

Michael Patrick Brian Gallagher

Nationality: Canadian

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Education

- Ph.D. in Statistics, 2020, Department of Mathematics and Statistics, McMaster University.
- M.Sc. in Statistics, 2017, Department of Mathematics and Statistics, McMaster University.
- B.Sc. in Mathematics and Statistics (Statistics Specialization), 2015, Summa cum Laude, Department of Mathematics and Statistics, McMaster University.

Employment

- Assistant Professor, Baylor University. January 2021-present.
- Banting Postdoctoral Fellow, McMaster University. April 2020–January 2021.
- Research Assistant for Dr. Paul McNicholas, McMaster University. September 2019–March 2020.
- Teaching Assistant, McMaster University. September 2016–September 2019.
- Research Assistant for Dr. Angelo Canty, NSERC Undergraduate Student Research Award, McMaster University. May 2014–August 2014 and May 2015–August 2015.
- Marker, Stats2D03, Summer Term course, McMaster University. July 2014–August 2014.
- Research Assistant for Dr. Mackenzie Wang, NSERC Undergraduate Student Research Award, McMaster University. May 2013–August 2013.
- Research Assistant for Dr. Reza Nejat, McMaster University. May 2012–August 2012.
- Relief Organist for a variety of churches (Knox Presbyterian, Waterdown; Christ’s Church Anglican, Flamborough; Trinity Anglican, Cambridge). No set schedule but rather to provide music during services when the organist is absent. 2011–Present.

Teaching Experience

- Currently Teaching at Baylor: STA 3381
- Winter School on Computational Data Science and Optimization, Fields Institute, Toronto, November 2019.
- At McMaster: Teaching assistant for: Stats 1L03, 2D03, 2MB3, Math 1C03, 1LS3, 1LT3.

Academic Service

- The Classification Society Representative to IFCS 2024.
- Elected Director of The Classification Society (2021-present).

Awards & Honours

- Helga and Wolfgang Gaul Stiftung Award, The International Federation of Classification Societies, 2022.
- Distinguished Dissertation Award, The Classification Society, 2021.

- The Governor General’s Academic Gold Medal, McMaster University, 2020.
From gg.ca: “The Governor General’s Academic Medal was first awarded in 1873 by the Earl of Dufferin, and has since become one of the most prestigious awards that a student in a Canadian educational institution can receive.”
- Banting Postdoctoral Fellowship, NSERC, 2020.
From <https://banting.fellowships-bourses.gc.ca/en/home-accueil.html>: “The Banting Postdoctoral Fellowships program provides funding to the very best postdoctoral applicants, both nationally and internationally, who will positively contribute to the country’s economic, social and research-based growth.”
- James Stewart Award, McMaster University, 2019.
- MacDATA Graduate Fellowship, McMaster University, 2018.
- Student Delegate to the Commonwealth Science Conference, Royal Society, 2017.
- Vanier Canada Graduate Scholarship, NSERC, 2016.
From <http://www.vanier.gc.ca/en/home-accueil.html>: “The Government of Canada launched the Vanier Canada Graduate Scholarships (Vanier CGS) program in 2008 to strengthen Canada’s ability to attract and retain world-class doctoral students and establish Canada as a global centre of excellence in research and higher learning. Vanier Scholars demonstrate leadership skills and a high standard of scholarly achievement in graduate studies in the social sciences and/or humanities, natural sciences and/or engineering and health.”
- Canada Graduate Scholarship-Masters Program, NSERC, 2015.
- Milos Novotny Fellowship, McMaster University, 2015.
- Provost’s Honour Roll Medal, McMaster University, 2014 and 2015.
- H.L. Jackson Memorial Scholarship, Department of Mathematics and Statistics, McMaster University, 2014.
- NSERC Undergraduate Research Award, McMaster University, Summers of 2013–2015
- Dr. Harry Lyman Hooker Scholarship, McMaster University, 2013 and 2014.
- G. and L. Keys Scholarship, Department of Mathematics and Statistics, McMaster University, 2013.
- Achievement Award of Excellence, Centre for Student Development, McMaster University, 2012–2014
- S.L. Squire Scholarship, Department of Mathematics and Statistics, McMaster University, 2012.
- The Governor General’s Academic Bronze Medal, Glendale Secondary School, 2011.

Research Interests

Big data; classification; clustering; computational statistics; data science; EM algorithm; matrix variate distributions; mixture models; non-Gaussian mixtures.

Research Funding

Agency, Program	Total	Year(s)
National Science Foundation, (SCORE Project),	\$1,200,000	2022-present
NSERC, Banting Postdoctoral Fellowship	\$70,000	2020
McMaster University, James Stewart Award	\$1,500	2019
McMaster University, MacDATA Fellowship	\$7,500	2018
NSERC, Vanier Canada Graduate Scholarship	\$150,000	2016–19
NSERC, Canada Graduate Scholarship- Masters Program	\$17,500	2015

Peer Reviewed Articles: Published or Finally Accepted

- [1] Gallaughar, M.P.B., Zhu, X. (2024), ‘Modelling matrix variate time series via hidden Markov models with skewed emissions’, *Statistical Analysis and Data Mining*, In press.
- [2] Gallaughar, M.P.B., McNicholas, P.D. (2023), ‘Clustering and semi-supervised classification for clickstream data via mixture models’, *Canadian Journal of Statistics* DOI: 10.1002/cjs.11795.
- [3] Pocuca, N., Gallaughar, M.P.B., Clark, K.M., McNicholas, P.D. (2023), ‘Visual assessment of matrix-variate normality’, *Australian and New Zealand Journal of Statistics*, **65**(2) 152-165.
- [4] Dang, U.J., Gallaughar, M.P.B., Browne, R.P., McNicholas, P.D. (2023), ‘Model-based clustering and classification using mixtures of multivariate skewed power exponential distributions’, *Journal of Classification*, **40** 145-167.
- [5] Gallaughar, M.P.B., Biernacki, C., McNicholas, P.D. (2022), ‘Parameter-wise co-clustering for high-dimensional data’, *Computational Statistics*, **38** 1597-1619.
- [6] Gallaughar, M.P.B., Tomarchio, S.D., McNicholas, P.D., Punzo, A. (2022), ‘Model-based clustering via skewed matrix-variate cluster-weighted models’, *Journal of Statistical Computation and Simulation*, DOI: 10.1080/00949655.2022.2084093.
- [7] Tomarchio, S.D., Gallaughar, M.P.B., Punzo, A., and McNicholas, P.D. (2022), ‘Mixtures of matrix variate contaminated normal distributions’. *Journal of Computational and Graphical Statistics*, DOI: 10.1080/10618600.2021.1999825.
- [8] Gallaughar, M.P.B., Tomarchio, S.D., McNicholas, P.D., Punzo, A. (2021) ‘Multivariate cluster weighted models using skewed distributions’, *Advances in Data Analysis and Classification* DOI: 10.1007/s11634-021-00480-5.
- [9] Gallaughar, M. P. B. and McNicholas, P. D. (2020), ‘Mixtures of skewed matrix variate bilinear factor analyzers’. *Advances in Data Analysis and Classification*, **14**, 415-434.
- [10] Gallaughar, M.P.B. and McNicholas, P.D. (2019), ‘On fractionally-supervised classification: Weight selection and extension to the multivariate t -distribution’, *Journal of Classification*, **36**(2), 232–265.
- [11] Gallaughar, M.P.B and McNicholas, P.D. (2019), ‘Three skewed matrix variate distributions’, *Statistics and Probability Letters*, **145**, 103–109.
- [12] Morton, R.W., Sata, K., Gallaughar, M.P.B., Oikawa, S.Y., McNicholas, P.D., Fujita, S. and Phillips, S.M. (2018), ‘Muscle androgen receptor content but not systemic hormones is associated with resistance training-induced skeletal muscle hypertrophy in healthy, young men’, *Frontiers in Physiology*, **9**, 1373.
- [13] Gallaughar, M.P.B. and McNicholas, P.D. (2018), ‘Finite mixtures of skewed matrix variate distributions’, *Pattern Recognition*, **80**, 83–93.
- [14] Gallaughar, M.P.B. and McNicholas, P.D. (2017), Discussion of ‘Random-projection ensemble classification’ by Cannings and Samworth, *Journal of the Royal Statistical Society: Series B*, **79**(4), 1011–1012.
- [15] Gallaughar, M.P.B. and McNicholas, P.D. (2017), ‘A matrix variate skew- t distribution’, *Stat*, **6**(1), 160–170.
- [16] Gallaughar M., Canty A.J., Paterson A.D. (2016), ‘Factors associated with heterogeneity in microarray gene expression in peripheral blood mononuclear cells from large pedigrees.’, *BMC Proceedings*, **10**(7), 91–95.

- [17] Buzano, M., Dancer, A.S., Gallaughar, M., Wang, M. (2015), ‘Non-Kähler expanding Ricci solitons, Einstein metrics, and exotic cone structures’, *Pacific Journal of Mathematics*, **273**(2), 369–394.

Peer Reviewed Book Chapters

- [18] Gallaughar, M. P. B. and McNicholas, P. D. (2020). ‘Parsimonious mixtures of matrix variate bilinear factor analyzers’. In T. Imaizumi et al., editors, *Advanced Studies in Behaviormetrics and Data Science*. Springer, Singapore.

Articles in Proceedings

- [19] Gallaughar, M.P.B., McNicholas, P.D. (2018), ‘Mixtures of matrix variate bilinear factor analyzers’, *JSM 2018 Proceedings. Alexandria, VA: American Statistical Association*.

Peer Reviewed Articles: Submitted

- [20] Pocuca, N., Gallaughar, M.P.B., McNicholas, P.D., ‘Modelling Shanghai soil properties with finite mixtures of SU Johnson distributions’, *Advances in Data Analysis and Classification*, Submitted January 2024.
- [21] Sochaniwsky, A., Gallaughar, M.P.B., Tang, Y., McNicholas, P.D., ‘Flexible clustering with a sparse mixture of generalized hyperbolic distributions’, *Journal of Classification*. Resubmitted January 2024.
- [22] Gallaughar, M.P.B., Tait, P.A., McNicholas, P.D., ‘Four skewed tensor variate distributions’, *Stat*, Submitted December 2023.
- [23] Lee, J., Gallaughar, M.P.B., Herring, A.S., ‘Clustering spatial data with a mixture of skewed regression models’, *Technometrics*, Submitted November 2023.
- [24] Gallaughar, M.P.B., McNicholas, P.D., Melnykov, V., Zhu, X., ‘Skewed distributions or transformations? Modelling skewness for a cluster analysis’, *Computational Statistics* Submitted October 2023.
- [25] Alamer, E.M., Gallaughar, M.P.B., McNicholas, P.D., ‘A mixture model for skewed mixed-type data’, *Computational Statistics and Data Analysis* Submitted August 2023.
- [26] ‘Comparing costs and utilization between Airosti and five provider types for back and neck pain’, *Journal of Manipulative and Physiological Therapeutics*, Major revisions requested November 2023.
- [27] Tomarchio, S.D., Gallaughar M.P.B., ‘Mixtures of regressions using matrix-variate heavy-tailed distributions’, *Advances in Data Analysis and Classification*. Resubmitted July 2023.

Software:

- [1] Tomarchio, S.D., Gallaughar, M.P.B., Punzo, A., and McNicholas, P.D. (2021), ‘MatrixMixtures: Model-based clustering via matrix-variate mixture models’, R package version 1.0.0.
- [2] Gallaughar, M.P.B., and McNicholas, P.D. (2019), ‘MatSkew: Matrix skew-t parameter estimation’, R package version 0.1.5.
- [3] Gallaughar, M.P.B., and McNicholas, P.D. (2019), ‘ClickClustCont: Mixtures of continuous time Markov models.’, R package version 0.1.6.
- [4] Pocuca, N., Gallaughar, M.P.B., and McNicholas, P.D. (2019), ‘MatrixVariate.jl: A complete statistical framework for analyzing matrix variate data.’, Julia package version 0.2.0.

Contributed and Invited Presentations at Conferences, Meetings and Seminars

- (i) “Mixtures of regressions with matrix-variate heavy-tailed distributions”, Southern Regional Conference on Statistics (**Invited**), Waco, Texas, July 2023.
- (ii) “Mixtures of contaminated matrix variate normal distributions”, Joint Statistical Meetings, (**Invited**), Washington D.C., August 2022.
- (iii) “Four skewed tensor variate distributions”, International Federation of Classification Societies, Porto, Portugal, July 2022. (**Invited**)
- (iv) “Topics in Clustering and Classification”, The Classification Society Annual Meeting, Waterloo, Ontario, Canada, June 2022. (**Invited**).
- (v) “A parameter-wise co-clustering model for high-dimensional Gaussian data”, Southwest Data Science Conference, Waco, Texas, March 2022.
- (vi) “Outlier Detection in Higher Order Data Clustering”, McCollum Data Science Seminar, Baylor University, February 2022, (**Invited**).
- (vii) “Four skewed tensor variate distributions”, Conference of Texas Statisticians, Virtual Conference, October 2021, (**Invited**).
- (viii) “Parameter-wise co-clustering for high dimensional data”, 13th Scientific Meeting of The Classification and Data Analysis Group, Virtual Conference, September 2021, (**Invited**).
- (ix) “Cluster weighted modeling with skewed distributions”, University of Alberta Statistics Seminar, Virtual Seminar, March 2021, (**Invited**)
- (x) “Advances in cluster weighted modelling”, Statistics Seminar, Baylor University, Waco, Texas, February 2021, (**Invited**).
- (xi) “Advances in clustering and classification”, Statistics Seminar, McMaster University, Hamilton, Canada, November 2019, (**Invited**).
- (xii) “Relaxing the identically distributed assumption in Gaussian co-clustering for high dimensional data.”, Conference on Data Science, Fields Institute, Toronto, Canada, November 2019, (**Invited**).
- (xiii) “Skewed distributions or transformations? Incorporating skewness in a cluster analysis.”, 12th Scientific Meeting of The Classification and Data Analysis Group, Cassino, Italy, September 2019, (**Invited**).
- (xiv) “Skewed distributions or transformations? Accounting for skewness in cluster analysis.”, 16th Conference of The International Federation of Classification Societies, Thessaloniki, Greece, August 2019, (**Invited**).
- (xv) “Skewed distributions or transformations? Handling skewed data in a cluster analysis”, The Classification Society Annual Meeting, Edmonton, Alberta, June 2019.
- (xvi) “Mixtures of skewed matrix variate bilinear factor analyzers”, ERCIM 2018, Pisa, Italy, December 2018, (**Invited**).
- (xvii) “Finite mixtures of skewed matrix variate distributions”, The Classification Society Annual Meeting, Stoney Brook, Long Island, New York, June 2018.
- (xviii) “Matrix variate mixtures”, MTO Colloquium, Tilburg, The Netherlands, May 2018, (**Invited**).
- (xix) “Matrix variate mixtures”, INRIA Modal Seminar, Lille, France, April 2018, (**Invited**).

- (xx) “Clustering and semi-supervised classification for clickstream data via mixture models”, The Classification Society Annual Meeting, Santa Cruz, California, June 2017.
- (xxi) “Clustering and classification of clickstream data with applications in anti-terrorism”, The Commonwealth Science Conference, Singapore, June 2017 (**Invited**).
- (xxii) “Clustering clickstream data using a mixture of continuous time Markov models”, The International Conference on Statistical Distributions and Applications, Niagara Falls, Ontario, October 2016 (**Invited**).
- (xxiii) “Extending fractionally supervised classification to non-Gaussian mixture models”, The Classification Society Annual Meeting, St. Louis, Missouri, June 2016.
- (xxiv) “Extending fractionally supervised classification to non-Gaussian mixture models”, The Statistical Society of Canada Annual Meeting, St. Catherines, Ontario, May 2016.

Society Memberships:

- The Classification Society, 2016–present.
- Golden Key International Honour Society, 2012–present.

Non-Academic Interests

RCM refers to the Royal Conservatory of Music

- **Musical Instruments:** piano (up to RCM Grade 9), violin (up to RCM Grade 8), pipe organ.
- **Music Theory:** Intermediate History (RCM), Intermediate Harmony (RCM).
- **Sports:** Tennis and golf.