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Professor Emeritus of Mathematics & Statistics
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Education

D.Phil. Oxford 1971 (Biomathematics)
Thesis “Statistical Inference Problems Arising with some Specific Stochastic Population Models”
supervised by Professor M.S. Bartlett, F.R.S.
M.Sc. Toronto 1967 (Mathematical Statistics)
B.Sc. Toronto 1966 (Mathematics and Physics)

Professional Accreditation

P.Stat. Statistical Society of Canada 2005

McMaster University

Professor Emeritus from July, 2010
Professor 1983-2010
Associate Professor 1978-83
Assistant Professor 1971-78
Co-ordinator of the Graduate Program in Statistics 1987-93 and 1996-2005

Sabbatical Positions

Department of Statistics, La Trobe University, Bundoora, Victoria, Australia, 1986
Institut national de la santé et de la recherche médicale, Paris, France, 1977-78

Other Positions

Special Graduate Faculty, Department of Mathematics and Statistics, University of Guelph, from May, 2009

Courses Taught

Introductory statistics, Introductory probability, Linear algebra, Engineering statistics, Engineering probability, Operations research, Survey sampling methods, Stochastic processes, Regression, Nonparametric methods, Biostatistics, Foundations of statistics (graduate), Multivariate analysis, Categorical data analysis, Generalized linear models, Advanced applied statistics, Seminar report writing, Bayesian methods, Markov chain Monte Carlo, Classification and regression trees, Case studies, Survival analysis, Statistical models and methods for financial markets.

Research Interests and Areas of Publication

Analysis of fisheries length-frequency data, Analysis of fisheries mark-recapture data, Non-linear estimation, Mixture distributions, Statistical computing, Programming in the R language, Branching-process models for cell proliferation.

Survey Design and Analysis

Hamilton Academy of Dentistry, Symphony Hamilton, Christ’s Church Cathedral, Ontario Potato Board.

Software Development

Software for length-frequency analysis and other mixture distribution applications.

United States Environmental Protection Agency

Appointed to the Science Review Board of the Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel (US EPA FIFRA SAP) to serve on panels several times a year, giving expertise in nonlinear modelling, simulation and general statistical issues. These panels are public hearings to review methodology proposed by the EPA. Panel reports are listed below under Publications.

Statistical Society of Canada

Numerous offices since 1979, including Program Chair 1980, Treasurer 1981-84, *Liaison* Managing Editor 1988-91, President-Elect 1989-90, President 1990-91, Past President 1991-92, Local Arrangements Chair 2002, Web Editor 2000-2008, Electronic Services Manager 2007-2008. Awarded the SSC Service Award in 1989 “in recognition of his outstanding contributions to the Statistical Society of Canada as Treasurer, Membership Directory Editor, Conference Program Chair and Chair or Member of many important Committees, and as an architect, activist and participant in many Society activities.”

International Biometric Society

Local Organising Committee Chair for IBC 1994 in Hamilton, Canada; IBS Council Member 1999-2004; Member Local Organizing Committee for IBC 2006 in Montreal, Canada. Elected to the Regional Committee of the Eastern North American Region (ENAR RECOM) 2008-2010.

Graduate Supervision

Liu, Zhihui Amy (2010). M.Sc. “Bayesian Mixture Models”

Fill, Roxanne (2007). M.Sc. “Variants of the Receiver Operating Characteristic (ROC) curve with applications to meta-analysis”

Yu, Yongmin (2007). Ph.D. (committee member) “Some problems in statistical process control”

Neupane, Binod (2005). M.Sc. “Optimal subsampling of finite mixture distribution”

Gao, Ruochu (2004). M.Sc. “An EM algorithm for estimation of finite mixture distributions with censored grouped data and conditional data”

Ng, William (2004). Ph.D. (Electrical and Computer Engineering – committee member) “Advances in wideband array signal processing using numerical Bayesian methods”

Du, Juan (2002). M.Sc. “Combined algorithms for constrained estimation of finite mixture distributions with grouped data and conditional data”

Ljubcic, Svetlana (2001). M.Sc. “Behaviour scoring: A government student loan recovery model”

Sigouin, C.S. (1999). M.Sc. “Great Lakes Fish Eaters Project: Analysis of data on individuals eating Great Lakes fish”

S.H. Steiner, S.H. (1992). Ph.D. (Business– committee member) “Control charting techniques based on grouped data”

Mangal, Milton (1990). M.Sc. “EM algorithm: constrained estimation of mixture normal distributions”

Chaput, G. (1988). M.Sc. (Université de Moncton – committee member) “Composition temporelle, géographique et aléatoire des caractères scalimétriques du saumon Atlantique: impact sur la discrimination des stocks”

Ambagaspitya, R. (1987). Ph.D. (committee member) “MML estimators and robust classification and linear regression procedures”

Ng, E.M. (1985). M.Sc. “Prognostic measures for infertile couples: analysis of data from an infertility clinic”

Green, P.E.J. (1984). M.Sc. “An analysis of mark-recapture data from coded wire tagging of hatchery-raised salmon, using log-linear models and graphics”

Lewis, M.E. (1983). M.Sc. “Spatial analysis applied to archaeological data”

Rayburn, H. (1983). Ph.D. (Biology– committee member) “The development of aberrant and normal axon-Schwann cell relationships as elucidated by mutant-normal chimaeras”

Waylen, P. (1982). Ph.D. (Geography– committee member) “Analysis of high flows in the Fraser drainage basin, British Columbia”

Bentley, M.M. (1977). Ph.D. (Biology– committee member) “Genetic studies of some spontaneously arising differences in aerialogenesis between *Neurospora Crassa* strains”.

Stitt, L.W. (1977). M.Sc. “Estimation methods for determining failure rates of component families”

Mekawi, M.A. (1976). M.Sc. “A new non-linear programming algorithm for statistical analysis of mixed normal distributions with new statistical information matrices”

Heath, R.A. (1976). Ph.D. (Psychology– committee member) “Response time models for temporal order discrimination”

Cole, T.J. (1970). B.Phil. (University of Oxford) “Some applications of multivariate analysis in comparative physiology”

Gilchrist, R. (1970). B.Phil (University of Oxford) “An appointment system with unpunctuality”

Publications

Books

Valleron, A.J. & Macdonald, P.D.M. (eds.) *Biomathematics and Cell Kinetics. Based on a Workshop held at Université Paris 7, February 27-28, 1978. Developments in Cell Biology, Vol. 2.* Elsevier/North-Holland Biomedical Press, xxvii + 431 pp. [For reviews, see: A.G. Hawkes, J.R. Statist. Soc. A 142, p. 390 (1979); G.G. Steel, *Biometrics* 35, pp. 531-532 (1979); MR 80f:92009]. (1978).

In preparation

Zweigenbaum, L., Macdonald, P.D.M. and Walter, S.W. (2007). Binomial model fitting to assess for heterogeneity in the segregation ratio of complex human traits. To be submitted to *Genetic Epidemiology*.

Submitted

Published in refereed journals

Young, Jennifer A. M., Marentette, Julie R., Gross, Caroline, McDonald, James I., Verma, Aikta, Marsh-Rollo, Susan, Macdonald, Peter D. M., Earn, David J. D., and Balshine, Sigal (2010). *Demography and*

substrate affinity of the round goby (*Neogobius melanostomus*) in Hamilton Harbour. *Journal of Great Lakes Research* 36 (1): 115-122. doi:10.1016/j.jglr.2009.11.001.

Smith, David R., Mandt, Mary T., & Macdonald, Peter D. M. (2009). Proximate causes of sexual size dimorphism in horseshoe crabs (*Limulus polyphemus*) of the Delaware Bay. *Journal of Shellfish Research* 28 (2): 1-13.

Wheeler, J. P., Purchase, C. F., Macdonald, P. D. M., Fill, R., Jacks, L., Wang, H., and Ye, C. (2009). Temporal changes in maturation, mean length-at-age, and condition of spring-spawning Atlantic herring (*Clupea harengus*) in Newfoundland waters. *ICES Journal of Marine Science* 66(8): 1800-1807. doi: 10.1093/icesjms/fsp117

Chase-Topping, Margo E., McKendrick, Iain J., Pearce, Michael C., Macdonald, Peter, Matthews, Louise, Halliday, Jo, Allison, Lesley, Fenlon, Dave, Low, J. Christopher, Gunn, George and Woolhouse, Mark E. J. (2007). Risk factors for the presence of high-level shedders of *Escherichia coli* O157 on Scottish farms. *Journal of Clinical Microbiology* 45 (5): 1594-1603.

Farruggia, J., Macdonald, P.D.M. and Viveros, R. (2000). Case study in data analysis: Vocalization differences among three harp seal herds. Who made the call? Classification based on logistic regression and trees. *The Canadian Journal of Statistics* 28 (1): 197-205.

Arey, M. J., Baetz, B. W., Macdonald, P. D. M. and Byer, P. H. (1993). Use of mixed probability distributions for the analysis of solid waste generation data. *Waste Management and Research* 11: 387-402.

Grün, R. and Macdonald, P. D. M. (1989). Non-linear fitting of TL/ESR dose-response curves. *Applied Radiation and Isotopes* 40 (10-12): 1077-1080.

Green, P. E. J. and Macdonald, P. D. M. (1987). Analysis of mark-recapture data from hatchery-raised salmon using log-linear models. *Canadian Journal of Fisheries and Aquatic Sciences* 44: 316-326.

Rotstein, J., Macdonald, P. D. M., Rabes, H. M. and Farber, E. (1984). Cell cycle kinetics of hepatocytes in early putative preneoplastic lesions in hepatocarcinogenesis. *Cancer Research* 44: 2913-2917.

Schwartz, D., Macdonald, P.D.M. & Heuchel, V. (1981). On the relationship between the number of spermatozoa and the probability of conception. *Reproduction, Nutrition, Développement* 21, 979-988.

Macdonald, P.D.M. & Smith, H.D. (1980). Mark-recapture estimation of salmon smolt runs. *Biometrics* 36, pp. 401-417.

Schwartz, D., Macdonald, P.D.M. & Heuchel, V. (1980). Fecundability, coital frequency and the viability of ova. *Population Studies* 34, pp. 397-400.

Klein, B. & Macdonald, P.D.M. (1980). The multitype continuous-time Markov branching process in a periodic environment. *Adv. Appl. Prob.* 12, pp. 81-93. [MR 81b: 60082; STMA 22/518].

Duhoux, E. & Macdonald, P.D.M. (1979). Analyse biostatistique du développement cellulaire du tube pollinique, au cours de la gamétogenèse mâle expérimentale du *Juniperus communis* (Cupressacées). *Can. J. Bot.* 57, pp. 1754-1760.

Chang, W.W.L. and Mak, K.M. & Macdonald, P.D.M. (1979). Cell population kinetics of 1, 2-dimethylhydrazine-induced colonic neoplasms and their adjacent colonic mucosa in the mouse. *Virchows Archiv B. Cell Pathology* 30, pp. 349-361.

- Macdonald, P.D.M. & Pitcher, T.J. (1979). Age-groups from size-frequency data: A versatile and efficient method of analyzing distribution mixtures. *J. Fish. Res. Board Can.* 36, pp. 987-1001. [STMA 21/2252].
- Hartmann, N.R., Gilbert, C.W., Jansson, B., Macdonald, P.D.M., Steel, G.G., & Valleron, A.-J. (1975). A comparison of computer methods for the analysis of fraction labelled mitoses curves. *Cell Tissue Kinet.* 8, pp. 119-124.
- Chan, W.W.-C., Mort, J.S., Chong, D.K.K. & Macdonald, P.D.M. (1973). Studies on protein subunits. III. Kinetic evidence for the presence of active subunits during the renaturation of muscle aldolase. *J. Biol. Chem.* 248, pp. 2778-2784.
- Pitcher, T.J. & Macdonald, P.D.M. (1973). A numerical integration method for fish population fecundity. *J. Fish. Biol.* 5, pp. 549-553.
- Pitcher, T.J. & Macdonald, P.D.M. (1973). Two models for seasonal growth in fishes. *J. Appl. Ecol.* 10, pp. 599-606.
- Barlow, P.W. & Macdonald, P.D.M. (1973). An analysis of the mitotic cell cycle in the root meristem of *Zea mays*. *Proc. R. Soc. Lond.* B183(1073), pp. 385-398.
- Bartlett, M.S. & Macdonald, P.D.M. (1971). Statistical estimation of the derivatives of density functions. *Nature Physical Science (Lond.)* 229(4), pp. 125-126.
- Macdonald, P.D.M. (1971). Comment on "An estimation procedure for mixtures of distributions" by Choi and Bulgren. *J.R. Statist. Soc.* B33, pp. 326-329. [STMA 13/889].
- Macdonald, P.D.M. (1970). Statistical inference from the fraction labelled mitoses curve. *Biometrika*, 57, pp. 489-503. [MR 43#1376; STMA 12/663].
- Macdonald, P.D.M. & Cheng, L. (1970). A method of testing for synchronization between host and parasite populations. *J. Anim. Ecol.* 39, pp. 321-331.
- Bartlett, M.S. & Macdonald, P.D.M. (1968). "Least-squares" estimation of distribution mixtures. *Nature (Lond.)* 217(5124), 195-196.

Invited Papers Published in Full in Refereed Conference Proceedings

- Macdonald, P.D.M. (1992). Practical aspects of fitting mixture distributions to data, *American Statistical Association: 1991 Proceedings of the Biopharmaceutical Section*, pp. 78-83.
- Macdonald, P.D.M. (1987). Analysis of length-frequency distributions. In *Age and Growth of Fish*. (Ed. R.C. Summerfelt & G.E. Hall), pp. 371-384. Iowa State University Press, Ames, Iowa.
- Macdonald, P.D.M., Smith, H.D., and Jantz, L. (1987). The utility of Babine smolt enumerations in management of Babine and other Skeena River Sockeye Salmon (*Oncorhynchus nerka*) stocks. In *Sockeye Salmon (Oncorhynchus nerka) Population Biology and Future Management* (Ed. H.D. Smith, L. Margolis, C.C. Wood), pp. 280-295. Canadian Special Publications in Fisheries and Aquatic Sciences 96. Invited Papers Published in Full in Other Conference Proceedings
- Macdonald, P.D.M. (1981). Towards an exact analysis of stathmokinetic and continuous-labelling experiments. In *Biomathematics and Cell Kinetics*, (Ed. M. Rotenberg), pp. 125-142. Elsevier/North-Holland Biomedical Press.

Macdonald, P.D.M. (1981). Measuring circadian rhythms in cell populations. In *The Mathematical Theory of the Dynamics of Biological Populations II*. (Ed. R.W. Hiorns & D. Cooke), pp. 281-306, Academic Press. [Institute of Mathematics and its Applications Conference, July 1980].

Macdonald, P.D.M. (1978). Age distributions in the general cell kinetic model. In *Biomathematics and Cell Kinetics*, (Ed., A.-J. Valleron and P.D.M. Macdonald), pp. 3-20. Elsevier/North-Holland Biomedical Press.

Macdonald, P.D.M. (1975). The distribution of DNA in exponentially-growing cell populations. In *Perspectives in Probability and Statistics: Papers in honour of M.S. Bartlett on the occasion of his sixty-fifth birthday*. (Ed. J. Gani), pp. 387-401. Applied Probability Trust & Academic Press. [MR 54#2246].

Macdonald, P.D.M. (1973). On the statistics of cell proliferation. In *The Mathematical Theory of the Dynamics of Biological Populations*. (Ed. M.S. Bartlett & R.W. Hiorns), pp. 303-314. Academic Press. [Institute of Mathematics and its Applications Conference, September 1972].

Contributed Papers Published in Full in Conference Proceedings

Macdonald, P.D.M. (1975). Estimation of finite distribution mixtures. In *Applied Statistics: Proceedings of the Conference at Dalhousie University, Halifax, May 2- 4, 1974*. (Ed. R.P. Gupta), pp. 231-245. North-Holland. [MR 54#11854].

Macdonald, P.D.M. (1974). Stochastic models for cell proliferation. In *Mathematical Problems in Biology, Victoria Conference* (Ed. P. van den Driessche), pp. 155-163. Lecture Notes in Biomathematics, Volume 2. Springer-Verlag. [University of Victoria Conference May 1973]. [MR 49#10392].

Reports of the United States Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel.

SAP Report No. 2010-06, FIFRA Scientific Advisory Panel Meeting, July 20-22, 2010. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: SHEDS-Multimedia version 4, Peer consult on PBPK Modeling, and a SHEDS-PBPK Permethrin study.

SAP Report No. 2009-10, FIFRA Scientific Advisory Panel Meeting, October 6-9, 2009. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Evaluation of Updated Standard Operating Procedures for Residential Exposure Assessment.

SAP Report No. 2009-02, FIFRA Scientific Advisory Panel Meeting, December 2-4, 2008. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: The Agency's Evaluation of Worker Reentry Exposure Assessment.

SAP Report No. 2008-02, FIFRA Scientific Advisory Panel Meeting, February 5-8, 2008. The Agency's Proposed Action Under FIFRA 6(b) Notice of Intent to Cancel Carbofuran.

SAP Report No. 2007-06, FIFRA Scientific Advisory Panel Meeting, August 14-15, 2007. Review of EPA/ORD/NERL's SHEDS-Multimedia Model, aggregate version 3.

SAP Report No. 2007-03, FIFRA Scientific Advisory Panel Meeting, January 9-12, 2007. Review of Worker Exposure Assessment Methods.

SAP Report No. 2007-02, FIFRA Scientific Advisory Panel Meeting, November 15-16, 2006. Studies Evaluating the Impact of Surface Coatings on the Level of Dislodgeable Arsenic, Chromium and Copper from Chromated Copper Arsenate (CCA)-Treated Wood.

SAP Report No. 2005-04, FIFRA Scientific Advisory Panel Meeting, August 23-26, 2005. Preliminary N-methyl Carbamate Cumulative Risk Assessment.

SAP Report No. 2005-03, FIFRA Scientific Advisory Panel Meeting, December 3, 2004. The N-methyl Carbamate Cumulative Risk Assessment: Strategies and Methodologies for Exposure Assessment.

SAP Report No. 2005-02, FIFRA Scientific Advisory Panel Meeting, December 2, 2004. Use of Pharmacokinetic Data to Refine Carbaryl Risk Estimates from Oral and Dermal Exposure.

SAP Report No. 2005-01, FIFRA Scientific Advisory Panel Meeting, February 15-18, 2005. N-methyl Carbamate Cumulative Risk Assessment: Pilot Cumulative Analysis.

SAP Report No. 2005-01, FIFRA Scientific Advisory Panel Meeting, November 30-December 1, 2004. Dimethoate: Issues Related to the Hazard and Dose Response Assessment.

SAP Report No. 2004-08, FIFRA Scientific Advisory Panel Meeting, September 9-10, 2004. Fumigant Bystander Exposure Model Review: SOil Fumigant Exposure Assessment System (SOFEA) Using Telone as a Case Study.

SAP Report No. 2004-04, FIFRA Scientific Advisory Panel Meeting, April 29-30, 2004. A Model Comparison: Dietary and Aggregate Exposure in Calendex, CARES, and Lifeline.

SAP Report No. 2004-03, FIFRA Scientific Advisory Panel Meeting, March 30-31, 2004. Refined (Level II) Terrestrial and Aquatic Models for Probabilistic and Ecological Assessment of Pesticides: Terrestrial.

SAP Report No. 2004-01, FIFRA Scientific Advisory Panel Meeting, April 1-2, 2004. Refined (Level II) Terrestrial and Aquatic Models for Probabilistic and Ecological Assessment of Pesticides: Level II Aquatic Session.

SAP Report No. 2003-06, FIFRA Scientific Advisory Panel Meeting, December 11-12, 2003. Physiologically-Based Pharmacokinetic/Pharmacodynamic Modeling: Preliminary Evaluation and Case Study for the N-Methyl Carbamate Pesticides: A Consultation

SAP Report No. 2003-04, FIFRA Scientific Advisory Panel Meeting, December 3-5, 2003. Draft Preliminary Probabilistic Exposure And Risk Assessment For Children Who Contact CCA-Treated Wood On Playsets And Decks And CCA-Containing Soil Around These Structures

SAP Report No. 2002-06, FIFRA Scientific Advisory Panel Meeting, August 30, 2002. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Stochastic Human Exposure and Dose Simulation Model (SHEDS): System Operation Review of a Scenario Specific Model (SHEDS-Wood) to Estimate Children's Exposure and Dose to Wood Preservatives from Treated Playsets and Residential Decks Using EPA's SHEDS Probabilistic Model.

SAP Report No. 2002-02, FIFRA Scientific Advisory Panel Meeting, April 30-May 1, 2002. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Cumulative and Aggregate Risk Evaluation System (CARES)TM Model Operation Review

SAP Report No. 2002-01, FIFRA Scientific Advisory Panel Meeting, February 5-7, 2002. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Methods Used To Conduct A Preliminary Cumulative Risk Assessment For Organophosphate Pesticides; Session 1: Hazard And Dose Response Analysis; Session 2: Assessment Of Food Exposure; Session 3: Assessment

Of Drinking Water Exposure; Session 4: Assessment Of Residential/Non-Occupational Exposure; Session 5: Risk Characterization.

SAP Report No. 2001-13. FIFRA SAP Meeting December 11-12, 2001. A set of scientific issues being considered by the EPA regarding: Session 1: Applicability of the Local Lymph Node Assay in Dermal Sensitization Testing; Session 2: Applicability of the Up and Down Procedure Methodology for Acute Oral Toxicity Testing.

SAP Report No. 2001-12. FIFRA SAP Meeting October 23-25, 2001. A set of scientific issues being considered by the EPA regarding: Preliminary Evaluation of the Non-dietary Hazard and Exposure to Children from Contact with Chromated Copper Arsenate (CCA)-treated Wood Playground Structures and CCA-Contaminated Soil.

SAP Report No. 2001-10. FIFRA SAP Meeting September 5-6, 2001. A set of scientific issues being considered by the EPA regarding: Preliminary Cumulative Hazard and Dose-Response Assessment for Organophosphorus Pesticides: Determination of Relative Potency and Points of Departure for Cholinesterase Inhibition.

SAP Report No. 2001-05. FIFRA SAP Meeting December 7-8, 2000. A set of scientific issues being considered by the EPA regarding: A Case Study of the Cumulative Risk of 24 Organophosphate Pesticides. Session I - Cumulative Risk Assessment for Dietary (Food) Exposure; Session II- Cumulative Risk assessment for Residential Exposure.

SAP Report No. 2000-03. FIFRA SAP Meeting September 27-28, 2000. A set of scientific issues being considered by the EPA regarding: Session III - Models - Residential Exposure Models (Rex); Session IV - Models - Calendex; Session V - Models - Residential Exposure Models (LifeLine).

SAP Report No. 2001-04. FIFRA SAP Meeting September 27-28, 2000. A set of scientific issues being considered by the EPA regarding: Session II – End Point Selection and Determination of Relative Potency in Cumulative Hazard Assessment: A Pilot Study of Organophosphorus Chemicals.

SAP Report No. 2000-01, May 25, 2000. FIFRA SAP Meeting February 29-March 3, 2000. A set of scientific issues being considered by the EPA regarding: Session II - Dietary Exposure Evaluation Model (DEEM) and MaxLIP (Maximum Likelihood Imputation Procedure) Pesticide Residue Decompositing Procedures and Software; Session III - Dietary Exposure Evaluation Model (DEEM).

Software

Macdonald, Peter and Du, Juan (2008). mixdist: Finite Mixture Distribution Models. R package version 0.5-2. <http://www.r-project.org>, <http://www.math.mcmaster.ca/peter/mix/mix.html>

Recent Presentations

“The EM algorithm for finite mixtures with subsampling”, Statistical Society of Canada Annual Meeting, London, ON, May 30, 2006. Contributed talk.

“An R package for finite mixture distributions”, Department of Biostatistics and Epidemiology, The University of Western Ontario, January 20, 2006. Invited Seminar.

“An R package for finite mixture distributions”, Department of Mathematics & Statistics, York University, October 27, 2005. Invited Seminar.

“An R package for finite mixture distributions”, Department of Epidemiology, Biostatistics, and Occupational Health, McGill University, January 31, 2005. Invited Seminar.

“An R package for finite mixture distributions”, International Biometric Conference, Cairns, Australia, July 11-16, 2004. Contributed talk.

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