Michael Fop

CONTACT DETAILS

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University College Dublin
Belfield, Dublin 4, Ireland

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RESEARCH INTERESTS

Latent variable models, Statistical network analysis, Mixture models, Clustering and classification, Bayesian data modeling, High-dimensional data analysis, Dimension reduction, Interdisciplinary applications

CURRENT ACADEMIC POSITIONS

Lecturer/Assistant Professor in Statistics **2019 – Present**
School of Mathematics and Statistics, University College Dublin

Programme director of BSc/BA/BScSocSc in Statistics **2019 – Present**
School of Mathematics and Statistics, University College Dublin

EDUCATION

PhD in Statistics **2017**
University College Dublin
Supervisor: Prof. Thomas Brendan Murphy

Master's Degree in Finance and Statistics **2013**
with honors, University of Perugia

Bachelor's Degree in Economics **2010**
with honors, University of Perugia

PUBLICATIONS

Preprints and submitted papers

- Geremia S., **Fop M.**, De Stefano D. (2025). A density-based framework for community detection in attributed networks. *Under review*, *arXiv:2512.24336*.
- Casa A., Murphy T. B., **Fop M.** (2025). A latent variable model for identifying and characterizing food adulteration. *Under review*, *arXiv:2512.13939*.
- Geremia S., De Stefano D., **Fop M.** (2025). Community-level core-periphery structures in collaboration networks. *Under review*, *arXiv:2511.19305*.
- Sweeney J., Haslett J., Bandyopadhyay D., **Fop M.**, Parnell A. C. (2025). Zero and N-inflated overdispersed binomial models for sum-constrained Poisson count processes. *Under review*, *arXiv:1407.0064*.
- Clarke CJ, **Fop M.** (2025). A latent position co-clustering model for multiplex networks. *Under review*, *arXiv:2507.09370*.

- Fritz C., Rastelli R., **Fop M.**, Caimo A. (2025). Scalable durational event models: Application to physical and digital interactions. *Under review*, *arXiv:2504.00049*.
- Promskaia I., O'Hagan A., **Fop M.** (2024). Multiplex Dirichlet stochastic block model for clustering multidimensional compositional networks. *Under review*, *arXiv:2412.11971*.
- Pacheco Menezes T., Murphy T. B., **Fop M.** (2024). Hausdorff distance-based record linkage for improved matching of households and individuals in different databases. *Under review*, *arXiv:2404.05566*.

Published articles

- Gwee X. Y., Gormley I. C., **Fop M.** (2025). Model-based clustering for network data via a latent shrinkage position cluster model. *Network Science*, to appear.
- Promskaia I., O'Hagan A., **Fop M.** (2025). A Dirichlet stochastic block model for composition-weighted networks. *Computational Statistics and Data Analysis*, 211, 108204.
- Babu G., Gowen A., **Fop M.**, Gormley I. C. (2025). A consensus-constrained parsimonious Gaussian mixture model for clustering hyperspectral images. *Advances in Data Analysis and Classification*, 19, 323-359.
- Cappozzo A., Casa A., **Fop M.** (2025). Sparse model-based clustering of three-way data via lasso-type penalties. *Journal of Computational and Graphical Statistics*, 34(3), 1030-1050.
- Gwee X. Y., Gormley I. C., **Fop M.** (2025). A latent shrinkage position model for binary and count network data. *Bayesian Analysis*, 20(2), 405-433.
- Nagle M., Broderick H. C., Buganza Tepole A., **Fop M.**, Ní Annaidh A. (2024). A machine learning approach to predict in vivo skin growth. *Scientific Reports*, 14, 17456.
- Nagle M., Broderick H. C., Vedel C., Destrade M., **Fop M.**, Ní Annaidh A. (2024). A Gaussian process approach for rapid evaluation of skin tension. *Acta Biomaterialia*, 182:54-66.
- Gwee X. Y., Gormley I. C., **Fop M.** (2024). Variational inference for the latent shrinkage position model. *Stat*, 13(2), e685.
- Nagle M., Price S., Trotta A., Destrade M., **Fop M.**, Ní Annaidh A. (2023). Analysis of in vivo skin anisotropy using elastic wave measurements and Bayesian modelling. *Annals of Biomedical Engineering*, 51:1781–1794.
- D'Angelo, S., Alfò, M., **Fop M.** (2023). Model-based clustering for multidimensional social networks. *Journal of the Royal Statistical Society Series A: Statistics in Society*, 186(3) 481–507.
- Casa A., Cappozzo A., **Fop M.** (2022). Group-wise shrinkage estimation in penalized model-based clustering. *Journal of Classification*, 39:648–674.
- **Fop M.**, Mattei P-A., Bouveyron C., Murphy T.B. (2022). Unobserved classes and extra variables in high-dimensional discriminant analysis. *Advances in Data Analysis and Classification*, 16, 55–92.
- Rastelli R., **Fop M.** (2020). A stochastic blockmodel for interaction lengths. *Advances in Data Analysis and Classification*, 14, 485-512.
- O'Connor S., McCaffrey N., Whyte E.F., **Fop M.**, Murphy T.B., Moran K.A. (2020). Can the Y balance test identify those at risk of contact or non-contact lower extremity injury in adolescent and collegiate Gaelic games? *Journal of Science and Medicine in Sport*, 23(10) 943–948.
- **Fop M.**, Murphy T.B., Scrucca L. (2019). Model-based clustering with sparse covariance matrices. *Statistics and Computing*, 29(4), 791–819.
- O'Connor S., McCaffrey N., Whyte E.F., **Fop M.**, Murphy T.B., Moran K.A. (2018). Is poor Hamstring flexibility a risk factor for hamstring injury in Gaelic games? *Journal of Sport Rehabilitation*, 28(7), 677-681.
- **Fop M.**, Murphy T.B. (2018). Variable selection methods for model-based clustering. *Statistics Surveys*,12, 18-65.

- **Fop M.**, Smart K., Murphy T.B. (2017). Variable selection for latent class analysis with application to low back pain diagnosis. *Annals of Applied Statistics*, 11(4), 2085–2115.

- Scrucca L., **Fop M.**, Murphy T.B., Raftery A.E. (2016). mclust 5: Clustering, classification and density estimation using Gaussian finite mixture models. *The R Journal*, 8(1), 289-317.
  "Highly Cited Paper" by Web of Science – Among the top 100 most cited papers of the last 10 years in the field of Mathematics.

Discussion papers

- Casa A., **Fop M.**, D'Angelo S. (2025). Contributed discussion to *Sparse Bayesian factor analysis when the number of factors is unknown*, by Frühwirth-Schnatter S., Hosszejni D., Freitas Lopes, H. *Bayesian Analysis*, 20(1), 213-344.

- Wyse J., Ng J., White A., **Fop M.** (2024). Contributed discussion to *Root and community inference on the latent growth process of a network*, by Crane H., Hu M. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 86(4), 884–885.

- Casa A., **Fop M.**, Murphy T.B. (2021). Contributed discussion to *Centered partition processes: informative priors for clustering*, by Paganin S., Herring A.H., Olshan A.F., Dunson D.B. *Bayesian Analysis*, 16(1), 301-370.

Conference proceedings and other publications (peer-reviewed)

- Babu G., **Fop M.**, Gormley I. C., Melnykov, V. (2025). A matrix-variate mixture model for clustering weather data with seasonal trends. *Proceedings of the 39th International Workshop on Statistical Modelling*, ISBN: 978-1-0369-2711-0.

- Promskaia I., O'Hagan A., **Fop M.** (2025). A stochastic block model for compositional relational data with zeros: Application to the Erasmus exchange network. *Statistics for Innovation I - SIS 2025 Short Papers, Plenary, Specialized, and Solicited Sessions*, ISBN: 978-3-031-96735-1.

- Corsini N., **Fop M.** (2024). A Bayesian overlapping stochastic block model for clustering biographical networks. *Methodological and Applied Statistics and Demography - SIS 2024 Short Papers*, ISSN: 3049-2135.

- Casa A., Murphy T.B., **Fop M.** (2024). Sparse partial membership models with applications in food science. *Methodological and Applied Statistics and Demography - SIS 2024 Short Papers*, ISSN: 3049-2135.

- Promskaia I., O'Hagan A., **Fop M.** (2023). A compositional stochastic block model for the analysis of the Erasmus programme network. *CLADAG 2023 Book of Short Papers*, ISBN: 978-88-9193-563-2

- Casa A., T. B. Murphy, **Fop M.** (2023). Partial membership models for high-dimensional spectroscopy data. *CLADAG 2023 Book of Short Papers*, ISBN: 978-88-9193-563-2

- Casa A., Cappozzo A., **Fop M.** (2022). Penalized model-based clustering with group-dependent shrinkage estimation. *International Conference on Soft Methods in Probability and Statistics*, in *Building Bridges between Soft and Statistical Methodologies for Data Science. SMPS 2022. Advances in Intelligent Systems and Computing*, (1433) 73-78.

- Cappozzo A., Casa A., **Fop M.** (2021). Penalized model-based clustering for three-way data structures. *Book of short papers - SIS 2021*. ISBN: 978-88-9192-736-1.

- **Fop M.**, Karlis D., Kosmidis I., O'Hagan A., Ryan C., Gormley I. C. (2021). Gaussian mixture models for high dimensional data using composite likelihood. *CLADAG 2021 Book of Short Papers*, ISBN: 978-88-5518-340-6

- Cappozzo A., Casa A., **Fop M.** (2021). Model-based clustering with sparse matrix mixture models. *CLADAG 2021 Book of Short Papers*, ISBN: 978-88-5518-340-6

- D'Angelo S., **Fop M.** (2019). A latent space model for clustering in multiplex data. *CLADAG 2019 Book of Short Papers*, ISBN: 978-88-8317-108-6.
- Rastelli R., **Fop M.** (2019). A stochastic blockmodel for network interaction lengths over continuous time. *CLADAG 2019 Book of Short Papers*, ISBN: 978-88- 8317-108-6.
- **Fop M.**, Murphy T. B., Hanlon, L. (2017). Model-based clustering of data with measurement errors. *CLADAG 2017 Book of Short Papers*, ISBN: 978-88-99459-71-0.

Academic supervision

Current PhD students

- Felice Lamberti (visiting, Univ. of Bologna, co-supervision with Assoc. Prof. Saverio Ranciati)
  Bayesian multidimensional scaling for matrix-variate data
- Adam Kilroy (co-supervision with Prof. Aisling Ní Annaidh)
  Statistical and machine learning methods to predict skin growth
- Jincheng Luo (co-supervision with Dr Miriam Casey)
  Statistical and mechanistic models for the transmission of bovine tuberculosis
- Niyati Seth
  Advances in Bayesian optimization for combinatorial problems

Past PhD students

- Sara Geremia (visiting, Univ. of Trieste, co-supervision with Prof. Domenico de Stefano) **2026**
  Methods for the analysis of complex group formation mechanisms in attributed networks
- CJ Clarke **2026**
  Bayesian latent variable models for collections of networks
- Ganesh Babu (co-supervision with Prof. Claire Gormley) **2025**
  Model-based clustering and classification methods for high-dimensional data with spatial and temporal dependence
- Iuliia Promskaia (co-supervision with Prof. Adrian O'Hagan) **2025**
  Model-based clustering methods for networks with edge weights and node features
- Thais Pacheco (co-supervision with Prof. Brendan Murphy) **2025**
  Record linkage approaches for matching databases with nested records
- Matt Nagle (co-supervision with Prof. Aisling Ní Annaidh) **2025**
  Improving reconstructive surgery: Machine learning approaches for biomechanical skin assessment
- Noemi Corsini (visiting, Univ. of Padova, co-supervision with Prof. Giovanna Menardi) **2025**
  Advances in density-based clustering for complex data
- Gwee Xian Yao (co-supervision with Prof. Claire Gormley) **2024**
  Bayesian nonparametric models for network data

MSc students

To date I have supervised 15 MSc students working on research-oriented projects covering a range of methodological and applied topics, including latent variable models, statistical network analysis, and model-based clustering, in application to urban networks, quantitative bias analysis, software dependency networks, mixed data.

Grants and funding

Collaborator of the ERC Consolidator project *BreastRecon: A patient specific approach to tissue expansion in breast reconstruction*, PI Prof. Aisling Ní Annaidh **2025-2030**

Member of the Scientific Board of the ERC Starting Grant project *HABITAT: How European Big Cities and Legal Systems Trigger Urban Inequality*, PI Prof. Alessio Sardo **2023-2028**

Co-Investigator and **Named Supervisor** of the *Research Ireland Centre for Research Training (CRT) in Foundations of Data Science*, PI Prof. Claire Gormley **2019-2027**

Charlemont Grant, project *Sparse multivariate regression methods for high-dimensional heterogeneous data*, Royal Irish Academy **2019**

Conference and Workshops Grant, Science Foundation Ireland **2016**

Editorial activity

Associate editor of the journal **Statistical Methods and Applications** **2026 – Present**

Associate editor of the **Journal of Data Science, Statistics, and Visualisation** **2024 – Present**

Editorial board reviewer for the **Journal of Machine Learning Research** **2020 – Present**

Reviewer for a number of scientific journals in statistics, machine learning, and other fields, including: Advances in Data Analysis and Classification, AISTATS, Annals of Applied Statistics, Bioinformatics, Biometrika, Computational Statistics and Data Analysis, Journal of Computational and Graphical Statistics, Journal of Statistical Software, Journal of the American Statistical Association, Journal of the Royal Statistical Society (Series A and C), Journal of Machine Learning Research, Pattern Recognition, Scientific Reports, Statistical Analysis and Data Mining, Statistical Modelling, Statistics and Computing, Statistics in Medicine

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Academic and professional activities

Committees and societies

- **Member** of the executive committee of the Irish Statistical Association **2022 – Present**
- **Member** of the scientific committee of the 7th MBC2 workshop **2023-2024**
- **Member** of the Equality, Diversity, and Inclusion (EDI) committee, UCD School of Mathematics and Statistics **2022 – 2023**
- **Member** of the programme committee of IC2S2 2021 **2021**
- **Founding chair** of the Young Section of the Irish Statistical Association **2019 – 2021**

PhD examination

- **Chair**, Catherine Higgins, *Dynamic gene regulatory network construction from high-throughput time-course data*, supervisors Dr. Michelle Carey, Prof. Brendan Loftus, UCD **2025**
- **Chair**, Koyel Majumdar, *Novel mixture models for bounded, high-dimensional and dependent omics data*, supervisors Prof. Claire Gormley, Prof. Brendan Murphy, UCD **2025**
- **External examiner**, Francesco Barile, *Advances in Bayesian methods: Nonparametric network modeling and scalable computations*, supervisor Prof. Bernardo Nipoti, University of Milano-Bicocca **2024**
- **Chair**, Chaoyi Lu, *Bayesian Strategies for Complex Statistical Models*, supervisor Prof. Nial Friel, UCD **2023**
- **External examiner**, Edoardo Revivo, *Modelling and Classification With Quantile Based Distributions*, supervisor Prof. Cinzia Viroli, University of Bologna **2023**

- **External examiner**, Emiliano Seri, *Advances in Model Based Clustering for the Social Sciences*, supervisor Prof. Roberto Rocci, Sapienza University of Rome **2022**
- **External examiner**, Huynh Bao-Tuyen, *Estimation and Feature Selection in High-Dimensional Mixtures-of-Experts Models*, supervisor Prof. Faïcel Chamroukhi, Université de Caen Normandie **2019**

Miscellanea

- **Lead coordinator** of the seminar series *Statistics and Actuarial Science* and *Working Group in Statistical Learning* of the UCD School of Mathematics and Statistics **2019 – Present**
- **Research visit** at Université de Caen Normandie (France) **2019**

Membership to scientific societies

- American Statistical Association
- ISBA (International Society for Bayesian Analysis)
- Institute of Mathematical Statistics
- Irish Statistical Association
- Italian Statistical Society

Software

Advanced knowledge of the language for statistical computing R. Author of and contributor to the following packages:

- **covglasso**: Sparse covariance matrix estimation. [Link]
- **damda**: Dimension-adaptive mixture discriminant analysis. [Link]
- **expSBM**: Exponential stochastic block model for interaction lengths. [Link]
- **LCAvarsel**: Variable selection for latent class analysis. [Link]
- **mclust**: Gaussian finite mixture modelling. [Link]
- **mixggm**: Mixtures of Gaussian graphical models. [Link]
- **spaceNet**: Latent space models for multivariate networks. [Link]

Additional software is available at my GitHub page and linked in the "Publications" section of my personal website.

Awards

Classification Society Distinguished Dissertation Award, The Classification Society **2018**

Presentations (selected, last three years)

2026

- *Mixtures of factor analyzers for segmenting hyperspectral food images*, invited talk, IFCS 2026, University of Milano Bicocca (July)
- *Model-based clustering of networks with compositional edges*, invited talk, Bernoulli Society seminar series, online (March)

2025

- *Latent position co-clustering for multiple social networks*, invited talk, CMStatistics 2025, Birbeck University of London (December)

- *Latent space co-clustering for multiplex networks*,
  invited talk, Working Group on Model-based Clustering, Université Côte d'Azur (July)
- *A matrix-variate mixture model for clustering weather data with seasonal trends*,
  talk, International Workshop on Statistical Modelling, University of Limerick (July)
- *A stochastic block model for compositional relational data with zeros: Application to the Erasmus exchange network*,
  invited talk, SIS2025 Statistics for Innovation, University of Genoa (June)

2024

- *Model-based clustering of networks with compositional edges*,
  invited talk, Working Group on Model-based Clustering, University of Bologna (June)
- *Clustering high-dimensional spectroscopy data*,
  invited talk, 4th Int. Workshop on Spectroscopy and Chemometrics, VistaMilk (April)
- *Model-based clustering of networks with compositional edges*,
  seminar, MACSI, University of Limerick (March)

Teaching

Lecturer for a number of Statistics and Machine Learning modules at undergraduate, postgraduate and PhD level, all involving a significant component of data programming (mainly in R).

Courses in UCD

- Statistical Machine Learning (STAT30270/STAT40750) **2019 – Present**
- Machine Learning & AI (STAT41120/STAT40970) **2019 – Present**
- Statistical Modelling (STAT10060) **2018 – 2019**
- Data Modelling for Science (STAT20070) **2018 – 2019**
- Advanced Biostatistics (STAT40430) **2018 – 2019**

Other courses

- Statistical Machine Learning (PhD) **2023**
- Introduction to Statistical Network Analysis (PhD) **2022 – 2023**
- Hands on R (PhD) **2020 – 2022**
- Applied Model-based Clustering (PhD) **2019**

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