

# 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

- Elected Director of The Classification Society (2021-present).

## Awards & Honours

- The Governor General’s Academic Gold Medal, McMaster University, 2020.  
From [gg.ca](http://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)
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. and McNicholas, P. D. (2020), ‘Mixtures of skewed matrix variate bilinear factor analyzers’. *Advances in Data Analysis and Classification*, **14**, 415-434.

- [2] 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.
- [3] Gallaughar, M.P.B. and McNicholas, P.D. (2019), ‘Three skewed matrix variate distributions’, *Statistics and Probability Letters*, **145**, 103–109.
- [4] 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.
- [5] Gallaughar, M.P.B. and McNicholas, P.D. (2018), ‘Finite mixtures of skewed matrix variate distributions’, *Pattern Recognition*, **80**, 83–93.
- [6] 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.
- [7] Gallaughar, M.P.B. and McNicholas, P.D. (2017), ‘A matrix variate skew- $t$  distribution’, *Stat*, **6**(1), 160–170.
- [8] 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.
- [9] Buzano, M., Dancer, A.S., Gallaughar, M., Wang, M. (2015), ‘Non-Khler expanding Ricci solitons, Einstein metrics, and exotic cone structures’, *Pacific Journal of Mathematics*, **273**(2), 369–394.

### Peer Reviewed Book Chapters

- [10] 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.

### Peer Reviewed Articles: Submitted

- [11] Gallaughar, M.P.B., McNicholas, P.D. (2018), ‘Clustering and semi-supervised classification for clickstream data via mixture models’, arXiv preprint [arxiv1802.04849](https://arxiv.org/abs/1802.04849), *Annals of Applied Statistics*. Submitted January 2021.
- [12] Gallaughar, M.P.B., McNicholas, P.D., Melnykov, V., Zhu, X. (2020), ‘Skewed distributions or transformations? Modelling skewness for a cluster analysis.’, arXiv preprint [arXiv:2011.09152](https://arxiv.org/abs/2011.09152), *Advances in Data Analysis and Classification*. Submitted November 2020.
- [13] Gallaughar, M.P.B., Biernacki, C., McNicholas, P.D. (2020), ‘Relaxing the identically distributed assumption in Gaussian co-clustering for high dimensional data’, *Pattern Recognition Letters*. Submitted October 2020.
- [14] Dang, U.J., Gallaughar, M.P.B., Browne, R.P., McNicholas, P.D., ‘Model-based clustering and classification using mixtures of multivariate skewed power exponential distributions’, *Journal of Classification*. Major Revisions Requested, July, 2020.
- [15] Tomarchio, S.D., Gallaughar, M.P.B., Punzo, A., McNicholas, P.D., ‘Mixtures of contaminated matrix variate normal distributions’, *Journal of Computational and Graphical Statistics*. Submitted, June, 2020.

- [16] Gallaughar, M.P.B., Tang, Y., McNicholas, P.D., ‘Flexible clustering with a sparse mixture of generalized hyperbolic distributions’, *Journal of Classification*. Submitted, Major Revisions Requested, September 2020.

### Articles in Proceedings

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

### Pre-Prints

- [18] Pocuca, N., Gallaughar, M.P.B., Clark, K.M., McNicholas, P.D. (2019), ‘Assessing and visualizing matrix variate normality’, arXiv preprint [arXiv:1910.02859](https://arxiv.org/abs/1910.02859).

### Software:

- [1] Gallaughar, M.P.B., and McNicholas, P.D. (2019), ‘MatSkew: Matrix skew-t parameter estimation’, R package version 0.1.5.
- [2] Gallaughar, M.P.B., and McNicholas, P.D. (2019), ‘ClickClustCont: Mixtures of continuous time Markov models.’, R package version 0.1.6.
- [3] 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) “Advances in clustering and classification”, Statistics Seminar, McMaster University, Hamilton, Canada, November 2019, (**Invited**).
- (ii) “Relaxing the identically distributed assumption in Gaussian co-clustering for high dimensional data.”, Conference on Data Science, Fields Institute, Toronto, Canada, November 2019, (**Invited**).
- (iii) “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**).
- (iv) “Skewed distributions or transformations? Accounting for skewness in cluster analysis.”, 16th Conference of The International Federation of Classification Societies, Thessaloniki, Greece, August 2019, (**Invited**).
- (v) “Skewed distributions or transformations? Handling skewed data in a cluster analysis”, The Classification Society Annual Meeting, Edmonton, Alberta, June 2019.
- (vi) “Mixtures of skewed matrix variate bilinear factor analyzers”, ERCIM 2018, Pisa, Italy, December 2018, (**Invited**).
- (vii) “Finite mixtures of skewed matrix variate distributions”, The Classification Society Annual Meeting, Stoney Brook, Long Island, New York, June 2018.
- (viii) “Matrix variate mixtures”, MTO Colloquium, Tilburg, The Netherlands, May 2018, (**Invited**).
- (ix) “Matrix variate mixtures”, INRIA Modal Seminar, Lille, France, April 2018, (**Invited**).
- (x) “Clustering and semi-supervised classification for clickstream data via mixture models”, The Classification Society Annual Meeting, Santa Cruz, California, June 2017.

- (xi) “Clustering and classification of clickstream data with applications in anti-terrorism”, The Commonwealth Science Conference, Singapore, June 2017 (**Invited**).
- (xii) “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**).
- (xiii) “Extending fractionally supervised classification to non-Gaussian mixture models”, The Classification Society Annual Meeting, St. Louis, Missouri, June 2016.
- (xiv) “Extending fractionally supervised classification to non-Gaussian mixture models”, The Statistical Society of Canada Annual Meeting, St. Catherines, Ontario, May 2016.

### **Society Memberships:**

- Classification Society, 2016–present.
- Golden Key International Honour Society, 2012–present.
- Royal Canadian College of Organists, 2009–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, guitar, flute, clarinet, oboe.
- **Music Theory:** Intermediate History (RCM), Intermediate Harmony (RCM).
- **Sports:** Tennis and golf.

### **Referees**

- Dr. Paul McNicholas  
Professor & Canada Research Chair  
Department of Mathematics & Statistics,  
McMaster University,  
Hamilton, Ontario, Canada.  
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- Dr. Volodymyr Melnykov  
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