Curriculum Vitae: Dr Ben D. Fulcher

Contact Information

Dr Ben D. Fulcher
School of Physics
Physics Rd, Camperdown
NSW 2006 Australia

+61 481 563 731
ben.fulcher@sydney.edu.au
ORCID: 0000-0002-3003-4055
Google Scholar

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Positions Held

2017– Senior Lecturer in Brain Dynamics and Neurophysics, School of Physics, The University of Sydney.

2015–2017 NHMRC Early Career Fellow, Brain and Mental Health Laboratory, School of Psychological Sciences, Monash University.

2013–2014 Research Fellow (Computational and Experimental Neuroscience), Brain and Mental Health Laboratory, School of Psychological Sciences, Monash University.

Education

2008–2012 D.Phil., *'Highly comparative time-series analysis'*, Department of Physics, Oxford University.

2008 M.Sc., School of Physics, The University of Sydney.

2004–2007 B.Sc. (Adv.) (Hons.) with a University Medal, The University of Sydney. Majors: Physics, Nanoscience and Technology.

Grants (Major)

All amounts are given in AUD$:

2021 The University of Sydney School of Physics Grand Challenge: *Nanoscale brain navigation for targeted drug delivery* (2021–2022). CIs: **B.D. Fulcher**, S. Wickham. Total awarded: $250 000.

2020 NHMRC Ideas Grant: *Integrating theory-guided and data-driven approaches for measuring consciousness* (2020–2024). CIs: N. Tsuchiya, **B.D. Fulcher**, O. Carter, T. Andrillon, H. Hogendoorn. Grant ID: GNT1183280. Total awarded: $1 295 513.

2018 NHMRC Project Grant: *A dimensional approach to mapping the risk mechanisms of mental illness* (2018–2022). CIs: A. Fornito, M. Bellgrove, M. Yücel, **B.D. Fulcher**, Z. Hawi. Grant ID: GNT1146292. Total awarded: $1 654 808.

2015 NHMRC Early Career Fellowship (2015–2018): *From brain maps to mechanisms: modeling the pathophysiology of schizophrenia.* **B.D. Fulcher**. Grant ID: GNT1089718. Total awarded: $309 436.

Grants (Minor)

Grants listed in this section are internal grants, small amounts of money, or when listed as an associate (not chief) investigator.

2019 The University of Sydney and Fudan University Brain and Intelligence Science Alliance: *Neural oscillations across space and time: properties and functional roles.* CIs: P. Gong and J. Feng. AIs: P. Martin, P. Robinson, A. D'Rozario, M. Shine, B.D. Fulcher, T. Kao, S. Postnova, J. Gao. Total awarded: $280 000.

2019 The University of Sydney Shanghai Jiaotong University Mobility Scheme: *Physical, data-driven approaches for clinical neuroimaging.* CI: B.D. Fulcher. Total awarded: $5000.

2018 The University of Sydney Centre for Complex Systems' Emerging Aspirations Funding Scheme: *Complex systems perspectives on dementia: population modelling, networks and information processing.* CIs: B.D. Fulcher, J.M. Shine, J. Lizier. Total awarded: $12 500.

2018 Sydney Nanoscience Grand Challenge: *Molecular nano-robotics for health: navigating the body to diagnose and treat early disease.* CIs: Shelley Wickham and Anna Waterhouse. Total awarded: $300 000.

2018 Strategic Education Grant, Faculty of Science, University of Sydney: *A new interdisciplinary, project-based physics unit, PHYS3888.* CIs: B. Kuhlmey, M. Wheatland, B.D. Fulcher, Z. Kuncic, A. Tuniz. Total awarded: $11 904.

2017 Staff Travel Grant, School of Psychology, Monash University: **B.D. Fulcher**. Total awarded: $1800.

2016 Research Development Grant, Monash Institute of Cognitive and Clinical Neurosciences, Monash University: **B.D. Fulcher**. Total awarded: $10 000.

2016 CASS Foundation Travel Award to attend *25th Annual Computational Neuroscience Meeting, CNS 2016*: **B.D. Fulcher**. Total awarded: $2000.

2016 Research Development Grant, Deakin University, *An investigation of neuroplasticity in autism spectrum disorder (ASD) using brain stimulation and neuroimaging.* CIs: M. Kirkovski, P. Enticott. AIS: M. Berk, P. Fitzgerald, N. Rogasch, A. Fornito, **B.D. Fulcher**, and L. Oberman. Total awarded: $19 991.50.

2016 Monash University, School of Psychological Sciences Travel Grant: **B.D. Fulcher**. Total awarded: $1500.

2015 Psychology Research Initiative Fund, Monash University, *An innovative app-based platform for real-world health and behavior monitoring*: **B.D. Fulcher**, M. Yücel, A. Fornito, A. Carter, and G. Youssef. Total awarded: $11 121.

2015 Deakin Faculty Research Development Grant, *Understanding the social brain through functional neuroimaging and brain stimulation.* CIs: M. Kirkovski, P. Enticott. AIs: M. Berk, P. Fitzgerald, A. Fornito, N. Rogasch, **B.D. Fulcher**. Total awarded: $10 000.

2010 Balliol Interdisciplinary Institute Grant for founding the *Interdisciplinary Perspectives on Time Series* project, a weekly interdisciplinary seminar series on time-series analysis, Balliol College, University of Oxford. Total awarded: £850.

Publications

Equal contributions are indicated as *. Openly accessible work is denoted as . Links to preprints are given to published articles that are not openly accessible. Relevant open code resources related to publications are denoted as , datasets as , and websites as .

1. G. Shafiei, **B.D. Fulcher**, B. Voytek, T.D. Satterthwaite, S. Baillet, B. Misic. Neurophysiological signatures of cortical micro-architecture. *Nature Communications* (*accepted*, 2023).
   bioRxiv preprint .

2. O.M. Cliff, J.T. Lizier, N. Tsuchiya, **B.D. Fulcher**. Unifying pairwise interactions in complex dynamics. *Nature Computational Science* (*accepted*, 2023).
   arXiv preprint .

3. S. Chopra, S. Oldham, A. Segal, A. Holmes, K. Sabaroedin, E.R. Orchard, S.M. Francey, B. O'Donoghue, V. Cropley, B. Nelson, J. Graham, L. Baldwin, J. Tiego, H.P. Yuen, K. Allott, M. Alvarez-Jimenez, S. Harrigan, **B.D. Fulcher**, K. Aquino, C. Pantelis, S.J. Wood, M. Bellgrove, P. McGorry, A. Fornito. Network-based spreading of grey matter changes across different stages of psychosis. *JAMA Psychiatry* (*accepted*, 2023).
   medRxiv preprint

4. J.C. Pang, K.M. Aquino, M. Oldehinkel, P.A. Robinson, **B.D. Fulcher**, M. Breakspear, A. Fornito. Geometric constraints on human brain function. *Nature* (2023).
   Paper . *bioRxiv* preprint .

5. S. Suzuki, X. Zhang, A. Dezfouli, L. Braganza, **B.D. Fulcher**, L. Parkes, L.F. Fontenelle, B.J. Harrison, C. Murawski, C. Suo, M. Yücel. Individuals with problem gambling and obsessive-compulsive disorder learn through distinct reinforcement mechanisms. *PLoS Biology* **21**: e3002031 (2023).
   Paper .

6. A. Arnatkevičiūtė, R.D. Markello, **B.D. Fulcher**, B. Mišić, A. Fornito. Towards best practices for imaging transcriptomics. *Biological Psychiatry* **93**: P391 (2023).
   Paper . *OSF* preprint .

7. N. Decat, J. Walter, Z.H. Koh, P. Sribanditmongkol, **B.D. Fulcher**, J.M. Windt, T. Andrillon, N. Tsuchiya. Beyond traditional visual sleep scoring: massive feature extraction and data-driven clustering of sleep time series. *Sleep Medicine* **98**: 39 (2022).
   Paper. *bioRxiv* preprint .

8. N.H. Barbara, T.R. Bedding, **B.D. Fulcher**, S.J. Murphy, T. Van Reeth. Classifying *Kepler* light curves for 12,000 A and F stars using supervised feature-based machine learning. *Monthly Notices of the Royal Astronomical Society* **514**: 2793 (2022).
   Paper . *arXiv* preprint .

9. S. Oldham, **B.D. Fulcher**, K. Aquino, A. Arnatkevičiūtė, C. Paquola, R. Shishegar, A. Fornito. Modeling spatial, developmental, physiological, and topological constraints on human brain connectivity. *Science Advances* **8**: eabm6127 (2022).
   Paper . *bioRxiv* preprint .

10. P.H. Siu, E. Müller, V. Zerbi, K. Aquino, **B.D. Fulcher**. Extracting dynamical understanding from neural-mass models of mouse cortex. *Frontiers in Computational Neuroscience* **16**: 847336 (2022).
    Paper . *bioRxiv* preprint .

11. K.M. Aquino, **B.D. Fulcher**, S. Oldham, L. Parkes, L. Gollo, G. Deco, A. Fornito. On the intersection between data quality and dynamical modelling of large-scale fMRI signals. *NeuroImage*. **256**: 119051 (2022).
Paper. *bioRxiv* preprint.

12. A. Arnatkevičiūtė, **B.D. Fulcher**, M.A. Bellgrove, A. Fornito. Imaging transcriptomics of brain disorders. *Biological Psychiatry: Global Open Science* **2**: 319 (2022).
Paper. *PsyArXiv* preprint.

13. J.M. Shine, M. Li, O. Koyejo, **B.D. Fulcher**, J.T. Lizier. Nonlinear Reconfiguration of Network Edges, Topology and Information Content During an Artificial Learning Task. *Brain Informatics* **8**: 26 (2021).
Paper. *bioRxiv* preprint.

14. R. Markello, A. Arnatkevičiūtė, J.-B. Poline, **B.D. Fulcher**, A. Fornito, B. Mišić. Standardizing workflows in imaging transcriptomics with the `abagen` toolbox. *eLife*. **10**: e72129 (2021).
Paper. *bioRxiv* preprint.

15. A. Arnatkevičiūtė, **B.D. Fulcher**, M.A. Bellgrove, A. Fornito. Where the genome meets the connectome: Understanding how genes shape the human brain connectivity. *NeuroImage*. **244**: 118570 (2021).
Paper. *PsyArXiv* preprint.

16. A. Arnatkevičiūtė, **B.D. Fulcher**, S. Oldham, J. Tiego, C. Paquola, Z.F. Gerring, K.M. Aquino, Z. Hawi, B. Johnson, G.M. Ball, M. Klein, G. Deco, B. Franke, M. Bellgrove, A. Fornito. Genetic influences on hub connectivity of the human connectome. *Nature Communications*. **12**: 4237 (2021).
Paper. *bioRxiv* preprint. Reproducible code. Data.

17. **B.D. Fulcher**, A. Arnatkevičiūtė, A. Fornito. Overcoming false-positive gene-category enrichment in the analysis of spatially resolved transcriptomic brain atlas data. *Nature Communications*. **12**: 2669 (2021).
Paper. *bioRxiv* preprint. Reproducible code. Data. Toolbox.

18. O.M. Cliff, L. Novelli, **B.D. Fulcher**, J.M. Shine, J.T. Lizier. Assessing the significance of directed and multivariate measures of linear dependence between time series. *Physical Review Research*. **3**: 013145 (2021).
Paper. *arXiv* preprint. Toolbox.

19. M. Biabani, A. Fornito, J.P. Coxon, **B.D. Fulcher**, N.C. Rogasch. The correspondence between EMG and EEG measures of changes in cortical excitability following transcranial magnetic stimulation. *The Journal of Physiology* **599**: 2907 (2021).
Paper. *bioRxiv* Preprint.

20. H.Y. Lau, A. Fornito, **B.D. Fulcher**. Scaling of gene transcriptional gradients with brain size across mouse development. *NeuroImage*. **224**: 117395 (2021).
Paper. *bioRxiv* preprint. Data. Reproducible code: data analysis. Reproducible code: modeling.

21. G. Shafiei, R.D. Markello, R. Vos de Wael, B.C. Bernhardt, **B.D. Fulcher**, B. Mišić. Topographic gradients of intrinsic dynamics across neocortex. *eLife*. **9**: e62116 (2020).
Paper. *bioRxiv* preprint.

22. E. Müller, B. Munn, L.J. Hearne, J.B. Smith, **B.D. Fulcher**, A. Arnatkevičiūtė, D.J. Lurie, L. Cocchi, J.M. Shine. Core and matrix thalamic sub-populations relate to spatiotemporal cortical connectivity gradients. *NeuroImage*. **222**: 117224 (2020).
Paper. *bioRxiv* preprint.

23. **B.D. Fulcher**, C.H. Lubba, S.S. Sethi, N.S. Jones. A self-organizing, living library of time-series data. *Scientific Data*. **7**: 213 (2020).
Paper. *arXiv* preprint. Reproducible code. Data. Website.

24. J. Fallon, P. Ward, L. Parkes, S. Oldham, A. Arnatkevičiūtė, A. Fornito, **B.D. Fulcher**. Timescales of spontaneous fMRI fluctuations relate to structural connectivity in the brain. *Network Neuroscience*. **4**: 788 (2020).
Paper. *bioRxiv* preprint. Reproducible code. Data.

25. S.S. Sethi, N.S. Jones, **B.D. Fulcher**, L. Picinali, D.J. Clink, H. Klinck, C.D.L. Orme, P.H. Wrege, R.M. Ewers. Characterizing soundscapes across diverse ecosystems using a universal acoustic feature set. *Proceedings of the National Academy of Sciences of the United States of America*. **117**: 17049 (2020).
Paper. *bioRxiv* preprint. Reproducible code. Data.

26. M. Markicevic, **B.D. Fulcher**, C. Lewis, F. Helmchen, M. Rudin, V. Zerbi, and N. Wenderoth. Cortical excitation : inhibition imbalance causes abnormal brain network dynamics as observed in neurodevelopmental disorders. *Cerebral Cortex*. bhaa084 (2020).
Paper. *bioRxiv* preprint. Reproducible code.

27. S.J. Murphy, N.H. Barbara, T.R. Bedding, D. Hey, **B.D. Fulcher**. Finding binaries from phase modulation of pulsating stars with *Kepler*: VI. Orbits for 10 new binaries with mischaracterised primaries. *Monthly Notices of the Royal Astronomical Society*. staa562 (2020).
Paper. *arXiv* preprint.

28. K. Aquino*, **B.D. Fulcher***, L. Parkes, K. Sabaroedin, A. Fornito. Identifying and removing widespread signal deflections from fMRI data: Rethinking the global signal regression problem. *NeuroImage*. **212**: 116614 (2020).
Paper. *bioRxiv* preprint. DiCER code. Results.

29. C.H. Lubba, S.S. Sethi, P. Knaute, S.R. Schultz, N.S. Jones*, **B.D. Fulcher***. *catch22*: CAnonical Time-series CHaracteristics. *Data Mining and Knowledge Discovery*. **33**: 1821 (2019).
Paper. *arXiv* preprint. *catch22* package. Reproducible code. Data.

30. A. Arnatkevičiūtė, **B.D. Fulcher**, A. Fornito. Uncovering the transcriptional signatures of hub connectivity in neural networks. *Frontiers in Neural Circuits* **13**: 63 (2019).
Paper. *psyArxiv* preprint.

31. S. Oldham, **B.D. Fulcher**, L. Parkes, A. Arnatkevičiūtė, C. Suo, A. Fornito. Consistency and differences between centrality metrics across distinct classes of networks. *PLoS ONE* **14**: e0220061 (2019).
Paper. *arXiv* preprint.

32. **B.D. Fulcher**. Discovering conserved properties of brain organization through multimodal integration and interspecies comparison. *Journal of Experimental Neuroscience* **13**: 1 (2019).
Paper.

33. **B.D. Fulcher**, J.D. Murray, V. Zerbi, X.-J. Wang. Multimodal gradients across mouse cortex. *Proceedings of the National Academy of Sciences of the United States of America* **116**: 4689 (2019).
Paper. *bioRxiv* preprint. Reproducible code. Data.

34. A. Arnatkevičiūtė, **B.D. Fulcher**, A. Fornito. A practical guide to linking brain-wide gene expression and neuroimaging data. *NeuroImage* **189**: 353 (2019).
Paper. *bioRxiv* preprint. Reproducible code. Data.

35. N.W. Bailey, K.E. Hoy, N.C. Rogasch, R.H. Thomson, S. McQueen, D. Elliot, C.M. Sullivan, **B.D. Fulcher**, Z.J. Daskalakis, P.B. Fitzgerald. Differentiating responders and non-responders to rTMS treatment for depression after one week using resting EEG connectivity measures. *Journal of Affective Disorders* **242**: 68 (2019).
Paper.

36. A. Fornito, A. Arnatkevičiūtė, **B.D. Fulcher**. Bridging the gap between connectome and transcriptome. *Trends in Cognitive Sciences* **23**: 34 (2019).
Paper. *OSF* preprint.

37. M.T. Wilson, **B.D. Fulcher**, P.K. Fung, P.A. Robinson, A. Fornito, N.C. Rogasch. Biophysical modeling of neural plasticity induced by transcranial magnetic stimulation. *Clinical Neurophysiology* **129**(6): 1230 (2018).
Paper. *bioRxiv* preprint.

38. E.M. Seabrook, M.L. Kern, **B.D. Fulcher**, N.S. Rickard. Predicting depression from language-based emotion dynamics: Longitudinal analysis of Facebook and Twitter status updates. *Journal of Medical Internet Research* **20**(5): e168 (2018).
Paper.

39. **B.D. Fulcher***, A. Arnatkevičiūtė*, R. Pocock, A. Fornito. Hub connectivity, neuronal diversity, and gene expression in the *Caenorhabditis elegans* connectome. *PLoS Computational Biology* **14**(2): e1005989 (2018).
Paper. Reproducible code. Data.

40. L. Parkes, **B.D. Fulcher**, M. Yücel, A. Fornito. An evaluation of the efficacy, reliability, and sensitivity of motion correction strategies for resting-state functional MRI. *NeuroImage* **171**: 415 (2018).
Paper.

41. **B.D. Fulcher***, S. Cohen*, S.M.W. Rajaratnam, R. Conduit, J.P. Sullivan, M.A. St Hilaire, A.J.K. Phillips, T. Loddenkemper, S.V. Kothare, K. McConnell, P. Braga-Kenyon, A. Shlesinger, J. Potter, F. Bird, W. Ahearn, K.M. Cornish, S.W. Lockley. Sleep patterns predictive of daytime challenging behavior in individuals with low-functioning autism. *Autism Research* **11**: 391 (2018).
Paper.

42. N.W. Bailey, K.E. Hoy, N.C. Rogasch, R.H. Thomson, S. McQueen, D. Elliot, C.M. Sullivan, **B.D. Fulcher**, Z.J. Daskalakis, P.B. Fitzgerald. Responders to rTMS for depression show increased fronto-midline theta and theta connectivity compared to non-responders. *Brain Stimulation* **11**(1): 190 (2018).
Paper.

43. S. Cohen, **B.D. Fulcher**, S.M.W. Rajaratnam, R. Conduit, J.P. Sullivan, M.A. St Hilaire, A.J.K. Phillips, T. Loddenkemper, S.V. Kothare, K. McConnell, P. Braga-Kenyon, A. Shlesinger, J. Potter, F. Bird, W. Ahearn, K.M. Cornish, S.W. Lockley. Behaviorally determined sleep phenotypes are robustly associated with adaptive functioning in individuals with low-functioning autism. *Scientific Reports* **7**: 14228 (2017).
Paper.

44. **B.D. Fulcher**, N. S. Jones. *hctsa*: A computational framework for automated time-series phenotyping using massive feature extraction. *Cell Systems* **5**(5): 527 (2017).
Paper. *bioRxiv* preprint. *arXiv* preprint. *hctsa* toolbox. Reproducible code (*Drosophila*). Data. Reproducible code (*C. elegans*). Data.

45. L. Parkes, **B.D. Fulcher**, M. Yücel, A. Fornito. Transcriptional signatures of connectomic subregions of the human striatum. *Genes, Brain & Behavior* **25**: 1176 (2017).
Paper.

46. S.S. Sethi*, V. Zerbi*, N. Wenderoth, A. Fornito, **B.D. Fulcher**. Structural connectome topology relates to regional BOLD signal dynamics in the mouse brain. *Chaos* **27**: 047405 (2017).
Paper. *bioRxiv* preprint.

47. **B.D. Fulcher** and A. Fornito. A transcriptional signature of hub connectivity in the mouse connectome. *Proceedings of the National Academy of Sciences of the United States of America* **113**: 1435 (2016).
Paper.

48. S.T.E. Baker, D.I. Lubman, M. Yücel, N.B. Allen, S. Whittle, **B.D. Fulcher**, A. Zalesky, A. Fornito. Developmental changes in brain network hub connectivity in late adolescence. *The Journal of Neuroscience* **35**: 9078 (2015).
Paper.

49. **B.D. Fulcher**, N.S. Jones. Highly comparative feature-based time-series classification. *IEEE Transactions on Knowledge and Data Engineering* **26**: 3026 (2014).
Paper. *arXiv* preprint.

50. **B.D. Fulcher**, A.J.K. Phillips, S. Postnova, P.A. Robinson. A physiologically based model of orexinergic stabilization of sleep and wake. *PLoS ONE* **9**: e91982 (2014).
Paper.

51. A.J.K. Phillips, **B.D. Fulcher**, P.A. Robinson, E.B. Klerman. Mammalian rest/activity patterns explained by physiologically based modeling. *PLoS Computational Biology* **9**: e1003213 (2013).
Paper.

52. **B.D. Fulcher**, M.A. Little, N.S. Jones. Highly comparative time-series analysis: the empirical structure of time series and their methods. *Journal of the Royal Society Interface* **10**: 20130048 (2013).
Paper. *arXiv* preprint.

53. **B.D. Fulcher**, X.Y. Cui, B. Delley, C. Stampfl. Hardness analysis of cubic metal mononitrides from first principles. *Physical Review B* **85**: 184106 (2012).
Paper.

54. P.A. Robinson, A.J.K. Phillips, **B.D. Fulcher**, M. Puckeridge, J.A. Roberts. Quantitative modeling of sleep dynamics. *Philosophical Transactions of the Royal Society A* **369**: 3840 (2011).
Paper.

55. M. Puckeridge, **B.D. Fulcher**, A.J.K. Phillips, P.A. Robinson. Incorporation of caffeine into a quantitative model of fatigue and sleep. *Journal of Theoretical Biology* **273**: 44 (2011).
Paper.

56. **B.D. Fulcher**, A.J.K. Phillips, P.A. Robinson. Quantitative physiologically based modeling of subjective fatigue during sleep deprivation. *Journal of Theoretical Biology* **264**: 407 (2010).
Paper.

57. **B.D. Fulcher**, A.J.K. Phillips, P.A. Robinson. Modeling the impact of impulsive stimuli on sleep-wake dynamics. *Physical Review E* **78**: 051920 (2008).
Paper.

Book Chapters

58. Arnatkevičiūtė, **B.D. Fulcher**, A. Fornito. Uncovering the genetics of the human connectome. *Connectome Analysis - Characterization, Methods and Applications*: Chapter 14, 309–341 (AP Academic Press, 2023).
Book chapter.

59. **B.D. Fulcher**. Feature-based time-series analysis. In: *Feature Engineering for Machine Learning and Data Analytics*, 87–116 (CRC Press, 2018).
Book chapter. *arXiv* preprint.

60. P.A. Robinson, S. Postnova, R.G. Abeysuriya, J.W. Kim, J.A. Roberts, L. McKenzie-Sell, A. Karanjai, C.C. Kerr, F. Fung, R. Anderson, M.J. Breakspear, P.M. Drysdale, **B.D. Fulcher**, A.J.K. Phillips, C.J. Rennie, G. Yin. A Multiscale "Working Brain" Model. In: *Validating Neuro-Computational Models of Neurological and Psychiatric Disorders* (eds. B.S. Bhattacharya and F.N. Chowdhury) pp 107–140 (Springer, 2015).
Book chapter.

61. P.A. Robinson, A.J.K. Phillips, **B.D. Fulcher**, M. Puckeridge, J.A. Roberts, C.J. Rennie. Quantitative modeling of sleep dynamics. In: *Sleep and Anesthesia: Neural Correlates in Theory and Experiment* (ed. A. Hutt) pp 45–68 (Springer, 2011).
Book chapter.

Peer-Reviewed Full Conference Papers

62. T. Henderson, A.G. Bryant, **B.D. Fulcher**. Never a Dull Moment: Distributional Properties as a Baseline for Time-Series Classification. 1st International Workshop on Temporal Analytics at *The 27th Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)* (2023).
arXiv preprint.

63. T. Henderson, **B.D. Fulcher**. An Empirical Evaluation of Time-Series Feature Sets. Systematic Feature Engineering for Time-Series Data Mining Workshop at *21st IEEE International Conference on Data Mining (ICDM)* (2021).
Paper. *arXiv* preprint.

64. C.H. Lubba, **B.D. Fulcher**, S.R. Schultz, N.S. Jones. Efficient peripheral nerve firing characterisation through massive feature extraction. *9th International IEEE EMBS Neural Engineering Conference* (2018).
Paper. *bioRxiv* preprint.

65. **B.D. Fulcher**, A.E. Georgieva, C.W.G. Redman, N.S. Jones. Highly comparative fetal heart rate analysis. *34th Annual International Conference of the IEEE EMBS* (2012).
Paper.

Commentaries

66. J.M. Shine, A. Arnatkevičiūtė, A. Fornito, **B.D. Fulcher**. Navigating a Complex Landscape: Using Transcriptomics to Parcellate the Human Cortex. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* **7**: 3 (2022).
Paper.

Other

67. **B.D. Fulcher**. Highly comparable time-series analysis in `Nitime`. *GigaScience Database* (2016).
Link.

Papers in Submission

1. P. Cajic, D. Agius, O.M. Cliff, J.M. Shine, J.T. Lizier*, **B.D. Fulcher***. On the information-theoretic formulation of network participation. *arXiv* preprint.

2. N. Bailey, **B.D. Fulcher**, B. Caldwell, A. Hill, B. Fitzgibbon, H. van Dijk, P.B. Fitzgerald. Uncovering a stability signature of brain dynamics associated with meditation experience using massive time-series feature extraction. *bioRxiv* preprint.

3. T. Chau, J. Tiego, L. Brown, O.J. Mellahn, B. Johnson, A. Arnatkeviciute, **B.D. Fulcher**, N. Matthews, M. Bellgrove. The Distribution of Parent-Reported Autistic and ADHD Traits in Children With and Without an ADHD Diagnosis.

4. A. Leung*, A. Mahmoud*, R. Jeans, **B.D. Fulcher**, B. van Swinderen, N. Tsuchiya. Towards blinded classification of loss of consciousness: distinguishing wakefulness from general anesthesia and sleep in flies using a massive library of univariate time series analyses. *PsyArXiv* preprint.

5. T. Henderson and **B.D. Fulcher**. Feature-based time-series analysis in `R` using the `theft` package. *arXiv* preprint.

6. A. Arnatkevičiūtė, A. Fornito, J. Tong, K. Pang, M.A. Bellgrove*, **B.D. Fulcher***. Linking GWAS to pharmacological treatments for psychiatric disorders. *medRxiv* preprint.

7. M. Markicevic, O. Sturman, J. Bohacek, M. Rudin, V. Zerbi*, N. Wenderoth*, **B.D. Fulcher***. Neuromodulation of striatal D1 cells shapes BOLD fluctuations in anatomically connected thalamic and cortical regions. *bioRxiv* preprint.

Conference/Workshop Proceedings

1. D. Li, J. Murray, Q. Gu, **B.D. Fulcher**, V. Zerbi. Noradrenergic neuromodulation of spatiotemporal dynamics in a large-scale model of mouse cortex. *Cosyne* (2021).

2. O.M. Cliff, M. Li, D. Hernaus, L. Scholtens, E. Müller, B. Munn, G. Wainstein, **B.D. Fulcher**, J. Lizier, J.M. Shine. Modulation of the hierarchical gradient of cognitive information processing dynamics during rest and task. *CNS* (2020).

3. S. Oldham, **B.D. Fulcher**, K. Aquino, A. Arnatkevičiūtė, R. Shishegar, A. Fornito. A Spatial Developmental Generative Model of Human Brain Structural Connectivity. *CNS* (2020).

4. U. bin Waheed, A. Afify, M. Fehler, **B.D. Fulcher**. Winning with Simple Models: Detecting Earthquakes in Groningen, the Netherlands. *82nd EAGE Conference and Exhibition* 1–5 (2020). Link. Preprint.

5. A. Arnatkevičiūtė, **B.D. Fulcher**, A. Fornito. Methodological considerations in relating brain-wide transcriptomic and neuroimaging data. *OHBM* (2018).

6. L. Parkes, **B.D. Fulcher**, M. Yücel, A. Fornito. Comprehensive comparison of head motion correction strategies in resting-state functional magnetic resonance imaging. *International Symposium on Biomedical Imaging (ISBI'17)*, Melbourne, Australia (2017).

7. A. Arnatkevičiūtė, **B.D. Fulcher**, A. Fornito. Hub connectivity and gene expression in a neuronal connectome. *International Symposium on Biomedical Imaging (ISBI'17)*, Melbourne, Australia (2017).

Conference Organization, Editorial Positions, and Scientific Initiatives

2022 Workshop organizer: *'Highly comparative analysis of neural dynamics'* and Tutorial organizer: *'Characterizing neural dynamics using highly comparative time-series analysis'* for the *31st Annual Computational Neuroscience Meeting (CNS2022)*, Melbourne, Australia.

2021 Workshop organizer (with Andreas Kempa-Liehr): *Systematic Feature Engineering for Time-Series Data Mining* for the *21st IEEE International Conference on Data Mining*, Auckland, New Zealand.

2021– Review Editor for *Frontiers in Computational Neuroscience*.

2020 Local Organizing Committee for *Neuroinformatics 2020* (Seattle, USA).

2019 Local Organizing Committee for the *Poladian Project*, an international festival of interdisciplinary research, The University of Sydney.

2018 Local Organizing Committee for the *11th Australasian Workshop on Neuro-Engineering and Computational Neuroscience*, *NeuroEng 2018*: A 3-day conference (The University of Sydney).

2018 Launched a new interactive website, `www.comp-engine.org`, that allows users to upload their own data to contribute towards a self-organizing, living library of time-series data.

2013 Developed an online collaborative scientific platform for time-series analysis that opens up years of work to the scientific community, which involved collecting and synthesizing tens of thousands of time series, and thousands of existing and newly-developed methods for measuring structure in time series. Over 66 000 views have been recorded since launching the website in February 2014.

Awards

2023 Selby Research Award 2023, Selby Scientific Foundation.

2021 Ranked in top 2% of scientists globally on citation metrics in the Ionnidis database.

2021 Physics Teaching Award: Best Lecturer (Voted by Students): Semester 1, 2021.

2020 Early Career Teaching Award (with Alessandro Tuniz), Faculty of Science, The University of Sydney.

2017 Australian representative for 9th Annual HOPE Meeting with Nobel Laureates (one of six Australians; Tokyo).

2014 2nd place in Melbourne-based medical hackathon *HealthHack* for our entry, *GIRROR: Tracking your emotions and gambling behavior*.

2011 *Nicholas Kurti Prize* for distinguished work as third year postgraduate student in Condensed Matter Physics, Department of Physics, University of Oxford.

2010 *David Ryan Prize* for distinguished work by a second year research student in Condensed Matter Physics, Department of Physics, University of Oxford.

2008 First Prize in the Poster Competition, Imperial College London, Institute of Systems and Synthetic Biology: Autumn Symposium.

2008 *Commonwealth Scholarship* to read for a D.Phil. at the University of Oxford.

2008 *Oxford Australia Scholarship* to read for a D.Phil. at the University of Oxford.

2008 *Science Centenary Fund Scholarship* for the highest ranked student over four years who proceeds to a postgraduate research degree in the Faculty of Science, University of Sydney.

Supervision and Mentorship

Postdoctoral Supervision

2020–2022 Oliver Cliff, School of Physics, The University of Sydney.

Primary PhD and MPhil Supervision

2023– Kieran Owens, School of Physics, The University of Sydney.

2022– Rishikesan Maran, School of Physics, The University of Sydney.

2022– Mai Nguyen (MPhil), School of Physics, The University of Sydney.

2022– Annie Bryant, School of Physics, The University of Sydney.

2021– Trent Henderson, School of Physics, The University of Sydney.

PhD Co-Supervision

2022– Brendan Harris, School of Physics, The University of Sydney.

2016–2020 Stuart Oldham (co-supervised with Alex Fornito), School of Psychological Sciences, Monash University.

2016–2020 External associate supervisor of Sarab Sethi, Department of Mathematics, Imperial College London, UK.

2016–2020 External associate supervisor of Carl Lubba, Department of Mathematics, Imperial College London, UK.

2015–2019 Linden Parkes (cosupervised with Alex Fornito and Murat Yücel), School of Psychological Sciences, Monash University.

2015–2019 Aurina Arnatkevičiūtė (cosupervised with Alex Fornito), School of Psychological Sciences, Monash University.

2015–2018 Elizabeth Seabrook (cosupervised with Nikki Rickard and Peggy Kern), School of Psychological Sciences, Monash University.

2014–2016 Simonne Cohen (cosupervised with Kim Cornish, Russell Conduit, Steven Lockley, Shanthakumar Rajaratnam), School of Psychological Sciences, Monash University.

Honours Supervision

2022-23 Joshua Moore, School of Physics, The University of Sydney.

2022-23 Muzheng Tan, School of Physics, The University of Sydney.

2021 Xavier Morris, School of Physics, The University of Sydney.

2021 Brendan Harris, School of Physics, The University of Sydney.

2020 Pok Him Siu, School of Physics, The University of Sydney.

2020 Eloisa Ana Perez-Bennetts, School of Physics, The University of Sydney.

2017 John Fallon, School of Psychological Sciences, Monash University.

2015 Patricia Tran (with Alex Fornito), School of Psychological Sciences, Monash University.

2015 Stuart Oldham (with Alex Fornito), School of Psychological Sciences, Monash University.

Visiting Research Student Supervision

2022-23 Zilu Cao (Northwestern Polytechnical University, China).

2021 Marija Markicevic (ETH, Switzerland).

2018 Gladys Hoi Yan Lau (The University of Hong Kong).

2018 Aditi Jha (IIT Delhi, India).

Undergraduate Supervision

2022 Physics 2nd Year Special Studies Project: Amy Shi, Grace Agostino, Hans Jutton, Jason Wang.

2021 Dalyell 3rd-Year Project Students: Pavle Cajic, Nada Salama, and Steven Wu.

2021 Physics 3rd-Year Interdisciplinary Special Project: Matthew Turner, Ben Braham, Hamish Sullivan, and Pranav Alavandi (with Shelley Wickham, Mac Shine, and Stuart Fraser). School of Physics, The University of Sydney.

2021 Google Summer of Code: Diptanshu Mittal: *A Django Platform for comparing scientific methods for analyzing neural time series analysis methods.*

2020 Physics 3rd-Year Interdisciplinary Special Project: Pavle Cajic and Dominic Agius (with Oliver Cliff, Mac Shine, and Joe Lizier). School of Physics, The University of Sydney.

2020 Physics SSP students: Steven Wu, Yifan Chen, Judd Katz, Leo Brodsky-Grey, Joska Steinbusch. Dalyell 3rd Year Project student: Brendan Harris. The University of Sydney.

2020 Google Summer of Code: Imran Alam and Salman Khan.

2020 Denison Scholarship students: Oscar McMullin, Zhaioxi Cao, Preethom Pal, The University of Sydney.

2019 SSP students Brendan Harris, Cory Aitchison, and Chloe Beydoun, The University of Sydney.

2019 Denison Scholarship student Adithya Vignaraja, The University of Sydney.

2018 SSP students Brendan Harris and Xavier Morris (with Leonardo Gollo), The University of Sydney.

2014 Winter scholarship students Rannee Lee and Brandon Lim (with Alex Fornito), Monash University.

2013 Summer student, Krishna Vysyaraju, in the project *Highly comparative feature-based inference* (with Nick Jones), Department of Mathematics, Imperial College London, UK.

2011 Summer student, Alex Gibberd, in the project *Pre-processing methods for predicting epileptic seizures* (with Nick Jones), Department of Physics, University of Oxford, UK.

2010 Fourth year M.Phil. Physics student Oliver Britton in project *Structure in symbolic strings* (with Nick Jones), Department of Physics, University of Oxford, UK.

Invited Talks & Presentations

Conferences and Workshops

June 2021 *CNS* (Online). Software Showcase: *Tools for Characterizing Neural Dynamics using Feature-Based Time-Series Analysis.*

June 2021 NIMH Advanced Statistical Methods and Dynamic Data Visualizations for Mental Health Studies: *'Visualizing and understanding complex neural time series'*. Link.

July 2020 CNS (Online): *'Characterizing neural dynamics using highly comparative time-series analysis'*. Slides. YouTube.

May 2020 OHBM Australia: The Reproducibility Crisis Webinar: *'A practical guide to working reproducibly'*. Slides. YouTube.

Dec 2019 CIBF Annual Science meeting, Adelaide Convention Centre, Australia: *'Multimodal gradients across mouse cortex and their human correspondence'*.

Nov 2019 NeuroEng 2019, Adelaide, Australia: *'Spatial embedding of gene transcriptional gradients through brain development'*.

Nov 2019 WOMBAT, a two-day conference on high-dimensional data analytics, Monash University, Australia: *'Inferring low-dimensional parametric variation underlying time-series datasets'*. Slides.

Oct 2019 Organization for Human Brain Mapping Australian Chapter Annual Scientific Meeting, University of Newcastle, Australia: *'Measuring and interpreting transcriptional gradients in mouse and human'*.

July 2019 IMS Invited Session: 'Complex Time Series Analysis', Joint Statistical Meeting (JSM), Denver, Colorado: *'Highly comparative time-series analysis as statistical learning across a massive interdisciplinary feature library'*. Slides.

June 2019 Organization for Human Brain Mapping (OHBM) 2019, Rome, Italy. Imaging genetics oral session: *'Multimodal gradients across mouse cortex and their human correspondence'*. Symposium: *'The transcriptomics of brain function: from circuitry and networks through psychiatric illness'*.

March 2019 Whistler Summer Workshop on Brain Functional Organization, Connectivity, and Behavior, Noosa, Australia: *'Multimodal gradients of the mouse cortex and their human correspondence'*. Slides.

Feb 2018 NII Shonan Meeting *Analysing large collections of time series*. Shonan Village, Japan: *'Feature-based time-series analysis'*.

March 2017 Connectomics Keystone Symposium, Santa Fe, New Mexico, US: *'Structural connectome topology relates to regional BOLD signal dynamics'*.

Nov 2016 NeuroEng, Brisbane, Australia: *'Structural connectome topology relates to regional BOLD signal dynamics in the mouse brain'*.

Nov 2016 Workshop on Rodent Neuroscience, Suzhou, China: *'Gene expression, axonal connectivity, and resting state dynamics in the mouse'*.

July 2016 25th Annual Computational Neuroscience Meeting (Connectome: Structure and large-scale dynamics workshop), Jeju Island, South Korea: *'Gene expression and neural activity in the connectome'*.

May 2016 Australia Node Representative at Advances in Neuroinformatics IV. AINI 2016 and International Neuroinformatics Coordinating Facility (INCF) Nodes Workshop Abstract: Oral Session IV-1, RIKEN, Saitama, Japan: *'Brain connectivity and dynamics: Highly comparative time-series analysis of neuroscience data, and gene expression patterns of brain connectivity'*. DOI: 10.14931/aini2016.osiv.1

July 2013 Workshop on Biological Dynamics, Department of Mathematics, University of Surrey, UK: *'Highly comparative time-series analysis for biological signal processing'*.

Aug 2012 34th Annual International Conference of the IEEE EMBS, San Diego, USA: *'Highly comparative fetal heart rate analysis'*.

March 2012 Royal Society satellite meeting: Signal processing for the physical sciences, The Kavli Royal Society International Centre, UK: *'Highly comparative time-series analysis'*.

Local Presentations (within Institutions or Research Groups)

July 2023 Chinese Open Science Network (COSN) (*online*): *Quantifying complex dynamical systems*.

June 2023 Japanese Computational Neurology Seminar Series, hosted at Hiroshima University: *The brain as a complex dynamical system*. Slides, AI-generated talk summary.

Mar 2023 Advanced Telecommunications Research Institute International, and RIKEN Center for Advanced Intelligence Project, Kyoto, Japan.: *Quantifying complex dynamical systems* and *Opportunities for Incorporating Brain-Atlas Datasets into Whole-Brain Models*.

Nov 2022 Earthbyte seminar series, School of Geosciences, The University of Sydney: *Quantifying patterns in time series*.

Oct 2022 MIIT Key Laboratory of Dynamics and Control of Complex Systems, Northwestern Polytechnical University, Xi'an, China: *Extracting Dynamical Understanding from Neural-Mass Models*.

July 2022 `sktime` dev days, London (and remote): *Feature-based time-series analysis: Reducing down a large, interdisciplinary literature*.

May 2022 Business Analytics Seminar Series, The University of Sydney: *Highly comparative time-series analysis*.

Dec 2021 NIH Chronomedicine Webinar Series on "Circadian & Dynamics Brain Connectome.": *How do structural connections shape local BOLD dynamics?*.

Nov 2021 Data Skeptic Podcast: *Comparing Time Series with hctsa*. Link.

Oct 2021 University of Auckland Statistics Departmental Seminar. *'Highly comparative time-series analysis'*.

July 2021 Data Skeptic Podcast: *Comp Engine*. Link.

August 2021 RMIT Data Analytics Seminar. *'An introduction to working with transcriptomic atlas data'*.

August 2021 Cambridge Seminar Series: Making Connections – Brains & Other Complex Systems. *'Quantifying Brain Dynamics and Structure Across Scales'*. Slides.

August 2020 QMNET, Melbourne University: *'The need for interdisciplinary comparison when analyzing time series'*. Slides. YouTube.

June 2020 Monash University BMM ECR Workshop: building CV. *'What can open science do for your career?'*.

Nov 2019 Bio-Engineering and Nanoscience Symposium (BEANS), The University of Sydney: *'Opportunities for nanoscience in leveraging modern brain databases'*.

Aug 2019 CIBF ECR Retreat, Canberra, Australia: *'Skills for Early-Career Scientists'*. Slides.

Feb 2019 Poladian Project, Sydney, Australia: *'Using machine learning to enhance productive interdisciplinary exchange'*. Slides.

Dec 2017 Complexity, Criticality and Computation (C^3) International Biannual Symposium. Sydney, Australia: *'Automating biomedical time-series analysis using massive feature extraction'*.

March 2017 Weekly Seminar Series, The Florey, Melbourne, Australia: *'Gene transcriptional signatures of structural connectivity in the mouse'*.

Oct 2016 Med-X Research Institute, Shanghai Jiaotong University, China: *'Gene expression, brain connectivity, and rs-fMRI dynamics in the mouse'*.

Sept 2016 Centre of Excellence for the Dynamics of Language, University of Queensland, Australia: *'Automated time-series phenotyping'*.

Aug 2016 Global Ideas Labs: Mental health and technology, Monash University, Melbourne, Australia: *'MICCN SurveyKit: Opening up app-based monitoring to researchers'*.

Aug 2016 Melbourne Mobile Meetup, Melbourne, Australia: *'The road to MICCN SurveyKit'*.

Nov 2015 Paris School of Economics, Paris, France: *'Highly comparative time-series analysis'*.

Sept 2015 Invited Speaker at BioMelbourne Network's BioBriefing at Carlton Connect Initiative, Melbourne, Australia: 'Why Hack'.

Aug 2015 School of Mathematics and Statistics, University of Melbourne, Australia: *'Highly comparative time-series analysis'*.

June 2015 Research Institute of Molecular Pathology (IMP), Vienna, Austria: *'A highly comparative time-series analysis engine'*.

June 2014 Integrative Brain Function Workshop, Monash Brain Imaging Facility, Monash University, Melbourne, Australia: *'Highly comparative time-series analysis for brain imaging'*.

Feb 2014 Sleep and Circadian Medicine Laboratory, Monash University, Melbourne, Australia: *'Physiologically based sleep modeling'*.

June 2013 Biomathematics Seminar Series, Imperial College, London, UK: *'Quantitative, physiologically-based sleep modeling'*.

Oct 2011 Atmospheric, Oceanic & Planetary Physics Seminar, Department of Physics, University of Oxford, UK: *'Highly comparative time-series analysis'*.

Oct 2011 Applied Dynamical Systems Seminar, Department of Mathematics, University of Oxford, UK: *'Highly comparative time-series analysis'*.

May 2011 Complex Agent-Based Dynamic Networks (CABDyN) Complexity Centre seminar, Saïd Business School, University of Oxford, UK: *'An engine for comparative time-series analysis'*.

Nov 2010 Nonlinear Seminars, Department of Mathematics, University of Surrey, UK: *'Quantitative sleep modeling'*.

April 2010 *Signals Day*, University of Oxford, UK: *'High-throughput time-series analysis'*.

Teaching

2021–2022 PHYS3934: Statistical Mechanics Computer Lectures.

2021–2022 PHYS3034/PHYS3934 Computational Physics, School of Physics, The University of Sydney.

2018–2022 Interdisciplinary Physics (PHYS3888) Course Designer and Coordinator, The University of Sydney.

2019 Guest lecture: Characterizing empirical dynamics using *hctsa* (CSYS5040: Criticality in Dynamical Systems), The University of Sydney.

2018–2019 Guest lecture: Machine learning methods for data visualization for Information Visualization Design Studio (DECO3100), The University of Sydney.

2018 PHYS1001 Tutorial Supervisor, The University of Sydney.

2016–2017 Lecturer for Computational Neuroscience, School of Psychological Sciences, Monash University.

2010 Guest lecturer in Machine Learning for Systems Biology Doctoral Training Center, Oxford University, UK.

2008–2010 Lecturer, demonstrator, and co-developer of a two-day *Research in Mathematical Biology* course for MSc Biology students, Oxford University, UK.

2009 Demonstrator for the first year electromagnetism physics laboratory, Oxford University, UK.

2008 Postgraduate Teaching Fellow, School of Physics, The University of Sydney.

2007–2008 Supervisor and tutor for first year advanced physics tutorials and laboratories, School of Physics, The University of Sydney.

2004–2008 Demonstrator and presenter for the Kickstart Program, School of Physics, The University of Sydney.