

# Dylan Hutchison

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**Objective:** To bridge linear and relational algebra systems both in theory and in practice.  
To build the *polystore optimizer* that translates and optimizes queries across systems, taking all known statistics, properties, and equivalences into account.

## Education

<b>University of Washington</b> <i>Ph.D. in Computer Science &amp; Engineering</i> <b>Awards</b> NSF Graduate Research Fellow	<b>Seattle, WA</b> 9/2015–≈2019
<b>Stevens Institute of Technology</b> <i>M.S. in Computer Science, M.S. in Applied Mathematics, B.E. in Computer Engineering</i> <b>GPA</b> 4.00 Graduate, 3.97 Undergraduate <b>Thesis</b> <i>ModelWizard: Toward Interactive Model Construction</i> advised by David A. Naumann, Philippos Mordohai, Andrew D. Gordon <b>Awards</b> 2014 National Barry Goldwater Scholar, Association of Old Crows Scholar, Tau Beta Pi Scholar, Computing Research Association <i>Outstanding Undergraduate Researcher</i> Honorable Mention <b>Societies</b> <i>Tau Beta Pi</i> (Engineering), <i>Upsilon Pi Epsilon</i> (Computer Science), <i>Eta Kappa Nu</i> (IEEE)	<b>Hoboken, NJ</b> 8/2010–5/2015
<b>University of Edinburgh</b> <i>Study Abroad Semester, 6 courses transferred</i>	<b>Edinburgh, UK</b> 1/2014–5/2014

## Experience

<b>Apache Accumulo – PMC Committer</b> ◦ Contributing Java code and discussion to the Apache Accumulo NoSQL database community	10/2015–Future
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### Laboratory & Industry.....

<b>MIT Lincoln Laboratory – Research Engineer</b> <i>Computing and Analytics Group, Advisors Jeremy Kepner, Vijay Gadepally</i> ◦ Engineered Graphulo, a Java server-side matrix math library for the Accumulo database ◦ Recasted graph algorithms into the GraphBLAS standard; prototyped in Matlab	<b>Lexington, MA</b> 1/2015–9/2015
<b>Microsoft Research – Research Intern</b> <i>Programming Principles and Tools Group, Advisor Andy Gordon</i> ◦ Designed ModelWizard: a DSL in F# for interactive model construction targeting Tabular, a schema-based probabilistic programming language. Presented a concept poster at the Microsoft PhD Summer School	<b>Cambridge, UK</b> 6/2014–8/2014
<b>Sandia National Laboratories – Technical Intern</b> <i>Information Assurance Group, Advisors Levi Lloyd, Tamara Kolda</i> ◦ Pursued network anomaly detection via Accumulo schemas, machine learning and visualization ◦ Scaled LXC's (Linux Containers) with MiniMega, a mass distributed VM experiment platform	<b>Livermore, CA</b> 5/2013–8/2013
<b>MIT Lincoln Laboratory – Research Intern</b> <i>Computing and Analytics Group, Advisor Jeremy Kepner</i> <i>Bioengineering and Systems Technology Group, Advisor Darrell Ricke</i> ◦ Integrated and benchmarked Accumulo distributed database features into D4M, a Matlab package delivering linear algebra and graph theory capabilities via Associative Arrays ◦ Applied D4M work to a DNA matching bioinformatics project, published in the <i>Lincoln Laboratory Journal</i>	<b>Lexington, MA</b> 5/2012–8/2012
<b>Brown Brothers Harriman – Web Development Co-op</b> <i>Business Application Development, Advisors John David, Steve Hansen</i> ◦ Designed and developed front- and back-end web applications for financial reporting using SQL, C++ and jQuery	<b>Jersey City, NJ</b> 1/2012–5/2012

## Teaching

**Stevens Institute of Technology**

**Hoboken, NJ**

**Computer Science Department:** *Teaching Assistant*

*8/2012–12/2013*

- Teach, create and evaluate computer science coursework for classes ranging from 40 up to 70 students
- CS 506: Intro to IT Security, CS 135: Discrete Structures, CS 334: Automata and Computation

**Academic Support Center:** *Tutor*

*8/2011–12/2013*

- Teach individuals and groups in Mathematics, Computer Science and Engineering

## Activities

**Reviewer for Information Systems:** A journal published by Wiley.

**Scientific Philosophy:** Presented *Our aims as Modelers: toward better Predictions, Explanations, Interventions* at Upsilon Pi Epsilon 'Tech Talk' seminar, April 2013; Sandia Technical Seminar, August 2013

**Graduate Computer Science Society:** *Vice President 2013*. Organized seminars and programming challenge events

**Cycling Club:** *President 2012*. Led the team and the Stevens Duck Country Circuit Race, Mountainside NJ

**Anime Club:** *Treasurer 2012; Head of Operations* for 2012 Castle Point Anime Convention, attracting over 2100 people

## Publications

### Conference Papers

- [C9] J. Wang, T. Baker, M. Balazinska, D. Halperin, B. Haynes, B. Howe, D. Hutchison, S. Jain, R. Maas, P. Mehta, D. Moritz, B. Myers, J. Ortiz, D. Suciu, A. Whitaker, and S. Xu, "The Myria big data management and analytics system and cloud service," in *Conference on Innovative Data Systems Research (CIDR)*, 2017.
- [C8] D. Hutchison, J. Kepner, V. Gadepally, and B. Howe, "From NoSQL Accumulo to NewSQL Graphulo: design and utility of graph algorithms inside a BigTable database," in *High Performance Extreme Computing Conference (HPEC)*, IEEE, Sep. 2016. DOI: 10.1109/HPEC.2016.7761577. arXiv: 1606.07085 [cs.DB], **Best Student Paper**.
- [C7] J. Kepner, V. Gadepally, D. Hutchison, H. Jananathan, T. Mattson, S. Samsi, and A. Reuther, "Associative array model of SQL, NoSQL, and NewSQL databases," in *High Performance Extreme Computing Conference (HPEC)*, IEEE, Sep. 2016. DOI: 10.1109/HPEC.2016.7761647. arXiv: 1606.05797 [cs.DB].
- [C6] T. Weale, V. Gadepally, D. Hutchison, and J. Kepner, "Benchmarking the Graphulo processing framework," in *High Performance Extreme Computing Conference (HPEC)*, IEEE, Sep. 2016. DOI: 10.1109/HPEC.2016.7761640. arXiv: 1609.08642 [cs.DB].
- [C5] A. Chen, A. Edelman, J. Kepner, V. Gadepally, and D. Hutchison, "Julia implementation of the dynamic distributed dimensional data model," in *High Performance Extreme Computing Conference (HPEC)*, IEEE, Sep. 2016. DOI: 10.1109/HPEC.2016.7761626. arXiv: 1608.04041 [cs.MS], **Best Paper**.
- [C4] J. Kepner, P. Aaltonen, D. Bader, A. Buluç, F. Franchetti, J. Gilbert, D. Hutchison, M. Kumar, A. Lumsdaine, H. Meyerhenke, S. McMillan, J. Moreira, J. D. Owens, C. Yang, M. Zalewski, and T. Mattson, "Mathematical foundations of the GraphBLAS," in *High Performance Extreme Computing Conference (HPEC)*, IEEE, Sep. 2016. DOI: 10.1109/HPEC.2016.7761646. arXiv: 1606.05790 [cs.MS].
- [C3] D. Hutchison, J. Kepner, V. Gadepally, and A. Fuchs, "Graphulo implementation of server-side sparse matrix multiply in the Accumulo database," in *High Performance Extreme Computing Conference (HPEC)*, IEEE, Sep. 2015. DOI: 10.1109/HPEC.2015.7322448. arXiv: 1507.01066 [cs.DB], **Best Student Paper Finalist**.

- [C2] V. Gadepally, J. Bolewski, D. Hook, D. Hutchison, B. Miller, and J. Kepner, "Graphulo: Linear algebra graph kernels for NoSQL databases," in *International Parallel & Distributed Processing Symposium Workshops (IPDPSW)*, IEEE, May 2015. DOI: 10.1109/IPDPSW.2015.19. arXiv: 1508.07372 [cs.DS].
- [C1] D. Hutchison and S. Kleinberg, "Causal inference under uncertainty via adjustments and SOPDs," in *Causality and Experimentation in the Sciences*, Paris, France, Jul. 2013. Online: <http://caeits.sciencesconf.org/conference/caeits/hutchison-caeits2013.pdf>.

#### Journal Papers.....

- [J2] M. J. Smith, V. Vaglica, M. Sajeve, N. McGough, D. Hutchison, A. D. Gordon, C. Russo, A. Ramarosandratana, and W. Stuppy, "Monitoring internet trade to inform species conservation actions," *Endangered Species Research*, 2017. DOI: 10.3354/esr00803.
- [J1] J. Kepner, D. Ricke, and D. Hutchison, "Taming biological big data with D4M," *Lincoln Laboratory Journal*, vol. 20, no. 1, 2013.

#### Thesis.....

- [T1] D. Hutchison, "ModelWizard: Toward interactive model construction," M.S. Thesis, Stevens Institute of Technology, May 2015. arXiv: 1604.04639 [cs.PL].

#### Preprints.....

- [U1] D. Hutchison, B. Howe, and D. Suciu, *Lara: a key-value algebra underlying arrays and relations*, Working draft, Apr. 2016. arXiv: 1604.03607 [cs.DB].

#### Posters.....

- [P8] D. Hutchison, S. Jain, B. Howe, and D. Maier, *Ocean genomic analysis with Myria*, Poster presented at Aug. 2016 summit for the Intel Science and Technology Center (ISTC) for Big Data, Aug. 2016.
- [P7] D. Hutchison, V. Gadepally, J. Kepner, and B. Howe, *Graphulo: native linear algebra in a NoSQL DB*, Poster presented at Aug. 2016 summit for the Intel Science and Technology Center (ISTC) for Big Data, Aug. 2016.
- [P6] D. Hutchison, B. Howe, D. Suciu, and Z. Tatlock, *Polystore optimization via program expression graphs*, Poster presented at North East Database Day (NEDB), Jan. 2016.
- [P5] D. Hutchison, J. Kepner, and V. Gadepally, *Graphulo: graph processing for Accumulo databases*, Poster presented at North East Database Day (NEDB) and Sep. 2015 retreat for the Intel Science and Technology Center (ISTC) for Big Data, Jan. 2016.
- [P4] L. Battle, L. Edwards, V. Gadepally, B. Gavin, B. Hancock, D. Hutchison, J. Kepner, and A. Moran, *Technologies for visualization of big medical text data*, Poster presented at Very Large Databases Conference (VLDB), Aug. 2015.
- [P3] D. Hutchison, E. Cherin, X. Li, and H. Yang, *HBaaS: Heterogeneously-accelerated bioinformatics-as-a-service*, Poster and demo presented at Stevens Institute Senior Design Expo, Apr. 2015.
- [P2] D. Hutchison and the Microsoft Research Tabular Team, *Structural clustering*, Poster presented at Microsoft PhD Summer School, Jul. 2014.
- [P1] D. Hutchison and D. Kleszyk, *Investigating the influence of infrastructure on the load response of stevens course servers*, Poster presented at Microsoft PhD Summer School, Dec. 2011.

#### Other Talks and Demos.....

- [O7] D. Hutchison, J. Kepner, and V. Gadepally, *Graphulo use and design*, Presentation and demo to government sponsors, Aug. 2015.

- [O6] V. Gadepally, L. Edwards, D. Hutchison, and J. Kepner, *Using d4m for rapid prototyping of analytics for apache accumulo*, Presentation at Accumulo Summit, Apr. 2015. Online: <http://accumulosummit.com/program/talks/using-d4m-for-rapid-prototyping-of-analytics-for-apache-accumulo/>.
- [O5] D. Hutchison, A. Gordon, and C. Russo, *ModelWizard: Interactive model construction for Tabular*, Presentation and demo to Programming Principles and Tools at Microsoft Research, Aug. 2014.
- [O4] D. Hutchison and L. Lloyd, *Network anomaly detection*, Presentation at an intern symposium at Sandia National Laboratories, Aug. 2013.
- [O3] D. Hutchison, *Our aims as modelers: toward better predictions, explanations, interventions*, Presentation at a technical seminar at Sandia National Laboratories, Aug. 2013. Online: [github.com/dhutchis/ModelTalk](https://github.com/dhutchis/ModelTalk).
- [O2] —, *Uncertain? Represent your belief with SOPD*, Minute madness talk at Programming Languages Mentoring Workshop (PLMW) at the Principles of Programming Languages Conference (POPL), Jan. 2013.
- [O1] —, *Accelerating bioinformatics with big data technologies*, Presentation at an intern symposium at MIT Lincoln Laboratory, Aug. 2012.