *ICML*, 2016. [Online]. Available: http://www.cs.cmu.edu/~hzhao1/papers/ICML2016/BL-SPN-main.pdf.

[C2] **B. Amos**, H. Turner, J. White, "Applying machine learning classifiers to dynamic Android malware detection at scale," in *IWCMC Security, Trust and Privacy Symposium*, 2013. [Online]. Available: http://bamos.github.io/data/papers/amos-iwcmc2013.pdf.

Workshop, Symposium, and Short Papers

[W1] N. A. J. Davies, N. Taft, M. Satyanarayanan, S. Clinch, **B. Amos**, "Privacy mediators: helping iot cross the chasm," in *HotMobile*, 2016. [Online]. Available: http://eprints.lancs.ac.uk/78255/1/44691.pdf.

[W2] Z. Chen, L. Jiang, W. Hu, K. Ha, **B. Amos**, P. Pillai, A. Hauptmann, M. Satyanarayanan, "Early Implementation Experience with Wearable Cognitive Assistance Applications," in *WearSys*, 2015. [Online]. Available: http://www.cs.cmu.edu/~satya/docdir/chen-wearsys2015.pdf.

[W3] W. Hu, **B. Amos**, Z. Chen, K. Ha, W. Richter, P. Pillai, B. Gilbert, J. Harkes, M. Satyanarayanan, "The Case for Offload Shaping," in *HotMobile*, 2015. [Online]. Available: http://www.cs.cmu.edu/~satya/docdir/hu-hotmobile2015.pdf.

[W4] **B. Amos** and D. Tompkins, "Performance study of Spindle, a web analytics query engine implemented in Spark," in *IEEE CloudCom*, 2014. [Online]. Available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7037709.

[W5] T. Andrew, **B. Amos**, D. Easterling, C. Oguz, W. Baumann, J. Tyson, L. Watson, "Global Parameter Estimation for a Eukaryotic Cell Cycle Model in Systems Biology," in *Summer Simulation Multiconference, Society for Modeling and Simulation International*, 2014. [Online]. Available: http://dl.acm.org/citation.cfm?id=2685662.

[W6] **B. Amos**, D. Easterling, L. Watson, B. Castle, M. Trosset, W. Thacker, "Fortran 95 implementation of QNSTOP for global and stochastic optimization," in *Spring Simulation Multiconference, High Performance Computer Symposium, Society for Modeling and Simulation International*, 2014. [Online]. Available: http://dl.acm.org/citation.cfm?id=2663525.

Magazine Articles

[M1] M. Satyanarayanan, P. Simoens, Y. Xiao, P. Pillai, Z. Chen, K. Ha, W. Hu, **B. Amos**, "Edge analytics in the internet of things," *IEEE Pervasive Computing*, no. 2, pp. 24–31, 2015. [Online]. Available: https://www.cs.cmu.edu/~satya/docdir/satya-edge2015.pdf.

[M2] H. Turner, J. White, J. A. Camelio, C. Williams, **B. Amos**, R. Parker, "Bad Parts: Are Our Manufacturing Systems at Risk of Silent Cyberattacks?" *Security & Privacy, IEEE*, vol. 13, no. 3, pp. 40–47, 2015. [Online]. Available: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7118094.

Tech Reports

[T1] **B. Amos**, B. Ludwiczuk, M. Satyanarayanan, "Openface: A general-purpose face recognition library with mobile applications," Technical Report CMU-CS-16-118, CMU School of Computer Science, Tech. Rep., 2016. [Online]. Available: http://reports-archive.adm.cs.cmu.edu/anon/anon/2016/CMU-CS-16-118.pdf.

[T2] Y. Gao, W. Hu, K. Ha, **B. Amos**, P. Pillai, M. Satyanarayanan, "Are cloudlets necessary?" Technical Report CMU-CS-15-139, CMU School of Computer Science, Tech. Rep., 2015. [Online]. Available: http://reports-archive.adm.cs.cmu.edu/anon/anon/2015/CMU-CS-15-139.pdf.

[T3] K. Ha, Y. Abe, Z. Chen, W. Hu, **B. Amos**, P. Pillai, M. Satyanarayanan, "Adaptive vm handoff across cloudlets," Technical Report CMU-CS-15-113, CMU School of Computer Science, Tech. Rep., 2015. [Online]. Available: http://ra.adm.cs.cmu.edu/anon/2015/CMU-CS-15-113.pdf.

[T4] **B. Amos**, D. Easterling, L. Watson, W. Thacker, B. Castle, M. Trosset, "QNSTOP-QuasiNewton Algorithm for Stochastic Optimization," 2014. [Online]. Available: https://vtechworks.lib.vt.edu/bitstream/handle/10919/49672/qnTOMS14.pdf.

Posters

[P1] **B. Amos** and J. Z. Kolter, "Input-convex deep networks," in *ICLR Workshop*, 2016. [Online]. Available: http://bamos.github.io/data/posters/2016-iclr-icnn.pdf.

[P2] **B. Amos** and M. Satyanarayanan, "Face Recognition for Context Sensitive IoT Systems," in *HotMobile*, 2016. [Online]. Available: http://bamos.github.io/data/posters/2016-hotmobile-facerec.pdf.