

BERNARD NG

PERSONAL INFORMATION

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Citizenship Canadian

RESEARCH INTERESTS

My principal research interests lie in developing new computational methods based on machine learning, sparse optimization, graphical models, and Bayesian statistics for biomedical applications. I am currently investigating new techniques for multimodal neuroimaging integration to improve brain connectivity inference. My future research plan is to additionally incorporate genetic and behavioural factors for establishing richer disease characterizations in enhancing disease detection and diagnosis.

EDUCATION

Sept. 2007 – Sept. 2011 **Ph.D. in Electrical and Computer Engineering**
with sub-specialization in Engineering Management
The University of British Columbia, Canada
Thesis: Prior-informed Multivariate Models for Functional Magnetic Resonance Imaging (*nominated for Governor General's Gold Medal as the top student of graduating class in Faculty of Applied Science*)
Supervisor: Dr. Rafeef Abugharbieh
GPA: 4.33/4.33

Sept. 2005 – Aug. 2007 **M.A.Sc. in Electrical and Computer Engineering**
The University of British Columbia, Canada
Thesis: Novel Region Based fMRI Analysis Using Invariant Moment Descriptors
Supervisors: Dr. Rafeef Abugharbieh and Dr. Martin J. McKeown
GPA: 4.33/4.33

Sept. 1999 – June 2005 **B.A.Sc. in Electronics Engineering, First Class Honours**
Simon Fraser University, Canada
Thesis: Investigating the Effects of Damping during Wrist Movements
Supervisors: Dr. Theodore E. Milner and Dr. David W. Franklin
GPA: 3.97/4.33

AWARDS AND SCHOLARSHIPS

2012 • NSERC Postdoctoral Fellowship (CAD\$80,000 over 2 years)

2011 • PRNI Trainee Travel Award (based on review score, US\$500)
• HBM Trainee Travel Award (based on review score, US\$460)

2010 • Foreign Government Award from French Government (€6,360)
• SPIE Educational Scholarship (US\$2,000)
• UBC Four Year Fellowships (in title)

- UBC Research Mobility Award (declined)
- 2009
 - MICCAI Travel Grant Award (based on review score, £350)
 - SPIE Educational Scholarship (US\$2,000)
 - UBC Four Year Fellowships (in title)
 - UBC Faculty of Applied Science Graduate Award (CAD\$6,000)
- 2008
 - MSFHR Research Trainee Award (CAD\$28,583 over 3 years)
 - Walter C. Sumner Memorial Fellowship (CAD\$12,000 over 2 years)
 - UBC Faculty of Applied Science Graduate Award (CAD\$6,000)
- 2007
 - NSERC Postgraduate Scholarship (CAD\$63,000 over 3 years)
 - Pacific Century Graduate Scholarship (declined)
- 2006
 - UBC University Graduate Fellowship (CAD\$16,000)
- 2003 – 2005
 - SFU Open Undergraduate Scholarship (CAD\$1,700)
- 2002
 - SFU Engineering Science Student Project Award (CAD\$400)
 - SFU Open Undergraduate Scholarship (CAD\$1,700)
- 2001
 - SFU Mathematics and Statistics Award
 - SFU Open Undergraduate Scholarship (CAD\$1,700)
- 2000
 - SFU Open Undergraduate Scholarship (CAD\$1,700)
- 1999
 - SFU Summit Scholarship (CAD\$3,500)

RESEARCH EXPERIENCE

Nov. 2011 – Present

Postdoctoral Researcher

PARIETAL team, INRIA, France

Supervisor: Dr. Bertrand Thirion

As a new collaboration between the PARIETAL team of INRIA and the FIND lab of Stanford University, I am currently developing at INRIA new sparse optimization techniques that facilitate integration of information from functional magnetic resonance imaging (fMRI) and diffusion MRI data for improving brain connectivity inference. I will then be refining the developed techniques for disease-specific analysis at Stanford University.

Sept. 2010 – Feb. 2011

Visiting Researcher

PARIETAL team, INRIA, France

Supervisor: Dr. Bertrand Thirion

Developed a novel Bayesian model for integrating resting state brain connectivity information into task activation detection.

Sept. 2005 – Oct. 2011

Research Assistant

Biomedical Signal and Image Computing Laboratory (BiSICL)

The University of British Columbia, Canada

Supervisor: Dr. Rafeef Abugharbieh

Developed new computational methods that permit incorporation of prior knowledge for improving fMRI activation detection, region of interest characterization, brain network analysis, and fMRI pattern classification. Also investigated into blind source separation techniques for EEG analysis.

- May 2004 – June 2005* **Research Assistant**
Neuromuscular Control Lab, Simon Fraser University, Canada
Supervisor: Dr. Theodore E. Milner
Conducted experiments to study the dynamics of human wrist motions for extending the simulated wrist model developed during my stay at ATR.
- Sept. 2003 – April 2004* **Research Assistant**
Advanced Telecommunication Research International (ATR), Japan
Supervisor: Dr. David W. Franklin
Performed human motor control experiments, statistical data analysis, and developed a computer-simulated human wrist model.

TEACHING AND SUPERVISORY EXPERIENCE

- 2010 – Present* **Supervisory Training**
BiSICL, The University of British Columbia, Canada
During my last two years of Ph.D. studies, I helped supervise a senior undergraduate student and a master student. My role involved introducing them to neuroimaging, devising suitable projects, and providing advice and guidance. Currently, I am helping supervise a Ph.D. student on a new collaborative project between BiSICL and the Cognitive Neuroscience of Schizophrenia (CNoS) lab. All projects resulted in publications.
- 2009* **Guest Speaker**
The University of British Columbia, Canada
Course: EECE 575 Digital Image and Video Processing
Presented state-of-the-art statistical analysis methods for fMRI research.
- 2007 – 2010* **Graduate Teaching Assistant**
The University of British Columbia, Canada
Courses: EECE 251 Circuit Analysis I, EECE 253 Circuit Analysis II, and EECE 446 Digital Signal Processing Systems
Responsible for preparing and marking assignments, holding tutorials and office hours, as well as invigilating and marking exams.
- 2000 – 2009* **Private Tutor**
Tutored university and high school level math, physics, and calculus.

INDUSTRIAL WORK EXPERIENCE

- Sept. 2001 – Dec. 2001* **Junior Hardware Designer**
Sierra Wireless Inc., Canada
Performed circuit reliability prediction, part search, modem calibration, and automated test equipment programming in Visual Basic, GPIB, and SCPI.

Jan. 2001 – Apr. 2001

Junior Design Engineer

Broadcom Canada Ltd., Canada

Modified, tested, and debugged circuit boards for VoIP.

PROFESSIONAL SERVICES

2007 – Present

Reviewer for Journals

- IEEE Transactions on Medical Imaging
- NeuroImage
- Neurocomputing
- Special issue on Brain Decoding in the journal of Pattern Recognition
- Special issue on fMRI Analysis for Human Brain Mapping in the Journal of Selected Topics in Signal Processing

Reviewer for Conferences

- Medical Image Computing and Computer Assisted Intervention
- Computer Vision and Pattern Recognition
- Mathematical Methods in Biomedical Image Analysis
- Human Brain Mapping
- Canadian Student Conference on Biomedical Computing

Reviewer for Grants

- National Research Council (CNCS) of Romania

2008

Workshop Volunteer

MICCAI 2008 Workshop on Analysis of Functional Medical Images, USA

Responsible for preparing the technical program and the proceedings, testing submission site, and providing general support throughout the workshop.

2007

Workshop Volunteer

Workshop on Mathematical Methods for Medical Image Analysis, Canada

Responsible for preparing the technical program, testing submission site, and providing general support throughout the workshop. I also presented my research titled, “Spatial Encoding of Brain Activation in fMRI.”

VOLUNTEER ACTIVITIES

UBC Hospital

Helped organize activities for UBC hospital residents for over 3 years

Let's Talk Science

Promoted graduate studies to junior students over round-table discussions

UBC Tri-mentoring

Shared my academic and work experience with a junior student

IEEE EMBC 2008

Pre-session setup and addressed conference attendees' enquires

IEEE AGM

Support staff

ENOCH outreach

Senior home visits

S.U.C.C.E.S.S.

Taught youth basic Microsoft Office tools

Maison du Japon, Paris

Volunteer salsa instructor

OTHER

<i>Languages</i>	English, Cantonese, Mandarin, Japanese
<i>Recreational Activities</i>	Badminton, basketball, ballroom, and salsa

PUBLICATIONS

Peer-reviewed Journal Articles

- [1] **B. Ng**, G. Hamarneh, and R. Abugharbieh, "Modeling Brain Activation in fMRI Using Group MRF," *IEEE Transactions on Medical Imaging*, vol. 31, pp. 1113–11123, 2012.
- [2] **B. Ng**, R. Abugharbieh, and M.J. McKeown, "Group Replicator Dynamics: A Novel Group-wise Evolutionary Approach for Sparse Brain Network Detection," *IEEE Transactions on Medical Imaging*, vol. 31, pp. 576–585, 2012.
- [3] **B. Ng**, S.J. Palmer, R. Abugharbieh, and M.J. McKeown, "Focusing Effects of L-dopa in Parkinson's Disease," *Human Brain Mapping*, vol. 31, pp. 88–97, 2010.
- [4] **B. Ng**, R. Abugharbieh, X. Huang, and M.J. McKeown, "Spatial Characterization of fMRI Activation Maps Using Invariant 3D Moment Descriptors," *IEEE Transactions on Medical Imaging*, vol. 28, pp. 261–268, 2009.
- [5] S.J. Palmer, **B. Ng**, R. Abugharbieh, L. Eigenraam, and M.J. McKeown, "Motor Reserve and Novel Area Recruitment: Amplitude and Spatial Characteristics of Compensation in Parkinson's Disease," *European Journal of Neuroscience*, vol. 29, pp. 2187–2196, 2009.

Full Length Peer-reviewed Conference Papers (presenter)*

- [1] **B. Ng**, G. Varoquaux, J.B. Poline, and B. Thirion, "A Novel Sparse Graphical Approach for Multimodal Brain Connectivity Inference," *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2012. (accepted, oral)
- [2] B. Yoldemir, **B. Ng**, and R. Abugharbieh, "Deconfounding the Effects of Resting State Activity on Task Activation Detection in fMRI," *Workshop on Multimodal Brain Image Analysis* held in conjunction with *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2012. (accepted, oral)
- [3] **B. Ng**, V. Siless, G. Varoquaux*, J.B. Poline, R. Abugharbieh, and B. Thirion, "Connectivity-informed Sparse Classifiers for fMRI Brain Decoding," *International Workshop on Pattern Recognition in NeuroImaging (PRNI)*, pp. 101–104, 2012. (oral)
- [4] **B. Ng***, R. Abugharbieh, G. Varoquaux, J.B. Poline, and B. Thirion, "Connectivity-informed fMRI Activation Detection," *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, vol. 6892, pp. 285–292, 2011.
- [5] **B. Ng*** and R. Abugharbieh, "Generalized Sparse Regularization with Application to fMRI Brain Decoding," *International Conference on Information Processing in Medical Imaging (IPMI)*, vol. 6801, pp. 612–623, 2011.
- [6] **B. Ng*** and R. Abugharbieh, "Generalized Group Sparse Classifiers with Application in fMRI Brain Decoding," *International Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 1065–1071, 2011.
- [7] **B. Ng*** and R. Abugharbieh, "Modeling Spatiotemporal Structure in fMRI Brain Decoding Using Generalized Sparse Classifier," *International Workshop on Pattern Recognition in NeuroImaging (PRNI)*, pp. 65–68, 2011. (oral)
- [8] **B. Ng***, G. Hamarneh, and R. Abugharbieh, "Detecting Brain Activation in fMRI Using Group Random Walker," *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, vol. 6362, pp. 331–338, 2010.

- [9] **B. Ng***, A. Vahdat, G. Hamarneh, and R. Abugharbieh, "Generalized Sparse Classifiers for Decoding Cognitive States in fMRI," *Workshop on Machine Learning in Medical Imaging* held in conjunction with *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, vol. 6357, pp. 108–115, 2010. (oral)
- [10] **B. Ng***, R. Abugharbieh, and G. Hamarneh, "Group MRF for fMRI Activation Detection," *International Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 2887–2894, 2010.
- [11] **B. Ng***, R. Abugharbieh, and M.J. McKeown, "Functional Segmentation of fMRI Data Using Adaptive Non-negative Sparse PCA (ANSPCA)," *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, vol. 5762, pp. 490–497, 2009.
- [12] **B. Ng***, R. Abugharbieh, G. Hamarneh, and M.J. McKeown, "Random Walker Based Estimation and Spatial Analysis of Probabilistic fMRI Activation Maps," *Workshop on fMRI Data Analysis* held in conjunction with *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, pp. 37–44, 2009.
- [13] **B. Ng***, R. Abugharbieh, and M.J. McKeown, "Discovering Sparse Functional Brain Networks Using Group Replicator Dynamics (GRD)," *International Conference on Information Processing in Medical Imaging (IPMI)*, vol. 5636, pp. 76–87, 2009. (oral)
- [14] **B. Ng***, R. Abugharbieh, and M.J. McKeown, "Detecting Maximal Directional Changes in Spatial fMRI Response Using Canonical Correlation Analysis," *International Symposium on Biomedical Imaging (ISBI)*, pp. 650–653, 2009.
- [15] **B. Ng***, R. Abugharbieh, and M.J. McKeown, "Adverse Effects of Template-based Warping on Spatial fMRI Analysis," *International Conference on Medical Imaging organized by SPIE*, vol. 7262, pp. 72621Y–12 pages, 2009.
- [16] **B. Ng***, R. Abugharbieh, and M.J. McKeown, "Enhanced fMRI Response Detection and Reduced Latency through Spatial Analysis of BOLD Signals," *Workshop on Analysis of Functional Medical Images* held in conjunction with *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, pp. 81–88, 2008.
- [17] **B. Ng**, R. Abugharbieh*, and M.J. McKeown, "Inferring Functional Connectivity Using Spatial Modulation Measures of fMRI Signals within Brain Regions of Interest," *International Symposium on Biomedical Imaging (ISBI)*, pp. 572–575, 2008.
- [18] **B. Ng***, R. Abugharbieh, S.J. Palmer, and M.J. McKeown, "Characterizing Task-Related Temporal Dynamics of Spatial Activation Distributions in fMRI BOLD Signals," *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, vol. 4791, pp. 767–774, 2007.
- [19] **B. Ng***, R. Abugharbieh, S.J. Palmer, and M.J. McKeown, "Joint Spatial Denoising and Active Region of Interest Delineation in Functional Magnetic Resonance Imaging," *Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 3404–3407, 2007.
- [20] **B. Ng***, R. Abugharbieh, X. Huang, and M.J. McKeown, "Characterizing fMRI Activations within Regions of Interest (ROIs) Using 3D Moment Invariants," *Workshop on Mathematical Methods in Biomedical Image Analysis (MMBIA)* held in conjunction with *International Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 63–8 pages, 2006. (oral)
- [21] T.E. Milner*, **B. Ng**, and D.W. Franklin, "Learning Feedforward Commands to Muscles Using Time-shifted Sensory Feedback," *International Conference on Brain-inspired Information Technology*, vol. 1291, pp. 113–116, 2005.

Peer-reviewed Abstracts (* presenter)

- [1] **B. Ng**, G. Varoquaux, J.B. Poline, and B. Thirion*, “Integrating Group Connectivity Prior into fMRI Activation Detection,” *International Conference on Human Brain Mapping (HBM)*, 2012.
- [2] **B. Ng***, R. Abugharbieh, J.B. Poline, and B. Thirion, “Inferring Brain Activation from Spatial Modulations of fMRI BOLD Distribution” *International Conference on Human Brain Mapping (HBM)*, 2011.
- [3] S.J. Palmer*, M.J. McKeown, **B. Ng**, and R. Abugharbieh, “3D-texture of BOLD fMRI Activation in Parkinson's Disease Reveals Recruitment of Ipsilateral Cerebello-thalamo-cortical Loops Modulated by L-dopa and Increasing Movement Frequency,” *Annual International Meeting of Society for Neuroscience (SfN)*, 2007.
- [4] M.J. McKeown*, **B. Ng**, M.M. Lewis, R. Abugharbieh, and X. Huang, “Task and Hand Dominance-specific Focussing Effect of L-dopa in Parkinson’s Disease (PD) and Normal Subjects,” *International Congress of Parkinson’s Disease and Movement Disorders*, 2006.