Duchwan Ryu

Division of Statistics

Northern Illinois University

1425 W. Lincoln Hwy.

DeKalb, IL 60115-2828

E-mail: dryu@niu.edu

Phone: (815) 753-6778

Fax: (815) 753-6776

RESEARCH INTERESTS

Bayesian Functional data analyses, Sequential Monte Carlo methods, Bayesian Nonparametric regressions, Longitudinal Measurements, Measurement Error models, Uncertainty Quantifications

EDUCATION

Ph.D. Statistics,	Texas A&M University,	College Station, Texas,	2005
M.S. Statistics,	Korea University,	Seoul, Korea,	1991
B.S. Statistics,	Korea University,	Seoul, Korea,	1989

ACADEMIC EXPERIENCE

Associate Professor . . . . Aug. 2018 – Present
Assistant Professor . . . . Aug. 2014 – Aug. 2018
Division of Statistics, Northern Illinois University

- Teaching: Statistics Courses for graduate and undergraduate students
- Consulting: Statistical advice and cooperation for Biostatistical researches
- Research: Bayesian functional data analysis for large volume of genetic data and circular data

Adjunct Professor . . . . Aug. 2014 – Present
Assistant Professor . . . . Jun. 2010 – Jun. 2014
Department of Biostatistics and Epidemiology, Georgia Regents University

- Teaching: Courses for Ph.D. and M.S. students
- Consulting: Statistical advice and cooperation for Biostatistical researches
- Research: Bayesian approaches for Biostatistical data from various fields including neuroscience, clinical trials, microarray, and public health

KAUST-IAMCS Postdoctoral Research Associate . . . . Sep. 2008 – 2010
Institute for Applied Mathematics and Computational Science, Texas A&M University

- Uncertainty quantification in simulation-based predictive science
  - Bayesian partition for high-dimensional input space
  - Karhunen–Loève and polynomial chaos expansion in state space model
  - Simulation data emulation via Gaussian process regression, Bayesian MARS, and seeming unrelated regression
  - Quantification of aleatory/statistical uncertainty and epistemic/systematic uncertainty
- Bayesian statistical modeling
  - Bayesian nonparametric regression under generalized linear model frame work with random effects covariates from longitudinal measurements
  - Dynamic weighted importance sampling for data assimilation with particle filtering
  - Karhunen–Loève expansion for multivariate random variable

Post Doctoral Fellow .... May 2005 – Nov. 2005
Partnerships in Prevention Science Institute, Iowa State University
- Statistical Analysis of Preventive Science

    - Multilevel (longitudinal) data analysis with nonlinear mixed model in cohort study of preventive interventions on adolescent substance abuse
    - Multiple imputation analysis for missing data and determination of effective sample size

Graduate Assistant Research .... Jan. 1998 – May 2005
Texas Transportation Ins., Texas A&M University
- Environmental and Soil Characteristics Analysis (with E. Fernando)

    - Analysis effects of environmental factors and soil property to the pavement durability
    - Construction environmental/soil regions for counties in Florida and Texas through clustering analysis with environmental factors and soil property to support road plan

- Pavement Management System Development (with E. Fernando)

    - Forecast road quality for segments of road with statistical models for quality indices (Crack, Ride, and Rutting) by pavement material and longitudinal pavement history
    - Fund allocation through incremental-benefit analysis on road quality and social expense
    - Establishment graphic user interface with SAS®procedures, AF, SCR, and MACRO

- Orient–Destination analysis for the transportation data (with C. Spiegelman)

    - Estimation traffic amount and flow with Orient-Destination matrix
    - Experimental design to generate data for the transportation simulation program

WORK EXPERIENCE

Business Analyst .... Nov. 2005 – Aug. 2008
Retail Service & Operations, JPMorgan Chase Bank
- Forecast Model for Cash Demand

    - Establishment generalized linear models and time series models to forecast daily customer cash flows within banking entities such as customer, branch, ATM, and vault
    - Segmentation branches and ATMs by customer demands, demographic statistics, geographic variables, marketing area features, branch properties, and other possible drivers
    - Forecast daily customer cash demand and evaluation forecast error for branch and branch serviced ATM as the foundation of branch cash shipment/order optimization
    - Forecast daily vendor serviced ATM usage with forecast error to support the decision of ATM replenishment amount
    - Recommendation and evaluation replenishment amount with utilization rate and number of incidents of out of cash, emergency cash, and unscheduled shipment, for pilot ATMs
    - Forecast the impact of Bank of New York merge to the branch ending cash balance based on geographic proximity to neighboring Chase branches

- Cash Shipment Optimization
- Baseline Model for New Accounts (at Retail Marketing as Statistical Model Analyst)

    - Application baseline model (additive Poisson regression model) to various line of business such as retail, small business, credit card, etc., and improvement of baseline model

- Data Collection and Cleaning
- Statistical Consulting for banker

PUBLICATIONS

- Published papers

    - **Ryu, D.**, D. Bilgili, Ergönül, Ö. and N. Ebrahimi (2018). Bayesian Analysis of Multiple-Inflation Poisson Models and Its Application to Infection Data. *Brazilian Journal of Probability and Statistics*, 32(2), 239–261.

    - **Ryu, D.**, D. Bilgili, Ergönül, Ö., F. Liang, and N. Ebrahimi (2018). A Bayesian Generalized Linear Model for Crimean-Congo Hemorrhagic Fever Incidents. *Journal of Agricultural, Biological and Environmental Statistics*, 23(1), 153–170.

    - **Ryu, D.**, Xu, H., George, V., Su, S., Wang, X., Shi, H. and Podolsky, R. (2016). Differential methylation tests of regulatory regions. *Statistical Applications in Genetics and Molecular Biology*, 15(3), 237–251.

    - Bilgili, D., **Ryu, D.**, Ergön"ul, Ö., Ebrahimi, N. (2016). Bayesian Framework for Parametric Bivariate Accelerated Lifetime Modeling and Its Application to Hospital Acquired Infections. *Biometrics*, 72(1), 56–63.

    - Linder, D., Panchal, V., Samawi, H., and **Ryu, D.** (2016). Balanced Bayesian LASSO for Heavy Tails. *Journal of Statistical Computation and Simulation*, 86(6), 1115–1132.

    - Jeong, Y., Lee, S., Han, K., **Ryu, D.**, and Jung, Y. (2015). Design of Short-term Forecasting Model of Distributed Generation Power for Solar Power Generation. *Indian Journal of Science and Technology*, 8, 261-270.

    - Kim, H., **Ryu, D.**, Mallick, B., and Genton, M. (2014). Mixtures of Skewed Kalman Filters. *Journal of Multivariate Analysis*, 123, 228-251.

    - **Ryu, D.**, Liang, F. & Mallick, B. (2013). Sea Surface Temperature Modeling using Radial Basis Function Networks With a Dynamically Weighted Particle Filter. *Journal of the American Statistical Association*, 108(501), 111-123.

    - **Ryu D.**, Xu, H., George, V., Su, S., Wang, X., Podolsky, R. (2013). Quantifying and Normalizing Methylation Levels in Illumina Arrays, *Journal of Biometrics & Biostatistics*, 4(3), 164.

    - Xu, H., Podolsky, R., **Ryu, D.**, Wang, X., Su, S., Shi, H. and George, V. (2013) A Method to Detect Differentially Methylated Loci With Next Generation Sequencing. *Genetic Epidemiology*, 37(4), 377-382.

    - Karimi, M., Florentino-Pineda, I. Weatherred, T., Qadeer, A., Rosenberg, C. A., Hudacko, A., **Ryu, D.** (2013). Blood conservation operations in pediatric cardiac patients: A paradigm shift of blood use. *Annals of Thoracic Surgery*, 95(3), 962-967.

    - **Ryu, D.**, Li, E. & Mallick, B. (2011). Bayesian Nonparametric Regression Analysis of Data with Random Effects Covariates from Longitudinal Measurements. *Biometrics*, 67, 454-466.

    - McClarren R., **Ryu, D.**, Drake, R., Grosskopf, M., Bingham, D., Chou, C., Fryxell, B., Holst, B., Holloway, J., Kuranz, C., Mallick, B., Rutter, E., Torralva B. (2011). A physics informed emulator for laser-driven radiating shock simulations. *Reliability Engineering and System Safety*, 96, 1194-1207.

    - Holloway, J., Bingham, D., Chou, C., Doss, F., Drake, R., Fryxell, B., Grosskopf, M., Holst, B., Mallick, B., McClarren, R., Mukherjee, A., Nair, V., Powell, K., **Ryu, D.**, Sokolov, I., Toth, G., Zhang, Z. (2011). Predictive modeling of a radiative shock system. *Reliability Engineering and System Safety*, 96, 1183-1193.

    - **Ryu, D.**, Sinha, D., Mallick, D., Lipsitz, S. & Lipshultz, S. (2007). Longitudinal Studies With Outcome-Dependent Follow-up: Models and Bayesian Regression. *Journal of the American Statistical Association*, 102, 952-961.

- Oh, J., **Ryu, D.**, Fernando, E. & Lytton, R. (2006). Estimation of Expected Moisture Contents for Pavements Using Environmental and Soil Characteristics. *Transportation Research Record: Journal of the Transportation Research Board*, 1967, 135-147. DOI: 10.3141/1967-14

- Submitted and working papers

  - "Layered Bayesian Nonparametric Regression for for DNA Methylation Rates", invited to revision to *Journal of Chemometrics*, 2018.

  - "Bayesian Circadian Functional Data Analysis with Application to Daily Physical Activity Data" with A. Polansky, H. Shen and S. Basu, submitted to *Statistical Methods in Medical Research*, 2018.

  - "Detection of Differentially Methylated Regions using Kernel Distance and Scan Statistics" with F. Dunbar, H. Xu, S. Ghosh, H. Shi and V. George, submitted to *Genes*, 2019.

  - "Tensor Product Splines with Periodic Covariates" with A. Polansky.

  - "Bias Correction for Nonparametric Tests" with S. Lee.

  - "Locale-Dependent Bayesian Smoothing Splines with Dynamically Weighted Particle Filter" with S. Chatterjee, S. Chowdhury and S. Basu.

  - "A Comparison of Random Survival Forest and Bayesian Additive Regression Tree for Survival Data" S. Saha and N. Ebrahimi.

  - "Strip-sufficient Density Estimation for a Multivariate Probabilistic Model of Three-dimensional Natural Scenes" with Z. Yang.

  - "pisodic Classification of Neurons with Multivariate Functional Clustering" with H. Shen.

  - "Bayesian SIMEX Method for Differential Measurement Errors".

  - "Functional Classification of Neurons by Response of Stimuli" with J. Tien.

  - "Environment Recognition via Multivariate Density Estimation" with Z. Yang.

PRESENTATIONS

  - Invited/contributed talks

    * "Recapitulation of Machine Learning at Symposium on Data Science & Statistics 2018" at Korea Enterprise Data, Korea, Jun. 2018.

    * "Dynamically Weighted Particle Filter for Crimean-Congo Hemorrhagic Fever Incidents" at the Department of Applied Statistics, Korea University, Korea, Jun. 2018.

    * "Multiple Inflated Poisson Models for Infection Data" at the Department of Mathematical Sciences, Sungkyunkwan University, Korea, Jun. 2018.

    * "Analysis of Crimean-Congo Hemorrhagic Fever Incidents with Dynamically Weighted Particle Filter" invited presentation at Symposium on Data Science and Statistics, Reston, VA, May. 2018.

    * "Biasedness in Nonparametric Tests" contributed presentation at ENAR, Atlanta, GA, Mar. 2018.

    * "Bayesian Analysis of Multiple Inflated Poisson Models and Its Application to Infection Data" contributed presentation at Joint Statistical Meeting, Baltimore, MD, Jul. 2017.

    * "Applications of Radial Basis Functional Networks with Dynamically Weighted Particle Filter", at the Department of Mathematical Sciences, Sungkyunkwan University, Korea, May. 2016.

* "Bayesian Analysis of Multiple Inflated Poisson Models and Its Application to Infection Data", at the Department of Mathematical Sciences, University of Nevada, Las Vegas, Nov. 2015.
* "Bayesian Analysis of Multiple Inflated Poisson Models and Its Application to Infection Data", at Division of Statistics, Northern Illinois University, Nov. 2015.
* "Sea Surface Temperature Modeling using Radial Basis Function Networks with Dynamically Weighted Particle Filter" at Department of Biostatistics & Epidemiology, Feb. 2013.
* "A Density Estimation for Highly Correlated 3D Scene Data" at Cancer Research Center, Georgia Health Sciences University, Mar. 2012.
* "Bayesian Functional Classification and Visualization of Neurons for Brain Decoding". contributed presentation at Joint Statistical Meeting, Miami, FL, Aug. 2011.
* "Bayesian Nonparametric Regressions with Random Effects of Longitudinal Measurements" at Dept. of Statistics, University of South Carolina, Mar. 2011.
* "Longitudinal Studies with Outcome-Dependent Follow-Up: Models and Bayesian Regression". November 2005 at Novartis, East Hanover, NJ.
* "Bayesian Regression in Longitudinal Studies with Outcome-Dependent Follow-Up". April 2005 at Massachusetts General Hospital and Harvard Medical School, Boston, MA.

- Poster presentations

  * D. Ryu, et al. "Bayesian Functional Data Analysis for Weather Forecast". July 2018 Joint Statistical Meeting.
  * D. Ryu, et al. "Bayesian Multivariate Adaptive Regression Splines (BMARS)". April 2009 TST Meeting.
  * D. Ryu, Z. Zhang, A. Mukherjee, J. Chou D. Bingham, B. Fryxell, B. Mallick, V. Nair, and J. Zhu. "Gaussian Process Regression (GPR)". April 2009 TST Meeting.
  * D. Ryu, B. Mallick, B. Fryxell, and P. Drake. "Bayesian Multivariate Adaptive Regression Splines for HYADES Data". IAMCS Spring 2009 Symposium.
  * R. McClarren, D. Ryu, Z. Zhang, A. Mukherjee, J. Chou D. Bingham, B. Fryxell, B. Mallick, V. Nair, and J. Zhu. "Gaussian Process Regression and Bayesian MARS for CRASH Initialization with HAYDES". September 2009 TST Meeting.
  * D. Ryu, R. McClarren, Z. Zhang, A. Mukherjee, J. Chou D. Bingham, B. Fryxell, B. Mallick, V. Nair, and J. Zhu. "Gaussian Process Regression and Bayesian MARS for CRASH Initialization with HAYDES". October 2009 CRASH Annual Review.
  * D. Ryu, F. Liang, and B. Mallick. "Particle Filtering with Nonparametric Regressions and Dynamically Weighted Importance Sampling". October 2009 IAMCS-PSS Workshop in Data Assimilation in the Geosciences.

PROFESSIONAL SERVICES AND AWARD

- member of Reviewer of Mathematical Reviews (MathSciNet), AMS.
- A member of *American Statistical Association*.
- A member of *International Society for Bayesian Analysis*.
- A member of editorial board of *Journal of Biometrics & Biostatistics*.
- A member of editorial board of *Annals of Biometrics & Biostatistics*.
- A member of editorial board of *Journal of Epidemiology and Preventive Medicine*.
- Peer review (2014) for a paper submitted to Journal of Computational and Graphical Statistics.
- Peer review (2013) for a paper submitted to *Journal of Statistical Research*.
- Peer review (2013) for a paper submitted to *Communications in Statistics*.

- Peer review (2012) for a grant proposal submitted to *American Mathematical Society/National Security Agency Grant.*
- Peer review (2011) for a paper submitted to *Journal of Animal Breeding and Genetics.*
- Peer review (2010) for a paper submitted to *Journal of Animal Breeding and Genetics.*
- Peer review (2010) for a paper submitted to *The Korean Journal of Applied Statistics.*
- Peer review (2010) for a paper submitted to *Journal of Computational and Graphical Statistics.*
- Peer review (2009) for a grant proposal submitted to *Fundação para a Ciência e a Tecnologia (Portuguese Foundation for Science and Technology).*
- A winner of the inaugural SBSS Student Paper Competition at 2005 Joint Statistical Meetings.

THESIS AND DISSERTATION ADVICE

- Advisor and Co-advisor
    - Saha, Satabdi, Comparison of Bayesian Additive Regression Trees with Random Survival Forests and Con Proportional Hazards Regression Analysis: An Application to Breast Cancer, for M.S. thesis on August, 2017.
    - Atef Alghzzy, Mohammed, Differential Methylation Identification Using DBSCAN on August, 2017.
    - Alhejaili, Wejdan, Accelerated Failure Time with LASSO for Lung Cancer Patients on August, 2017.
    - Azizi, SeyedSoroosh, Panel Regression with Nonstationary Variables, for M.S. thesis on August, 2017.
    - Osell, Shawn, Sequential Monte Carlo Macroeconomics, for M.S. thesis on August, 2017.
    - Ekahator, Uche Eseosa, The Effect of Residing in Gang Neighborhoods on Youth Crime and Recidivism, for M.S. thesis on August, 2017.
    - Can, Meng (with N. Ebrahimi), Marginal Structure Model to Estimate the Causal Effect of Cognitive Decline on Body Mass Index Changes in Elderly People. M.S. at NIU on May, 2016.
    - Chen, Chen Chun (with V. George), Classification methods for circular-linear data using periodic functions. Ph.D. at GRU on August, 2016.
    - Campbell, Jeffrey (with V. George), Bayesian Functional Clustering and VMR Identification in Methylation Microarray Data. Ph.D. at GRU on August, 2015.
- Member of committees
    - Wang, Yiging (Advisor S. Basu), A Dependent Competing Risks Model. Ph.D. at NIU on December, 2018.
    - Dmitrieva, Tatiana (Advisor N. Ebrahimi), Use of Empirical Likelihood in Approximate Bayesian Computation. Ph.D. at NIU on May, 2018.
    - Hulan, Luvsandash (Advisor N. Ebrahimi), Spatial-Temporal Change Point Detection Problem for Dependent Data. Ph.D. at NIU on May, 2017.
    - Paul, Erina (Advisor S. Basu), Approximate Bayesian Computation in Nonparametric Bayesian Models. Ph.D. at NIU on May, 2017.
    - Maity, Arnab Kumar (Advisor S. Basu), Bayesian Variable Selection in Linear and Nonlinear Models. Ph.D. at NIU on May, 2016.
    - Hu, Fengjiao (Advisor V. George), Statistical Methods to Detect Deferentially Methylated Regions with Next-Generation Sequencing Data. Ph.D. at GRU on August, 2016.
    - Worrall, Alicia (Advisor N. Ebrahimi), Statistical Analysis of Interval-Censored Failure Time Data. M.S. at NIU on May, 2015.

– Li, Shuang (Advisor V. George), A Bayesian Framework To Detect Differentially Methylated Loci in Both Mean And Variability with Next Generation Sequencing. Ph.D. at GRU on August, 2015.

– Garren, Jeonifer (Advisor J. Kim), A Resampling Method of Time Course Gene Expression Data for Gene Network Inference. Ph.D. at GRU on May, 2015.

– Joshua, Greene (Advisor G. Rempala), Multivariate Poisson Abundance Models for Analyzing Antigen Receptor Data. Ph.D. at GRU on August, 2013.

– Linder, Diniel (Advisor G. Rempala), Penalized Least Squares and the Algebraic Statistical Model for Biochemical Reaction Networks. Ph.D. at GRU on May, 2013.

– McCracken, Courtney (Advisor S. Looney), Correlation Coefficient Inference for Left-Censored Biomarker Data with Known Detection Limits. Ph.D. at GRU on May, 2013.

- On going service theses and dissertations as an advisor

  – Shen, Hao (with A. Polansky), Bayesian Functional Clusterings for Circadian Response and Multidimensional Response, Ph.D. dissertation.

  – Chatterjee, Suvo (with S. Basu), Bayesian Functional Survival Analysis for Lung Cancer Patients with Methylation Rate, for Ph.D. dissertation.

  – Tang, Liang (with A. Polansky), Outlier Detection for Multi-Dimensional Health Data, for Ph.D. dissertation.

  – Bano, Sakeena, Detection of Variably Methylated Regions by Using SCAN Statistics, for Ph.D. dissertation.

  – Zhang, Yang, Applications of Shape Analysis, for Ph.D. dissertation.

- On going service on thesis and dissertation committees

  – Dovoedo, Philippe (Advisor A. Polansky) for Ph.D. dissertation.

  – Kane, Kacy for M.S. thesis.

  – Neely, Justin for M.S. thesis.

  – Torin, Quinlivan for M.S. thesis.

TEACHING EXPERIENCE

STAT 8510	*Programming for Data Analysis*	STAT 9110	*Generalized Linear Models*
STAT 9120	*Theory of Linear Models*	STAT 9220	*Advanced Statistical Inference*
STAT 9280	*Bayesian Inference*	STAT 579	*Practice of Bayesian Statistics*
STAT 666	*Discrete Multiv. Data Analysis*	STAT 674	*Design & Analysis Experiments*
STAT 675	*Multivariate Methods*	STAT 679	*Generalized Linear Models*
STAT 680	*Bayesian Statistics*	STAT 775	*Stat. Methods for Measurement Errors*

RESEARCH SUPPORTS

- NIH Research Project Grant Program (R15, PI) Cancer Progression and Survival, Differential Methylation and Functional Data Analysis, pending. 2017.

- Georgia Regents University, Pilot Study Research Program (PI), Intramural Award. 2013-2014.

- NIH Research Project Grant Program (R03, PI) Bayesian functional data analysis to identify differently methylated regions for hepatocellular cancer cells, pending. 2013.

- National Science Foundation (PI), Bayesian Nonparametric Regressions Analysis for Replicated Data: Application to Genomic Research as PI, pending. 2013

- U.S Army Medical Research Acquisitions Activity (Co-PI), Virtual living as a new paradigm of cognitive rehabilitation, pending. 2013.

- National Science Foundation (Co-PI), A new paradigm of vision rehabilitation for age-related macular degeneration, pending. 2013.

- National Science Foundation (PI), Applications of Bayesian Nonparametric Regressions to Handle Big Data and Big Calculation, not funded. 2012.

- NIH Research Project Grant Program (R01, PI), Detecting differentially methylated regions in complex diseases, not funded. 2012.

- NIH Research Project Grant Program (R01, PI), Decoding real-time traumatic memory traces: a novel approach to study post-trauma, not funded. 2010.

- King Abdullah University of Science and Technology (J. Calvin, PI), KUSC1-016-04, Award. 2008-2010 .

- The Department of Energy, DE-FC52-08NA28616 (P. Drake, PI) Predictive Science Academic Alliances Program. 2008-2010.

COMPUTING SKILL

- Statistical Analysis Packages

  - Proficient in SAS®for data related procedures and SQL with DB2/ODBC, missing data manipulation, MACRO and IML programming, construction graphical user interface, graphs and maps, multivariate analyses, optimization, and various types of statistical model fittings

  - Selective familiar SAS®procedures: AF/SCL, ARIMA, CLUSTER, CONNECT, DISCRIM, EXPORT, FACTOR, GMAP, GPLOT, GENMOD, GLM, IML, IMPORT, LOGISTIC, LP, MACRO statements, MI, MIANALYZE, MIXED, NLMIXED, OPTMODEL, REG, SQL, TRANSREG

  - Familiar with MATLAB®, SPLUS®, SPSS®, R, and other statistical soft-wares

- Other computing experiences

  - Programming Language : C/C++, FORTRAN, Applet, and JAVA script

  - Database and OS : Business Object, MS Access, SQL 2005 in Windows, and UNIX