Sanjay Chaudhuri

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Education

- **Doctorate :** Ph.D from **University Of Washington, Seattle** : October 2005.
- **Master of Statistics :** M.Stat from the **Indian Statistical Institute, Calcutta** : May 2000. Specialisation : Mathematical Statistics and Probability.
- **Bachelor of Statistics :** B.Stat with Honours from the **Indian Statistical Institute, Calcutta** : May 1998.

Academic Appointments

- Associate Professor at the Department of Statistics and Applied Probability, National University of Singapore, January 2012 - present.
- Assistant Professor at the Department of Statistics and Applied Probability, National University of Singapore, August 2005 - December 2011.

Research Interests

- Development and analysis of methodologies in statistics, machine learning and data science;
- Theory and application of empirical likelihood; Analysis of complex survey data; Statistical data integration; Application of statistics in demography; Statistics on network data; Bayesian empirical likelihood;
- Small area estimation; Mixed effects models; Variance component estimation, Benchmarking techniques;
- Graphical Markov models; Covariance estimation for high-dimensional data; Graphical model selection; Causality; Artificial intelligence;
- Computation intensive statistical methods; Approximate Bayesian computation; Markov chain Monte Carlo techniques; Optimisation problems;
- Order restricted inference; Multivariate statistics and decision theory;
- Survival analysis; Competing risk models;
- Application of statistics to real life problems; Statistical analysis of data obtained from experiments in natural, engineering and marketing sciences;
- Developing user-friendly statistical softwares.

Publications[1]

Journal Publications :

- Chaudhuri, Sanjay and Handcock, Mark S. (2018) A Conditional Empirical Likelihood Based Method for Model Parameter Estimation from Complex Survey Datasets. *Statistics and Application, The special J. N. K. Rao felicitation issue, The Society of Statistics, Computer and Application,* Vol **16**(1):245–268.

- Ong, Meng Hwee Victor*, Chaudhuri, Sanjay, and Turlach, Berwin. (2018) Edge selection for undirected graphs. *Journal of Statistical Computation and Simulation,* Vol **88**(17):3291–3322.

- Chaudhuri, Sanjay, Mondal, Debashis, and Yin, Teng*. (2017) Hamiltonian Monte Carlo sampling in Bayesian empirical likelihood computation. *Journal of the Royal Statistical Society: Series B (Statistical Methodology),* Vol **79**(1):293–320.

- Kubokawa, Tatsuya, Sugasawa, Shonosuke, Ghosh, Malay, and Chaudhuri, Sanjay. (2016) Prediction in heteroscedastic nested error regression models with random dispersions. *Statistica Sinica,* Vol **26**:465–492.

- Bandyopadhyay, Antar and Chaudhuri, Sanjay. (2014) Variance estimation for tree order restricted models. *Statitics,* Vol **48**(5):1122–1137.

- Chaudhuri, Sanjay. (2014) Qualitative inequalities for squared partial correlations of a Gaussian random vector. *Annals of Institute of Statistical Mathematics,* Vol **48**(2):345–367.

- Pham, Kim Cuc*, Nott, David J., and Chaudhuri, Sanjay. (2014) A note on approximating ABC-MCMC using flexible classifiers. *Stat,* Vol **3**(1):218–227.

- Perlman, Michael D. and Chaudhuri, Sanjay. (2012) Reversing the Stein Effect. *Statistical Science,* Vol **27**(1):135–143.

- Chaudhuri, Sanjay and Ghosh, Malay. (2011) Empirical likelihood for small area estimation. *Biometrika,* Vol **98**(2):473–480.

- Chaudhuri, Sanjay and Tan, Gui Liu*. (2010) On qualitative comparison of partial regression coefficients for Gaussian graphical Markov models. Vianna, Marlos A. G. and Wynn, Henry P. (Eds.), *Algebraic Methods in Statistics and Probability II.* Contemporary Mathematics. American Mathematical Society. 125–133.

- Chaudhuri, Sanjay, Handcock, Mark S., and Rendall, Michael S. (2008) Generalized linear models incorporating population level information: an empirical-likelihood-based approach. *Journal of the Royal Statistical Society: Series B (Statistical Methodology),* Vol **70**(2):311–328.

- Chaudhuri, Sanjay, Drton, Mathias, and Richardson, Thomas S. (2007) Estimation of a covariance matrix with zeros. *Biometrika,* Vol **94**(1):199–216.

- Chaudhuri, Sanjay, Handcock, Mark S., and Rendall, Michael S. (2007) A 2-step empirical likelihood based approach for combining sample and population data in regression estimation. *Proceedings of the ISI 2007.*

- Chaudhuri, Sanjay and Perlman, Michael D. (2007) Consistent estimation of the minimum normal mean under the tree-order restriction. *J. Statist. Plann. Inference,* Vol **137**(11):3317–3335.

[1] * indicates a Phd., MSc or an undergraduate final year project student.

- Kar, Abhijit, Chaudhuri, Sanjay, Sen, Pratik K., and Ray, Ajoy Kumar. (2007) Evaluation of hardness of the interfacial reaction products at the alumina-stainless steel brazed interface by modeling of nanoindentation results. *Scripta Materialia,* Vol **57**(9):881–884.

- Chaudhuri, Sanjay and Perlman, Michael D. (2006) Two step-down tests for equality of covariance matrices. *Linear Algebra Appl.,* Vol **417**(1):42–63.

- Chaudhuri, Sanjay and Perlman, Michael D. (2005) Biases of the maximum likelihood and Cohen-Sackrowitz estimators for the tree-order model. *Statist. Probab. Lett.,* Vol **71**(3):267–276.

- Chaudhuri, Sanjay and Perlman, Michael D. (2005) On the Bias and Mean-Squared Error of Order-restricted Maximum Likelihood Estimators. *J. Statist. Plann. Inference,* Vol **130**(1-2):229–250.

- Perlman, Michael D. and Chaudhuri, Sanjay. (2004) The role of reversals in order-restricted inference. *Canad. J. Statist.,* Vol **32**(2):193–198.

- Chaudhuri, Sanjay and Richardson, Thomas. (2003) Using the structure of d-connecting paths as a qualitative measure of strength of dependence. 19*th conference of Uncertainty in Artificial Intelligence*. 116–123.

- Kumar, Krishna, Chaudhuri, Sanjay, and Das, Alaka. (2002) Quasiperiodic waves at the onset of zero-Prandtl-number convection with rotation. *Phys. Rev. E,* Vol **65**(2):026311.

Technical Reports :

- Chaudhuri, Sanjay and Drton, Mathias. On the Bias and Mean-squared Error of the Sample Minimum and the Maximum Likelihood Estimator for two Ordered Normal Means. Tech. rep. 432. Department of Statistics, University of Washington. (2003).

PhD. Thesis :

- Chaudhuri, Sanjay. *Using the structure of d-connecting paths as a qualitative measure of the strength of dependence*. PhD thesis. University of Washington. (2005).

Preprints :

- Bhattacharyya, Jhimli, Kumar, Gopinatha Suresh, Maiti, Souvik, Miyoshi, Daisuke, and Chaudhuri, Sanjay. An Unified Statistical Procedure to Analyse Irreversible Thermal Curves.

- Char, Monalisa, Chakraborty, Amit K, Manna, Smarajit, Aditya, Subhrangsu, Chaudhuri, Sanjay, and Kar, Abhijit. Effect of thin film multilayer on the morphologuical and functional properties of lead free solder joint interface.

- Chaudhuri, Sanjay, Ghosh, Subhroshekhar, Nott, David J., and Pham, Kim Cuc*. An easy-to-use empirical likelihood ABC method.

- Chaudhuri, Sanjay, Handcock, Mark S., and Rendall, Michael S. Population level information combined parameter estimation from complex survey datasets.

- Chaudhuri, Sanjay, Kubokawa, Tatsuya, and Sugasawa, Shonosuke. Use of Covariance Moment Equation for Improving Variance Estimators.

- Chaudhuri, Sanjay and Teng, Yin*. A Two-step Metropolis Hastings Method for Bayesian Empirical Likelihood Computation with Application to Bayesian Model Selection.

- Kien, Dang Trung*, Wai, Neo Han*, and Chaudhuri, Sanjay. elhmc: An R Package for Hamiltonian Monte Carlo Sampling in Bayesian Empirical Likelihood.

Software Development

- `glmc`: A package for combining sample and population information using *empirical likelihood*.
- `ES`: Implementation of the *Edge Selection Algorithm*. Package mostly mostly by Victor Meng Hwee Ong with inputs from me and Berwin Turlach.
- `elhmc`: Sampling from a empirical likelihood Bayesian posterior of parameters using Hamiltonian Monte Carlo. Package mostly coded by Dang Trung Kien from an initial code written by Neo Han Wai.
- `Anhysnuc`: Analysis of Hysteric (Irreversible) Thermal Curves from Nucleic Acid Hybridisation Experiments. This is a web-based R package to analyse irreversible thermal curves frequently obtained from hybridisation experiments involving nucleic acids. The package in its current form is mostly written by me and Dang Trung Kien. It can be found in https://panda.stat.nus.edu.sg/sanjay/hysteresis-dashboard/.

Honours and Awards

- *Indian International Statistical Association Young Statistical Scientist Award*: 2018, for contribution to Theoretical Statistics and Probability.
- *International Centre Visiting Professor, T. U. Munich*: 10*th* to 30*th* July 2017.
- *Fellow of The Royal Statistical Society* : June 2004.
- The *Laha Award* from the Institute of Mathematical Statistics : 2004.
- The *Travel award* from the Center for Statistics and the Social Sciences, University of Washington : 2004.
- *National Merit Scholar of India* : 1993, 1995.

Research Funding

- *On Useful Properties of the Gradient of Log-empirical Likelihood*: 03/2018 to 03/2020, SGD 31,000.
- *Empirical Likelihood based Methods for Complex Survey Data*: 09/2016 to 08/2019, SGD 31,769.
- *Bayesian Model Selection with Empirical Likelihood*: 09/2013 to 02/2017, SGD 74,000.
- *Model Selection for Graphical Markov Models*: 09/2012 to 08/2015, SGD 78,000.
- *Bayesian Empirical Likelihood*: 04/2011 to 03/2014, SGD 42,918.
- *Information Inequalities for Random Vectors with Applications to Graphical Markov Models*: 09/2008 to 02/2012, SGD 41,500.
- *Empirical Likelihood Based Procedures for Estimating Parameters of Interest in Graphical Markov Models*: 10/2005 to 10/2008, SGD 40,421.

Student Advising

PhD.

- Victor Meng Hwee Ong, Graduated 2014.
- Yin Teng, Graduated 2015.
- Thi Kim Cuc Pham, Graduated 2016. (*Jointly supervised with David Nott.*)
- Osei Prince Peprah, Graduated 2018. (*Jointly supervised with Ajay Jasra.*)

MSc.

- Yan Liyuan, Graduated 2012.

Undergraduate Final Year project (selected).

- Jian Hao Tan, Gui liu Tan, Wang Xu, Victor Meng Hwee Ong, Dang Trung Kien, Neo Han Wei, Hong Jie, Cai Sijia, Wang Jiamin, Zhu Yiqing, Dai Mingxi, Png Hang.

Courses Taught

- *Undergraduate*:
  - Introduction to Data Science,
  - Design and Analysis of Experiments,
  - Survey Methodology,
  - Probability,
  - Linear Models,
  - Demographic Methods,
  - Freshman Seminars.
- *Graduate*:
  - Experimental Designs,
  - Applied Regression Analysis,
  - Graphical Markov models,
  - Sampling from a Finite Population,
  - Analysis of Time Series Data.

Editorial Service

- **Associate Editor :**
  - Journal of Nonparametric Statistics, 2011 - present.
  - STAT, 2012 - present.
  - Journal of Statistical Planning and Inference, 2016 - present.
  - Sankhya, Series B, 2016 - present.

  - Statistics and Applications, 2016 - present.
  - Electronic Journal of Statistics, July 2015 - December 2015.
- **Refereeing Activity :** Electronic Journal of Statistics, Journal of Multivariate Analysis, Sankhya, Statistica Sinica, Statistics and Probability Letters, Journal of Statistical Planning and Inference, Canadian Journal of Statistics, Biometrika, Annals of Statistics, Journal of the American Statistical Association etc.
- Reviewer for Mathematical Reviews, American Mathematical Society.

Membership of Organising Committees

- Chair: Organising Committee, Programme on Statistical Data Integration, Institute for Mathematical Sciences, National University of Singapore, 5th - 16th August 2019.
- Member: Scientific Program Committee, International Indian Statistical Association Conference, 2017.
- Member: Scientific programme Committee, ISI Regional Statistics Conference 2017.
- Main organiser: Empirical Likelihood Based Methods in Statistics, Institute for Mathematical Sciences, National University of Singapore, 6 June - 1 July 2016.
- Member: International organising committee, International Conference organised by Institute of Applied Statistics Sri Lanka, December 2014, 2017.
- Member: International Statistical Institute Outreach Committee on South East Asia: 2014-present.
- Member: Scientific advisory committee, SAE 2013, The First Asian ISI Satellite Meeting on Small Area Estimation, September 2013.
- Member: Scientific programme committee, CFE 2012, 6th CSDA International Conference on Computational and Financial Econometrics, Oviedo, December, 2012.
- Member: New researchers committee, Institute of Mathematical Statistics: 2008-2011.
- Member: Organising committee, Singapore Conference on Statistical Science: Singapore.
- Member: Organising committee, Probability Approximations and Beyond : A Conference in Honour of Louis Chen on his 70th Birthday: Singapore, 2010.
- Member: Local organising committee, $7th$ World Congress in Probability and Statistics (jointly sponsored by Bernoulli Society and Institute of Mathematical Statistics) : Singapore, 2008.

Membership of Professional Organisations

- The Royal Statistical Society : 2004 - present.
- Institute of Mathematical Statistics : 2002 - present.
- International Biometric Society: 2015 - present.

Invited Presentations

- "Hamiltonian Monte Carlo in Bayesian Empirical Likelihood Computation", EAC-ISBA conference, Seoul, South Korea, July, 2018.

- "On the Properties of the Gradient of Log Empirical Likelihood", International Chinese Statistical Association Conference, Qingdao, China, June, 2018.
- "On Empirical Likelihood based Covariance Matrix Estimation", EcoSta Conference, Hong Kong, June, 2018.
- "A Conditional Empirical Likelihood Based Bayesian Method for Complex Survey Data", SAE 2018, Shanghai, China, June, 2018.
- "Covariance based Moment Equations for Improved Variance Component Estimation", Annual Conference of the Indian International Statistical Association, Gainesville, Florida, USA, May, 2018.
- "Empirical Likelihood for Respondent Driven Sampling", Annual Conference of the Indian International Statistical Association, Hyderabad, India, December, 2017.
- "Empirical Likelihood for Respondent Driven Sampling", Workshop on Robust inference for sample Surveys, Wollongong, Australia, July, 2017.
- "Bayesian Empirical Likelihood Based Analysis for Patterned Missing Data", International Chinese Statistical Association Conference, Chicago, USA, June, 2017.
- "A two-step Metropolis Hastings Method for Bayesian empirical likelihood computation", Contemporary Theory and Practice of Survey Sampling: Celebration of Research Contribution of J. N. K Rao , Kun Ming, China, May, 2017.
- "Hamiltonian Monte Carlo for Bayesian Empirical Likelihood Computation" Departmental seminar, Department of Statistics, University of California, Davis, USA, November, 2016.
- "A two-step Metropolis Hastings Method for Bayesian empirical likelihood computation", Annual Conference of the Indian International Statistical Association, Corvallis, USA, August, 2016.
- "A two-step Metropolis Hastings Method for Bayesian empirical likelihood computation", Cross-Strait statistics conference, Chengdu, China, July 2016.
- "Empirical Likelihood for respondent driven sampling", IMS-APRM meeting, Hong Kong, June, 2016.
- "Hamiltonian Monte Carlo for Bayesian Empirical Likelihood Computation" Departmental seminar, Department of Statistics, University of Minnesota, USA, February, 2016.
- "Hamiltonian Monte Carlo for Bayesian Empirical Likelihood Computation", Calcutta Triennial Conference, Calcutta, India, December, 2015
- "Empirical Likelihood in Approximate Bayesian Computation", Annual Conference of the Indian International Statistical Association, Pune, India, December, 2015.
- "Empirical Likelihood for respondent driven sampling", 60th World congress of International Statistical Institute, Rio de Janeiro, Brazil, July, 2015.
- "Hamiltonian Monte Carlo for Bayesian Empirical Likelihood Computation" Monday Colloquium, Indian Statistical Institute, Calcutta, India, June, 2015.
- "Hamiltonian Monte Carlo for Bayesian Empirical Likelihood Computation" Departmental seminar, Department of Statistics, Oregon State University, USA, February, 2015.
- "Hamiltonian Monte Carlo for Bayesian Empirical Likelihood Computation" International conference organised by Institute of Applied Statistics Sri Lanka, Colombo, Sri lanka, December, 2014.
- "Empirical Likelihood in Approximate Bayesian Computation", Topic contributed session, Joint Statistical Meeting, Boston, USA, August, 2014.

- "Conditional Empirical Likelihood method for Complex Survey Data", 2nd Conference of the international society for nonparametric statistics, Cadiz, Spain, June, 2014.
- "On Bayesian Inference for Complex Survey Data", Conference honouring 70th birthday of Prof. Malay Ghosh, University of Maryland College Park, USA, May, 2014.
- "An empirical likelihood based approach to incorporate sampling weights and population level information", Department of Statistics, London School of Economics, UK, March, 2013.
- "Some results on comparison of dependence for Gaussian graphical Markov models", Department of Mathematics and Southampton Statistical Sciences Research Institute, University of Southampton, UK, March, 2013.
- "An empirical likelihood based approach to incorporate sampling weights and population level information", Department of Statistics, University of Washington, Seattle, USA, November, 2012.
- "Some results on comparison of dependence for Gaussian graphical Markov models", Department of Biostatistics, University of California, Los Angeles, USA, October, 2012.
- "An empirical likelihood based approach to incorporate sampling weights and population level information", Department of Statistics, University of California, Davis, USA, October, 2012.
- "An empirical likelihood based approach to incorporate sampling weights and population level information", Department of Statistics, University of California, Los Angeles, USA, October, 2012.
- "An empirical likelihood based approach to incorporate sampling weights and population level information", Department of Statistics, University of Florida, Gainsville, USA, September, 2012.
- "Empirical likelihood for small area estimation", Indian Science Congress, Bhubaneswar, India, January, 2012.
- "Empirical likelihoods for unit level models in small area estimation.", Colombo, December 2011.
- "A conditional empirical likelihood based approach to combine sampling design and population level information.", IISA JSM, Ralleigh, April 2011.
- "Empirical likelihood for small area estimation", First Singapore conference on statistical science, Singapore, November, 2010.
- "A conditional empirical likelihood based approach to combine sampling design and population level information.", Southampton Statistical Sciences Institute, Southampton, October 2010.
- "Empirical likelihood for small area estimation", International conference on statistical analysis of complex data, Kun Ming, China, July, 2010.
- "Empirical likelihood for small area estimation", 8th IISA JSM conference, Visakhapatnam, India, January 2010.
- "An empirical likelihood based approach to incorporate sampling weights and population level information", International conference on frontiers of interface between statistics and sciences, Hyderabad, India, January 2010.
- "Estimation of the minimum mean of normal populations under the tree order restriction", 7th international triennial symposium on Statistics and Probability, Calcutta university, India, December 2009.
- "Empirical likelihood for small area estimation", The 10th Islamic Countries Conference on Statistical Sciences, Cairo, Egypt, December 2009.

- "A conditional Empirical Likelihood based approach to combine sampling design and population level information.", Indian Statistical institute, Delhi, November 2009.
- "A 2-step empirical likelihood based approach for combining sample and population data in regression estimation", Department of Statistics, University of Florida, Gainsville, Florida, July 2009.
- "Qualitative inequalities for squared partial correlations of a Gaussian random vector", AMS regional conference, Urbana-Champagne, March 2009.
- "Testing equality of multivariate normal population with recursive graphical Markov structure", Monday Colloquium, Indian Statistical Institute, Calcutta, August 2008.
- "Estimation of the minimum mean of normal populations under the tree order restriction", Indian Statistical Institute, Delhi, December 2007.
- "On qualitative comparisons of dependence between d-connected vertices of a singly connected Gaussian DAG", Monday Colloquium, Indian Statistical Institute, Calcutta, December 2007.
- "On qualitative comparisons of dependence between d-connected vertices of a singly connected Gaussian DAG", New researchers Conference, Salt Lake City, July 2007. (*Invited poster presentation*)
- "An empirical likelihood-based approach to estimate covariance matrices with structural zeroes", Monday Colloquium, Indian Statistical Institute, Calcutta, June 2007.
- "A two-step empirical likelihood based approach for combining sample and population data in regression estimation", IISA JSM conference, Cochin, India, January, January 2007.
- "A 2-step empirical likelihood based approach for combining sample and population data in regression estimation", 6th international triennial symposium on Statistics and Probability, Calcutta university, India, December 2006.
- "Estimation of the minimum mean of normal populations under the tree order restriction", S.N. Roy Memorial Conference Calcutta, India, December 2006.
- "On qualitative comparisons of dependence between d-connected vertices of a singly connected Gaussian DAG", Chalmers Technical University, Gothenburg, Sweden, June 2006.
- "A 2-step empirical likelihood approach combining sample and population data in regression estimation", Monday Colloquium, Indian Statistical Institute, Calcutta, December 2005.
- "A 2-step empirical likelihood approach combining sample and population data in regression estimation", Annual meeting of the Population Association of America, Philadelphia, April 2005. (*Topic contributed presentation*)
- "On qualitative comparisons of dependence between d-connected vertices of a singly connected Gaussian DAG", Department of Statistics, University College London, London, England, September 2004.
- "On qualitative comparisons of dependence between d-connected vertices of a singly connected Gaussian DAG", Lancaster University, Lancaster, England, February 2004.
- "Estimation of the minimum mean of normal populations under the tree order restriction", *Monday Colloquium*, Indian Statistical Institute, Calcutta, September 2003.
- "Using the structure of d-connecting paths as a qualitative measure of the strength of dependence", $19th$ conference on uncertainty in artificial intelligence, 2003, Acapulco, Mexico, August 2003. (*Refereed poster presentation*)