Cole Brokamp

CONTACT INFORMATION

Department of Environmental Health
University of Cincinnati
Cincinnati, OH 45220 USA

Voice: (513) 518-5121
E-mail: cole.brokamp@gmail.com
Website: www.colebrokamp.com

RESEARCH INTERESTS

Machine learning applied to biomedical data, statistical methods for Random Forest, statistical computing, environmental health, air pollution, land use modeling

EDUCATION

University of Cincinnati, Cincinnati, Ohio USA

Ph.D. Candidate, Biostatistics, May 2015 (expected graduation date: April 2016)

University of Cincinnati, Cincinnati, Ohio USA

B.S., Biomedical Engineering, June, 2010

RESEARCH EXPERIENCE

Department of Biostatistics and Bioinformatics, University of Cincinnati

Statistical Inference for Random Forest *January 2015 – present*
Advisor: Roman Jandarov, MB Rao

Deveopment of theory for calculating confidence intervals for random forest predictions using the infinitesimal jackknife. Executed simulations to test the accuracy and precision of novel estimators. Created software package for R to implement novel techniques to help users extract more statistical inferences from random forests.

Cincinnati Childhood Allergy and Air Pollution Study (CCAAPS) *March 2014 – present*
Advisor: Patrick Ryan

Conducted unsupervised clustering analysis of asthmatic children into clinically-useful subtypes and machine learning based prediction of disease phenotypes. Analyzed and visualized big air pollution data from real-time, GPS equipped sensors using GIS tools. General statistical consulting for epidemiologists and clinicians involved with study.

Relationship of Indoor Outdoor and Personal Air (RIOPA) *January 2014 – November 2014*
Advisor: Patrick Ryan, MB Rao

Characterized and analyzed multivariate data using clustering and principal component techniques. Implemented machine learning algorithm for prediction of personal exposure to individual elements in PM2.5 based on indoor and outdoor air data, as well as information about potential PM2.5 sources and personal activties.

Brief Rating of Aggression by Children and Adolescents (BRACHA) *March 2013 – August 2014*
Advisor: Jeff Welge, Doug Mossman, Drew Barzman

Created novel data tool combining machine learning and logistic regression to predict presence, severity, frequency, and timing of aggressive acts committed in Cincinnati Children's College Hill Psychiatric Residential Clinic.

Department of Pharmacology and Biophysics, University of Cincinnati

Ultrasound- and Liposome-Mediated Targeted Gene Therapy *July 2010 – January 2012*
Advisor: Keith Jones, Christy Holland

Developed novel methodology for delivering genetic material to myocardium in mouse model of acute myocardial infarction. Ultrasound-mediated delivery of oligonucleotides targeted to suppress inflammation-related gene expression with spatial and temporal control over dosing.

Department of Biomedical Engineering, University of Cincinnati

Ion Channel Engineering and Characterization *March 2007 – July 2010*
Advisor: David Wendell, Carlo Montemagno

Implemented a planar artificial lipid bilayer system to study voltage-responsive ion currents through several ion channels. Characterized Connexin-43 and several mutants' responses to voltage differences as well as several compounds. Designed and purified several membrane proteins: genetic design and construction, protein production and purification, reconstitution into liposomes and polysomes.

Academic Experience

University of Cincinnati, Cincinnati, Ohio USA

Instructor *August - December, 2015*
Co-taught graduate level course for the Department of Biostatistics and Epidemiology. Shared responsibility for lectures, exams, homework assignments, and grades.

BE-9063 Computing with R Shiny, Fall 2015.

Publications

Cole Brokamp, MB Rao, Patrick Ryan, and Roman Jandarov. A comparison of resampling and recursive partitioning methods in random forest for estimating the asymptotic variance using the infinitesimal jackknife. [In preparation.]

Cole Brokamp, MB Rao, Roman Jandarov, and Patrick Ryan. Land use models for eleven elemental components of particulate matter in an urban environment: A comparison of linear regression and random forest models. [In preparation.]

Jennifer Kannan, **Cole Brokamp**, David I. Bernstein, James E. Lockey, Manuel Villareal, Gurjit K. Khurana Hershey, Grace K. LeMasters, and Patrick Ryan. Clinical and environmental factors associated with habitual snoring in the cincinnati childhood allergy and air pollution study. [In preparation.]

Kristin A. Schmidlin, **Cole Brokamp**, Grace K. LeMasters, David I. Bernstein, James E. Lockey, Manuel Villareal, Gurjit K. Khurana Hershey, and Patrick Ryan. Cluster analysis of childhood asthma phenotypes identifies specific environmental risk factors. [In preparation.]

Jessica S. Tan, **Cole Brokamp**, David I. Bernstein, Grace K. LeMasters, Gurjit K. Khurana Hershey, James E. Lockey, Manuel Villareal, and Patrick Ryan. Patterns of longitudinal allergic sensitization identifies phenotypes of children at increased risk for asthma. [In preparation.]

Patrick Ryan, James E. Lockey, Brad Black, Carol H. Rice, Jeff Burkle, Tim Hilbert, Linda Levin, **Cole Brokamp**, Roy McKay, Ted Larson, and Grace K. LeMasters. Childhood exposure to libby amphibole asbestos and respiratory symptoms in young adulthood. [In preparation.]

Cole Brokamp, Grace LeMasters, and Patrick Ryan. Residential mobility impacts exposure assessment and community socioeconomic characteristics in longitudinal epidemiology studies. [In Press - Journal of Exposure Science and Environmental Epidemiology.]

Kanistha C. Coombs, Ginger L. Chew, Christopher Schaffer, Patrick H. Ryan, **Cole Brokamp**, Sergey A. Grinshpun, Gary Adamkiewicz, Steve Chillrude, Curtis Hedman, Meryl Colton, Jamie Ross, and Tiina Reponen. Indoor air quality in green-renovated vs. non-green low-income homes of children living in a temperate region of US (Ohio). Science of The Total Environment, 554–555:178 – 185, 2016. [download]

Patrick Ryan, **Cole Brokamp**, Z-H Fan, and MB Rao. Analysis of personal and home characteristics

associated with the elemental composition of pm2.5 in indoor, outdoor, and personal air in the riopa study. Health Effects Institute, Research Report 185, 2015. [download]

Kelly J Brunst, Patrick H Ryan, **Cole Brokamp**, David Bernstein, Tiina Reponen, James Lockey, Gurjit K Khurana Hershey, Linda Levin, Sergey A Grinshpun, and Grace LeMasters. Timing and duration of traffic-related air pollution exposure and the risk for childhood wheeze and asthma. American journal of respiratory and critical care medicine, (ja), 2015. [download]

Patrick H Ryan, Sang Young Son, Christopher Wolfe, James Lockey, **Cole Brokamp**, and Grace LeMasters. A field application of a personal sensor for ultrafine particle exposure in children. Science of The Total Environment, 508:366-373, 2015. [download]

Cole Brokamp, MB Rao, Zhihua Tina Fan, and Patrick H Ryan. Does the elemental composition of indoor and outdoor PM2.5 accurately represent the elemental composition of personal PM2.5? Atmospheric Environment, 101:226-234, 2015. [download]

Cole Brokamp, Jacob Todd, Carlo Montemagno, and David Wendell. Electrophysiology of single and aggregate cx43 hemichannels. PLoS ONE, 7(10):e47775, 2012. [download]

Sheryl E Koch, Xiaoqian Gao, Lauren Haar, Min Jiang, Valerie M Lasko, Nathan Robbins, Wenfeng Cai, **Cole Brokamp**, Priyanka Varma, Michael Tranter, et al. Probenecid: novel use as a non-injurious positive inotrope acting via cardiac trpv2 stimulation. Journal of molecular and cellular cardiology, 53(1):134-144, 2012. [download]

Michael Tranter, Robert N Helsley, Waltke R Paulding, Michael McGuinness, **Cole Brokamp**, Lauren Haar, Yong Liu, Xiaoping Ren, and W Keith Jones. Coordinated post-transcriptional regulation of hsp70. 3 gene expression by microrna and alternative polyadenylation. Journal of Biological Chemistry, 286(34):29828-29837, 2011. [download]

Consulting

Sewer Overflow
Collaborators: Louis Muglia, Andrew Beck, Patrick Ryan, Todd Trabert

GIS data extraction and statistical modeling for relationship between sewer overflows and admission to CCHMC. A collaboration with the Metropolitan Sewer District of Greater Cincinnati.

Abusive Head Trauma Incidence
Collaborators: Emily Eismann, Kathi Makoroff

Mapping and statistical models for relationship of abusive head trauma cases at CCHMC and socioeconomic status.

Phenotypic Subtypes of Autism based on Gene Expression
Collaborators: Ping-I (Daniel) Lin

Semi-supervised principal components analysis on genome wide expression data and association of functional gene pathways with autistic severity scores.

Breast Density and Air Pollution
Collaborators: Lusine Yaghjyan, Patrick Ryan

Air pollution exposure assessment for nationwide cohort of breast cancer patients. Model uses EPA's hierarchical Bayesian model and combines monitoring data with output from the Community Multi-scale Air Quality model.

Infectious Diseases and Trauma Transportation
Collaborators: Monir Hossain

Calculation of tranportation related GIS data for nationwide cohort. Calculation of estimated driving times between accident locations and major trauma centers using Google Maps API.

Traffic Exposures for Rush University Medical Center
Collaborators: Christopher Codispoti

Geocoding and GIS calculation of traffic related variables for a cohort of subject in the Chicago, IL area.

Conference Presentations

Brokamp C, LeMasters G, Ryan PH. Childhood Residential Changes are Associated with Decreased Traffic Exposure and Improved Neighborhood Characteristics. A talk given at the International Society of Exposure Science Annual Meeting, October 2015, Las Vegas, NV.

Brokamp C, Appel K, Welge J, Mossman D, Barzman D. Brief Rating of Aggression by Children and Adolescents (BRACHA) 1.0. A poster presented at the American Academy of Psychiatry and the Law conference, October 2014, Chicago, IL.

Brokamp C, Rao MB, Ryan P. Assessing the Improvement in Predicting Personal Exposure to Elements in PM2.5 by Including Indoor PM2.5 Measurements and Home Characteristics to Outdoor PM2.5 Measurements. A poster presented at the International Society of Exposure Science Conference, October 2014, Cincinnati, OH.

Brokamp C, Rao MB, Ryan P. Assessing Personal PM2.5 Exposure Prediction Improvement After Addition of Indoor PM2.5 Exposure and Personal Characteristics to Outdoor PM2.5 Exposure Measurements. A poster and speed oral presentation at the Joint Statistical Meeting, August 2014, Boston, MA.

Brokamp C, Rao MB, Ryan P. Assessing the Improvement in Predicting Personal Exposure to Elements in PM2.5 by Including Indoor PM2.5 Measurements and Home Characteristics to Outdoor PM2.5 Measurements. A poster presented at the Health Effects Institute Conference, May 2014, Alexandria, VA.

Brokamp C, Wendell D, Montemagno C. Electrophysiology and Plaque Formation of Cx43 Hemichannels. A poster presented at the Biophysical Society Conference, March 2010, San Francisco, CA.

Brokamp C, Wendell D, Montemagno C. Exogenous Control of Gene Expression in Insect Cells via Ribozyme Modulation. A poster presented at the Biophysical Society Conference, March 2009, Boston, MA.

Brokamp C, Wendell D, Montemagno C. The Engineering and Conductance of a Membrane Bound Nanopore from the Phi29 Portal Protein GP10. A poster presented at the Biophysical Society Conference, March 2009, Boston, MA.

Brokamp C, Wendell D, Montemagno C. Exogenous Control of Gene Expression in Insect Cells via Ribozyme Modulation. A poster presented at the University of Cincinnati Undergraduate Poster Symposium, June 2008, Cincinnati, OH.

Brokamp C, Wendell D, Montemagno C. Engineering the Calvin Cycle: A Cell Free Photoconversion System for Biofuel Generation. A poster presented at the University of Cincinnati Undergraduate Poster Symposium, June 2008, Cincinnati, OH.

Seminar Presentations

Brokamp C. Geospatial Data for Environmental Epidemiology. A seminar presentation for the Environmental Epidemiology Shared Interest Group at Cincinnati Children's Hospital Medical Center, February 2016, Cincinnati, OH.

Brokamp C. Confidence Intervals for Random Forest Predictions Using the Infinitesimal Jackknife. A seminar presentation for the University of Cincinnati Division of Biostatistics and Bioinformatics, November 2015, Cincinnati, OH.

Brokamp C. R Studio and R Markdown: An integrated IDE and report generator for R. A guest lecture for BE7022 (Intro To Biostatistics), University of Cincinnati, September 2015, Cincinnati,

OH.

Brokamp C. Does the Elemental Composition of Indoor and Outdoor PM2.5 Accurately Represent the Elemental Composition of Personal PM2.5? A seminar presentation for the University of Cincinnati Division of Biostatistics and Epidemiology, September 2014, Cincinnati, OH.

Brokamp C. Exact Sampling and Counting for Fixed-Margin Matrices. A seminar presentation for University of Cincinnati Biostatistics and Epidemiology, September 2013, Cincinnati, OH.

Brokamp C. Calculating Correct Standard Errors from Subsets of Complex Sampling Designs in R. A seminar presentation for University of Cincinnati Biostatistics and Epidemiology, August 2013, Cincinnati, OH.

Brokamp C. Statistical Analysis of Microarray Data: Controlling the False Discovery Rate. A seminar presentation for BE 7089, University of Cincinnati Biostatistics and Epidemiology, October 2012, Cincinnati, OH.

Brokamp C. Small Molecule Disruption of G Beta Gamma Signaling Inhibits the Progression of Heart Failure. A seminar presentation for the University of Cincinnati Department of Pharmacology and Biophysics, November 2011, Cincinnati, OH.

Brokamp C. Ultrasound-Targeted Microbubble Destruction to Deliver Nucleic Acid to the Heart. A seminar presentation for the University of Cincinnati Department of Pharmacology and Biophysics, March 2011, Cincinnati, OH.

Brokamp C. An academic research cooperative education experience. A seminar presentation for BME 321, University of Cincinnati Biomedical Engineering, February 2011, Cincinnati, OH.

Brokamp C. Chronopharmacology: The Role of the Circadian Clock in Pharmacology. A seminar presentation for the University of Cincinnati Department of Pharmacology and Biophysics, January 2011, Cincinnati, OH.

Computer Skills

Statistical Packages: R (including GIS packages: rgdal, rgeos, sp, raster)

Languages: Python, Unix shell scripting, R Markdown, Max

Applications: RShiny, Knitr, LaTeX, MS Office, qGIS, ArcGIS, GEOS, LSF

Operating Systems: Unix/Linux, Mac, Windows

Software

`RFinfer`

A package for R that implements novel versions of the random forest from my dissertation research, produces confidence intervals and prediction variances.

Available at `https://github.com/cole-brokamp/RFinfer`.

`aiRpollution`

A package for R that assesses exposure to air pollution components in Cincinnati, Ohio. Also includes other convience functions for extracting Cincinnati GIS variables.

Available at `https://github.com/cole-brokamp/aiRpollution`.

`CB`

A package for R that covers my commonly used personal functions. Includes data exploration functions common to epidemiologic studies.

Available at `https://github.com/cole-brokamp/CB`.

`Location-based Pollution Exposure`

A portable R Shiny web application that generates predictions of traffic related air pollution exposures based on location. Supports interactive mapping as well as batch submission of addresses.

Available at `http://colebrokamp.com/shiny`.

`Other Projects`

My contributions to open source projects and more software currently under development. Available at `https://github.com/cole-brokamp`.

Awards and Memberships

Member - International Society of Exposure Science	*2014 – present*
Member - American Statistical Assocation	*2013 – present*
Choose Ohio First Scholarship Recipient	*2010 – 2015*
University Graduate Scholarship Recipient	*2010 – present*
Distinguished Honors Scholar, UC Engineering	*2010*
University of Cincinnati Alumni Scholarship	*2008 – 2009*
University Cincinnatus Scholar Recipient	*2005 – 2010*

Leadership and Service

Co-founded Biostatistics Student Journal Club, Department of Biostatistics, University of Cincinnati	*2013*
Student Representative to Graduate Education Committee, Department of Pharmacology, University of Cincinnati	*2010 – 2011*