

Dr Kevin Aquino

BSc PhD

Brain, Mind and Society Research Hub
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Current employment

2017 –

Brain and Mental Health Research Hub

Research Fellow, Head of Computational Modeling

Employed as a research fellow at Monash University with the school of Psychology (MICCN) under the Brain division of the Brain and Mental health (BMH) research hub lead by Prof. Alex Fornito. This role includes:

- Setting up collaborative projects between BMH and Prof Gustavo Deco at the Universitat Pompeu Fabra, Barcelona.
- Employing and developing physiological models to understand resting state fMRI networks
- Being the Head of Computational Modeling with the Brain division of BMH research Hub
- Supervising Honours, and PhD students within BMH

Turner Institute, Monash University, Australia

Education

2012

Doctor of Philosophy (Physics)

University of Sydney

Thesis: *Spatiotemporal Hemodynamics: From Theory to Experiment*

(December) Supervised by Prof. Peter Robinson (principal), Prof. Michael Breakspear (associate), Dr Mark Schira (associate) and Dr Peter Drysdale (associate).

2006

Bachelor of Science (Honors I)

University of Sydney,

Thesis: *Wavelet analysis of Brain activity*

Supervised by Prof. Peter Robinson (principal), Prof. Michael Breakspear (associate).

2005

Bachelor of Science

University of Sydney,

Majors in Physics and Mathematics.

Expertise

Research areas fMRI, MRI, Spatiotemporal Hemodynamics, Modeling, Neural Field Theory, Data analysis, Image processing, Deconvolution, task-fMRI, & resting-state fMRI.

Programming: Proficient in MATLAB, L^AT_EX & Python. Familiar in C, C++, CSS, & Java.

Software: Freesurfer, SPM, FSL, AFNI, mrTools, mrVista.

Research experience

2015 – 2017	University of Nottingham <i>Research Fellow, July 2015 – July 2017</i> Worked with Prof. Susan Francis, Dr Karen Mullinger, and Rosa Sanchez-Panchuelo on Laminar fMRI, Ultra-high field neuroimaging and EEG-fMRI at 7T.	Nottingham, Nottinghamshire, UK
2013 – 2015	University of Sydney <i>Research Associate, January 2013 – July 2015</i> Worked with Prof. Peter Robinson and Dr. Mark Schira on projects with Spatiotemporal hemodynamics, Brain Connectivity, Neural Field Modelling and co-supervised 3 PhD Students.	Camperdown, NSW, Australia
2012 – 2013	Queensland Institute of Medical Research <i>Research Assistant, July 2012 – January 2013</i> Worked under Part time (0.5) with Prof. Michael Breakspear projects on Deconvolution of fMRI data.	Herston, QLD, Australia
2012 – 2013	University of Sydney <i>Research Associate, July 2012 – January 2013</i> Worked under Part time (0.5) with Prof. Peter Robinson on projects with Spatiotemporal hemodynamics.	Camperdown, NSW, Australia
2005 – 2006	The Blackdog institute Research Assistant to Prof. Michael Breakspear Casual work to analyse Functional Magnetic Resonance Imaging (fMRI) data, and electrical encephalography (EEG). Also worked on a neural mass model that resulted in a publication.	Randwick, NSW, Australia

Honors and awards

2020	Australian Research Council Discovery Project Awarded \$509,561 AUD For project: Modelling brain network development (DP200103509): with Alex Fornito, Gustavo Deco, and Kevin Aquino (CI-C).
2017	PLOS Early Career Travel Award Program Awarded \$500 USD to attend ISMRM 2017 in Hawaii see: http://blogs.plos.org/thestudentblog/2017/08/08/how-science-is-communicated-impacts-how-science-is-received-early-career-researchers-share-their-take-on-the-future-of-scicomm/
2016	Guarantors of Brain Travel Grant Guarantors of Brain Travel Grant to attend the Organization for Human Brain Mapping Annual Meeting in Geneva, Switzerland travel Award, £600 GBP.
2013	Trainee Abstract Travel Award Organization for Human Brain Mapping Annual Meeting in Seattle, WA, USA travel Award for abstract: "Spatiotemporal neural dynamics from fMRI: Deconvolution with a spatiotemporal HRF", \$700 USD.
2007 – 2010	Australian Postgraduate Award Scholarship Australian government award. Stipend for \$20,000 AUD p/a while taking a research degree.
2006	Science Foundation for Physics, Scholarship No. 3 Faculty of Science, University of Sydney Prize for \$1000 AUD.
2005	Summer student scholarship Neuroscience Institute of Schizophrenia and Allied Disorders (NISAD) award: \$2000 AUD, for work on "Multiscale character of evoked cortical activity" with Prof. Michael Breakspear.
2003 – 2005	Faculty of Science Dean's List of Excellence in Academic Performance University of Sydney award for Years 1–3 of the undergraduate degree for having an average of High Distinction (85/100) or greater.
2003 – 2004	Talented Student Program University of Sydney first and second year program for students to undertake in projects in various research groups. First year: electron microscopy unit (Vicki Keast), Second year: Complex Systems (Michael Breakspear).

Publications

1. Arnatkeviciute, A., Fulcher, B.F., Oldham, S., Tiego, J., Paquola, C., Gerring, Z.F., **Aquino, K.M.**, et al. (2020). Genetic influences on hub connectivity of the human connectome. *BioRxiv*, , <https://doi.org/10.1101/2020.06.21.163915>.
2. **Aquino, K.M.**, Fulcher B.F., Parkes, L., Sabaroeedin, K., & Fornito, A. (2020). Identifying and removing widespread signal deflections from fMRI data: Rethinking the global signal regression problem. *Neuroimage*, 212, 116614.
3. **Aquino, K.M.**, Sokoliuk, R., Pakenham, D., Sanchez, R., Hanslmayr, S., Mayhew, S., Mullinger, K.J., & Francis, S.T. (2019). Addressing challenges of high spatial resolution, UHF fMRI for group analysis of higher-order cognitive tasks; an inter-sensory task directing attention between visual and somatosensory domains.. *Human Brain Mapping*, 40, 1298–1316.
4. Sokoliuk, R., Mayhew, S., **Aquino, K.M.**, Wilson, R., Brookes, M.J., Francis, S.T., Hanslmayr, S., & Mullinger, K.J. (2019). Two spatially distinct posterior alpha sources fulfill different functional roles in attention. *Journal of Neuroscience*, 39, 7183–7194.
5. Parkes, L., Tiego, J., **Aquino, K.M.**, Braganza, L., Chamberlain, S.R., Fontenelle, L., Harrison, B.J., Lorenzetti, V., Paton, B., Razi, A., Fornito, A., Yucel, M. (2019). Transdiagnostic variations in impulsivity and compulsivity in obsessive-compulsive disorder and gambling disorder correlate with effective connectivity in cortical-striatal-thalamic-cortical circuits.. *Neuroimage*, 202, 116070.
6. Tewarie, P.K., Hunt B.A.E., O'Neill, G.C., Byrne, A., **Aquino, K.M.**, Bauer, M., Mullinger, K.J., Coombes, S.C., & Brookes, M.J. (2018). Relationships between neuronal oscillatory amplitude and dynamic functional connectivity. *Cerebral Cortex*, , 1–14.
7. Pang, J.C., **Aquino, K.M.**, Robinson, P.A., Lacy, T.C., & Schira, M.M. (2017). Biophysically based method to deconvolve spatiotemporal neurovascular signals from fMRI data. *J. Neurosci. Meth.*, 308, 6–20.
8. Pandejee, G.M., Robinson, P.A., Henderson, J.A., **Aquino, K.M.**, & Sarkar, S. (2017). Inference of Direct and Multistep Effective Connectivities from Functional Connectivity of the Brain and of Relationships to Cortical Geometry. *J. Neurosci. Meth.*, 283, 42-54.
9. Pang, J.C., Robinson, P.A., **Aquino, K.M.**, & N., Vasan. (2017). Effects of astrocytic dynamics on spatiotemporal hemodynamics: Modeling and enhanced data analysis. *Neuroimage*, 147, 994–1005.
10. Lacy, T.C., **Aquino, K.M.**, & Robinson, P.A. (2016). Shock-like BOLD Responses Induced in the Primary Visual Cortex by Moving Visual Stimuli. *J. R. Soc. Interface*, 13 (125), 20160576.
11. Robinson, P.A., Zhao, X., **Aquino, K.M.**, Griffiths, J.D., Sarkar, S., & Pandejee, G.M (2016). Eigenmodes of Brain Activity: Neural Field Theory Predictions and Comparison with Experiment. *Neuroimage*, 142, 79–89.
12. Pang, J.C., Robinson, P.A., & **Aquino, K.M.** (2016). Response-mode decomposition of spatio-temporal haemodynamics. *J. R. Soc. Interface*, 13 (118), 20160253.
13. Puckett, A., **Aquino, K.M.**, Robinson, P.A., Breakspear, M., & Schira, M.M. (2016). The 3D hemodynamic response function for depth-dependent fMRI of human cortex. *Neuroimage*, 139, 240–248.
14. **Aquino, K.M.**, Robinson, P.A., Schira, M.M., & Breakspear, M. (2014). Deconvolution of neural dynamics from fMRI data using a spatiotemporal hemodynamic response function. *Neuroimage*, 94, 203–215.
15. **Aquino, K.M.**, Robinson, P.A., & Drysdale, P.M. (2014). Spatiotemporal hemodynamic response functions derived from physiology. *Journal of Theoretical Biology*, 347, 118–136.
16. **Aquino, K.M.**, Schira, M.M., Robinson, P.A., Drysdale, P.M., & Breakspear, M. (2012). Hemodynamic traveling waves in Human Visual Cortex. *PLoS - Computational Biology*, 8, e1002435.
17. Drysdale, P.M., Huber, J.P., Robinson, P.A., & **Aquino, K.M.** (2010). Spatiotemporal BOLD hemodynamics from a poroelastic hemodynamic model. *The Journal of Theoretical Biology*, 265, 523–534.
18. Freyer, F., **Aquino, K.M.**, Robinson, P.A., Ritter P., & Breakspear, M. (2009). Bistability and non-Gaussian fluctuations in spontaneous cortical activity. *The Journal of Neuroscience*, 29, 8512–8524.

19. Breakspear, M., Bullmore, Ed T., **Aquino, K.M.**, Das, P., & Williams, L. M. (2006). The multiscale character of evoked cortical activity. *Neuroimage*, 30, 1230–1242.

Oral presentations

1. **Aquino, K.M.** (October 2019). Educational workshop: Pre-processing of MRI: State-of-the-art, challenges and pitfalls. *Annual Meeting of the Organization for Human Brain Mapping: Australian Chapter*, Newcastle, Australia.
2. **Aquino, K.M.** (June 2019). OHBM. *More than Meets the Eye: Methods for characterizing and removing large-scale structured signals from resting-state fMRI data.*, Morning workshop: The Global Signal Strikes Back: Understanding and Addressing Widespread Signal Fluctuations in fMRI 25th Annual Meeting of the Organization for Human Brain Mapping. Rome, Italy
3. **Aquino, K.M.** (March 2019). More than meets the eye: methods for characterizing and removing large- scale structured signals from resting-state fMRI. *Noosa workshop on Brain Function, Connectivity and Behaviour*, Noosa, Australia.
4. **Aquino, K.M.** (November, 2018). On the intersection between theory and experiment in large- scale brain network modelling. *NeuroEng*, Sydney, Australia.
5. **Aquino, K.M.**, Robinson, P.A., Puckett, A., Breakspear, M., & Schira, M.M. (June 2014). From Visual Stimulus to BOLD Measurements, a complete spatiotemporal model derived from submillimetre fMRI. *Morning workshop: The hemodynamic response and neurovascular coupling: From sources to measures to models*, 20th Annual Meeting of the Organization for Human Brain Mapping, Hamburg, Germany.
6. **Aquino, K.M.**, Robinson, P.A., Schira, M.M., Lacy, T., & Breakspear, M. (November 2013). Spatiotemporal hemodynamics from a physiological model: Deconvolution of fMRI data, and interactions of BOLD responses. *Meeting for the Society for Neuroscience*, San Diego, CA, USA.
7. **Aquino, K.M.**, Robinson, P.A., Schira, M.M., & Breakspear, M. (June 2013). Spatiotemporal neural dynamics from fMRI: Deconvolution with a spatiotemporal HRF. *19th Annual Meeting of the Organization for Human Brain Mapping*, Seattle WA, USA. (Recipient of the trainee abstract travel award).
8. **Aquino, K.M.**, Schira, M.M., Robinson, P.A., & Breakspear, M. (February 2013). A physiologically plausible spatiotemporal model of BOLD allows deconvolution of hemodynamic and neuronal response components. *ANS 2013: the 33rd Annual Meeting of the Australian Neuroscience Society*, Melbourne, VIC, Australia.
9. **Aquino, K.M.** (December 2012). Spatiotemporal Neural Dynamics from fMRI: Deconvolution using a spatiotemporal hemodynamic response function. *Brain Modes, Large-scale models of the brain*, Queensland Institute of Medical Research, QLD, Australia.
10. **Aquino, K.M.**, Schira, M.M., Robinson, P.A., Drysdale, P.M., & Breakspear, M. (December 2011). Spatiotemporal Hemodynamics: From theory to Experiment. *5th Australian Workshop on Computational Neuroscience*, University of Western Sydney, NSW, Australia.

Poster presentations

1. **Aquino, K.M.**, Sanchez-Panchuelo, R. S., Mullinger, K.J., Hanslmayr, S., Mayhew S., Sokoliuk, R., & Francis, S.T. (April 2017). Top-down modulation in a directed sensory attention task. *25th Annual meeting for the International Society of Magnetic Resonance Imaging in Medicine*, Poster No. 5368, Honolulu, HI, USA..
2. **Aquino, K.M.**, Sanchez-Panchuelo, R. S., Mullinger, K.J., Hanslmayr, S., Mayhew S., Sokoliuk, R., & Francis, S.T. (June 2016). In vivo segmentation of layer IV in primary visual cortex using anatomy. *22nd Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 1256, Geneva, Switzerland.
3. Lacy, T.C., **Aquino, K.M.**, Robinson, P.A.,& Schira, M.M. (June 2015). Induction of Hemodynamic Shocks by Moving Stimuli in the Primary Visual Cortex. *21st Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 3739, Honolulu, Hawaii, USA.
4. **Aquino, K.M.**, Lacy, T.C., Robinson, P.A.,& Schira, M.M. (June 2015). Using models to design fMRI experiments – not just fit data. *21st Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 3729, Honolulu, Hawaii, USA.

5. Puckett, A. M., **Aquino, K.M.**, Isherwood, Z., & Schira, M.M. (June 2015). Laminar Differences in Retinotopic Maps: Measured and Modeled. *21st Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 4049, Honolulu, Hawaii, USA.
6. Robinson, P.A., Zhao, X., **Aquino, K.M.**, Griffiths, J.D., Sarkar, S., & Pandejee G.M (June 2015). Neural Field Theory of Eigenmodes of Brain Activity. *21st Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 3870, Honolulu, Hawaii, USA.
7. Puckett, A., **Aquino, K.M.**, Robinson, P.A., Breakspear, M., & Schira, M.M. (June 2014). Laminar analysis: The spatiotemporal profile of the BOLD response changes with depth. *20th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 2062, Hamburg, Germany.
8. **Aquino, K.M.**, Robinson, P.A., Puckett, A., Breakspear, M.& Schira, M.M. (June 2014). From Visual Stimulus to BOLD Measurements, a complete spatiotemporal model derived from sub millimetre fMRI. *20th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 1702, Hamburg, Germany.
9. **Aquino, K.M.**, Robinson, P.A., Schira, M.M., & Breakspear, M. (June 2013). Spatiotemporal neural dynamics from fMRI: Deconvolution with a spatiotemporal HRF. *19th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 1752, Seattle, WA, USA. (Recipient of the trainee abstract travel award).
10. **Aquino, K.M.**, Breakspear, M., Robinson, P.A., & Schira, M.M. (November 2011). Disambiguating between neural and hemodynamic effects. *Annual meeting for the Society for Neuroscience*, Poster No. 619.12/YY4, Washington, DC, USA.
11. Schira, M.M., Breakspear, M., Paxinos, G., & **Aquino, K.M.** (November 2011). High resolution characterisaton of spatiotemporal point spread of BOLD: Vascular versus neuronal spread in human V1 and V2. *Annual meeting for the Society for Neuroscience*, Poster No. 271.14/JJ5, Washington, DC, USA.
12. **Aquino, K.M.**, Drysdale, P.M., & Breakspear, M. (June 2010). A spatiotemporal HRF derived from physiology. *16th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 2456, Barcelona, Spain.
13. Drysdale, P.M., Huber J.P., Robinson, P.A., & **Aquino, K.M.** (June 2010). Spatiotemporal BOLD hemodynamics from a poroelastic hemodynamic model. *16th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 1080, Barcelona, Spain.
14. **Aquino, K.M.**, Schira, M.M., Drysdale, P.M., Robinson, P.A., & Breakspear, M. (June 2010). BOLD travelling waves in primary visual cortex. *16th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 2460, Barcelona, Spain.
15. **Aquino, K.M.**, Robinson, P.A., Schira, M.M., Drysdale, P.M., & Breakspear, M. (June 2008). Characterization of physiologic and neural fluctuations in sensory-evoked fMRI of the primary visual cortex. *14th Annual Meeting of the Organization for Human Brain Mapping*, Poster No. 491, Melbourne, VIC, Australia.

Teaching & supervision

2019	PhD Primary supervisor Supervising student YuChi at Monash University.
2018 –	Honours Primary supervisor Supervised Honours students Anna Earl, Alex Wulff, and Jia Lee in their 4th year psychology projects at Monash University.
2017 –	Associate supervisor Associate supervisor to PhD candidates: Kristina Sabaroedin, Sid Chopra, and Ashlea Segal
2016	Undergraduate Teaching Assisted in teaching 4th year undergraduate physics module : Image processing at the University of Nottingham. Involved in marking student presentations as well as creating and supervising 2 student projects (2 students per project).
2016	Modeling Seminar Series Co-organized and gave 2 Lectures of a Modeling seminar series at the Sir Peter Mansfield Imaging center. Six lectures were scheduled with an attendance of ≈20 members that included staff from around the University of Nottingham.
2013 –	Associate Supervisor Honors Student (4th year) Thomas Lacy (2013), PhD Candidate Thomas Lacy (from 2014), PhD Candidate James Pang (from 2015, submitted 2018), and PhD candidate Grishma Mehta-Pandejee (completed 2018)
2014	First year informatics course: INFO 1903 Guest Lecture: "Hemodynamics: from Theory to experiment."
2011 – 2013	Supervisor Third year Physics special project students: Thomas Lacy (2011) & Nikhil Vasan (2013).
2011 – 2012	Teaching Assistant Redesign of Computational Physics module in Physics II.
2010 – 2012	Laboratory Supervisor Physics II, Computational Physics.
2006 – 2009	University Tutor Computational Physics II, Physics I, and Computational Science (First year course).

Academic Service

1. Organized an educational course to teach Dynamic Causal modelling and ordinary differential equations. Lectures were made online at <https://www.youtube.com/watch?v=q-yypnHgCII> and have reached over 100 hours of viewing time.
2. Gave pre-processing seminars at the Sir Peter Mansfield Imaging Centre, University of Nottingham (2016,2018) attended by ≈ 50 staff and student members.
3. Organizer of Complex systems seminar series. (2013–2015)
4. Webmaster, Complex Systems group <http://physics.usyd.edu.au/complex-systems/> (2015)
5. Reviewer: Neuroimage, Neural Networks), Frontiers in Neuroscience, Human Brain Mapping (Conference Abstracts), Human Brain mapping, PLoS Computational Biology, Journal of Neuroscience Methods, & Science Advances.
6. Volunteer for University of Sydney Open day.