

# Elisabeth Baseman

📞 (413) 345 2944 • ✉ lissa@lissalytics.com • 🌐 <http://www.lissalytics.com>

## Summary

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Applied computer science researcher with skills in advanced machine learning, graph analysis, and computational social science. Currently leading machine learning research projects for the high performance computing division at Los Alamos National Laboratory. Seeking a research position in machine learning and data science.

## Technical Skills

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- o Relational learning, ensemble methods, graphical models
- o Analyst-centric data mining tool development
- o Agile software development and code testing
- o Presentation and communication of scientific results
- o Proficient: Python, Ruby on Rails, Java
- o Databases: PostgreSQL, MySQL, MonetDB
- o Familiar: C, C++, Clojure, Eclipse, Haskell, HTML/CSS,
- o Amazon Web Services: Redshift, S3, SQS, SNS
- JavaScript, MIPS, Pixar's Renderman, Prolog, Matlab,
- Mathematica, R, x86

## Education

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### M.S. in Computer Science, University of Massachusetts Amherst

*"Exploring Collective Behavior in Social Computation Through Relational Statistical Models"* 2011 - 2015

Advisor: David Jensen, Knowledge Discovery Laboratory GPA: 3.88/4.00

- o **Research highlights:** relational and temporal machine learning, graph analysis, explanatory anomaly detection
- o Coursework: Probabilistic Graphical Models, Statistics, Artificial Intelligence, Modern Computer Architecture, Research Methods in Empirical Computer Science, Advanced Algorithms, Advanced Compiler Design, Robotics

### B.A. in Computer Science, Summa cum Laude with Distinction, Amherst College

*Senior honors thesis: "Computing with Quantum Physics"*

2007 - 2011

Advisor: Lyle A. McGeoch, Computer Science

GPA: 3.72/4.00

## Select Projects

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### Explanatory Anomaly Detection

LANL: Ongoing

Adapted classifier-adjusted density estimation to include an interpretable component by aggregating across a random forest, and provided mechanism to modify learned model to avoid false positives.

### Twitter User Classification

MIT-LL, LANL: Ongoing

Accurately classified Twitter account types without use of profile information. Created novel hypergraph representation for use in relational probability trees, and compared content to context features.

### System Log Anomaly Detection

LANL: Ongoing

Developed fine-grained anomaly detection framework for complex computing system logs using methods from social network analysis, including statistical relational learning and Infomap for community detection.

### Strategic Collective Behavior

MIT-LL, UMass Amherst: 2015

Designed a relational temporal model of human behavior in game theory experiments with human subjects. Compared validity across varying strategies based on inherent versus contextual features.

### Hardware Fault Identification

LANL: Ongoing

Modernizing memory fault characterization through supervised methods. Random forests predict fault modes faster and more accurately than current state-of-the-art, a crucial improvement for exascale machines.

### Financial Fraud Detection

MIT-LL: 2013

Used relational statistical techniques to detect factors important for potential fraudulent activity in the Kiva international microfinance data set. Results agreed with documented known cases of fraud.

## Experience

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### Los Alamos National Laboratory – High Performance Computing Design

Research Data Scientist, Ultrascale Systems Research Center

Los Alamos, NM

September 2015 - present

- o Leading division effort on machine learning for high performance computing problems
- o Improving detection and characterization of memory faults (DRAM, SRAM, and SSD)
- o Designing and implementing anomaly detection for system monitoring and user behavior
- o Advising on new laboratory-wide initiative for social media analysis
- o Applying graphical models to Twitter data for disruptive event prediction

**Fiksu, Inc.**

Software Engineer

Northampton, MA

September 2014 - July 2015

- Led technical design and specification writing for predictive analytics project
- Developed, tested, and deployed quality code in a high-impact production environment
- Maintained Amazon Web Service infrastructure

**Los Alamos National Laboratory – Center for Nonlinear Studies**

Graduate Research Assistant, Quantum Computing for Machine Learning

Los Alamos, NM

Summer 2014

Supervisor: Rolando Somma

- Contributed to design and theoretical analysis of quantum computing algorithm for machine learning
- Simulated quantum computing system for experimentation

**MIT Lincoln Laboratory – Human Language Technology**

Graduate Research Assistant, Relational Learning for Big Data Exploration

Lexington, MA

Summer 2013 - August 2014

Supervisor: William Campbell

- Applied relational learning techniques to microfinance (Kiva) and microblogging (Twitter) data
  - Detected anomalies in Kiva that corresponded to real-world fraud
  - Classified Twitter user type (celebrity, business organization, etc.) using only a few tweets
- Engineered, with collaborators, a novel hypergraph analytical method for Twitter
- Developed slides on relational learning presented to DARPA sponsor
- Secured graduate research funding to continue work at UMass Amherst

**University of Massachusetts Amherst**

Graduate Research Assistant, Knowledge Discovery Laboratory

Amherst, MA

Fall 2011 - Spring 2014

Advisor: David Jensen

- Researched strategic behavior of individuals and groups in social networks
- Contributed to DARPA ADAMS and XDATA projects
- Enhanced statistical relational learning techniques for classification and anomaly detection

**Publications**

- Siddiqua, Taniya, Vilas Sridharan, Steven Raasch, Nathan DeBardeleben, Kurt Ferreira, Scott Levy, **Elisabeth Baseman**, and Qiang Guan. *Lifetime Memory Reliability Data from the Field*. Defect and Fault Tolerance in VLSI and Nanotechnology Systems.
- **Baseman, Elisabeth**, Nathan DeBardeleben, Kurt Ferreira, Vilas Sridharan, Taniya Siddiqua, and Olena Tkachenko. *Automating DRAM Fault Mitigation By Learning From Experience*. Dependable Systems and Networks 2017.
- **Baseman, Elisabeth**, Sean Blanchard, Zongze Li, and Song Fu. *Relational Synthesis of Text and Numeric Data for Anomaly Detection on Computing System Logs*. ICMLA 2016.
- Morrow, Adam, **Elisabeth Baseman**, and Sean Blanchard. *Ranking Anomalous High Performance Computing Sensor Data Using Unsupervised Clustering*. Computational Science and Computational Intelligence: Symposium on Parallel and Distributed Computing and Computational Science 2016.
- **Baseman, Elisabeth**, Sean Blanchard, Nathan DeBardeleben, Amanda Bonnie, and Adam Morrow. *Interpretable Anomaly Detection for Monitoring of High Performance Computing Systems*. Outlier Definition, Detection, and Description on Demand: KDD 2016 workshop paper.
- **Baseman, Elisabeth**, Nathan DeBardeleben, Kurt Ferriera, Scott Levy, Steven Raasch, Vilas Sridharan, Taniya Siddiqua, Qiang Guan. *Improving DRAM Fault Characterization Through Machine Learning*. Dependable Systems and Networks 2016.
- Siddiqua, Taniya, Vilas Sridharan, Nathan DeBardeleben, **Elisabeth Baseman**, Qiang Guan, Devesh Tiwari, Christian Engelmann, and Saurabh Gupta. *Memory Error Analysis and Lessons Learned from Large-scale Field Data*. 2016, Los Alamos National Laboratory and AMD internal document.
- Guan, Chung, Nathan DeBardeleben, Panruo Wu, Stephan Eidenbenz, Sean Blanchard, Laura Monroe, **Elisabeth Baseman**, and Li Tan. *Design, Use, and Evaluation of P-FSEFI: A Parallel Soft Error Fault Injection Framework for Emulating Soft Errors in Parallel Applications*. SIMUTOOLS 2016.
- **Baseman, Elisabeth**, and David Jensen. *Collaborative Behavior in Social Networks: A Relational Approach*. Networks in the Social and Information Sciences. NIPS 2015 workshop paper.

- **Baseman, Elisabeth** and David Jensen. *Exploring Collective Behavior in Social Computation Through Relational Statistical Models*. Computational Social Science Society of the Americas 2015.
- Campbell, William, **Elisabeth Baseman**, and Kara Greenfield. *Content + Context = Classification: Examining the Roles of Social Interactions and Linguist Content in Twitter User Classification*. Social NLP. COLING 2014 workshop paper.
- Campbell, William, **Elisabeth Baseman**, and Kara Greenfield. *Content + Context Networks for User Classification in Twitter*. Frontiers of Network Analysis. NIPS 2013 workshop paper.
- **Baseman, Elisabeth**. *Computing with Quantum Physics*. Amherst College honors thesis, 2011.

## Presentations

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- **Baseman, Elisabeth**. "Interpretable Anomaly Detection for High Performance Computing Centers: Monitoring System Logs". Chesapeake Large-Scale Analytics Conference invited talk. October, 2017.
- **Baseman, Elisabeth**. "Interpretable, Context-Aware Anomaly Detection for High Performance Computing Systems: Monitoring Syslog". Carnegie Mellon University invited talk. August 29, 2017.
- **Baseman, Elisabeth**. "Machine Learning for High Performance Computing". Southern Data Science Conference invited talk. April 7, 2017.
- **Baseman, Elisabeth**. "Don't Be Pipelined". HPC Pipeline Workshop: Diversifying the HPC Workforce invited talk. January 26, 2017.
- **Baseman, Elisabeth**. "Machine Learning for Detection and Diagnosis: From Computational Social Science to High Performance Computing". United States Department of Defense invited talk. September 15, 2016.
- **Baseman, Elisabeth**. "Little Machines Helping Big Machines: Data Science for High Performance Computing". Los Alamos National Laboratory Ultrascale Systems Research Center 1st Annual Symposium keynote. August 4, 2016.
- **Baseman, Elisabeth**, Nathan DeBardleben, Kurt Ferreira, Scott Levy, Steven Raasch, Vilas Sridharan, Taniya Siddiqua, Qiang Guan. "Machine Learning for Automatic Memory Fault Mode Characterization". Silicon Errors in Logic — System Effects 2016 random access talk.
- **Baseman, Elisabeth**. "Relational Learning for Fraud Detection". Fiksu engineering talk. April 2015.
- **Baseman, Elisabeth**. "An Introduction to Quantum Computing". Fiksu engineering talk. November 2014.
- **Baseman, Elisabeth**. "Applications of Relational Learning". Invited talk for MIT Lincoln Laboratory Computing and Analytics group. March 12, 2014.
- **Baseman, Elisabeth**. "Relational Learning for XDATA". Talk for MIT Lincoln Laboratory Human Language Technology group. Summer 2013.

## Posters

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- **Baseman, Elisabeth**, Nathan DeBardleben, Kurt Ferreira, Scott Levy, Steven Raasch, Vilas Sridharan, Taniya Siddiqua, and Qiang Guan. *A Machine Learning Approach for Automatic Characterization of Memory Faults*. Conference on Data Analysis 2016 poster.
- **Baseman, Elisabeth** and David Jensen. *Relational Statistical Models of Collaborative Behavior in Social Networks*. Women in Machine Learning 2015 workshop poster.
- **Baseman, Elisabeth**, Michael Kearns, Stephen Judd, and David Jensen. *Dynamic Statistical Models of Collective Social Network Behavior*. New England Machine Learning Day 2014 poster.
- **Baseman, Elisabeth**, Michael Kearns, Stephen Judd, and David Jensen. *Statistical Models of Collective Social Network Behavior*. Women in Machine Learning 2013 workshop poster.

## Teaching Experience

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### Los Alamos National Laboratory

Lecturer: Applied Machine Learning Tutorial

February 2016 - Present

- Lecturing weekly on current machine learning techniques
- Tailoring topics to high performance computing problems
- Demonstrating use of Python for machine learning
- Providing advice on machine learning for HPC researchers' current projects

### University of Massachusetts Amherst

*Teaching Assistant: Introduction to Problem Solving with Computers (Java Programming)      Spring 2013*

- Lectured twice a week
- Held weekly office hours
- Graded midterm and final exams

### Amherst College

*Teaching Assistant, Laboratory Teaching Assistant, Grader      Spring 2009 - Spring 2011*

- Introduction to Computer Science II      ○ Computer Systems II
- Electromagnetism and Optics      ○ Modern Physics

## Advising

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### Los Alamos National Laboratory

*Data Science Advisor/Mentor*

- Alexandra DeLucia, Rollins College, Undergraduate Student, 2017-2018
- Ashley Michalenko, New Mexico State University, PhD Student, 2017
- Abida Haque, Georgia Tech, Post-Masters Student, 2017
- Olena Tchachenko, Florida International University, Post-Baccalaureate Student, 2017
- Adam Morrow, Brigham Young University, Undergraduate Summer Student, Summer 2016
- Zongze Li, University of North Texas, Graduate Summer Student, Summer 2016

### Fiksu, Inc.

*Career Mentor*

- Evelyn Ting, Amherst College, Undergraduate Student, Spring 2015
- Elizabeth Lefever, Amherst College, Undergraduate Student, Spring 2015

## Awards

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**Laboratory Pathfinder Grant:** LANL, High Performance Computing, 2017 FY

**Laboratory Directed Research & Development grant:** LANL, High Performance Computing, 2016 FY

**Summer GRA funding grant:** LANL, Theoretical Division, Center for Nonlinear Studies, Summer 2014

**CISCO grant to attend CRA-W Grad Cohort:** University of Massachusetts Amherst, Spring 2014

**RA funding grant:** MIT Lincoln Laboratory, Fall 2013 - September 2014

**Grant for UMass CS Women:** Women for UMass, Fall 2012

**Graduate School Fellowship:** University of Massachusetts Amherst, 2011

**Computer Science Prize:** Amherst College, Spring 2011

**Scholarship to Quantum Information Science for Undergraduates:** Massachusetts Institute of Technology, 2010

**Amherst College Schupf Scholar:** Fall 2007 - Spring 2011

**IBM Thomas J Watson Memorial Scholarship:** Fall 2007 - Spring 2011

## Memberships, Activities, and Service

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### Academic.....

**Advisory Board Member, Southern Data Science Conference (SDSC):** 2017-present

**Reviewer, Women in Machine Learning Workshop (WiML):** 2017-present

**Program Committee Member, Computational Social Science Society of the Americas (CSSSA):** 2016-present

**Reviewer, Statistical Analysis and Data Mining (SAM):** 2016

**Technical Program Committee Member, 2nd International Workshop of Fault Tolerant Systems (FTS):** 2016

**Subreviewer, High-Performance Parallel and Distributed Computing (HPDC):** 2016

**Subreviewer, International Symposium on Cluster, Cloud, and Grid Computing (CCGrid):** 2016

**Session Chair, Computational Social Science Society of the Americas:** October 2015

**UMass Amherst Graduate Women in STEM:** Spring 2013 - Spring 2014

**Student Member, Association for Computing Machinery:** Fall 2011 - present

**Co-Chair, UMass CS Women:** 2012

**Associate Member, Sigma Xi:** 2011 - present

**President and Founder, Amherst College Women in Technology and Science:** 2010 - 2011

**Outreach**.....

**Workshop Presenter, Expand Your Horizons Conference, Santa Fe, NM:** March 2016, March 2017

**Science Fair Judge, Hampden Charter School of Science, Chicopee, MA:** Spring 2012