SULLIVAN + BREEN + KING

Robert E. Simmonds, QC (Counsel) + Rosellen Sullivan + Erin K. Breen + Michael N.R. King + Ellen C. O'Gorman

January 13, 2017

Commissioner Leo Barry
Commission of Inquiry into the Death of Donald Dunphy
Filed via e-mail attachment

Dear Commissioner Barry:

Re: Application on behalf of Meghan Dunphy to have Dr. Stephen Czarnuch, Biomechanical Engineer, called as an expert witness

As directed by the Commission on January 7, 2017, we provide this letter as the Application of Ms. Dunphy for the Commission to call Dr. Stephen Czarnuch, biomechanical engineer, as an expert witness. Dr. Czarnuch's CV and preliminary report setting out his proposed methodology have been provided.

We submit that Dr. Czarnuch's opinion will assist the Commission with respect to subsections 3(1) (f) and (j) of the terms of reference.

Constable Smyth has stated that Mr. Dunphy, while seated in his chair, obtained a rifle from his right hand side and then pointed the rifle while Constable Smyth stood across from him. Constable Smyth stated that he did not see this take place although he had Mr. Dunphy in his peripheral vision. The physical movements necessary to obtain a rifle in this manner and the time it would take are not known. Dr. Czarnuch's preliminary statement proposes a biomechanical engineering methodology that will produce a reliable standard against which the veracity of Constable Smyth's testimony may be tested. Dr. Czarnuch's output would not be within the common knowledge of the Commission and would assist the Commission in its analysis of this material issue.

Respectfully submitted,

ERIN K. BREEN AND ROBERT E. SIMMONDS Q.C.

Suite 300, 233 Duckworth Street, St. John's, NL A1C 1G8 + P 709.739.4141 + F 709.739.4145 + wefighthardcases.ca

Preliminary Statement related to the Commission of Inquiry Respecting the Death of Donald Dunphy

Prepared for:

Erin Breen and Robert Simmonds, Q.C.,

SBK – Defense

Prepared by:

Stephen Czarnuch, Ph.D., P.Eng.
Assistant Professor
Department of Electrical and Computer Engineering,
Faculty of Engineering and Applied Science /
Discipline of Emergency Medicine, Faculty of Medicine
Memorial University of Newfoundland

January 12, 2017

Introduction

This statement is prepared in response to an email sent to me by Ms. Erin Breen on Sunday, January 8, 2017 at 4:36pm. I was provided with the following evidence for my preliminary statement:

1. Statement of Joseph Smyth – December 22, 2015 (transcripts);
2. Statement of Joseph Smyth – June 17, 2015 (transcripts);
3. A binder of approximately 40 photos of the room;
4. A three-page document beginning with a short statement followed by a Twitter tweet (unknown source); and
5. A one-page floorplan of Mr. Dunphy's house, titled Appendix II (p.23, unknown source)

My statement is solely based on these documents and contextualized by the original email sent by Ms. Breen.

Expertise in the area

I obtained my PhD in biomedical engineering at the University of Toronto in 2014, with a specific focus on human motion tracking, task and activity identification, detection and monitoring. My research on computer vision-based human motion tracking began in 2009 when I started my PhD, and is now largely centred on biomechanical modeling of humans and human motion in three-dimensions. My work in this area is largely focused on persons with physical and cognitive disabilities (e.g., dementia, multiple sclerosis), and has resulted in over ten peer-reviewed scholarly publications in the area [e.g., 1, 2-10]. Prior to my PhD, I worked for over a decade as an electrical and computer engineer, and spent the last five years of this period specializing in computerized human tracking and task identification in a manufacturing setting. Finally, through my research I routinely conduct motion trials with humans in an attempt to identify tasks and activities, including timing human motion.

Experience providing expert opinion in a judicial hearing

I have never provided an expert opinion in a judicial hearing.

Awareness and understanding of the role of an expert witness in a judicial proceeding.

I understand that my role as an expert witness is to maintain impartiality. With respect to my involvement in the Dunphy case I understand that all of my correspondences are to be documented, ideally in written form, to the greatest extent possible. Furthermore, any methodologies that I employ and opinions that I express must be scientifically based and unbiased toward any result. I am familiar with this role as an ongoing expectation of my role as a professional, as evidenced by my ongoing certification as a licensed and practicing Professional Engineering in the Province of Newfoundland and Labrador, member #08223.

Declaration of any bias, real or perceived, that may exist.

I hold no personal bias with respect to this role. In the interest of full disclosure of real or perceived conflicts of interests, I believe it prudent to disclose that my partner, Dr. Rosemary Ricciardelli is an Associate Professor in the Department of Sociology and the Coordinator of the Criminology Certificate at

Memorial University. She specializes in corrections research although does limited policing research as well. In her academic role, she serves on the police studies academic advisory committee and may teach Royal Newfoundland Constabulary (RNC) cadets (or future cadets) in her classes. She does work in partnership with the Royal Canadian Mounted Police (RCMP), B Division and has engaged in research with the Child Abuse and Sexual Assault Unit as well as that of the Child Internet Exploitation Unit of the RNC. To the best of her knowledge, she does not know Smyth nor anything beyond public knowledge of the Dunphy case.

Understanding of the questions being asked to consider for the Commission.

I am confident I fully understand the questions I am being asked to consider for the Commission. Namely, I am being asked to consider:

1. What physical movements were required for Mr. Dunphy (with the parameters outlined below) to obtain the rifle from his right hand side while seated in his chair?
2. How long, time wise, could these actions take?

I also understand that my proposed consideration and procedure must contemplate all reasonable possibilities, including the quickest and easiest way that the rifle could be obtained *by a young and fully able-bodied adult male*. To accomplish this, and implicit to my methodology, will be the determination of the possible/probable locations the rifle could have been stored during the exchange between Mr. Smyth and Mr. Dunphy while remaining accessible to Mr. Dunphy, but potentially not visible to Mr. Smyth.

Methodology and proposed results

I propose three main steps: 1) identify possible classes of locations for the rifle; 2) biomechanical modeling of a young and fully able-bodied adult male (of the same height and basic measurements of Mr. Dunphy) reaching for the rifle; and 3) timing trials with a representative sample of young and fully-able-bodied males. In this way, I expect to be able to produce the following results:

1. A list of possible locations to the right of the chair that the rifle could have been stored and accessible to Mr. Dunphy but potentially not visible to Mr. Smyth, categorized by classes.
    - In this context, a *class* would refer to a location that would be accessible by the same or similar physical and anatomical human movements, while allowing for some variation in the actual placement. For example, a class could be identified as "on the floor, approximately parallel to the chair with the barrel toward the mantle".
    - Accessible to Mr. Dunphy suggests that he could reach the rifle without leaving his chair.
    - Potentially not visible to Mr. Smyth suggests that, under some circumstances Mr. Smyth may have been able to see the rifle, but that is was possible he could not see it depending on location, environmental conditions, etc.
    - Location classes would be identified by physical dimensioning and examination of the room and rifle.
2. A static biomechanical model of a young, able-bodied male of similar anatomical dimensions to Mr. Dunphy in his chair, and reaching for the rifle in the location classes identified in the first step.
    - This model will primarily identify the transformation of the posture and positioning of a man similar to Mr. Dunphy that would be required under ideal conditions to reach the rifle.
    - This modeling may also discount certain possible locations based on the motions required to reach them.

3. A set of simulated or real trials to help characterize how long, time wise, it would take a young, able bodied adult male to obtain the rifle into a defined position.
    - The position, currently, has not been fully defined but may include: the rifle being held by the grabbing hand; the rifle being held by both hands; the rifle being held and pointed at the probable location of Mr. Smyth by the mantle without necessarily being oriented properly; the rifle being held and pointed at Mr. Smyth and oriented properly.
    - The use of simulated trials (i.e., in a mock setting with objects of similar dimensions) versus real trials (i.e., in the Mr. Dunphy's home) will be determined under the advisement of the Commission.
    - The number of participants required to characterize a young, able-bodied adult male will be determined under the advisement of the Commission
    - These trials will help understand both the *average* time it takes to perform the considered action, as well as the amount of variation one could reasonably expect as a result of individual capabilities. In other words, these trials will provide an expected range of times it would take for a healthy adult male to perform the action for each possible location of the rifle.

How this opinion would assist the Commission in carrying out its mandate

From the data collected using the stated methodology, one could gain an understanding of the amount of time it would likely take for a seated, able bodied adult male to, for example, reach for the rifle in in a known storage location, properly orient the rifle (for example if it was picked up upside down), and point the rifle toward the mantle. These data could also be compared across possible rifle locations. From these data, in conjunction with the biomechanical modeling of the posture and pose deformation potentially required to reach the weapon, and from a review of the timing trials, one could also gain an evidence-based understanding of what Mr. Smyth may have seen, directly or peripherally, if a young, able-bodied adult male were reaching for and drawing the rifle from Mr. Dunphy's seat. Finally, and in consideration of any disability or injury Mr. Dunphy may have had, one could opine on how these data collected from a young, able-bodied adult male could have been affected. For example, an assertion could be made that Mr. Dunphy's physical disability or injury may in fact cause him to take more time than a young, healthy adult male to draw his weapon. However, this assertion would require a better understanding of Mr. Dunphy's disability than is currently known at this time.

Closing Remarks

I have attached a copy of my Curriculum Vitae, dated January 11, 2017, along with this statement. If you require any additional information or have any questions or comments about this statement, please do not hesitate to contact me.

Sincerely

Stephen Czarnuch, PhD, P.Eng.

References

[1] A. J. R. Hynes and S. Czarnuch, "Assessing the gait of people with multiple sclerosis using 3D motion tracking: toward objective outcome measures," in *Americas Committee for Treatment & Research in Multiple Sclerosis (ACTRIMS)*, Orlando, FL, 2017.

[2] S. Czarnuch and A. Mihailidis, "Development and evaluation of a hand tracker using depth images captured from an overhead perspective," *Disability & Rehabilitation: Assistive Technology,* vol. 11, pp. 150-157, 2016.

[3] S. Czarnuch and M. Ploughman, "Toward inexpensive, autonomous, and unobtrusive exercise therapy support for persons with MS," in *Americas Committee for Treatment & Research in Multiple Sclerosis (ACTRIMS)*, New Orleans, LA, 2016.

[4] A. J. R. Hynes and S. Czarnuch, "Combinatorial Optimization for Human Body Tracking," in *Lecture Notes in Computer Science, Proceedings of the International Symposium on Visual Computing*, Las Vegas, NV, 2016.

[5] A. J. R. Hynes and S. Czarnuch, "Building a feature vector for assessing the gait of persons with multiple sclerosis," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2016.

[6] Z. Yang and S. Czarnuch, "3D Point Cloud based Human Skeleton Identification," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2015.

[7] S. Czarnuch, "Advancing the COACH automated prompting system toward an unsupervised, real-world deployment," Doctor of Philosophy, Institute of Biomaterials and Biomedical Engineering, University of Toronto, Toronto, 2014.

[8] S. Czarnuch and M. Ploughman, "Automated gait analysis in people with Multiple Sclerosis using two unreferenced depth imaging sensors: Preliminary steps," presented at the Proceedings of the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2014.

[9] S. Czarnuch and A. Mihailidis, "Development and evaluation of a hand tracker using depth images captured from an overhead perspective," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2014.

[10] S. Czarnuch, S. Cohen, V. Parameswaran, and A. Mihailidis, "A real-world deployment of the COACH prompting system," *Journal of Ambient Intelligence and Smart Environments, Thematic Issue on Designing and Deploying Intelligent Environments,* vol. 5, pp. 463–478, 2013.

Current Position:	Assistant Professor Department of Electrical and Computer Engineering, Faculty of Engineering and Applied Science / Discipline of Emergency Medicine, Faculty of Medicine Memorial University
Address:	S.J. Carew, EN-3030 St. John's, NL Canada A1B3X5
E-mail Address:	sczarnuch@mun.ca
Phone:	709.864.7850
Fax:	709.864.3490

1 EDUCATION

Degree	Institution	Department	Year
Ph.D.	University of Toronto	Institute of Biomaterials and Biomedical Engineering	2014
M.A.Sc.	McMaster University	Electrical and Computer Engineering	2005
B.Eng. & Mgmt.	McMaster University	Electrical and Computer Engineering	2002

2 EMPLOYMENT HISTORY

2.1 Academic Appointments

2015-present Assistant Professor
Memorial University

2014-2015 Post-doctoral fellow
Memorial University
St. John's Canada
Co-advisors: Dr. Ray Gosine (Engineering), Dr. Michelle Ploughman (Medicine)
Title: Toward automated rehabilitation support and progress assessment for people with Multiple Sclerosis: Improving recovery, objectivity and safety with technology

2014, Spring Per-course instructor, Concurrent Programming
Memorial University
St. John's Canada

2002, Fall Teaching Assistant, Electrical Machines
McMaster University
Hamilton Ontario

2002, Winter — Teaching Assistant, Microelectronics
McMaster University
Hamilton Ontario

2.2 Non-Academic Appointments

2005-2014 — Electrical Engineer
General Motors of Canada
Oshawa, Ontario

- Created and supervised the implementation of research and development projects to improve manufacturing processes
  - Independently conceptualized and lead large-scale research based projects (up to $250,000) to support manufacturing requirements such as:
    - Designing a human tracking systems to enforce the safety and security of manufacturing personnel in unsafe areas
    - Creating an innovative human-object interaction detection system to ensure compliance with safety regulations during the installation of critical vehicle components
  - Collaboratively contributed to team-based, interdisciplinary projects valued at as much as $1 million, such as:
    - Redesigning infrastructure for tracking and verifying build data and processes across the General Motors Oshawa Car Plants
  - Explored the application of leading-edge hardware to improve manufacturing accountability and traceability
  - Designed custom industrial Human-Machine Interfaces to allow seamless interaction between process equipment, skilled trades and unskilled production workers
  - Supervised teams of skilled trades during the installation and validation of process equipment
- Autonomously provided engineering support for automated process equipment
  - Utilized problem solving skills to diagnose equipment failures and resolve chronic manufacturing issues
  - Coordinated teams of skilled trades and production personnel under significant pressure caused by the financial impact of lost production time

2003-2005 — Control Systems Engineer and Electrical Designer
ATL Industries
Uxbridge, Ontario

- Conceptualized, designed and implemented innovative electrical and control systems for the automotive and manufacturing industries
  - Collaboratively designed electrical and pneumatic control system and novel industrial communication networks for projects up to $2.5 million
- Supervised onsite installation teams during machine installation and commissioning for multiple projects in North America, such as:
  - Brose Technik full door assembly line, Vance, Alabama

    - ABC Technologies Inc., plastic processing equipment, Gallatin, Tennessee
    - Honda Manufacturing, car battery installation line, Lincoln, Alabama
    - Honda Manufacturing, air pressure decay HVAC test, Aliston, Ontario
  - Communicated directly with customers during quoting, contract negotiation, equipment design, equipment testing, installation, training, and service

2002-2003 Electrical Engineer
Delphi Energy and Engine Management Systems
Oshawa, Ontario

- Implemented and supervised entire projects from start to finish, including the design, installation, debugging and training
- Supported manufacturing production with several processes such as:
  - Injection moulding (plastics)
  - Molten lead moulding
  - TIG and Extrusion/Fusion welding
  - Industrial computer vision systems
  - Hazardous material handling
- Maintained existing plant equipment during regular production and assisted with troubleshooting equipment malfunctions
- Supervised both production and maintenance teams as required and when the opportunity was available

3 PRIMARY RESEARCH INTERESTS

- Computer vision human motion tracking and activity detection
- Multi-sensor synthesis and 3D scene reconstruction
- Supporting aging-in-place with assistive technologies for persons with dementia
- Multiple sclerosis rehabilitation and assessment with intelligent technologies

4 PUBLICATION LIST

Publication Type	Pre-2015	2016	2017	Career Total
Peer-Reviewed Journal Articles	3	2	1	6
Peer-Reviewed Conference Papers/Abstracts	15	4	2	21
Peer-Reviewed Conference Proceedings	1	1	4	6
Chapters in Books	1	1	0	2
Reports	0	1	0	1
Non-Peer-Reviewed Articles/Proceedings/Presentations	13	2	0	15

Invited Presentations/Lectures/Keynotes	11	5	2	18
Media Appearances	0	1	0	1

4.1 Peer-Reviewed Journal Articles

[1] E. M. D. Jean-Baptiste, **S. Czarnuch**, A. Mihailidis, “Monte Carlo Algorithm for Factored POMDP-based Assistive System,” Journal of Ambient Intelligence and Smart Environments, 2017 (under review).

[2] **S. Czarnuch**, R. Ricciardelli, and A. Mihailidis, "Predicting the role of assistive technologies in the lives of people with dementia using objective care recipient factors," BMC Geriatrics, vol. 16, pp. 1-11, 2016.

[3] **S. Czarnuch** and A. Mihailidis, "Development and evaluation of a hand tracker using depth images captured from an overhead perspective," Disability & Rehabilitation: Assistive Technology, vol. 11, pp. 150-157, 2016.

[4] M. Grzes, J. Hoey, S. Khan, A. Mihailidis, **S. Czarnuch**, D. Jackson, and A. Monk, "Relational approach to knowledge engineering for POMDP-based assistance systems as a translation of a psychological model," International Journal of Approximate Reasoning, vol. 55, pp. 36-58, 2014.

[5] **S. Czarnuch**, S. Cohen, V. Parameswaran, and A. Mihailidis, "A real-world deployment of the COACH prompting system," Journal of Ambient Intelligence and Smart Environments, Thematic Issue on Designing and Deploying Intelligent Environments, vol. 5, pp. 463–478, 2013.

[6] **S. Czarnuch** and A. Mihailidis, "The design of intelligent in-home assistive technologies: Assessing the needs of older adults with dementia and their caregivers," Gerontechnology, vol. 10, pp. 165-178, 2011.

4.2 Peer-Reviewed Conference Papers/Abstracts

Student first-authors *italicized*.

[1] *K. Habib* and **S. Czarnuch**, "State of the art of ground plane detection in 3D applications: A systematic review," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2016.

[2] *A. J. R. Hynes* and **S. Czarnuch**, "Building a feature vector for assessing the gait of persons with multiple sclerosis," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2016.

[3] *Z. Yang* and **S. Czarnuch**, "3D Point Cloud based Human Skeleton Identification," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2015.

[4] M. Ploughman, S. N. Rancourt, L. P. Kelly, G. Grover, E. M. Wallack, S. Granter-Button, D. T. G. Philpott, D. Button, K. Power, and **S. Czarnuch**, "Assessing peak oxygen consumption in peoplewith multiple sclerosis using total body recumbent stepper and weight supported treadmill," presented at the Rehabilitation in MS Annual Conference, Milan, Italy, 2015.

[5] M. Ploughman, S. N. Rancourt, L. P. Kelly, G. Grover, E. M. Wallack, S. Granter-Button, D. T. G. Philpott, D. Button, K. Power, and **S. Czarnuch**, "Reducing post-exercise decrements inperformance in MS: Preliminary Steps," presented at the Rehabilitation in MS Annual Conference, Milan, Italy, 2015.

[6] **S. Czarnuch**, "Automated ground plane detection using human motion and environmental geometry," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2015.

[7] *L. Lin*, **S. Czarnuch**, A. Malhotra, C. Yu, and J. Hoey, "Affectively aligned cognitive assistance using Bayesian affect control theory," presented at the 8th International Conference on Ubiquitous Computing & Ambient Intelligence (UCAmI) & 6th International Work-conference on Ambient Assisted Living (IWAAL) Belfast, Ireland, 2014.

[8] **S. Czarnuch** and M. Ploughman, "Automated gait analysis in people with Multiple Sclerosis using two unreferenced depth imaging sensors: Preliminary steps," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2014.

[9] **S. Czarnuch** and A. Mihailidis, "Development and evaluation of a hand tracker using depth images captured from an overhead perspective," presented at the Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section, St. John's, NL, 2014.

[10] R. Wang, P. Viswanathan, **S. Czarnuch**, J. Boger, G. Nejat, and A. Mihailidis, "Developing advanced assistive technologies for older adults with dementia: Lessons learned," presented at the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA), Bellevue, WA, 2013.

[11] R. Ricciardelli, A. Bridgman, **S. Czarnuch**, B. Ye, J. Bell, and A. Mihailidis, "The impact of caregiver socio-demographic factors on assistive technology needs when caring for a person with Alzheimer's disease," presented at the Canadian Association on Gerontology (CAG): Aging...from Cells to Society, Halifax, NS, 2013.

[12] R. Ricciardelli, J. Bell, **S. Czarnuch**, B. Ye, J. Tong, and A. Mihailidis, "The impact of care recipient factors on their assistive technology needs for daily task completion," presented at the Canadian Association on Gerontology (CAG): Aging...from Cells to Society, Halifax, NS, 2013.

[13] *J. Hill*, R. Ricciardelli, **S. Czarnuch**, and A. Mihailidis, "The relationship between perceptions of assistive technology and the ethical and legal concerns relevant to their acceptance and use," presented at the Canadian Association on Gerontology (CAG): Aging...from Cells to Society, Halifax, NS, 2013.

[14] **S. Czarnuch**, R. Ricciardelli, J. Bell, B. Ye, and A. Mihailidis, "Financial realities and occupational strain: Designing accessible, needed, and appropriate Intelligent Assistive Technologies for people with dementia," presented at the Canadian Association on Gerontology (CAG): Aging...from Cells to Society, Halifax, NS, 2013.

[15] **S. Czarnuch** and A. Mihailidis, "An in-home efficacy study of the COACH prompting system," presented at the Canadian Association on Gerontology (CAG): Aging...from Cells to Society, Halifax, NS, 2013.

[16] *A. Bridgman*, **S. Czarnuch**, R. Ricciardelli, and A. Mihailidis, "Linking caregiver's experiences of 'caregiver burden' with their perception of the usefulness of Assistive Technologies when caring for a person with Alzheimer's disease," presented at the Canadian Association on Gerontology (CAG): Aging...from Cells to Society, Halifax, NS, 2013.

[17] **S. Czarnuch** and A. Mihailidis, "The COACH: Assisted Cognition," presented at the Humboldt Colloquium, Toronto, Canada, 2012.

[18] **S. Czarnuch** and A. Mihailidis, "The COACH: A real-world effectiveness study," presented at the Canadian Student Health Research Forum, Winnipeg, Manitoba, 2012.

[19] **S. Czarnuch** and A. Mihailidis, "The COACH: A real-world efficacy study," presented at the Alzheimer's Association International Conference (AAIC), Vancouver, British Columbia, 2012.

[20] **S. Czarnuch** and A. Mihailidis, "The COACH prompting system: Determining and understanding the needs of caregivers and older adults with dementia," presented at the 6th Annual Canadian Conference on Dementia, Montreal, Canada, 2011.

[21] **S. Czarnuch**, J. Boger, and A. Mihailidis, "COACH@Home: An Ambient Assistive Living Technology for People with Dementia," presented at the Festival of International Conferences on Caregiving, Disability, Aging and Technology, Toronto, Ontario, 2011.

4.3 Peer-Reviewed Conference Proceedings

[1] **S. Czarnuch**, "The role of technology as an MS endpoint: Old problems with new perspectives," in Americas Committee for Treatment & Research in Multiple Sclerosis (ACTRIMS), Orlando, FL, 2017.

[2] A. Hynes, and **S. Czarnuch**, "Assessing the gait of people with multiple sclerosis using 3D motion tracking: toward objective outcome measures," in Americas Committee for Treatment & Research in Multiple Sclerosis (ACTRIMS), Orlando, FL, 2017.

[3] Z. Chen, **S. Czarnuch**, A. Smith, and M. Shehata, "Performance evaluation of 3D keypoints and descriptors," in Lecture Notes in Computer Science, Proceedings of the International Symposium on Visual Computing, Las Vegas, NV, 2016.

[4] A. J. R. Hynes and **S. Czarnuch**, "Combinatorial Optimization for Human Body Tracking," in *Lecture Notes in Computer Science, Proceedings of the International Symposium on Visual Computing*, Las Vegas, NV, 2016.

[5] **S. Czarnuch** and M. Ploughman, "Toward inexpensive, autonomous, and unobtrusive exercise therapy support for persons with MS," in Americas Committee for Treatment & Research in Multiple Sclerosis (ACTRIMS), New Orleans, LA, 2016.

[6] M. Grzes, J. Hoey, S. Khan, A. Mihailidis, **S. Czarnuch**, D. Jackson, and A. F. Monk, "Relational Approach to Knowledge Engineering for POMDP-based Assistance Systems with Encoding of a Psychological Model," in Proceedings of the ICAPS 2011 Workshop on Knowledge Engineering for Planning and Scheduling (KEPS), Freiburg, Germany, 2011.

4.4 Chapters in Books

[1] R. Ricciardelli and **S. Czarnuch**, "Surviving parenthood in academia: Two professionals striving to maintain work life balance," in The parent-track: Timing, balance and choice within academia, E. Berger and C. DeRoche, Eds., Waterloo: Wilfred Laurier Press, 2016.

[2] A. Mihailidis, J. Boger**, S. Czarnuch**, T. Nagdee, and J. Hoey, "Ambient Assisted Living Technology to Support Older Adults with Dementia with Activities of Daily Living: Key Concepts and the State of the Art," in Handbook of Ambient Assisted Living - Technology for Healthcare, Rehabilitation and Well-being, J. C. Augusto, M. Huch, A. Kameas, J. Maitland, P. McCullagh, J. Roberts, A. Sixsmith, and R. Wichert, Eds., ed Amsterdam, The Netherlands: IOS Press, 2012, pp. 304 - 330.

4.5 Reports

[1] **S. Czarnuch**, R. Ricciardelli, B. Ye, and A. Mihailidis, "Moving toward a user-centred design: Assistive technology for older adults with dementia," Alzheimer Society of Canada, Ottawa, ON, 2015.

4.6 Non-Peer-Reviewed Articles/Proceedings/Presentations

[1] **S. Czarnuch**, J. Connolly, and C. Maddox, "MS Society of Canada, Avalon Chapter annual newsletter," ed. St. John's, Canada, 2016.

[2] R. Ricciardelli and **S. Czarnuch**. (2013) Moving into milestones... with multiples. Multiple Moments Quarterly: Multiple Births Canada. 16-18.

[3] **S. Czarnuch** and A. Mihailidis, "The COACH: An automated daily task support for older adults with dementia," presented at the Toronto Rehab's 9th Annual Research Day, Toronto, Canada, 2013.

[4] **S. Czarnuch** and A. Mihailidis, "A community-based efficacy study of the COACH," presented at the IBBME Scientific Day, Toronto, Canada, 2012.

[5] A. Mihailidis and **S. Czarnuch**, "Towards a Pervasive Prompting System: Improving and Expanding the COACH," presented at the 7th Annual Every Day Technologies for Alzheimer's Care (ETAC) symposium, Toronto, ON, 2011.

[6] A. Hwang, K. Truong, **S. Czarnuch**, and A. Mihailidis, "Bringing C.O.A.C.H. one step closer to the home: Designing a computer-based tool for dementia caregivers," presented at the Toronto Rehab's 7th Annual Research Day, Toronto, Canada, 2011.

[7] M. Grzes, J. Hoey, K. Shehroz, A. Mihailidis, **S. Czarnuch**, D. Jackson, and A. Monk, "Relational Approach to Knowledge Engineering for POMDP-based Assistance Systems with Encoding of a Psychological Model," presented at the Toronto Rehab's 7th Annual Research Day, Toronto, Canada, 2011.

[8] **S. Czarnuch**, A. Mihailidis, and J. Boger, "Determining Technical Design Criteria for the COACH Prompting System," presented at the Toronto Rehab's 7th Annual Research Day, Toronto, Canada, 2011.

[9] **S. Czarnuch**, J. Boger, and A. Mihailidis, "Supporting Older Adults with Dementia with Ambient Assistive Living Technology," presented at the IBBME Scientific Day, Toronto, Ontario, 2011.

[10] **S. Czarnuch**, J. Boger, and A. Mihailidis, "COACH@Home: Participatory Design of AT for People with Dementia," presented at the Caregiving Best Practices Day, Toronto, Ontario, 2011.

[11] **S. Czarnuch**. (2011) Challenges in caring. Multiple Moments. 12.

[12] **S. Czarnuch**, "CARE Trainee Profile," Institute for Biomaterials and Biomedical Engineering, University of Toronto, Toronto, 2011.

[13] **S. Czarnuch**, J. Boger, and A. Mihailidis, "Prompting older adults with dementia through tasks with the COACH," presented at the Toronto Rehab's 6th Annual Research Day, Toronto, Canada, 2010.

[14] A. Mihailidis and **S. Czarnuch**, "Towards a Pervasive Prompting System: Improving and Expanding the COACH," presented at the 5th Annual Every Day Technologies for Alzheimer's Care (ETAC) symposium, Portland & Hillsboro, OR., 2009.

[15] **S. Czarnuch**, K. Zagorovsky, P. Tang, N. Wu, and A. Posatskiy, "A Tool For Rudimentary Self-Screening of Diabetic Retinopathy and Related Disorders," presented at the BME1450 Poster session, 2009.

4.7 Invited Presentations/Lectures/Keynotes

[1] S. Czarnuch, "The medicalization of deviance, disability, aging and technology," in Guest lecture in the Faculty of Humanities and Social Sciences, department of Sociology at Memorial University, ed. St. John's, NL, 2016.

[2] **S. Czarnuch**, "Enhancing rehabilitation in MS with pervasive technology," in Avalon MS Society chapter meeting, ed. St. John's, NL, 2016.

[3] **S. Czarnuch**, "Perspectives on work-life balance: Can it be achieved in academic research?," in Toronto Rehabilitation Institute/University of Toronto, ed. Toronto, Ontario, 2016.

[4] **S. Czarnuch**, "Intelligent technologies: Supporting persons with MS," in Avalon MS Society chapter meeting, ed. St. John's, NL, 2015.

[5] **S. Czarnuch**, "Pervasive technology for healthcare: Supporting an aging population," in Invited presentation at the Newfoundland and Labrador Centre for Applied Health Research, Research Group on Aging, ed. St. John's, NL, 2015.

[6] **S. Czarnuch**, "Biomedical Engineering," in Speaker series lecture conducted at the Faculty of Engineering and Applied Science, Memorial University, ed. St. John's, NL, 2015.

[7] **S. Czarnuch**, "Enhancing rehabilitation in MS," in Invited presentation at the Atlantic endMS 2014 MS Research Retreat, ed. Halifax, NS, 2014.

[8] **S. Czarnuch** and J. G. Bell, "Toward Developing an Assistive Technology Framework for Older Adults with Dementia: A User-Centred Design Approach," in Invited presentation at the Alzheimer Society of Niagara Region, ed. St. Catherines, Ontario, 2013.

[9] **S. Czarnuch**, "Activity tracking from an overhead depth camera: From joint proposals to a skeleton model," in Speaker series lecture conducted at the Department of Computer Science. Memorial University, ed. St. John's. NL, 2013.

[10] A. Mihailidis and **S. Czarnuch**, "Innovations in technology to support people with Alzheimer's disease," in Invited presentation at the Toronto Memory Program, ed. Toronto, ON, 2012.

[11] **S. Czarnuch** and A. Arcelus, "Smart Home Technologies and Artificial Intelligence: Applications to Older Adults," in Invited lecture on Artificial Intelligence for the Da Vinci Engineering Enrichment (DEEP) program, University of Toronto, ed. Toronto, Ontario, 2012.

[12] **S. Czarnuch**, "The COACH prompting system," in Invited presentation at the Southlake Regional Health Centre, ed. Newmarket, ON, 2012.

[13] **S. Czarnuch**, "Technology and an aging population," in Guest lecture in the Faculty of Liberal Arts and Professional Studies, department of Sociology at York University, ed. North York, ON, 2011.

[14] **S. Czarnuch**, "Assistive technology: The future of health and health care?," in Guest lecture in the Faculty of Health Sciences, department of Sociology at York University, ed. North York, ON, 2010.

[15] **S. Czarnuch**, "Towards a pervasive prompting system for older adults with dementia: Improving and expanding the COACH," in Invited presentation at the West Hill Community Services Centre, ed. Toronto, ON, 2010.

[16] **S. Czarnuch**, "Introduction to research methodologies," in Guest lecture in the Faculty of Criminology, Justice and Policy Studies at the University of Ontario Institute of Technology, ed. Oshawa, ON, 2009.

[17] **S. Czarnuch**, "Exploring interdisciplinary research methodologies," in Guest lecture in the Faculty of Arts, department of Sociology at Trent University, ed. Peterborough, ON, 2009.

4.8 Media Appearances

[1] K. Breen, "Engineers give man technology to compete in boccia," in NTV News, ed. St. John's, NL, 2015, http://ntv.ca/engineers-give-man-technology-to-compete-in-boccia/.

4.9 Dissertations and Theses

[1] **S. Czarnuch**, "Advancing the COACH automated prompting system toward an unsupervised, real-world deployment," Doctor of Philosophy, Institute of Biomaterials and Biomedical Engineering, University of Toronto, Toronto, 2014.

[2] **S. Czarnuch**, "Interbar Currents in Rotating Stator Induction Machines," M.A.Sc., Electrical and Computer Engineering, McMaster University, Hamilton, Ontario, Canada, 2005.

4.10 Manuscripts in Preparation

[1] Z. Chen, S. Czarnuch & M. Shehata, “3D Hand Tracking using Multiple RGB-D Sensors”.

[2] A. Hynes and S. Czarnuch, “Graph theory and Dijkstra’s shortest path: four limb skeleton modelling optimization”.

[3] S. Czarnuch. & A. Mihailidis, “Overhead hand, grip and arm tracking using skeleton models”.

[4] S. Czarnuch, R. Ricciardelli, and A. Mihailidis, “Culture, ethnicity, and race: Impacting caregiver use of assistive technology for cognition”.

[5] S. Czarnuch, R. Ricciardelli, and A. Mihailidis, “The predictive efficacy of objective carer factors: Helping persons with dementia by understanding their needs”.

5 RESEARCH FUNDING

5.1 Funding Received or Under Review

Year	Grantor; Type; Title; Investigators	Role	Status	Amount
2016	Memorial University, Seed, Bridge and Multidisciplinary Fund; *Exploring factors*	PI	Awarded	$9,776.16

	affecting participation in home exercise therapies for persons with multiple sclerosis: A needs assessment, S. Czarnuch.			
2016	NSERC; Discovery Grant; *Human motion tracking-by-detection using point cloud data from multiple depth sensors*; S. Czarnuch.	PI	Awarded	$145,000
2016	Canadian Foundation for Innovation (CFI); *Computer-Aided Design Laboratory for Analog and Mixed-Signal VLSI Systems*; L. Zhang (PI) and H. Heys (PI), S. Czarnuch.	Collaborator	Awarded	$91,756
2015	Memorial University; Faculties of Engineering and Applied Science and Medicine Start-up funds; *Human Motion Tracking and Automated Planning*; S. Czarnuch	PI	Awarded	$50,000
2014-2017	Multiple Sclerosis Society of Canada; Post-doctoral fellowship; *Toward automated rehabilitation support and progress assessment for people with Multiple Sclerosis: Improving recovery, objectivity and safety with technology*; S. Czarnuch	PI	Awarded	$117,000
2012-2014	Alzheimer Society of Canada; Alzheimer Society Research Program; *Toward developing an assistive technology framework for older adults with dementia: A user-centred design approach*; A. Mihailidis, R. Ricciardelli, S. Czarnuch, T. Nagdee	Collaborator	Awarded	$118,040

5.2 Unsuccessful Funding Applications

Year	Grantor; Type; Title; Investigators	Role	Amount
2016	SSHRC; Connection Grant; *Post-Traumatic Stress Disorder: A Multidisciplinary Conference on Causes, Consequences and Responses*; R. Ricciardelli, S. Czarnuch and S. Bornstein	Co-Investigator	$ 24,135
2016	CIHR; CIHR Project Scheme; *Quantifying disease progression in persons with multiple sclerosis using unobtrusive, three-dimensional full-body gait analysis*; S. Czarnuch.	PI	$170,000
2016	Memorial University Faculty of Medicine; Dean's Innovation Fund; *Improving the evaluation of treatment*	PI	$19,985

	efficacy and disease progression in multiple sclerosis using automated full-body gait analysis; S. Czarnuch.		
2015	Memorial University; Seed, Bridge and Multidisciplinary Fund; *International Extension of an Assistive Technology Framework for Older Adults with Dementia: A Pilot Study*; S. Czarnuch, R. Ricciardelli, L. Swiss.	PI	$9776
2015 (fall)	Multiple Sclerosis Society of Canada; Clinical and Population Health Research Operating Grant; *Automated rehabilitation support and assessment for people with Multiple Sclerosis: Improving recovery, objectivity and safety with intelligent technology*; S. Czarnuch, M. Ploughman, R. Ricciardelli	PI	$116,462
2015 (spring)	Multiple Sclerosis Society of Canada; Clinical and Population Health Research Operating Grant; *Automated rehabilitation support and assessment for people with Multiple Sclerosis:* *Improving recovery, objectivity and safety with intelligent technology*; S. Czarnuch, M. Ploughman, R. Ricciardelli	PI	$269,771
2015	Memorial University; Seed, Bridge and Multidisciplinary Fund; *Toward Developing an Assistive Technology Framework for Older Adults with Dementia: A User-Centred Design Approach*; Stephen Czarnuch, Rosemary Ricciardelli, Liam Swiss	PI	$9979.83
2015	CIHR; Strategy for Patient-Oriented Research (SPOR), *GoMobile with Clear*, P.Wang et al., S. Czarnuch	Collaborator	N/A
2014	Multiple Sclerosis Society of Canada; Clinical and Population Health Research Operating Grant; M. Ploughman, C. Moore, K. Power, D. Button, S. Czarnuch, M. Stefanelli	Collaborator	$300,000
2014	Newfoundland and Labrador Centre for Applied Health Research; Project Grant; *Automated fatigue detection in people with MS: Improving the safety and efficacy of rehabilitation exercise*; Stephen Czarnuch, Michelle Ploughman, Diane Cook	PI	$22,068

6 AWARDS AND FUNDING

Year	Award Title	Organization	Amount

2016	Best Paper Award	Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	$0
2016	Young Investigator Award: Educational Grant	Americas Committee for Treatment & Research in Multiple Sclerosis (ACTRIMS)	$600 USD
2014	Doctoral Completion Award	Institute of Biomaterials and Biomedical Engineering, University of Toronto	$5,000
2014	Best Paper award: Engineering in a Clinical Setting	Institute of Biomaterials and Biomedical Engineering, University of Toronto	$250
2013	Travel Fellowship	Annual General Meeting of the Canadian Association on Gerontology	$250
2012	Travel Fellowship	Alzheimer's Association International Conference	$2,500
2012	Travel Fellowship	CIHR Canadian Student Health Research Forum	$1,000
2011-2012	Research Assistant Stipend	CIHR/Alzheimer's Association	$17,500
2011-2012	University of Toronto Fellowship	Institute of Biomaterials and Biomedical Engineering	$2,000
2010-2012	NSERC CREATE: Care Scholarship	NSERC/University of Toronto	$39,000
2010-2011	Research Assistant Stipend	CIHR/Alzheimer's Association	$15,000
2009-2010	Research Assistant Stipend	CIHR/Alzheimer's Association	$15,000
2009-2010	University of Toronto Fellowship	Institute of Biomaterials and Biomedical Engineering	$10,000
2009-2010	Barbara and Frank Milligan Fellowship	University of Toronto	$3,000
2002-2004	Graduate Student Scholarship	McMaster University	$24,000
2000	Millennium Bursary	Canada Millennium Scholarship Foundation	$3,000
1999	Ontario Student Opportunity Grant	Ministry of Training, Colleges and Universities	$459

7 SCHOLARLY AND PROFESSIONAL ACTIVITIES

7.1 Teaching

7.1.1 Courses Taught at Memorial University

Year	Course No.	Level	Course Name	Institution
2017	ENGI 8853	Undergraduate	Computer Engineering project course II	Memorial University
2017	ENGI 8103	Undergraduate	Engineering in Medicine	Memorial University
2016	ENGI 7803	Undergraduate	Computer Engineering project course I	Memorial University
2016	ENGI 8103	Undergraduate	Engineering in Medicine	Memorial University
2015	ENGI 8853	Undergraduate	Computer Engineering project course II	Memorial University
2015	ENGI 7804	Undergraduate	Computer Engineering project course I	Memorial University
2014	ENGI 7894/ 9869	Undergraduate/ Graduate	Concurrent programming	Memorial University
2012	DEEP	High-school	Da Vinci Engineering Enrichment Program	University of Toronto

7.2 Supervisory Activities

7.2.1 M.Eng. (Thesis) Students

Start Year	Role	Status	Student	Project Title
2016	Supervisor	In progress	Hynes, A. J. R.	Combinatorial optimization for human body tracking
2014	Co-supervisor	In progress	Chen, Z.	Automatic evaluation of ultrasound operators' skill

7.2.2 M.A.Sc. (Coursework) Students

Year	Course	Status	Student	Project Title

2016	ENGI 980A/980B	In progress	Tian, Y.	Finger Joint Detection for Clinical Practice
2015	ENGI 980A/980B	Completed	Yang, Z.	Human motion tracking-by-detection using point cloud data from multiple depth sensors

7.2.3 Undergraduate Research Project Supervision

Year	Course	Status	Students	Project Title
2016	ENGI 7804/8854	In progress	George, M., Pratt, C., Seymour, R.	Precise point
2016	ENGI 7804/8854	In progress	Beazley, M., Bennett, T., Murrin, H., Power, M., Ryan, C.	Kloud 9: Automated multi-sensor ground plane detection and depth calibration
2015	ENGI 7804/8854	Completed	Bonnell, A., Chaytor, S., Randell, A, Wicks, J.	Wearable Integrated Safety Alarm and Locator (WISAL)
2015	ENGI 7804/8854	Completed	Davis, M., Nugent, S., Rodgers, J., Stevens, T.	Vision-impaired emblem warning system (VIEWS)
2014	ENGI 7926/8926	Completed	Ellwood, D., Mandke, U., McGrath, B., Williams, M.	An improved ramp and pointer for Boccia Ball players with cerebral palsy
2014	HKR 4610	Completed	Abbot, C., Buckle, N., Holloway, B., Lockyer, E.,	Creation of a dual-task, metronome-timed bipedal hop test: A sensitive and reliable measure for mild Multiple Sclerosis

7.2.4 Medical Student Research Phase Mentoring

Year	Research Phase	Status	Student	Project Title
2016	Phase 2	In progress	Krustev, E.	Assessing Abnormal Gait in Patients with Multiple Sclerosis
2016	Phase 2	In progress	Ballouk, H.	Intelligent Technologies that can Assist Seniors with Dementia to Age at Home
2015	Phase 1	Completed	Krustev, E.	Assessing Abnormal Gait in Patients with Multiple Sclerosis: A Review

2015	Phase 1	Completed	Ballouk, H.	Survey of Intelligent Technologies that can Assist Seniors with Dementia to Age at Home
2015	Phase 1	Completed	Vessey, C.	Prosthetics for Dancers with Transtibial Amputations: A literature review

7.2.5 Research Assistant Supervision

Period	Name	Education	Hiring/Training objective
September, 2016 – present	Andres, E.	M.A	Further development of skills to support transition from graduate school to industry
August, 2016 – December, 2016	Habib, K.	M. Eng.	Exploration of biomedical engineering in consideration of graduate studies (PhD)
September, 2016 – December, 2016	Rahimi, A.	M. Sc.	Further development of skills to support transition from graduate school to industry
September, 2016 – December, 2016	Crichton, H.	M. A.	Expansion and evaluation of qualitative skills into health and healthcare
September, 2016 – December, 2016	Mooney, T.	B. A.	No specific training objectives for this project
August, 2016 – present	Fathi, P.	B. Eng.	Exploration of biomedical engineering in consideration of graduate studies (M.A.Sc.)
June - July, 2016	Chen, Z.	B. Eng.	No specific training objectives for this project
June 2014 – May, 2015	Tong, J.	M.Sc.	No specific training objectives for this project

7.3 Assessment and Review Activities

7.3.1 Graduate Examination Activities

Date	Activity	Role	Level	Student
2016	Thesis submission and Defense	Internal Examiner	PhD	Dion Hicks
2016	Thesis submission and Defense	Internal Examiner	PhD	Amir Tahavorgar
2016	Comprehensive examination	Chair	PhD	Muamer Shebani
2016	Comprehensive examination	Chair	PhD	Murtada Abdein El-Haj
2016	Comprehensive examination	Chair	PhD	Khalifa Alrbee
2016	Thesis submission	Internal Examiner	M.Eng.	Abdelrahman Ahmed

2015	Thesis submission and Defense	Internal Examiner	PhD	Javier Ortiz Castro
2015	Comprehensive examination	Chair	PhD	Swapna Puthukkudi Chalil
2015	Comprehensive examination	Chair	PhD	Suhad Sbeih

7.3.2 Journal Reviewer

Journal	Year(s)	Role
Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2016	Invited Reviewer
Journal of Ambient Intelligence and Smart Environments (JAISE)	2015, 2016	Invited Reviewer
PLOS ONE	2015	Invited Reviewer
Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2015	Invited Reviewer
IEEE 23rd Annual Newfoundland Electrical and Computer Engineering Conference	2014	Invited Reviewer
IEEE Transactions on Human-Machine Systems	2014	Invited Reviewer
Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2014	Invited Reviewer
International Conference on Pervasive Computing Technologies for Healthcare	2012	Invited Reviewer
IEEE Transactions on Mechatronics	2010, 2011	Invited Reviewer
RESNA Annual Conference	2009	Invited Reviewer

7.3.3 Roles in Major Conferences

Conference	Date	Role
National Falls Prevention	2017 (April)	Advisory Committee
Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2015 (November)	Session Chair – Controls & Instrumentation II

Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2015 (November)	Session Chair – Power
PervasiveHealth 2016	2016	Programme Committee
Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2015 (November)	Session Chair – Biomedical
Newfoundland Electrical and Computer Engineering Conference, IEEE, Newfoundland and Labrador Section	2015 (November)	Session Chair – Communication and Networking
Newfoundland Electrical and Computer Engineering Conference, IEEE, NL Section	2014 (November)	Session Chair – Computer Vision
Toronto Rehab's 9th Annual Research Day	2013 (November)	Student poster competition judge

7.4 Academic Service

Committee	Year	Role
Multiple Sclerosis Society of Canada, endMS Summer School Review Committee	2017	Scientific Reviewer
Multiple Sclerosis Society of Canada, Personnel Awards Review Committee	2016 – 2017	Scientific Reviewer
Electrical and Computer Engineering undergraduate curriculum committee	2016 - present	Member
Electrical and Computer Engineering department head search committee	2016	Member
Faculty of Engineering and Applied Science Program Review Committee – Design Courses	2016	Chair and member

7.5 Community Service

Organization; Contribution	Year	Role
MS Society of Canada, Avalon Chapter; annual newsletter	2016 - present	Editor

7.6 Research Groups

Organization, Group	Year(s)	Role

Social Sciences and Humanities Council (SSHRC) Centre for Research on Work Disability Policy (CRWDP), Disability Inclusion Group (DIG-MUN)	2015 – present	Member
Newfoundland and Labrador Centre for Applied Health Research, Research Exchange Group on Aging	2015 - present	Member

7.7 Memberships in Academic, Community and Professional Societies

Status	Year(s)	Organization
Active	2015 – present	Professional Engineers and Geoscientists of Newfoundland and Labrador (PEGNL) Member #08233
Active	2014 – present	Tetra Society of North America
Active	2010 – present	Alzheimer's Association International Society to Advance Alzheimer Research and Treatment (ISTAART)
Inactive	2009 – 2014	Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)
Inactive	2013 – 2015	Canadian Association on Gerontology (CAG)
Inactive	2014 – 2015	IEEE Student Member #93214255

8 PROFESSIONAL DEVELOPMENT

Year	Course Title	Institution
2015	Problem-Based Learning	Memorial University
2014	Teaching Skills Enhancement Program (TSEP)	Memorial University

9 ACREDITATIONS AND ACCOMPLISHMENTS

- Graduated from PhD (2014) with 4.0 GPA (Note: The University of Toronto does not provide distinction for graduate students)
- Graduated Summa Cum Laude from Masters Degree (2005) with 4.0 GPA
- Graduated Summa Cum Laude from Undergraduate Degree (2002) with 3.7 GPA
- Deans Honour List (1998-2002)
- Good Citizen Award (1998, 1999)
- Golden Key Honour Society Member (1998)