

# 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>	<b>Seattle, WA</b>
<i>Ph.D. in Computer Science &amp; Engineering, M.S. in Computer Science &amp; Engineering (3/2017)</i>	9/2015–≈2019
<b>Awards</b> NSF Graduate Research Fellow	
<b>Advisors</b> Bill Howe, Dan Suciu, Zachary Tatlock	
<b>Stevens Institute of Technology</b>	<b>Hoboken, NJ</b>
<i>M.S. in Computer Science, M.S. in Applied Mathematics, B.E. in Computer Engineering</i>	8/2010–5/2015
<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>University of Edinburgh</b>	<b>Edinburgh, UK</b>
<i>Study Abroad Semester, 6 courses transferred</i>	1/2014–5/2014

## Experience

<b>Apache Accumulo – PMC Committer</b>	10/2015–Future
○ Contributing Java code and discussion to the Apache Accumulo NoSQL database community	
<b>Laboratory &amp; Industry</b> .....	
<b>MIT Lincoln Laboratory – Research Engineer</b>	<b>Lexington, MA</b>
<i>Computing and Analytics Group, Advisors Jeremy Kepner, Vijay Gadepally</i>	1/2015–9/2015
○ Engineered Graphulo, a Java server-side matrix math library for the Accumulo database	
○ Recasted graph algorithms into the GraphBLAS standard; prototyped in Matlab	
<b>Microsoft Research – Research Intern</b>	<b>Cambridge, UK</b>
<i>Programming Principles and Tools Group, Advisor Andy Gordon</i>	6/2014–8/2014
○ 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>Sandia National Laboratories – Technical Intern</b>	<b>Livermore, CA</b>
<i>Information Assurance Group, Advisors Levi Lloyd, Tamara Kolda</i>	5/2013–8/2013
○ 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>MIT Lincoln Laboratory – Research Intern</b>	<b>Lexington, MA</b>
<i>Computing and Analytics Group, Advisor Jeremy Kepner</i>	5/2012–8/2012
<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>Brown Brothers Harriman – Web Development Co-op</b>	<b>Jersey City, NJ</b>
<i>Business Application Development, Advisors John David, Steve Hansen</i>	1/2012–5/2012
○ Designed and developed front- and back-end web applications for financial reporting using SQL, C++ and jQuery	

## Teaching

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**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

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**Reviewer for Information Systems:** *2016*. 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

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### Conference Papers

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- [C10] D. Hutchison, B. Howe, and D. Suciu, **LaraDB: A minimalist kernel for linear and relational algebra computation**, in *SIGMOD Workshop on Algorithms and Systems for MapReduce and Beyond (BeyondMR)*, ACM, 2017.
- [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].

#### Blog Posts.....

- [B1] D. Hutchison, B. Howe, D. Suciu, and Z. Tatlock. (Apr. 2016). **PolyPEG: A proposal for polystore optimization**, Online: <http://istc-bigdata.org/index.php/polypeg-a-proposal-for-polystore-optimization>.

#### Posters.....

- [P9] D. Hutchison, B. Howe, V. Gadepally, and J. Kepner, **In-database vs. external system analytics on a key-value store**, Poster presented at Jan. 2017 North East Database Day (NEDB), Jan. 2017.
- [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.....

- [O9] D. Hutchison, **In-database analytics for NoSQL key-value stores**, Qualifying Project Talk, Dec. 2016. Online: <https://www.cs.washington.edu/qualsexam/dhutchis>.
- [O8] B. Howe, D. Hutchison, and S. Jain, **Demo of myria as a federated database**, Presentation and demo to government sponsors, Oct. 2016. Online: [https://github.com/uwescience/raco/blob/SPJA\\_federation/HPDA\\_review.ipynb](https://github.com/uwescience/raco/blob/SPJA_federation/HPDA_review.ipynb).
- [O7] D. Hutchison, J. Kepner, and V. Gadepally, **Lara: A language of linear and relational algebra for polystores**, UWDB Database Day 2015 industry talk, Dec. 2015. Online: [http://db.cs.washington.edu/events/database\\_day/2015/database\\_day\\_2015.html](http://db.cs.washington.edu/events/database_day/2015/database_day_2015.html).
- [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.