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Statement of Purpose

I am a mathematician-turned-data engineer with a penchant for applying elegant thinking to difficult quantitative problems in the technology space. I am notorious for asking the right questions. I also have a deep love for information presentation and communication.

Education

- 2015-Jan 2016: Galvanize Data Engineering Immersive
- 2015: Galvanize D3 Workshop
- 2008-May 2014: Ph.D. in Mathematics, Kansas State University
  Surowski Memorial Fellowship Research Excellence Award, University Academic Excellence Award.
- 2004-2008: Bachelors Degree in Mathematics, Westminster College.

Professional Experience

Data Engineering

Galvanize Data Engineering Immersive October 2015-January 2016

- Project driven course on the most popular and essential big data technologies. Solo and pair programming labs daily implementing, problem solving, and testing lessons learned that day.
- Data Engineering Capstone: ongoing
- **Used Spark, Scala, MapReduce, Hive, Pig, Sqoop, Flume, Scalding, HDFS, Hadoop, Python, REST API, JSON, Java, JUnit, and more**

IBM(Aspera Labs) February 2014-Present: Software Engineer, Research and Development

- Designed a Spark Streaming Data Pipeline
  - Utilizing Spark, Spark Streaming, ScaleKV(Redis), and ASCP I designed an injest pipeline for processing high value log files in real time.
  - Designed and implemented a Lambda architecture to fit with the Spark Streaming layer and allow for permanent storage solutions simultaneously.

Data Science and Software Engineering

IBM(Aspera Labs) February 2014-Present: Software Engineer, Research and Development

- Data Visualization Dashboard and Log File Processing
  - Built D3 data visualizations for extremely high dimensional data sets parsed from transfer log files.
  - Brainstormed, prototyped, tested, implemented and redesigned more than 20 different data visualizations for a custom data dashboards for incredibly large and high resolution data.
  - Met with expected customers of dashboard, and implemented their requests and suggestions for the dashboard.
  - Integrated visualizations into a large Ruby and JS codebase, pulling data from a Python/Hadoop backend live datastore.
  - Presented dashboard and analysis results at IBC in the Netherlands to hundreds of customers; answered technical questions and usage questions from engineers, managers, and sales-people.
  - Worked in a team of 3.
- Livestream data transfer experimentation, analysis, and paper writing
  - Designed an experiment to test efficiency of a new livestream video technology quatitatively.

  - Utilized a modification of TCPDump to observe packets in large scale transfers and gather *perfect* resolution data at the packet level.
  - Designed and ran a large test rubrik and data pipeline in BASH and Python to manage the transfers, collect the data, parse the data, analyze the data, and output the data to a D3 visualization.
  - Wrote a white-paper from my results; presented paper and analysis at NAB in Las Vegas to thousands of customers; shortlisted for the Game-Changer award due to my work proving the efficiency of the new technology and its applicability to the use-cases; answered technical questions and usage questions from people all across the media-tech space, including a panel of judges.
  - Worked primarily alone, with assistance from others on certain technologies.
- Brainstormed and prototyped a number of data products for integration with Aspera's core software. This ranges from researching ML algorithms in specialized fields, to extensive mathematical modeling of signals. *Many details of this work I am not permitted to disclose.*
- (Ongoing) Satellite network analysis
  - Designed an experiment to test network qualities of a particular satellite network.
  - Configured the network, built the test framework, built the data pipeline for processing, generated data visualization and analysis. Used data analysis to redesign the transfer for networks of this type.
  - Expanded test cases to include WAN networks. Retested, and expanded model to include WAN use-cases.
  - Brainstormed and prototyped modifications to the core technology for optimization of these networks.
  - Worked with an intern.
- **Used Python, REST API, JSON, Javascript, D3.js, CSS, HTML, Awk, Sed, BASH, GNUplot, C++, C, Ruby, jQuery, signal processing, statistics, control theory, experimental design.**

Sentiment Analysis

- Built a Python framework for extracting tweets in a particular community to build a sentiment analysis model improving on the opensource AFINN model. Framework extends to any subject field with minimal modifications.
- Extracted tweets mentioning specific products related to the field and evaluate their sentiment using improved AFINN model.
- Built an interactive D3.js webpage using the Rickshaw framework to display sentiment timeseries associated to each keyword and summary statistics provided by the analysis.
- **Used Python, REST API, AFINN, JSON, Javascript, D3.js, Rickshaw, CSS, HTML, Awk, Sed, and BASH.**

Research

Noncommutative differential operators

- Proved that two classical results on quantum differential operators had a deep unknown connection.
- Proved a series of results on quantum differential calculus on quantum spaces.
- Proved theoretical results on the algebraic structure of quantum differential algebras and linear algebraic representations.
- **Used Category Theory, Higher Algebra, Algebraic Geometry, and Representation Theory**

Pictoral basis for the vector space of framed, linked, knots

- Invented a combinatorial algorithm to generate all possible diagrams representing knots with orientation and a finite number of pieces. Created mathematical and computational representations to efficiently store diagrams in memory for large-scale linear algebra operations.
- Implemented this combinatorial algorithm in JAVA, generated $>$ 1M new diagrams unknown to mathematicians.
- Wrote a data processing tool to convert this data to a million-entries sparse matrix.

- Wrote a batch file(Windows Script) to transfer this matrix into Mathematica for fast row-reduction and run on the computing cluster at KSU.
- Wrote a JAVA script to read this matrix output, isolate particular entries, reduce by a mathematical dependence relation, and draw the 2-dimensional diagrams associated to them.
- **Used advanced algebraic/combinatorial techniques, JAVA, Batch, Mathematica, Javascript.**

Technical Skills

- **Languages** - I have worked in Javascript, Python, Bash, Awk, Sed, HTML, and Mathematica. I have had courses in R, Matlab, and Gap. I completed about 75% of an undergrad CS curriculum in JAVA.
- **Platforms and Techniques** - Text Mining, Sentiment Analysis, Restful APIs, Scripting, Algorithm Design, Technical Writing, Vector Graphics, MapReduce, Experimental Design and Statistics.

Education, Service, and Leadership

CommonCore Curriculum writer

- Designed and planned the curriculum for 11th grade mathematics for the national CommonCore education initiative.
- Wrote modules and exercise sets for teachers to use during classes.
- Led other writers to develop modules and exercise sets.
- **Used Sharepoint, Latex, Word.**

Graduate Teaching Assistant

- Taught undergraduate courses in mathematics, TA'ed graduate course in algebra, conducted qualifying exam study sessions for new graduate students.
- **Courses Taught: Single and Multi-variable calculus.**

Summer REU mentor

- Served as a research and technology mentor for undergraduates participating in the KSU NSF REUs in 2010, 2011.
- **Topics lectured: Algebraic Number Theory, Linear Algebra, Latex, Matlab.**

Special Summer Math lecturer

- Trained K-12 teachers on mathematics modules and applied mathematics examples for use in their classrooms.
- Wrote small programming scripts to extract data to connect the mathematics we were covering with current events.
- Wrote python scripts to scrape tweets and perform n-gram analysis, used R to plot the data, analyze it, and compare it to the classical version by Peter Norvig. Presented graphics generated at an R "graphics contest" on campus, got second place.
- Wrote a simulator to show the efficiency of binary vs linear search and related to translating morse code/decoding messages based on a tree representation.
- **Python, R, REST API, ggplot2.**

Organizer, KSU Algebra and Representation Theory Conference

- Organized subject matter, contacted invited speakers, determined schedule, contacted conference participants.
- Wrote CSS webpage, advertised on research boards/newsgroups.
- Organized KSU graduate students to carry out tasks during the conference, food, refreshments, excursions.
- **Used CSS, HTML.**