BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES**.

NAME: Brunson, Jason Cory

eRA COMMONS USER NAME (credential, e.g., agency login): brunsonj

POSITION TITLE: Postdoctoral Fellow at the Center for Quantitative Medicine

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (*if applicable*)	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Virginia Tech, Blacksburg	B.S.	08/2000	05/2004	Mathematics
Virginia Tech, Blacksburg	B.S.	08/2001	08/2004	Statistics
Virginia Tech, Blacksburg	M.S.	08/2004	05/2005	Mathematics
Virginia Tech, Blacksburg	Ph.D.	08/2005	12/2013	Mathematics
UConn Health, Farmington	Postdoc	06/2014	present	Biomedical Informatics

A. Personal Statement

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

B. Positions and Honors

Positions and Employment

2010–2013	Visiting Research Assistant, Virginia Bioinformatics Institute, Virginia Tech, Blacksburg, VA
2014	Adjunct Professor, Department of Mathematics, Radford University, Radford, VA
2014–	Postdoctoral Fellow, Center for Quantitative Medicine, UConn Health, Farmington, CT

Other Experience and Professional Memberships

2014–	Member, Society for Industrial and Applied Mathematics (SIAM)
2015–	Founding member, UConn Health–JAX-GM Postdoctoral Association (UJPDA)
2017–2019	President, UJPDA
2018–	Member, American Medical Informatics Association (AMIA)

Collaborations

2015–2016	"Analysis of increased compound drug prescriptions in Connecticut 2014–2015", training project with S. Czunas and T. Woodruff for the Office of the State Comptroller of Connecticut
2016–2017	"Identifying molecular pathways that lead to CD8+ T cell memory formation", collaboration with T. Samji in Departments of Immunology at UConn Health and New York University
2018–	"Developing a User-Friendly R Package Providing Standardized Coding and Analytic Methods for Comparative Effectiveness Research Using Administrative Healthcare Claims Data", consultancy with C. Coleman at the UConn School of Pharmacy and Hartford Hospital

Mentorship

2010	Mentor, Research Experience for Undergraduates (REU) on Modeling and Simulation in Systems Biology
2016–2019	Mentor, High School Student Research Apprentice Program (2018 scheduled)
2017	Mentor, REU on Modeling and Simulation in Systems Biology
2019	Mentor, Grad Student Project on Topological Data Analysis?

Professional Service

2012–2014	Co-Organizer, Virginia Tech Grad Student Speed Dating
2015	Co-PI, ACSB 2015: A Conference on Algebraic and Combinatorial Approaches in Systems Biology, (NSF DMS-1503562, PI Vera–Licona)
2015–2017	Postdoc Representative and Negotiating Team Member, University Health Professionals AFT Local 3837 (UHP)
2015–2018	Front Desk & Clinical Support, Hartford Gay and Lesbian Health Collective
2016–	Reviewer, AMIA
2017–	Poster judge, Medical and Dental Student Research Day
2017	Co-organizer, Postdoc Research Day
2017	Drop-in editing, Tool Kit for Scientific Communication course
2017–2019	`beamerthemeuconn`: UConn LaTeX Beamer Theme
2018	Co-organizer, UConn Health Speed Networking
2018	Drop-in R Consulting
2018	Scientific Writing & Editing Support Group
2019	Open Access and Science invited talk and discussion
2019	GitHub Coordinator, Medication Reconciliation Hackathon
2019	Matching Coordinator, UConn Health Speed Networking

Presentations

2012	"Evolution of the mathematics research collaboration network": Graduate Student Association Research Symposium, Virginia Tech
2012	Lecture series on Schubert calculus, Virginia Bioinformatics Institute
2013	"Caution in interpreting graph-theoretic diagnostics", SIAM Student Seminar
2014	"Surveying the Diagnostic Landscape", Mining Networks and Graphs: A Big Data Analytic Challenge, SIAM International Conference on Data Mining
2014	"Triad census for two-mode networks", SIAM Workshop on Network Science
2014	"Evolving Collaboration Patterns in Medical Research", AMIA Annual Symposium
2015	Tutorial on data analysis and visualization in R, Postdoctoral Seminar, UConn Health
2016	"Scientometrics in Space and Time", CQM Faculty/Staff seminar
2016	"Modulus on graphs as a generalization of standard graph theoretic quantities", Mathematics in Medicine (MiM) Journal Club
2016	"Emerging network methods in healthcare informatics", Connecticut Institute for Clinical and Translational Science (CICATS) methods seminar
2017	"RPKM versus TPM for comparing multiple gene expression across multiple RNA-seq samples", Laubenbacher Group meeting
2017	"Power-law distributions in empirical data", MiM Journal Club + CICATS methods seminar

2017	"Applications of network analysis to routinely collected health care data", CQM presentation, UConn Health
2017	"Modeling Incidence and Severity of Disease using Administrative Healthcare Data", Open Data in Action, Hartford Public Library
2018	"Co-occurrence Networks from Correlation Matrices", CICATS methods seminar
2018	"Conventional versus topological data analysis for disease subtyping: cases of type-2 diabetes mellitus", MiM Journal Club
2018	"Pairwise versus multivariate constructions of co-occurrence networks", SIAM Workshop on Network Science
2018	"Network analysis to measure disparities in professional healthcare infrastructure", MiM Journal Club
2019	"Network Analyses of Murine Glomeruli", Research Roundtable, UConn
2019	"Network Analyses of Glomerular Capillaries", Biology and Medicine Through Mathematics Conference, Virginia Commonwealth University

Software

2014–2017	bitriad: Triadic Analysis of Affiliation Networks
2017–	ggalluvial: Alluvial Diagrams in ggplot2
2018–	ordr: A tidyverse Extension for Ordinations and Biplots
2019–	tdaunif: Uniform Manifold Samplers for Topological Data Analysis
2019–	ggtda: ggplot2-Compatible Visualization of Persistent Homology (with Raoul Wadhwa)

C. Contribution to Science

1. Scientometrics. Together with a team of four undergraduates, I was introduced to network analysis and scientometrics at a summer program organized around systems biology. We conducted a thorough analysis of the network and took an original approach to mapping its evolution over time, using a custom family of nonlinear changepoint models to characterize two pronounced shifts in coauthorship structure. Our study has been cited several times since, often as a touchstone for patterns of collaboration in one discipline (mathematics) as contrasted with others, though also as a launch point for theoretical work. Some follow-up analysis led to the design of a study on coauthorship rates in the much larger biomedical literature, in which we took the first step toward teasing apart the entangled contributions of methodological complexity and research culture on the accelerating rise of multiple authorship. From here, several directions remain to be explored, including a careful validation of subject classification assignments as a proxy for disciplinary scope and a range of proposed network-based metrics of researcher specialization and diversification.

   a. J.C. Brunson, S. Fassino, A. McInnes, M. Narayan, B. Richardson, C. Frank, P. Ion, and R.C. Laubenbacher, Evolutionary events in a mathematical sciences research collaboration network, Scientometrics 99(3): 973–998, 2014.

   b. J.C. Brunson, X. Wang, and R.C. Laubenbacher, Effects of research complexity and competition on the incidence and growth of coauthorship in biomedicine, PLoS One 12(3): e0173444, 2017.

2. Network science. Our analysis of mathematics research output prompted a follow-up question that turned out to be remarkably under-studied: How can triadic closure be understood in an affiliation (bipartite) network context? My efforts to resolve this problem led to the unexpected discovery of a family of graph statistics, parameterized in category-theoretic terms, that included the classical clustering coefficient (evaluated on the unipartite projection) and both families of bipartite statistics that had been proposed up to that point. More recently, I've had published a systematic review of studies that employ network analysis techniques for secondary use of healthcare data. This literature contains myriad projects in diverse domains that in several respects stand to benefit from sharing and combining techniques, and we brought them together into a single reference (and methodological synthesis) we hope will improve collaborations and accelerate advances. One lesson from this review was that the increasingly popular use of "comorbidity networks" suffers from inconsistent methodology and uncertain validity. In response, we're just completing a sensitivity analysis of the comorbidity network construction and several network statistics that have been used to characterize them, which we hope will encourage more consistent and transparent use of this concept in the future.

    a. J.C. Brunson, Triadic analysis of affiliation networks, <u>Network Science</u> 3(4): 480–508, 2015.

    b. J.C. Brunson and R.C. Laubenbacher, Applications of network analysis to routinely collected healthcare data: a systematic review, <u>Journal of the American Medical Informatics Association</u> 25(2): 210–221, 2018.

    c. J.C. Brunson, T.P. Agresta, and R.C. Laubenbacher, Reproducibility and sensitivity of comorbidity network analysis, in preparation.

3. <u>Healthcare analytics.</u> My appointment at the Center for Quantitative Medicine entailed self-training as a "data scientist"—a combination of statistical literacy, computational programming, and consultancy. One project in this role was a training collaboration with the Office of the State Comptroller of Connecticut, in which I combined pharmacy and insurance claims data provided by the state with publicly available healthcare survey data to describe how several out-of-state compound pharmacies pushed product to patients at exorbitant costs to the state. This project pushed me to adopt reproducible documentation as a research standard, which also proved useful for updating reports as new data became available, and some of the visualization software I wrote to communicate my results has been used by several other researchers. More recently, I mentored a team of undergraduates in developing risk models for myocardial infarction (MI) using the open-access critical care database MIMIC-III. We built analysis pipelines to contribute to the MIMIC-III code repository and built several MI triage and risk models, which are being written up for submission to a medical journal. I'm presently engaged in software development with a pharmacist and medical researcher on an R package to expedite comparative effectiveness research using the comprehensive claims database MarketScan. Hundreds of validated specifications for index events, outcome measures, eligibility criteria, and covariates will be incorporated into a simple framework to extract and process the necessary data from standardized tables, substantially reducing the research overhead.

    a. J.C. Brunson, Matrix Schubert varieties for the affine Grassmannian, PhD Thesis with Mark Shimozono, 2013.

    b. J.C. Brunson, ggalluvial: Alluvial Diagrams in 'ggplot2'. R package version 0.6.0., 2018, `https://cran.r-project.org/web/packages/ggalluvial/index.html`.

    c. J.C. Brunson, reebr: Statistical Reeb graphs in R, R package, in preparation.

    d. J.C. Brunson, cerms: Efficient comparative effectiveness research using MarketScan, R package, in preparation.

<u>Complete List of Published Work in MyBibliography:</u>

https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/47860258/?sort=date&direction=ascending

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support
508DE021989-07   Mina   07/01/2011–06/30/2021
NIDCR
Skeletal, Craniofacial, and Oral Biology Training Grant
The goal of this proposal is the continuation of the Institutional Training Program in Skeletal, Craniofacial and Oral Biology at the University of Connecticut School of Dental Medicine as a T90/R90 program. It is intended to help meet the substantial need for independent scientists trained in research related to improving oral, dental and craniofacial health in the United States.

Internal   Coleman   02/01/2018–07/31/2018
UConn School of Pharmacy
Developing a User-Friendly R Package Providing Standardized Coding and Analytic Methods for Comparative Effectiveness Research Using Administrative Healthcare Claims Data
We propose developing a user-friendly R package that will enable the building of a functional research database utilizing standardized covariate and outcomes coding and implement analytic methods for comparative effectiveness research using administrative healthcare claims data. Having such a package for the "R Project for Statistical

Computing" platform would both reduce the burden on investigators in preparing administrative claims data for research studies and provide greater accountability and interpretability for end users of these real-world studies (including Bayer AG).

Scholastic Performance

YEAR	COURSE TITLE	GRADE
2003	Complex Analysis	4.00
2003	Graph Theory	4.00
2004	Complex Analysis	3.30
2004	Specialized Topics in Algebra (Symmetric Polynomials)	4.00
2004	Abstract Algebra	4.00
2004	Real Analysis	3.30
2004	Combinatorics	4.00
2005	Abstract Algebra	4.00
2005	Real Analysis	3.70
2005	Specialized Topics in Algebra (Elliptic Curves)	4.00
2005	Functional Analysis	3.70
2005	TS: Lie Groups	4.00
2005	TS: Algebraic Topology I	4.00
2006	Functional Analysis	3.00
2006	TS: Lie Groups	4.00
2006	TS: Algebraic Topology II	3.00
2006	TS: Introduction to Algebraic Geometry	4.00
2006	TS: Several Complex Variables	4.00
2007	TS: Several Complex Variables	4.00
2007	SS: Mathematics of Computer Simulations	4.00
2007	TS: Homological Algebra	4.00
2007	Topology and Geometry	4.00
2008	TS: Introduction to Algebraic Geometry	4.00
2009	TS: Introduction to Algebraic Geometry II	4.00
2009	TS: De Rham Cohomology	3.30
2010	TS: Hodge Theory	3.25
2013	SS: Communicating Science	4.00