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

University of Washington — **Seattle, WA**
Ph.D. in Computer Science & Engineering, M.S. in Computer Science & Engineering (3/2017) — *9/2015– ≈2019*
Awards NSF Graduate Research Fellow
Advisors Bill Howe, Dan Suciu, Zachary Tatlock

Stevens Institute of Technology — **Hoboken, NJ**
M.S. in Computer Science, M.S. in Applied Mathematics, B.E. in Computer Engineering — *8/2010–5/2015*
GPA 4.00 Graduate, 3.97 Undergraduate
Thesis *ModelWizard: Toward Interactive Model Construction*
advised by David A. Naumann, Philippos Mordohai, Andrew D. Gordon
Awards 2014 National Barry Goldwater Scholar, Association of Old Crows Scholar, Tau Beta Pi Scholar, Computing Research Association *Outstanding Undergraduate Researcher* Honorable Mention
Societies *Tau Beta Pi* (Engineering), *Upsilon Pi Epsilon* (Computer Science), *Eta Kappa Nu* (IEEE)

University of Edinburgh — **Edinburgh, UK**
Study Abroad Semester, 6 courses transferred — *1/2014–5/2014*

Experience

Apache Accumulo – *PMC Committer* — *10/2015–Future*
- Contributing Java code and discussion to the Apache Accumulo NoSQL database community

Laboratory & Industry

MIT Lincoln Laboratory – *Research Engineer* — **Lexington, MA**
Computing and Analytics Group, Advisors Jeremy Kepner, Vijay Gadepally — *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

Microsoft Research – *Research Intern* — **Cambridge, UK**
Programming Principles and Tools Group, Advisor Andy Gordon — *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

Sandia National Laboratories – *Technical Intern* — **Livermore, CA**
Information Assurance Group, Advisors Levi Lloyd, Tamara Kolda — *5/2013–8/2013*
- Pursued network anomaly detection via Accumulo schemas, machine learning and visualization
- Scaled LXCs (Linux Containers) with MiniMega, a mass distributed VM experiment platform

MIT Lincoln Laboratory – *Research Intern* — **Lexington, MA**
Computing and Analytics Group, Advisor Jeremy Kepner — *5/2012–8/2012*
Bioengineering and Systems Technology Group, Advisor Darrell Ricke
- 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 *Lincoln Laboratory Journal*

Brown Brothers Harriman – *Web Development Co-op* — **Jersey City, NJ**
Business Application Development, Advisors John David, Steve Hansen — *1/2012–5/2012*
- Designed and developed front- and back-end web applications for financial reporting using SQL, C++ and jQuery

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: *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

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. Jananthan, 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. Sajeva, 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

[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, *In-database analytics for nosql key-value stores*, Qualifying Project Talk, Dec. 2016. Online: `https://www.cs.washington.edu/qualsexam/dhutchis`.

[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`.

[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.