

# Brandon Amos

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## Research Interests

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Machine learning, computer vision, and mobile computing.

## Education

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

## Research Experience

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- Research Assistant, Carnegie Mellon University Aug 2014–Present
  - **Advisor:** Prof. Mahadev Satyanarayanan
  - **Area:** Machine learning, computer vision, and mobile computing.
  - Project lead of OpenFace, which provides face recognition with deep neural networks and is available on GitHub at <http://github.com/cmusatyalab/openface>.
- Undergraduate Research Assistant, Magnum Research Group May 2012–May 2014
  - **Advisor:** Prof. Jules White
  - **Area:** Mobile computing, cyber-physical systems, and security.
  - Android malware detection research implemented with a distributed **Actor-based Scala** system.
  - Manufacturing cyber-physical security research implemented with **VC#** and **Python**.
- Undergraduate Research Assistant, Virginia Tech Jan 2013–May 2014
  - **Advisor:** Prof. Layne Watson
  - **Area:** Scientific computing, global/stochastic optimization, and bioinformatics.
  - Algorithm development for global and stochastic optimization using quasi-Newton methods for **parameter estimation** in **Fortran 95** and **OpenMP**.
  - Bioinformatics research on yeast cell modeling using **Fortran 95**, **C++**, and **Matlab**.
- Undergraduate Research Assistant, Systems Software Research Group Nov 2012–Mar 2014
  - **Advisor:** Prof. Binoy Ravindran
  - **Area:** Heterogeneous compilers.
  - Compiler research on a heterogeneous system on automatic **OpenMP** to **CUDA** translation using **C++** and the **ROSE** compiler framework.
  - Polyhedral loop optimization research to restructure **OpenCL** kernels for locality using **LLVM** and **Polly**.

## Publications

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### Conference Proceedings

- [C1] 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*, 2015. [Online]. Available: <http://www.cs.cmu.edu/~satya/docdir/chen-wearsys2015.pdf>.
- [C2] 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*, 2015. [Online]. Available: <http://www.cs.cmu.edu/~satya/docdir/hu-hotmobile2015.pdf>.
- [C3] **B. Amos** and D. Tompkins, "Performance study of Spindle, a web analytics query engine implemented in Spark," in *(Short Paper) Proceedings of the 2014 IEEE International Conference on Cloud Computing Technology and Science (CloudCom)*, 2014.
- [C4] 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 *2014 Summer Simulation Multiconference, Society for Modeling and Simulation International*, 2014. [Online]. Available: <http://dl.acm.org/citation.cfm?id=2685662>.
- [C5] **B. Amos**, D. Easterling, L. Watson, B. Castle, M. Trosset, W. Thacker, "Fortran 95 implementation of QNSTOP for global and stochastic optimization," in *2014 Spring Simulation Multiconference, 22nd High Performance Computer Symposium, Society for Modeling and Simulation International*, 2014. [Online]. Available: <http://dl.acm.org/citation.cfm?id=2663525>.
- [C6] **B. Amos**, H. Turner, J. White, "Applying machine learning classifiers to dynamic Android malware detection at scale," in *IWCMC'13 Security, Trust and Privacy Symposium*, 2013. [Online]. Available: <http://bamos.github.io/data/papers/amos-iwcmc2013.pdf>.

### Journal Articles

- [J1] **B. Amos**, D. Easterling, L. Watson, W. Thacker, B. Castle, M. Trosset, "QNSTOP-QuasiNewton Algorithm for Stochastic Optimization," submitted, pre-print available as a tech report. [Online]. Available: <https://vtechworks.lib.vt.edu/bitstream/handle/10919/49672/qnTOMS14.pdf>.

### 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*, to appear. [Online]. Available: <http://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>.

## Teaching Experience

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- Software Design and Data Structures (CS 2114), Undergraduate TA VT S2013

## Industry Experience

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- Data Scientist Intern, Adobe Research May 2014–Aug 2014
  - **Research Area:** Distributed Systems
  - Built and released *Spindle* as an open source web analytics processing engine using **Scala**, **Spark**, **Spray**, and **Parquet** on **HDFS**. Spindle is available on GitHub at <http://github.com/adobe-research/spindle>.
- Software Engineer Intern, Snowplow Analytics Dec 2013–Jan 2014
  - Open-source **Scala** development with a startup on the Snowplow analytics platform. My contributions are available at <https://github.com/snowplow/snowplow/commits?author=bamos>.

- Developed a new server using **Spray** and **Actors** to store **Apache Thrift** events on **Amazon Kinesis**.
- Completed project ahead of schedule, and also helped port Snowplow's Scala enrichment process to Kinesis.
- Software Engineer Intern, Qualcomm May 2013–Aug 2013
  - Developed an XML modification **web application** for fuzz vector generation. Implemented with client-side **HTML** and **js**, using **D3** for graphics and **Handlebars** for templating.
  - Developed an XML-based grammar translator in **C++** with the **Xerces** XML parser in **Linux**. Reimplemented in **Python** using the **ElementTree** XML API for sophisticated analysis and tree transformations.
- Software Engineer Intern, Phoenix Integration May 2012–Aug 2012
  - Developed industry software in **VC++**, **VC#**, **Java**, and **Tomcat**.
  - Improved the testing (**JUnit** and **NUnit**) and installation (**Ant**, **InstallShield**, and **Make**) frameworks.
  - Integrated a new licensing mode into CenterLink, a grid computing application, using **FLEXlm** 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

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- Computer Vision (16-720), D. Ramanan S2016
- 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 Systems and Distributed Systems (15-712), D. Andersen F2014
- Mobile and Pervasive Computing (15-812), M. Satyanarayanan and D. Siewiorek F2014

## Skills

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

## Honors & Awards

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- 1st Place Undergraduate Senior Capstone Award, Virginia Tech Computer Science 2014
- David Heilman Research Award, Virginia Tech Computer Science 2014
  - Given to the Computer Science student with the most outstanding research experience.
- Senior Scholar Award, Virginia Tech Computer Science 2014
  - Given to the senior in Computer Science with the most outstanding academic record.
- Honorable Mention, CRA Outstanding Undergraduate Researcher Award 2014
- Awarded eight undergraduate merit scholarships 2011–2014