Daniel Brice, Ph.D.

Mathematician, Software Engineer III

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Career Objective

Seeking challenging and rewarding problems.

Reseach Interests

Multi-armed bandits, Bayesian inference, conjugate priors, matrix and tensor decomposition, structure theory of Lie algebras, derivations of Lie algebras, zero product determined algebras, category theory.

Eduction

- **Ph.D. Mathematics** □ Auburn University □ June 2014.
  Advisor: Huajun Huang.
  Dissertation: *On the Derivation Algebras of Parabolic Lie Algebras with Applications to Zero Product Determined Algebras.*
  Honors: *Baskervil Fellowship* recipient, Spring 2009.
- **B.S. Mathematics** □ California State University, Channel Islands □ December 2007.
  Emphasis: Mathematics Education.
  Honors: *Mathematics Department Program Honors* and *Cum Laude.*

Work History

- **Software Engineer III** □ CJ Affiliate □ March 2018 to Present
  Design and implementation of customer-facing APIs. Continuous deployment of systems at scale. Data collection and analysis at scale. Contribute to development of training materials for incoming engineers. Full-stack application development.
- **Associate Software Engineer** □ CJ Affiliate □ June 2016 to March 2018
  Development of models, algorithms, and implementation of a Bayesian-reasoning reinforcement-learning applications, leveraging technologies such as AWS, Docker, Hadoop, Kafka, Kinesis, Kubernetes, Scala, Spark, as a framework for solving domain-related multi-armed bandit problems.
- **Lecturer of Mathematics** □ California State University, Bakersfield □ September 2015 to June 2016
  Various teaching duties, including *Set Theory and Logic, Calculus I, II* (standard track and *for Engineering Sciences* track); Advise undergraduates; Serve on various administrative committees.
- **Assistant Professor of Mathematics** □ Tuskegee University □ August 2014 to May 2015
  Various teaching duties, including *Calculus I, Pre-Calculus;* Advise undergraduates; Serve on various administrative committees.

- **Graduate Teaching Assistant** □ Auburn University □ August 2008 to July 2014
  Various teaching duties, including *Math for Elementary Education I, Calculus I, II, III, Calculus with Business Applications, Pre-Calculus Algebra;* Assist instruction of graduate *Abstract Algebra I, II.*

- **Teaching Assistant** □ California State University, Channel Islands □ August 2007 to May 2008
  Instruction of *College Algebra;* Assist instruction of *Abstract Algebra, Real Analysis.*

Publications

- "On derivations of parabolic Lie algebras". In: *Journal of Lie Theory* (Feb. 2017)
- "The matrix Lie algebra on a one-step ladder is zero product determined". In: *Alabama Journal of Mathematics* (Dec. 2015)
- with Huajun Huang. "On zero product determined algebras". In: *Linear and Multilinear Algebra* (Feb. 2015)
- "A note on zero product determined Lie algebras". Manuscript in preperation

Selected Courses Taught

- *Set Theory & Logic*
  2016 CSUB.
- *Mathematics for Elementary Education I*
  2010 Auburn U.
- *Real Analysis Grading and Recitation*
  2007 CSUCI.
- *Abstract Algebra Grading and Recitation*
  2007 CSUCI, 2012 Auburn U.
- *Abstract Algebra II Grading and Recitation*
  2013 Auburn U.
- *Calculus with Engineering Applications I, II*
  2015-2016 CSUB.
- *College Algebra*
  2007-2008 CSUCI.
- *Calculus I, II, III*
  Too many times and places to count.

Technical Skills

- Knowledgeable in functional programing paradigm and languages including Haskell and Scala.
- Currently using Jenkins, Docker, Kubernetes, and AWS to achieve continuous deployment in production.

- Currently using Kafka, Kinesis, Hadoop, and Spark for machine learning data pipeline in production.
- Currently employing Bayesian inference and the theory of conjugate priors to develop and implement reinforcement learning algorithms to solve multi-armed bandit problems.
- Experience using Canny edge detection, gradient vector fields, and principle component analysis to perform algorithmic image analysis and anomaly detection.
- Understanding of principles and design patterns common in object-oriented programming and working familiarity with Java.
- Understanding of use of tensor decomposition, singular value decomposition, and Perron–Frobenius theorem in structural analysis of graphs, particularly as it applies to the study of networks and the World-wide Web.
- Understanding of the basic ideas of topological data analysis–such as persistence homology–Fourier analysis, and related applications such as seasonal decomposition, Markov chain Monte Carlo search, and its applications to optimization, neural networks, and applications to handwriting recognition, and a desire to refine my understanding of these topics.
- Some experience with C, Python, and Javascript, and a desire to build proficiency.
- Familiarity with Linux system administration, BASH shell scripting.

Selected Presentations

- "Applications of Category Theory to Programming Languages". CSUCI Math and Physics Seminar. Camarillo CA, Mar. 2018
- "Impressions and Implications of 'Infinite sets that admit fast exhaustive search' by Martín Escardó". Papers We Love, LA. Santa Monica CA, Sept. 2017
- "Thompson Sampling". Santa Barbara Machine Learning Meetup. Santa Barbara CA, Mar. 2017
- "On 'On the likelihood that one unknown probability exceeds another in view of the evidence of two samples' by W. R. Thompson". Papers We Love, LA. Santa Monica CA, Feb. 2017
- "Applications of Thompson Sampling to Machine Learning". CSUCI Math and Physics Seminar. Camarillo CA, Feb. 2017
- "Automatic Differentiation in Haskell". Santa Monica Haskell Users Group. Santa Monica CA, Aug. 2016
- "Applications of Linear Algebra to Data Analysis". CSUCI Math and Physics Seminar. Camarillo CA, Feb. 2016
- "Linear Lie Algebras, Block Matrices, and Ladder Matrices". MAA Golden Section/SoCal-Nevada Section Joint Meeting. San Luis Obispo CA, Nov. 2015
- "Upper Triangular Ladder Matrix Algebras, A Preliminary Report". AMS Fall Western Section Meeting. Fullerton CA, Oct. 2015
- with Huajun Huang. "Parabolic Lie algebras are zero product determined". Southern Regional Algebra Conference. Lafayette LA, Mar. 2015
- "Derivations of parabolic Lie algebras with applications to zero product determined algebras". AMS Southeastern Section Meeting. Greensboro NC, Nov. 2014

- "Applications of multilinear algebra to World Wide Web search". Auburn U. Linear Algebra Seminar. Auburn AL, Oct. 2014
- "Constructions on zero product determined algebras". AMS Wester Section Meeting. Riverside CA, Nov. 2013
- "Zero product determined algebras I, II, & III". Auburn U. Linear Algebra Seminar. Auburn AL, Oct. 2013
- "Characterizing derivation algebras of parabolic subalgebras". Southeast Lie Theory Workshop. Baton Rouge LA, May 2013
- "Direct sums of zero product determined algebras". Southern Regional Algebra Conference. Morrow GA, Mar. 2012

Community Activity

- **Global Urban Datafest** □ *Regional winner, global finalist* □ Spring 2015, Auburn AL
  Worked on a team with three others to develop a data-intensive web application over the course of one weekend. We created an app that analyzes webcam images via Canny edge detection, gradient vector fields, and principle component analysis to detect arbitrary unusual activity. Applications include automated surveillance, early-warning systems, and disaster recovery.
- **AMP'd Challenge** □ *Volunteer organizer* □ Various years, Auburn AL
  AMP'd Challenge is an annual mathematics puzzle-hunt for high school and middle school student sponsored by the Auburn U. College of Sciences and Mathematics. I have contributed by designing mathematical puzzles, judging solutions, and staffing events.
- **Auburn Puzzle Party 3** *Winning team,* **4, 5** *Volunteer organizer* □ Falls 2009, 2010, 2012, Auburn AL
  Auburn supports a thriving community of puzzle-hunters that hosts several puzzle-hunts each year. In addition to regular participation, I have served as an organizer for two puzzle-hunts. I contributed through designing puzzles, event production, and event staffing.
- **Eagle Scout** April 2002, Rialto CA
  Organized over 30 youth volunteers, gathering donations, purchasing materials, and coordinating labor for building improvements at Grace Lutheran Church in Rialto, CA.