# CENTRE FOR INTELLIGENT MACHINES (CIM)

Centre de recherche sur les machines intelligentes
www.cim.mcgill.ca

## Annual Report 2016

Director
Professor James J. Clark

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# Summary

The McGill Centre for Intelligent Machines (CIM) is a multi-disciplinary, inter-departmental, inter-faculty research group formed in 1985 to provide an enriched mentoring and training environment for graduate students studying in the field of robotics and intelligent systems.

For over 3 decades, CIM has been a pioneering force in cross-disciplinary research. The Centre is primarily located in contiguous space where labs and student offices are shared. CIM's membership and students have been universally recognized over the years for their highest standards of excellence – exceptional scientific achievements and outstanding contributions to society and industry.

The Centre is comprised of 21 full members from both the Faculties of Engineering and Science -- the Department of Electrical and Computer Engineering, Department of Mechanical Engineering and the School of Computer Science. CIM also has associate members representing a diversity of research collaborations, such as within the Faculty of Medicine --the Royal Victoria Hospital and the Montreal Neurological Institute.

The Centre is home to a diverse population of researchers: in addition to the 21 full members, at the end of 2015 the centre boasted a complement in excess of 250 graduate students, post-docs and undergraduate students, as well as visiting scholars, research assistants and associates from various disciplines.

| Ph.D | Master Thesis | Master Non-Thesis | Undergrad | Post doc | **Total** |
|---|---|---|---|---|---|
| 77.5 | 64.5 | 4 | 95.5 | 19.5 | **261** |

*Note: .5 indicates co-supervision of a student

The 2016 calendar year brought a number of noteworthy events for the Centre. These include:

- Promotion of David Meger in Computer Science from associate member to full member. Addition of a new associate member, Derek Nowrouzezahrai in Electrical and Computer Engineering.
- Awarding of a number of significant honours and awards.
- CIM researchers were very productive, having presented their research results and developments in more than 200 publications in major conferences and journals.

# Section I – Membership

## Full Members

| | |
|---|---|
| **Angeles, Jorge** | James McGill Professor, Mechanical Engineering |
| **Arbel, Tal** | Associate Professor, Electrical and Computer Engineering |
| **Boulet, Benoit** | Associate Professor, William Dawson Scholar, ECE |
| **Caines, Peter** | MacDonald Professor, Electrical and Computer Engineering |
| **Clark, James** | Professor, Electrical and Computer Engineering |
| **Cooperstock, Jeremy** | Associate Professor, Electrical and Computer Engineering |
| **Dudek, Gregory** | James McGill Professor, Computer Science |
| **Ferrie, Frank** | Professor, Electrical and Computer Engineering |
| **Forbes, James Richard** | Assistant Professor, Mechanical Engineering |
| **Kovecses, Jozsef** | Associate Professor, Mechanical Engineering |
| **Kry, Paul** | Associate Professor, Computer Science |
| **Langer, Michael** | Associate Professor, Computer Science |
| **Levine, Martin** | Professor, Electrical and Computer Engineering |
| **Mahajan, Aditya** | Assistant Professor, Electrical and Computer Engineering |
| **Meger, David** | Assistant Professor, Computer Science |
| **Michalska, Hannah** | Associate Professor, Electrical and Computer Engineering |
| **Nahon, Meyer** | Professor, Mechanical Engineering |
| **Pineau, Joelle** | Associate Professor, Computer Science |
| **Sharf, Inna** | Professor, Mechanical Engineering |
| **Siddiqi, Kaleem** | Professor, Computer Science |
| **Zsombor-Murray, Paul** | Associate Professor, Mechanical Engineering |

## Associate Members

| | |
|---|---|
| **Adamchuk, Viacheslav** | Associate Professor, Bioresource Engineering, McGill University |
| **Cecere, Renzo** | Associate Professor, Cardiac Surgery (RVH), McGill University |
| **Cheung, Jackie Chi Kit** | Assistant Professor, School of Computer Science, McGill University |
| **Collins, Louis** | Professor, Neurology & Neurosurgery/Biomedical Engineering |
| **Dimitrakopoulos, Roussos** | Professor, Mining Engineering, McGill University |
| **Hamann, Marco** | Professor, Math/Informatics, Dresden University of Applied Sciences |
| **Hayward, Vincent** | Professor, ISIR, Université Pierre et Marie Curie, Paris France |
| **Husty, Manfred** | Professor, Geometry and CAD, University of Innsbruck, Austria |
| **Liu, Xue** | Associate Professor, Computer Science, McGill University |
| **Misra, Arun** | Professor, Mechanical Engineering, McGill University |
| **Mongrain, Rosaire** | Associate Professor, Mechanical Engineering, McGill University |
| **Musallam, Sam** | Associate Professor, CRC chair in Bioengineering, ECE, McGill University |
| **Nowrouzezahrai, Derek** | Associate Professor, ECE, McGill University |
| **Panangaden, Prakash** | Professor, Computer Science, McGill University |
| **Paranjape, Aditya** | Assistant Professor, Mechanical Engineering, McGill University |
| **Pike, Bruce** | Professor, Faculty of Medicine, University of Calgary |
| **Precup, Doina** | Associate Professor, Computer Science, McGill University |

## New Members

**David Meger** (associate to full)

Professor Meger has become a full member of CIM, after spending a year as an associate member. Before this appointment he was already involved with CIM as a postdoctoral researcher in the Mobile Robotics Lab under the supervision of Greg Dudek, who he continues to work closely with. His research interests include computer vision, machine learning and robotics, and his latest project was the development of adaptive gait control for swimming robots such as AQUA. This work was a best paper finalist at ICRA 2015.

**Derek Nowrouzezahrai** (associate)

Prof. Nowrouzezahrai is the newest associate member of CIM, hailing from the department of Electrical and Computer Engineering at McGill. His research interests include light synthesis and estimation to create and manipulate realistic synthetic images. Before coming to McGill, Prof. Nowrouzezahrai was an Assistant Professor in the Department of Computer Science and Operations Research at the University of Montreal. He received his Ph.D and M.Sc. from the University of Toronto and worked as a Post-Doctoral Researcher at Disney Research Zurich. He was also the recipient of the Outstanding Young Computer Science Researcher Prize – 2014 awarded by the Canadian Association of Computer Science.

## Visitors

The following researchers were long-term (one month or longer) visitors to CIM, working in the labs of one or more CIM members:

| | |
|---|---|
| **Mohamed Amir Sassi** | Université du Québec à Chicoutimi – hosted by Jeremy Cooperstock |
| **Jessica Nogueira Dalla-Libera** | hosted by Jorge Angeles |
| **Sumeha Kashyap** | Indian Institute of Technology, Guwahati – hosted by Jeremy Cooperstock |
| **Yiming Chen** | hosted by Frank Ferrie |
| **Xing Wu** | hosted by Jorge Angeles |
| **Nicola Gallo** | Politecnico di Torino, Italy - hosted by Jeremy Cooperstock |
| **David Corinaldi** | University of Le Marche, Italy - hosted by Jorge Angeles |
| **Yi Xie** | Zhejiang University, China - hosted by Martin Levine |
| **Cameron Knox** | Australia - hosted by Jorge Angeles |
| **Yanxiang Fan** | National University of Defense Technology, China - hosted by Martin Levine |
| **Yonjun Pan** | Spain - hosted by Jozsef Kovecses |

# Section II – Awards

Professor **James Forbes** was awarded the 2016 McGill Association of Mechanical Engineers (MAME) Professor of the Year.

Professor **Jozsef Kovecses** won the best paper award of the 12th ASME International Conference on Multibody Systems, Nonlinear Dynamics, and Control, Charlotte, NC, Aug. 21-24, 2016 in the multibody systems category.

Prof. **Kovecses** group's work "Demonstration Toward Open-Source Portable Haptic Displays: An Interactive Physics Demo with the Haplet", was finalist for the Best Demonstration Award at the 2016 IEEE Haptics Symposium, Philadelphia, PA, April 8-11, 2016.

Professor **Aditya Mahajan** was awarded the 2016 Discovery Accelerator Award, NSERC. Awarded to researchers who have a superior research program that is highly rated in terms of originality and innovation, and who show strong potential to become international leaders within their field. In the 2016 competition, 125 applicants out of 3191 were awarded Discovery Accelerator Supplement.

**Jhelum Chakravorty** won the 2016 Best Student Paper Award for the paper "Remote-state estimation with packet drop," coauthored with her supervisor **Aditya Mahajan** at the IFAC Workshop on Distributed Estimation and Control in Networked Systems (NecSys), 2016. Awarded based on originality, clarity, and potential impact on practical applications or theoretical foundations of estimation and control in networked systems.

Professor **Peter Caines** delivered the Opening Plenary Lecture at the Conference on the Mathematical Theory of Networks and Systems. Minneapolis. MN, July 2016.

**Damien Goblot**, a master's student working under the supervision of Prof. **Kaleem Siddiqi**, won first prize in the "heart failure" category for his poster "Cartan frames for characterizing fiber geometry in pig hearts from diffusion tensor imaging (DTI)" presented at the 2016 Imaging Network Ontario symposium in Toronto. Details are here: http://imno.ca/2016-awards

Professor **Joelle Pineau** was awarded the David Thompson Award for Excellence in Graduate Teaching & Supervision at McGill.

Professor **Paul Kry** was the recipient of a Research Gift, distinguished faculty award, from Oculus research, $25000 USD. Letter asks not to publicly acknowledge the gift. Letter received 22 December 2016, and fund opened in 2017.

Professor **Paul Kry** won the best paper award for artistic robot, awarded at Expressive 2016 in Lisbon, Portugal along with students Brendan Galea, Ehsan Kia and Nicholas Aird.

Professor **Inna Sharf** was named an Excellent Reviewer for the Journal of Guidance, Control, and Dynamics (JGCD) for the period of Oct. 1, 2015 – Sept. 30, 2016.

# Section III – Research Funding

The research carried out in the Centre is funded from a wide range of sources, including the Governments of Canada and Quebec (primarily through NSERC Discovery and Partnership grants and FRQNT grants) as well as industry (through research contracts and contributions to governmental partnership programs). These programs are too numerous to list individually. However, there are some large programs that affect a significant proportion of the researchers in the Centre, and we provide some details on these in the following section.

## REPARTI

**Regroupement pour l'étude des environnements partagés intelligents répartis**
**April 2006 to March 31, 2019**

Regroupement REPARTI – Phase 2 (April 2013-March 2019) is a $2.6M inter-institutional, interdisciplinary collaborative venture comprised of 8 Quebec institutions, 35 members and over 300 students. The McGill node of REPARTI is represented by 13 members from the McGill Centre for Intelligent Machines (CIM). The members of the McGill node collaborate in grants and contracts valued in excess of $5M annually. This FRQNT regroupement is a primary funding source for the McGill Centre for Intelligent machines (CIM).

The institutions participating in REPARTI are: Université Laval (host institution), McGill University, Université de Sherbrooke, Ēcole Polytechnique, Université de Montréal, Université du Québec à Chicoutimi and École de technologie supérieure (ÉTS).

Supported by the Quebec government's Fonds de recherche Nature et technologies (FQRNT), this regroupement stratégique builds on some unique precedents:

(1) The historical and concrete partnership that developed over the past 25 years between prominent researchers in U. Laval and McGill (CIM) as a result of the NSERC National Centres of Excellence program, the interuniversity-industrial consortium IRIS-Precarn, and the FQRNT Réseau QERRAnet.

(2) The long and productive relationship established between the McGill Centre for Intelligent Machines (CIM) and the Quebec government through the former FCAR Centre de recherche programme.

The regroupement REPARTI was successfully renewed in 2013 for 6 years until 2019.

# CREATE-MIA

**NSERC Collaborative Research and Training Experience in Medical Image Analysis**

**April 2012 to March 2018**

The CREATE-MIA, funded by NSERC, was started in 2012 and ends in March 2018, with the aim of training students for research careers in both academia and industry. The program employs a collaborative and multi-faceted approach including:

- experts from academia, industry and/or medicine to oversee a trainee's progress throughout the program
- a selection of advanced courses from different academic departments to provide a comprehensive background in medical imaging
- internships with our industrial partners on company premises to give first-hand real-world industry experience
- participation in events such as seminars, workshops, and a summer school to broaden and enrich their knowledge-base
- participation in SKILLSETS training seminars offered by McGill University to gain professional skills that will be useful when entering the workforce or starting businesses of their own.

The institutions participating in CREATE-MIA are: McGill University (host institution), Université de Sherbrooke, and École de technologie supérieure (ÉTS). Currently, the program supports 21 graduate students, 11 of whom are currently supervised by CIM members.

The director of the CREATE-MIA program is CIM member **Kaleem Siddiqi**. The program faculty includes CIM member **Tal Arbel**, CIM associate members **Louis Collins, Bruce Pike**, and CIM alumni **Catherine Laporte** (now assistant professor at ÉTS) and **Maxime Descoteaux** (now an assistant professor at Universite de Sherbrooke).

APC

**Automotive Partnership Canada**

CIM is home to a four -year, $4.6 million project, funded by the NSERC Automotive Partnership Canada program. The goal of this project is to combine electric motor technology obtained from Quebec-based TM4 Electrodynamic Systems with a multi-speed drive train from Ontario-based Linamar Corporation. This project aims to improve electric vehicle efficiency, speed and driving range without increasing drains on batteries. The research will reduce costs of electric vehicle engines through the development of multi-speed drivetrains that are smaller and lighter than the single-speed drivetrains currently in use.

The McGill APC project was announced in February 2013 and ends in August 2017, and is led by CIM member Professor **Benoit Boulet**.

## CFI

The Centre's director, in collaboration with fellow CIM members Benoit Boulet, Greg Dudek, Dave Meger, Joelle Pineau, and Inna Sharf, as well as non-CIM members David Lowther (ECE dept.), Geza Joos (ECE dept.), Viacheslav Adamchuck (BioRes dept.), and Loic Boulon (Universite du Quebec a Trois Rivieres), prepared and submitted a large ($17.3M) proposal to the Canadian Foundation for Innovation fund program. The focus of the proposal was the creation of a new space at McGill for carrying out research into field robotics, autonomous ground and air vehicles, and electric vehicle drivetrains and control systems.

The proposal was not funded, however and a revised version will be submitted in the next call for proposals.

# NCFRN

**NSERC Canadian Field Robotics Network**

June 20, 2012 to June 29, 2018

The NCFRN is a Canada-wide network spanning 8 universities and 14 partner organizations. The network brings together academic, government, and industrial researchers in the area of field robotics, to develop the science and technologies to eventually allow teams of heterogeneous robots (on land, in the air, on the surface of or under water) to work collaboratively in outdoor environments, and to communicate critical information to humans who operate them or use them.

The NCFRN supports the work of 11 researchers from 8 different universities. It connects the academic participants with 10 industrial partners and 4 government agencies to leverage their complementary experience and capabilities. The network investigates fundamental issues in robotics science as well as develops technologies developed addressing particularly Canadian problems such as environmental monitoring and maintenance, border surveillance, cleanup of environmental disasters, and assisting and caring for senior citizens.

The NCFRN primarily provides direct support for students, thereby training highly qualified new researchers, engineers and technicians able to work in robotics-related industry.

The NCFRN network management is hosted by McGill and CIM, with CIM member **Greg Dudek** serving as scientific director. CIM member **Joelle Pineau** serves as the leader of the thematic area “Human”. CIM member **Inna Sharf** is also a research member of the NCFRN.

The NCFRN is a 5-year program that started on June 30, 2012 and will end on June 29, 2018.

# Section IV – Events

## Third Annual Student Research Showcase

On October 19th, 2016, the third annual Student Research Showcase was held in the Zames seminar room. It featured short one-slide presentations in the areas of Robotics, Systems and Control, Human-Computer Interaction, Machine Vision and Medical Image Analysis. Over fifty students participated in the event, and several professors and other students attended as spectators. It was a wonderful opportunity for everyone to learn about the research in other CIM labs and network. This showcase built on the success of previous years and is expected to continue to foster ties in the department for years to come.

## CIM Team Building Event

To mark the end of the semester, the students and professors at the Centre for Intelligent Machines convened in the CIM Zames room for an afternoon of socializing and team building. The event was well attended and participants enjoyed a fun video created by faculty members with a very important message about the use of Centre resources.

## Informal Systems Seminars

Organized by Profs. Aditya Mahajan and Peter Caines every Friday, this seminar series brings together researchers from many universities. Speakers come from all over the world to present on diverse topics of importance in the field of systems and control, and these events are well attended by faculty and grad students alike.

## Seminars at CIM

| | |
|---|---|
| Francesco Ticozzi | Università degli Studi di Padova & Dartmouth College |
| Mark Schubin | Society of Motion-Picture and Television Engineers |
| Robert DiRaddo | Simulation and Digital Health Group at NRC |
| Guillaume Lavoué | INSA de Lyon, France |
| Xiaozhe Wang | McGill University, Canada |
| Chen Chen | University of California, Berkeley, USA |
| Colm Elliot | McGill University, Canada |
| Scott McCloskey | Honeywell Labs, USA |
| Hamid Krim | North Carolina State University, USA |
| Ankur Gupta | University of British Columbia, Canada |
| Cedric Langbort | University of Illinois at Urbana-Champaign, USA |
| Luis Rodrigues | Concordia University, Canada |
| Nikos Paragios | University of Paris-Saclay, France |
| Chinwendu Enyioha | Harvard University, USA |
| Jean-Charles Bazin | Disney Research Zurich, Switzerland |
| Jason Pacheco | |
| Nobuyuki Umetani | Autodesk Research, Canada |
| Martin Guay | Disney Research Zurich, Switzerland |
| Roy Featherstone | Australian National University, Australia |
| Angelos Georghiou | McGill University, Canada |
| Anqi Xu | McGill University, Canada |
| Luis Rodrigues | Concordia University, Canada |
| Ryan James Caverly | University of Michigan, USA |
| Rabih Salhab | Ecole Polytechnique de Montreal, Canada |
| David Levanony | Ben Gurion University, Israel |
| Stephane Blouin | Defence R&D Canada, Canada |
| Natasha Devroye | University of Illinois - Chicago, USA |
| Morten Fjeld | Chalmers University of Technology, Sweden |
| Peter B. Luh | University of Connecticut, USA |

# Section V – Plans for the Coming Year

Some activities that are planned for 2017 include:

- Formation of an advisory board for the Centre. This would complement the Centre's board, which focuses on administrative and operational matters, and would provide guidance for carrying out the Centre's research mission.
- Review and updating of the Centre bylaws.
- Institution of a day-long research showcase for students. This will include short 3-minute presentations by graduate student members of CIM as well as a networking event with industrial partners. This event is planned to be held in the Fall.
- Further development of industrial partnerships, particularly in the areas of Artificial Intelligence (AI), Transportation and Smart Cities, and Aerospace.
- Creating a "Case for Support" in collaboration with the Faculty of Engineering Development and Alumni Relations office to be shared with potential donors to the Centre. This will feed into the expected new funding campaign for the University.

# Section VI – Industrial Partners

Many of the centre's research activities are carried out in collaboration with industrial partners. A (partial) list of these partners is given in the following table.

- Alta Precision Inc.
- Astrium SAS
- Bombardier Inc.
- Brisk Synergies
- CAE
- Canadian Space Agency
- Cirque du Soleil
- Clear Path Robotics
- CMLabs
- CMLabs Simulations
- ConsumerReport
- Crosswing
- Digital District
- Disney Research Zurich
- Dreco Energy Services
- Elekta
- Google
- General Motors Canada
- Genetec
- Hewlett-Packard
- HoloLabs Studio Inc.
- Imeka
- Immersion
- Independent Robotics
- Infolytica
- Intelerad
- InterDigital Canada
- IREQ – HydroQuebec
- Irystec
- Kinsol
- Linamar
- Macdonald Dettwiler & Associates
- MDA
- MT4
- National Oilwell Varco
- Neptec
- NeuroRX
- Nokia
- NSPRO
- Nuance
- Object Research Systems
- Open Source Robotics Foundation
- ORS
- Placage Unique Inc.
- Pleaides Inc.
- Pratt and Whitney Canada
- DRDC Suffield
- Revol Technologies Ltd.
- Rogue Research
- SportLogiq
- Synaptive Medical
- TandemLaunch Inc.
- Technospin Inc.
- Telemar
- Thermo FS
- TM4
- True Positive
- Ubisoft
- Vecna
- Wellbore Technologies

# Section VII – Publications

(Note: publications listed are those that appeared during the calendar year of 2016)

**Angeles, Jorge**

Articles in refereed publications

1. Li, W., Angeles, J. and Valášek, M., “Contributions to the kinematics of pointing,” Mechanism and Machine Theory, Vol. 108, pp. 97-109.
2. Pennestrì, E., Valentini, P.P., Figliolini, G. and Angeles, J., “Dual Cayley-Klein parameters and Möbius transform: theory and applications,” Mechanism and Machine Theory, Vol. 106, pp. 50-67.
3. Zou, T., Shaker, M., Angeles, J. and Morozov, A., 2016, “An innovative tooth root profile for spur gears and its effect on service life,” Meccanica, DOI: 10.1007/s11012-016-0519-7.
4. Figliolini, G., Rea, P. and Angeles, J., 2016, “The synthesis of the axodes of RCCC linkages,” ASME Journal of Mechanisms and Robotics, Vol. 8, No. 2, DOI: 10.1115/1.4031950.
5. Ghotbi, B., González, F., Kövecses, J. and Angeles, J., 2016, “Mobility evaluation of wheeled robots on soft terrain: effect of internal force distribution,” Mechanism and Machine Theory, Vol. 100, pp. 259-282.
6. Chaudhary, M., Angeles, J. and Morozov, A., 2016, “Design and kinematic analysis of a spherical cam-roller mechanism for an automotive differential,” CSME Transactions, Vol. 40, pp. 243-252.
7. Saha, D., Angeles, J. and Kövecses, J., 2016, “Design of a pitch-roll joystick based on a three-lobe spherical cam mechanism,” CSME Transactions, Vol. 40, pp. 113-124.
8. Rahimi Mousavi, M.S., Sauze, G., Morozov, A., Angeles, J., Boulet, B., 2016, “Mechatronics design of an X-by-wire prototype of an electric vehicle,” CSME Transactions, Vol. 40, pp. 231-242.
9. Léger, J. and Angeles, J., 2016, “Off-line programming of six-axis robots for optimum five-dimensional tasks,” Mechanism and Machine Theory, Vol. 100, pp. 155-169.

Other refereed contributions

10. Morozov, A., Humphries, K., Zou, T. and Angeles, J., 2016, "Performance Evaluation Criteria for the Analysis of Class-4 Electric Truck,'' CSME International Congress 2016, Kelowna, BC, June 26-29.

11. Humphries, K. and Morozov, A., 2016, "A Comparison of Vehicle Simulation Software and Dynamometer Results for Battery Electric Vehicles,'' CSME International Congress 2016, Kelowna, BC, June 26-29.
12. Morozov, A., Zou,T., Rahimi Mousavi, M.S., Angeles, J. and Boulet, B., 2016, "Design of a Modular Swift-shift Multi-speed Transmission with Double Dual Clutches for Electric Vehicles,'' International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium EVS29, Montreal, QC, June 19-22.
13. Hewlett, J., Kovács, L., Callejo, A., Kry, P., Kövecses, J. and Angeles, J., 2016, "Adaptive semi-implicit integrator for articulated rigid-body systems, 2016 ASME International Design Engineering Technical Conferences, 12th International Conference on Multibody Systems, Nonlinear Dynamics, and Control, Charlotte, NC., Aug. 21-24. This paper was a finalist in the "Best Paper Award'' competition.

All other publications, including those from research that you supervised

14. Howison, T., 2016, "The Application of Dual Algebra to the Numerical Implementation of the Inverse-kinematics of Six-revolute Serial Robots", Master's Thesis, University of Bristol, UK. (exchange student)
15. Yassin, Maged, 2016, "The Dynamics of an Innovative Pick-and-Place Robot", Department of Mechanical Engineering Honours Thesis, McGill University.

Knowledge translation/dissemination activities

16. "Kinematic Synthesis and Dynamics of Multibody Mechanical Systems", a 24-hour seminar at University of Rome-Tor Vergata, on May 3-12, 2016.

Invited presentations

17. "Form, Structure and Reciprocity in Multibody-systems Models", Keynote Lecture at the 4th Joint International Conference on Multibody System Dynamics, May 29 – June 2, 2016, Montreal.

**Arbel, Tal**

Articles in refereed publications

18. S. Drouin, A. Kochanowska, M. Kersten-Oertel, I. J. Gerard, R. Zelmann, D. De Nigris*, S. Bériault, T. Arbel, D. Sirhan, A. F. Sadikot, J. A. Hall, D. S. Sinclair, K. Petrecca, R. F. Del Maestro, D. L. Collins, "IBIS: An OR ready Open Source platform for Image-Guided Neurosurgery", International Journal of Computer Assisted Radiology and Surgery, August 2016.

19. R. Karim, P. Bhagirath, P. Claus, R. J. Housden, Z. Chen, Z. Karimaghaloo*, H. M. Sohn, L. L. Rodriguez, S. Vera, X. Alba, A. Hennemuth, H. O. Peitgen, T. Arbel, M. A. Gonzalez Ballester, A. F. Frangi, M. Gotte, R. Razavi, T. Schaeffter, K. Rhode, "Evaluation of state-of-the-art segmentation algorithms for left ventricle infarct from late Gadolinium enhancement MR images", Medical Image Analysis, Issue 30, pp. 95-107, May 2016.
20. M. Demirkus*, D. Precup, J. J. Clark, and T. Arbel, "Hierarchical Spatio-Temporal Probabilistic Graphical Model with Multiple Feature Fusion for Estimating Binary Facial Attribute Classes in Real-World Face Videos", IEEE Transactions on Pattern Analysis and Machine Intelligence , Vol. 38, Issue, 6, pp. 1185-1203, June 2016.
21. Z. Karimaghaloo*, D. L. Arnold and T. Arbel, "Adaptive Multi-level Conditional Random Fields for Small Enhanced Pathology Detection and Segmentation in Medical Images", Medical Image Analysis, Special Issue on Discrete Graphical Models, Issue 27, pp. 17-30, January 2016.

Papers in refereed conference proceedings

22. Q. Tian*, T. Arbel, J.J. Clark, "Shannon Information Based Adaptive Sampling for Action Recognition", in Proceedings of the 23rd International Conference on Pattern Recognition (ICPR 2016), Cancun, Mexico, Dec. 2016, pp. 962-967.
23. J. Gerard, C. Couturier, M. Kersten-Oertel, S. Drouin, D. De Nigris,* J. A. Hall, K. Mok, K. Petrecca, T. Arbel, D.L. Collins, "Towards a Second Brain Images of Tumours For Evaluation (BITE2) Database", in Proceedings of the Brain Lesions (Brainles) Workshop held in conjunction with the 19th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2016), Athens, Greece, October 2016.

All other publications, including those from research that you supervised

24. A. Doyle*, Master's Thesis, "Probabilistic patient grouping and prediction of Multiple Sclerosis disease activity based on a Bag of Lesions brain image representation", Electrical and Computer Engineering, McGill University, December 2016 (submitted).

**Boulet, Benoit**

Articles in refereed publications

25. Mousavi, M.S.R., Alizadeh, H.V., Boulet, B., Estimation of Synchromesh Frictional Torque and Output Torque in a Clutchless Automated Manual Transmision of a Parallel Hybrid Electric Vehicle, IEEE Trans. On Vehicular Technology, Volume: PP, Issue: 99, DOI: 10.1109/TVT.2016.2619915

26. Mousavi, M.S.R., Boulet, B., Estimation of the State Variables and Unknown Input of a Two-Sped Electric Vehicle Driveline Using Fading-Memory Kalman Filter, IEEE Tans, on Transportation Electrification, Vol. 2, No. 2, Jun. 2016, pp. 210-220.
27. Alizadeh, H.V., Boulet, B., Analytical Calculation of the Magnetic Vector Potential of an Axisymmetric Solenoid in the Presence of Iron Parts, IEEE Trans. On Magnetics, Vol. 52, No. 3, Mar. 2016, pp. 1-4.
28. Tang, Q., Fu, J., Liu, J., Boulet, B., Tan, L., Zhao, Z., Comparison and analysis of the effects of various improved turbocharging approaches on gasoline engine transient performances, Applied Thermal Engineering Vol. 93, Jan. 2016, pp.797-812.
29. Mousavi, M.S.R., Sauze, G., Morozov, A., Angeles, J., Boulet, B., Mechatronics Design of an X-By-Wire Prototype of an Electric Vehicle, Trans. Canadian Society for Mechanical Engineering, Vol. 40, No. 2, Jan. 2016, pp.231-242

Other refereed contributions

30. A. Najmabadi, K. Humphries, B. Boulet, T. Rahman, “Battery voltage optimization of a variable DC vus voltage control powertrain for medium duty delivery trucks for various drive cycles”, IEEE Transportation Electrification Conference

**Caines, Peter**

Publications in journals

31. P. E. Caines and A.C. Kizilkale***, "epsilon-Nash Equilibria for Partially Observed LQG Mean Field Games with Major Player {IEEE Transactions on Automatic Control} On line publication: 08 December 2016 http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7778116 DOI: 10.1109/TAC.2016.2637347
32. M. Helwa** and P. E. Caines, ``In-Block Controllability of Affine Systems on Polytopes'', {IEEE Trans. on Automatic Control.} On line publication: 07 September 2016. http://ieeexplore.ieee.org/document/7562453/. Print version to appear , June, 2017
33. A. Pakniyat* and P.E.Caines, ``Hybrid Optimal Control of an Electric Vehicle with a Dual-Planetary Transmission'', {\it Nonlinear Analysis: Hybrid Systems}. On line publication: 24th September, 2016. http://authors.elsevier.com/sd/article/S1751570X16300528, Print version, 2016
34. N. Sen** and P.E. Caines, ``Mean Field Game Theory with a Partially Observed Major Agent''. {SIAM J. Control and Optimization}, 2016, 54(6). pp 3174-3224 DOI: 10.1137/16M1063010

35. M. Aziz*** and P. E. Caines, ``A Mean Field Games Computational Methodology for Decentralized Cellular Network Optimization''. { IEEE Trans. on Control Systems Technology} On line publication: 01 June ,2016. http://ieeexplore.ieee.org/abstract/document/7482763/

36. N. Sen** and P.E. Caines, ``Nonlinear Filtering Theory for McKean-Vlasov Type Stochastic Differential Equations'', {SIAM J. Control and Optimization}, 2016, 54(1), 2016, pp. 153–174.

Refereed Conference Publications

37. A. Pakniyat* and P. E. Caines, “On the Stochastic Minimum Principle for Hybrid Systems”, { 55th IEEE Conference on Decision and Control}, Las Vegas, USA, December, 2016, pp 1139 - 1144
38. N. Sen** and P. E. Caines, “Mean Field Game Theory for Agents with Individual-State Partial Observations”, { 55th IEEE Conference on Decision and Control}, Las Vegas, USA, December, 2016. pp 6105 - 6110
39. D. Firoozi* and P. E. Caines, “Mean Field Game epsilon-Nash Equilibria for Partially Observed Optimal Execution Problems in Finance”, { 55th IEEE Conference on Decision and Control}, Las Vegas, USA, December, 2016, pp 268 - 275
40. N. Sen** and P.E. Caines, “Mean Field Games and Nonlinear Filtering for Agents with Individual-State Partial Observations”, {American Control Conference}, Boston, USA, 6-8 July, 2016, pp. 4681-4686.
41. P. E. Caines and D. Firoozi*, “The Execution Problem in Finance: A Partially Observed Mean Field Game Formulation”. American Mathematical Society Fall Meeting, Bowdoin College, Brunswick, Maine September 2016. Abstract index 1121-93-133

Other refereed contributions

42. D. Firoozi* and P. E. Caines, “The Execution Problem in Finance : A Mean Field Game Formulation”, { 17th International Symposium on Dynamic Games and Applications, Urbino, Italy 12-15 July, 2016
43. N. Sen** and P. E. Caines, “Mean Field Game Theory: The Case of Agents with Partial Observations on their Individual States”, {17th International Symposium on Dynamic Games and Applications}, Urbino, Italy 12-15 July, 2016
44. 7th Biannual Meeting on System and Control Theory, Queen's University, Kingston, ON, May 11-13, 2016 Co-authored work with P. E. Caines presented by students:
(i) Dena Firoozi*: “ε-Nash Equilibria for Partially Observed Optimal Execution Problem: Mean Field Game Approach

(ii) Ali Pakniyat *: “Optimal Control of Hybrid Systems: Theory and Applications”

Non-refereed contributions

45. Peter E. Caines, “Mean Field Games Theory and the Control of Large Scale Systems”, Opening Plenary Address {23rd International Symposium on Mathematical Theory of Networks and Systems} (MTNS), 11 July, 2016 (see Invited Presentations below).

Policy papers

46. "Statement Concerning Canadian Energy Policy and Climate Change" addressed to the Prime Minister, Justin Trudeau; also mailed to members of the Liberal and NDP Parties, October, 2016 (6 pages).

Invited presentations

47. Opening Plenary Address, "Mean Field Game Theory and the Control of Large Scale Systems", {23rd International Symposium on Mathematical Theory of Networks and Systems} (MTNS), 11 July, 2016.
48. Air Force Office of Scientific Research Annual Review Meeting of the Control and Dynamics Program, 04 August, 2016: "Mean Field Game Theory for Agents with Individual-State Partial Observations"
49. Cambridge University, UK, July 2016: Department of Engineering: "Mean Field Game Theory and the Control of Large Scale Systems".
50. Princeton University, NJ, November, 2016: Department of Operations Research and Financial Engineering: "Mean Field Game Theory and its Financial Applications".
51. Festschrift Birthday Talks Honouring Tyrone Duncan and Tamer Basar delivered at the IEEE Control Systems Society Conference on Decision and Control, Las Vegas, December, 2016

**Clark, James**

Articles in refereed publications

52. Rezagholizadeh, M., Akhavan, T., Soudi, A., Kaufmann, H., and Clark, J.J., ``A retargeting approach for mesopic vision: simulation and compensation'', Journal of Imaging Science and Technology, Vol. 60, No. 1, pp 10410-1-10410-12.

Other refereed contributions

53. Tian, Q., Arbel, T. and Clark, J.J., ``Shannon Information Based Adaptive Sampling for Action Recognition'', 23rd International Conference on Pattern Recognition, Cancun Mexico, December 2016.
54. Gao, X., Yu, B., Ding, L., and Clark, J.J., ``Generation of Spatial-temporal Panoramas with a Single Moving Camera'', Computer and Robot Vision Conference (CRV), Victoria, Canada, June 2016.
55. Rezagholizadeh, M., Akhavan, T., Soudi, A., Kaufmann, H., and Clark, J.J., ``A retargeting approach for mesopic vision: simulation and compensation'', IS&T International Symposium on Electronic Imagine Science and Technology, Color Imaging XXI: Displaying, Processing, Hardcopy, and Applications, February 2016.

All other publications, including those from research that you supervised

56. Mehdi Rezagholizadeh, PhD Thesis, Color Measurement at Low Light Levels, November 2016

**Cooperstock, Jeremy**

Articles in refereed publications

57. E. Aguilera, J. J. Lopez, and J. R. Cooperstock. “Spatial Audio for Audioconferencing in Mobile Devices: Investigating the Importance of Virtual Mobility and Private Communication and Optimizations.” In: Journal of the Audio Engineering Society 64.5 (May 2016), pp. 332–341. url: http://www.aes.org/e-lib/browse.cfm?elib=18138.
58. *D. El-Shimy and J. R. Cooperstock. “User-Driven Techniques for the Design and Evaluation of New Musical Interfaces.” In: Computer Music Journal 40.2 (2016). url: http: //www.mitpressjournals.org/doi/pdf/10.1162/COMJ_a_00357.
59. *F. Tordini, A. Bregman, and J. R. Cooperstock. “Prioritizing foreground selection of natural chirp sounds by tempo and spectral centroid.” In: Multimodal User Interfaces, Special Issue on Auditory Display 10.3 (Sept. 2016). Ed. by B.F.G. Katz and G. Marentakis, pp. 221–234. url: http://link.springer.com/article/10.1007%2Fs12193-016-0223- x.

Papers in refereed conference proceedings

60. *E. Sheepy, M. Orjuela-Laverde, and J. R. Cooperstock. “Encouraging active and collaborative learning in two engineering courses.” In: Supporting Active Learning and Technological Innovation in Studies of Education. Montreal, Canada, June 2016.

61. *J. Blum and J. R. Cooperstock. “Expressing Human State via Parameterized Haptic Feedback for Mobile Remote Implicit Communication.” In: Augmented Human. Geneva, Switzerland: ACM, Feb. 2016.
62. *N. Hieda, *J. Anlauff, *S. Smith, *Y. Visell, and J. R. Cooperstock. “An Intelligent Floor Surface for Foot-based Exploration of Geospatial Data.” In: International Workshop on Multimedia Signal Processing. Montreal, Canada, Sept. 2016.

All other publications, including those from research that you supervised

63. *D. Horodniczy, Characterization and Application of a Variable-Friction Foot Device. Master's Thesis, Electrical and Computer Engineering, McGill University, 2016.

**Dudek, Gregory**

Conference publications

64. Xu and G. Dudek, “Towards modeling real-time trust in asymmetric human–robot collaborations,” in Robotics Research Journal. Springer International Publishing, 2016, pp. 113–129.
65. T. Manderson, J. Li, D. C. Poza, N. Dudek, D. Meger, and G. Dudek, “Towards autonomous robotic coral reef health assessment,” in Journal of Field and Service Robotics. Springer International Publishing, 2016, pp. 95–108.
66. Quattrini Li, I. Rekleitis, S. Manjanna, N. Kakodkar, J. Hansen, G. Dudek, L. Bobadilla, J. Anderson, and R. Smith, “Data correlation and comparison from multiple sensors over a coral reef with a team of heterogeneous aquatic robots,” International Symposium of Experimental Robotics (ISER), 2016.
67. Y. Girdhar and G. Dudek, “Modeling curiosity in a mobile robot for long-term autonomous exploration and monitoring,” Autonomous Robots (journal), vol. 40, no. 7, pp. 1267–1278, 2016.
68. J. Li, D. Meger, and G. Dudek, “Learning to generalize 3d spatial relationships,” in Robotics and Automation (ICRA), 2016 IEEE International Conference on. IEEE, 2016, pp. 5744–5749.
69. T. Manderson, F. Shkurti, and G. Dudek, “Texture-aware slam using stereo imagery and inertial information,” in Computer and Robot Vision (CRV), 2016 13th Conference on. IEEE, 2016, pp.456–463.
70. S. Manjanna, N. Kakodkar, M. Meghjani, and G. Dudek, “Efficient terrain driven coral coverage using gaussian processes for mosaic synthesis,” in Computer and Robot Vision (CRV), 2016 13$^{th}$ Conference on. IEEE, 2016, pp. 448–455.

71. Dudek and M. Jenkin, “Inertial sensing, gps and odometry,” in Springer Handbook of Robotics. Springer International Publishing, 2016, pp. 737–752.
72. Xu and G. Dudek, “Maintaining efficient collaboration with trust-seeking robots,” in Intelligent Robots and Systems (IROS), 2016 IEEE/RSJ International Conference on. IEEE, 2016, pp. 3312–3319. Nominee for best-paper award from over 2000 submitted papers.
73. M. Meghjani, S. Manjanna, and G. Dudek, “Multi-target search strategies,” in Safety, Security, and Rescue Robotics (SSRR), 2016 IEEE International Symposium on. IEEE, 2016, pp. 328–333.
74. “Multi-target rendezvous search,” in Intelligent Robots and Systems (IROS), 2016 IEEE/RSJ International Conference on. IEEE, 2016, pp. 2596–2603. Nominee for best-paper award in the Search and Rescue category, from over 2000 submitted papers.
75. “Fast and efficient rendezvous in street networks,” in Intelligent Robots and Systems (IROS), 2016 IEEE/RSJ International Conference on. IEEE, 2016, pp. 1887–1893.
76. Koreitem, Y. Girdhar, W. Cho, H. Singh, J. Pineda, and G. Dudek, “Subsea fauna enumeration using vision-based marine robots,” in Computer and Robot Vision (CRV), 2016 13th Conference on. IEEE, 2016, pp. 101–108.

**Ferrie, Frank**

Articles in Refereed Conference Proceedings

77. Haji Abolhassani, A.A., Dimitrakopoulos, D., and Ferrie, F.P., Anisotropic Interpolation of Sparse Images, Proc. 13th Conference on Computer and Robot Vision (CRV), Victoria, British Columbia, June 1-3, 2016, pp. 432-439.
78. Mu, Y, Dimitralopoulos, R., and Ferrie, F.P., Generalizing Generative Models: Application to Super-Resolution, Proc. 13th Conference on Computer and Robot Vision (CRV), Victoria, British Columbia, June 1-3, 2016, pp. 8-15.
79. St-Martin Cormier, O., and Ferrie, F.P., Evaluation of Shape Description Metrics Applied to Human Silhouette Tracking, Proc. 13th Conference on Computer and Robot Vision (CRV), Victoria, British Columbia, June 1-3, 2016, pp. 370-375.

Conference Presentations (refereed abstracts)

80. Haji Abolhassani, A.A., Dimitrakopoulos, D., and Ferrie, F.P., A new high-order statistical simulation that is non-stationary and transformation invariant, 10th International Geostatistical Conference, Valencia, Spain, Sept. 5-9, 2016, Vol. 2., pp. 33-34.

**Forbes, James Richard**

Articles in refereed publications

81. R. J. Caverly and J. R. Forbes, “Estimator Design for a Single Degree of Freedom Cable-Actuated System,” Journal of the Franklin Institute, vol. 353, no. 18, pp. 4845–4869, 2016.
82. R. J. Caverly and J. R. Forbes, “Dynamic Modeling, Trajectory Optimization, and Control of a Flexible Kiteplane,” IEEE Transactions on Control Systems Technology, 2016. To Appear. Accepted on August 15, 2016.
83. F. R. Hogan and J. R. Forbes, “Modeling of a Rolling Flexible Spherical Shell,” ASME Journal of Applied Mechanics, vol. 83, no. 9, pp. 091010(1)–091010(12), 2016.
84. R. J. Caverly, C. Li, C. Eun Jung, J. R. Forbes, and Y. L. Young, “Modeling and Control of Flow- Induced Vibrations of a Flexible Hydrofoil in Viscous Flow,” Smart Materials and Structures, vol. 25, no. 6, pp. 065007–065020, 2016.
85. A. Walsh and J. R. Forbes, “A Very Strictly Passive Gain-Scheduled Controller: Theory and Experiments,” IEEE/ASME Transactions on Mechatronics, vol. 21, no. 6, pp. 2817–2826, 2016.
86. D. E. Zlotnik and J. R. Forbes, “Exponential Convergence of a Nonlinear Attitude Estimator,” Automatica, vol. 72, pp. 11–18, October 2016.
87. L. J. Bridgeman and J. R. Forbes, “The Extended Conic Sector Theorem,” IEEE Transactions on Automatic Control, vol. 61, pp. 1931 – 1937, July 2016.
88. R. J. Caverly and J. R. Forbes, “Saturated Control of Flexible-Joint Manipulators Using a Hammerstein Strictly Positive Real Compensator,” Robotica, vol. 34, pp. 1367–1382, June 2016.
89. F. R. Hogan and J. R. Forbes, “Trajectory Tracking, Estimation, and Control of a Pendulum-Driven Spherical Robot,” AIAA Journal of Guidance Control and Dynamics, vol. 39, pp. 1119–1125, May 2016.
90. H. Sommer, J.R. Forbes, R. Siegwart, and P. Furgale, “Continuous-TimeEstimationofAttitudeUsing B-Splines on Lie Groups,” AIAA Journal of Guidance, Control, and Dynamics, vol. 39, pp. 242–261, February 2016.

**Kovecses, Jozsef**

Articles in refereed publications

91. Gholami, F., Nasri, M., Kövecses, J., and Teichmann, M., “A Linear Complementarity Formulation for Contact Problems with Regularized Friction”, Mechanism and Machine Theory, Vol. 105, pp. 568-582, 2016.

92. Arbatani, S., Callejo, A., Kövecses, J., Kalantari, M., Marchand, N.R., and Dargahi, J., “An Approach to Directional Drilling Simulation: Finite Element and Finite Segment Methods with Contact”, Computational Mechanics, Vol. 57, Issue 6, pp. 1001-1015, 2016.
93. Gonzalez, F., Kövecses, J. and Font-Llagunes, J.M., “Load Assessment and Analysis of Impacts in Multibody Systems”, Multibody System Dynamics, Vol. 38, Issue 1, pp 1-19, 2016.
94. Gholami, F., Trojan, D., Kövecses, J., Haddad, W. and Gholami, B., “A Microsoft Kinect-Based Point-of-Care Gait Assessment Framework for Multiple Sclerosis Patients”, IEEE Journal of Biomedical and Health Informatics, pp.1-10, published online July 2016, doi:10.1109/JBHI.2016.2593692. McGill published a press release on Aug. 15, 2016 based on the work reported in this paper. This press release has been picked up and covered by various news agencies worldwide. An interview on CTV News was also broadcasted on Aug. 30.
95. Ghotbi, B., Gonzalez, F., Kövecses, J., Angeles, J., “Mobility Evaluation of Wheeled Robots on Soft Terrain: Effect of Internal Force Distribution”, Mechanism and Machine Theory, Vol. 100, pp. 259-282, 2016.
96. Mashayekhi, M.J. and Kövecses, J., “A Comparative Study Between the Augmented Lagrangian Method and the Complementarity Approach for Modeling the Contact Problem”, Multibody System Dynamics, pp. 1-19, published online, March 2016, doi:10.1007/s11044-016-9510-2.
97. Gholami, F. and Kövecses, J., “An Eigenvector-Based Approach for Improved Parameter Variation for Multibody Mechanical Systems”, Mechanics Based Design of Structures and Machines, pp. 1-8, published online, February 2016, doi: 10.1080/15397734.2016.1146148.
98. Saha, D., Angeles, J., and Kövecses, J.: "Design of a Pitch-Roll Joystick Based on a Three-Lobe Spherical Cam Mechanism", Transactions of the Canadian Society for Mechanical Engineering, CSME Transactions, Vo.40, No.2, pp. 113-124, 2016.

**Kry, Paul**

Refereed journals

99. Rabbani, M. van de Panne, **P. G. Kry**, Anticipatory balance control and dimension reduction, Computer Animation and Virtual Worlds, July 2016. DOI: 10.1002/cav.1726

Refereed conference proceedings

100. B. Galea, E. Kia, N. Aird, **P. G. Kry**, Stippling with aerial robots, Expressive '16 Proceedings of the Joint Symposium on Computational Aesthetics and Sketch Based

Interfaces and Modeling and Non-Photorealistic Animation and Rendering, pp. 125-134, 2016. **(best paper award)**

101. M. Bächer, B. Hepp, F. Pece, **P. G. Kry**, B. Bickel, B. Thomaszewski, O. Hilliges, DefSense: Computational Design of Customized Deformable Input Devices, CHI '16 Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems, pp. 3806-3816, 2016. doi>10.1145/2858036.2858354.
102. Rabbani, **P. G. Kry**, PhysIK: Physically plausible and intuitive keyframing, Proceedings of Graphics Interface, pp. 153-161, 2016. DOI 10.20380/GI2016.19.

***Books or book chapters***

103. F. Quaine, L. Reveret, S. Courtemanche, **P. G. Kry**, Postural regulation and motion simulation in rock climbing, Chapter 7, The Science of Biomechanics of Climbing, 12 pages, 2016.

Other publications

104. M. van de Panne, **P. G. Kry**), A Conversation with the CHCCS/SCDHM 2016 Achievement Award Winner, Proceedings of Graphics Interface, 3 pages, 2016. DOI 10.20380/GI2016.01

**Langer, Michael**

Refereed journal publications

105. M.S. Langer, H. Zheng, S. Rezvankhah. Depth discrimination from occlusions in 3D clutter. Journal of Vision 16: 11, Sept. 2016

Refereed conference publications

106. F. Mannan and M.S. Langer. Discriminative filters for depth from defocus. International Conference on 3D Vision, Stanford CA Oct. 2016
107. F. Mannan and M.S. Langer. What is a good model for depth from defocus? 13th Conference on Computer and Robot Vision, Victoria, Canada, June 2016
108. F. Mannan and M.S. Langer. Blur calibration for depth from defocus, 13th Conference on Computer and Robot Vision, Victoria, Canada, June 2016

Conference Presentations

109. M.S. Langer. Depth discrimination from occlusions in 3D clutter, Vision Sciences Society Annual Meeting, St. Pete Beach, FL May 2016

**Mahajan, Aditya**

Articles in refereed publications

110. A. Mahajan and M. Mannan*, “Decentralized stochastic control,” Annals of Operations Research, vol. 241, no. 1, pp. 109-126, June 2016.

Other refereed contributions

111. J. Chakravorty* and A. Mahajan, “Remote-state estimation with packet drop,” IFAC Workshop on Distributed Estimation and Control in Networked Systems, Tokyo, Japan, Sep 8–9, 2016. (Recipient of the Best Student Paper Award)
112. J. Chakravorty* and A. Mahajan, “Structural results for two-user interactive communication,” IEEE International Symposium of Information Theory (ISIT), Barcelona, Spain, July 10–15, 2016.
113. S. Li, A. Khisti, and A. Mahajan, “Privacy-optimal strategies for smart metering systems with rechargeable battery,” American Control Conference (ACC), Boston, MA, July 6–8, 2016.
114. S.Li, A.Khisti,and A.Mahajan,“Privacy preserving rechargeable battery policies for smart metering systems,” International Zurich Seminar on Communications (IZS), Zurich, Switzerland, March 2–4, 2016.
115. J. Arabneydi* and A. Mahajan, “Optimal Decentralized Control of System with Partially Exchangeable Agents,” Allerton Conference on Communication, Control, and Computing, Monticello, IL, Sep 27–30, 2016.
116. J. Chakravorty* and A. Mahajan, “The distortion transmission function for remote estimation under communication constraints,” International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt), Tempe, AZ, May 9–13, 2016.

Non-refereed contributions

117. M. Afshari* and A. Mahajan, “Value of common information in static teams,” Eighth Workshop on Dynamic Games in Management Science, Montreal, QC, Oct 27-28, 2016.
118. J. Arabneydi* and A. Mahajan, “Mean-field Teams,” Information Theory and Applications (ITA) Workshop, San Diego, CA, Feb 1–5, 2016.
119. J. Chakravorty* and A. Mahajan, “The distortion transmission function for transmitting autoregressive Markov processes under communication constraints,” Information Theory and Applications (ITA) Workshop, San Diego, CA, Feb 1–5, 2016.

120. J. Chakravorty* and A. Mahajan, “Structural results for two-user interactive communication,” Les Cahiers du GERAD, no. G-2016-40, July 2016.

All other publications, including those from research that you supervised

121. Jalal Arabneydi, New Concepts in Team Theory: Mean Field Teams and Reinforcement Learning, PhD Thesis, Dec 2016.
122. Chuangshen Dong, Greener Cyber Physical Systems—Data Analysis and Algorithm Design, PhD Thesis, April 2016.
123. Calvin Ma, Multi-armed bandits for MPSoC design space exploration, MEng Thesis, Aug 2016.

Invited presentations

124. “Remote state estimation over erasure channels: structure of optimal strategies and fundamental limits”, Information Theory Forum, Stanford University, Stanford, CA, Nov 2016.
125. “Optimal Decentralized Control of System with Partially Exchangeable Agents”, Allerton Conference on Communication, Control, and Computing, Monticello, IL, Sep 2016.
126. “Distortion transmission function for transmitting Markov processes under communication constraints”, International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks, Tempe, AZ, May 2016.
127. “The distortion transmission function for transmitting autoregressive Markov processes under communication constraints”, Information Theory and Applications (ITA) Workshop, San Diego, CA, Feb 2016.

**Meger, David**

Refereed journal publications

128. Travis Manderson, Jimmy Li, Natasha Dudek, David Meger, and Gregory Dudek. Robotic coral reef health assessment using automated image analysis. Journal of Field Robotics (JFR) Special Issue: Field and Service Robotics, 34:170 – 187, December 2016.

Refereed conference publications

129. Jimmy Li, David Meger, and Gregory Dudek. Learning to generalize 3d spatial relationships. In Proceedings of the International Conference on Robotics and Automation (ICRA), pages 5744 – 5749, May 2016.

Invited lectures or Presentations

130. Object recognition robots. McGill COMP 424 Guest Lecture- Montreal, Quebec, March 31th 2016. Guest lecture.
131. Swimming by design and from experience. Research seminar at McGill Bellairs Institute, Barbados: Mobile Robotics Lab ocean field trials, January 2016.
132. Physically intelligent robotics. McGill Physical Society Colloquium, December 2nd 2016. Department-wide colloquium given in Rutherford 112 (attendance approx. 80).
133. An intro to robotics at McGill. McGill Soup and Science program, January 29 2016.
134. Learning swimming controllers. Research seminar at McGill Bellairs Institute, Barbados: Physically-inspired animation and robotics workshop, February 2016.
135. Autonomous learning for swimming robots. McGill Tomlinson Talks, April 13 2016. McGill-wide session for holders of funding from Dr. Richard H. Tomlinson at the University Club, Montreal.
136. Autonomous learning for swimming robots. Invited talk at the symposium on Learning at the Computer and Robot Vision Conference, June 1 2016. Oral presentation to all conference attendees (approx. 80).
137. Learning to perceive and act. Invited talk: Distall fellow introduction at the NSERC Canadian Field Robotics Network (NCFRN) yearly meeting, June 9 2016. Oral presentation to all network members (approx. 100).
138. Robots that see (and move and learn). Invited talk at the School of Computer Science Robotics Summer Camp, June 27 2016. Oral presentation to student summer camp attendees (approx. 40).
139. Semantic object recognition for robotics. Corporate Lunch and Learn at WRNCH, August 16, 2016. Oral presentation to all company employees (approx. 10).
140. Learning for robotics. Invited talk at Barrick Gold, March 2 2016. Oral presentation to members of the Barrick research and development division sponsored by NSERC Strategic Network Enhancement Inititive (SNEI).

Conference Presentations

141. Learning to generalize 3d spatial relationships. Oral and poster presentation at the International Conference on Robotics and Automation (ICRA), May 16th 2016. This presentation was given by Jimmy Li, a PhD student that I co-supervise. I was a co-author of the corresponding paper in the conference.

**Nahon, Meyer**

Articles in refereed publications

142. M. Al-Solihat and M. Nahon, 2016, 'Stiffness of Slack and Taut Moorings', Ships and Offshore Structures, Vol. 11, No. 8, pp. 890-904.
143. W. Chen, A. Bifeng and M. Nahon, 2016, 'Adaptive Robust Backstepping (ARB) Control for Quadrotor Robot in Presence of Payload Variation and Unknown Disturbances', International Journal of Control and Automation, Vol. 9, No. 3, pp. 417-434.

Other refereed contributions

144. M. Al-Solihat and M. Nahon, 2016, 'Flexible Multibody Dynamic Modeling of an Offshore Floating Wind Turbine', 4th Joint International Conference on Multibody System Dynamics, Montreal, QC, May 29 – June 2.
145. W. Khan and M. Nahon, 2016, 'Modeling Dynamics of Agile Fixed-Wing UAVs for Real-Time Applications', International Conference on Unmanned Aircraft Systems (ICUAS'16), Arlington, VA, June 7-10.
146. J. Levin, M. Nahon and A. Paranjape, 2016, 'Optimal Trajectory Design for an Aggressive Turn-Around Maneuver with an Agile Fixed-Wing UAV', 20th IFAC Symposium on Automatic Control in Aerospace (ACA 2016), Sherbrooke, QC, August 21 - 25.

All other publications, including those from research that you supervised

147. W. Khan, 'Dynamics Modeling of Agile Fixed-Wing Unmanned Aerial Vehicles', PhD Thesis, Department of Mechanical Engineering, McGill University, August 2016.

**Pineau, Joelle**

Publications in refereed journals

148. A. Barreto, D. Precup, J. Pineau. "Practical Kernel-Based Reinforcement Learning". Journal of Machine Learning Research. 17 (67). pp. 1-70. 2016.
149. A. Emami, J. El Youssef, R. Rabasa-Lhoret, J. Pineau, J. Castle, A. Haidar. "Modelling Glucagon Action in Patients with Type 1 Diabetes". IEEE Journal of Biomedical and Health Informatics. 2016.
150. B. Wang, J. Pineau. "Online Bagging and Boosting for Imbalanced Data Streams". IEEE Transactions on Knowledge and Data Engineering. 12 (48). pp. 3353-3366. 2016.

151. B. Kim & J. Pineau. “Socially Adaptive Path Planning in Dynamic Environments Using Inverse Reinforcement Learning”. International Journal of Social Robotics. Vol. 8(1). pp. 51-66. 2016.

Publications in refereed conference proceedings

152. C.-W. Liu, R. Lowe, I.V. Serban, M. Noseworthy, L. Charlin, J. Pineau. “How NOT To Evaluate Your Dialogue System: An Empirical Study of Unsupervised Evaluation Metrics for Dialogue Response Generation”. Empirical Methods in Natural Language Processing (EMNLP). 2016.
153. R. Lowe, I.V. Serban, M. Noseworthy, L. Charlin, J. Pineau. “On the Evaluation of Dialogue Systems with Next Utterance Classification”. Annual Meeting on Discourse and Dialogue (SIGdial). 2016.
154. B. Wang, J. Pineau. “Generalized Dictionary for Multitask Learning with Boosting”. International Joint Conference on Artificial Intelligence (IJCAI). 2016.
155. P. Thodoroff, J. Pineau, A. Lim. “Learning robust features using deep learning for automatic seizure detection”. Machine Learning and Healthcare Conference (MLHC) 2016.
156. C. Zhou, B.B. Balle, J. Pineau. “Learning Time Series Models for Pedestrian Motion Prediction”. International Conference on Robotics and Automation (ICRA). 8p. 2016.
157. 10. B. Wang, B.B. Balle, J. Pineau. “Multitask Generalized Eigenvalue Program”. Association for the Advancement of Artificial Intelligence (AAAI). 7p. 2016.
158. 11. A.M.S. Barreto, R.L. Beirigo, J. Pineau, D. Precup. “Incremental Stochastic Factorization for On-line Reinforcement Learning. Association for the Advancement of Artificial Intelligence (AAAI). 7p. 2016.
159. I.V. Serban, A. Sordoni, Y. Bengio, A. Courville, J. Pineau. “Building End-To-End Dialogue Systems Using Generative Hierarchical Neural Network Models”. Association for the Advancement of Artificial Intelligence (AAAI). 7p. 2016.

Books or Book Chapters

160. S.M. Shortreed, E.B. Laber, J. Pineau, S.A. Murphy. “Imputing Missing Data from Sequential Multiple Assignment Randomized Trials”. Book chapter. To appear in Adaptive Treatment Strategies in Practice: Planning Trials and Analyzing Data for Personalized Medicine. M.R. Kosorok and E.E.M. Moodie (eds). 2016.
161. 14. R. Vincent, J. Pineau. “Practical reinforcement learning in dynamic treatment regimes”. Book chapter. To appear in Adaptive Treatment Strategies in Practice: Planning Trials and Analyzing Data for Personalized Medicine. M.R. Kosorok and E.E.M. Moodie (eds). 2016.

Other publications

162. D. Bahdanau, P. Brakel, K. Xu, A. Goyal, R. Lowe, J. Pineau, A. Courville, Y. Bengio. “An Actor-Critic Algorithm for Sequence Prediction”. arXiv: 1607.07086. 2016.
163. I.V. Serban, A. G. Ororbia II, J. Pineau, A. Courville. “Multi-modal Variational Encoder-Decoders”. arXiv: 1612.00377. 18pp. 2016.
164. I.V. Serban, R. Lowe, L. Charlin, J. Pineau. “Generative Deep Neural Networks for Dialogue: A Short Review”. arXiv: 1611.06216. 6pp. 2016.

Invited lectures or Presentations

165. Dec 10 2016 Deep learning models for natural language interactions. NIPS workshop on Deep Learning for Action and Interaction. Barcelona, Spain.
166. Dec 4 2016. Towards an Automatic Turing Test: Learning to Evaluate Dialogue Responses CIFAR Learning in Machine and Brains Annual Meeting. Barcelona, Spain.
167. Nov 11 2016. Interactive Dialogue Systems: A Deep Learning Approach. Microsoft Research. New York, USA.
168. Nov 3 2016. The AI Revolution. Keynote talk 3rd Annual Canada 2020 Conference. Ottawa, Canada.
169. Oct 18 2016. Perspectives on healthcare in the information age. Keynote talk Drug Information Association (DIA) Annual Canadian Meeting. Ottawa, Canada.
170. Sep 21 2016. Avances et perspectives davenir en robotique. Conferences de la Montagne. Universite de Montreal. Montreal, Canada.
171. Aug 19 2016. Improving sequential treatment strategies through reinforcement learning. Keynote talk International Conference on Machine Learning in Health Care. Los Angeles, USA.
172. Aug 5 2016. Reinforcement Learning: From basic concepts to deep Q-networks. Deep Learning Summer School, Universite de Montreal. Montreal. Canada.
173. Jul 11 2016. Natural Language Processing: Challenges and Opportunities for Deep Reinforcement Learning. IJCAI workshop on Deep Reinforcement Learning. New York, USA.
174. Jun 24 2016. Contextual Bandits for the Discovery of Personalized Adaptive Treatment Strategies. ICML workshop on Computational Frameworks for Personalization. New York, USA.
175. Jun 24 2016. Data-efficient learning from EEG signals using spectral, temporal, spatial information. ICML workshop on Data-Efficient Machine Learning. New York, USA.
176. Jun 23 2016. What is deep learning in the small data regime?. ICML workshop in Deep Learning. New York, USA.
177. Apr 18 2016. Natural Language Processing: Challenges & Opportunities for Deep Reinforcement Learning. Google. Mountain View, CA.

178. Apr 1 2016. Natural Language Processing: Challenges & Opportunities for Deep Reinforcement Learning. Data Learning and Inference (DALI) meeting. Sestri Levante, Italy.

Conference Presentations

179. "How NOT To Evaluate Your Dialogue System: An Empirical Study of Unsupervised Evaluation Metrics for Dialogue Response Generation". Empirical Methods in Natural Language Processing (EMNLP). Poster presentation by Michael Noseworthy (I am a co-author).

180. "On the Evaluation of Dialogue Systems with Next Utterance Classification". Annual Meeting on Discourse and Dialogue (SIGdial). Oral presentation by Ryan Lowe (I am a co-author).

181. "Generalized Dictionary for Multitask Learning with Boosting". International Joint Conference on Artificial Intelligence (IJCAI). Oral presentation by Boyu Wang (I am a co-author).

182. "Learning robust features using deep learning for automatic seizure detection". Machine Learning and Healthcare Conference (MLHC) Poster presentation by Pierre Thodoroff (I am a co-author).

183. "Learning Time Series Models for Pedestrian Motion Prediction". International Conference on Robotics and Automation (ICRA). Oral presentation by Chenghui Zhou (I am a co-author).

184. "Multitask Generalized Eigenvalue Program". Association for the Advancement of Artificial Intelligence (AAAI). Oral presentation by Boyu Wang (I am a co-author).

185. "Incremental Stochastic Factorization for On-line Reinforcement Learning. Association for the Advancement of Artificial Intelligence (AAAI). Oral presentation by Andre Barreto (I am a co-author).

186. "Building End-To-End Dialogue Systems Using Generative Hierarchical Neural Network Models". Association for the Advancement of Artificial Intelligence (AAAI). Oral presentation by Julian Serban (I am a co-author).

187. "Conditional Computation in Neural Networks for faster models". International Conference on Learning Representations (ICLR). Workshop Track Poster presentation by Emmanuel Bengio (I am a co-author).

188. "Conditional Computation in Neural Networks for faster models". ICML Workshop on Abstraction in Reinforcement Learning Workshop. Poster presentation by Emmanuel Bengio (I am a co-author).

189. "Simultaneous Machine Translation using Deep Reinforcement Learning". ICML workshop on Abstraction in Reinforcement Learning. Poster presentation by Harsh Satija (I am a co-author).

190. “Deep Conditional Multi-Task Learning in Atari”. ICML workshop on Abstraction in Reinforcement Learning. Poster presentation by Joshua Romoff (I am a co-author).
191. “Automatic Seizure Detection using Deep Learning”. ICML Workshop on Data-Efficient ML. Poster presentation by Pierre Thodoroff (I am a co-author).
192. “Automated Sleep Staging with Convolutional Nets on Spectrograms”. Machine Learning for Health Care Workshop. Poster presentation by Evgeny Naumov (I am a co-author).

**Sharf, Inna**

Articles in refereed publications

193. E.M. Botta, I. Sharf, M. Teichmann, and A.K. Misra. ''On the Simulation of Tether-Nets for Space Debris Capture with Vortex Dynamics,'' Acta Astronautica, Vol. 123, pp. 91-102, 2016.
194. Zarrouk, D., I. Sharf and M. Shoham, ''Energetic Analysis and Experiments of Earthworm-Like Locomotion over Compliant Surfaces,'' Bioinspiration and Biomimetics, Vol. 1, art. no. 014001, 11 pages, 2016.

Other refereed contributions

195. P. Abouzakhm and I. Sharf, "Guidance, Navigation, and Control for Docking of Two Cubic Blimps," 20th IFAC Symposium on Automatic Control in Aerospace, IFAC-PapersOnline, pp. 260-265, Sherbrooke, Quebec, August 19-22, 2016.
196. F. Chui, G. Dicker and I. Sharf, "Dynamics of a Quadrotor Undergoing Impact with a Wall," 2016 International Conference on Unmanned Aircraft Systems, ICUAS, pp. 717-726, Arlington, US, June 7-10, 2016.
197. LX.T. Fung, I. Sharf and B. Beckman, "Implementation of a leader-follower controller for a skid-steering wheel-legged robot," 2016 IEEE 14th International Workshop on Advanced Motion Control, pp. 304-309, Auckland, New Zealand, April 22-24, 2016.
198. E.M. Botta, I. Sharf, A.K. Misra. "Effect of Energy and Momentum on the Deployment Dynamics of Nets for Active Space Debris Removal," 67th International Astronautical Congress (IAC 2016), Guadalajara, Mexico, September 2016. IAC-16-A6.5.6.
199. I. Sharf, P. Woo, Nguyen Huynh, T.-C. and A.K. Misra. "System Rigidization and Control for Post-capture Maneuvering of Large Space Debris," IEEE Aerospace Conference, AERO 2016, Montana, US, March 5-12, 2016.

200. B. Thomsen, M. Zhang and I. Sharf, "Bio-inspired Time-to-contact Control for Autonomous Quadrotor Vehicles," AIAA Guidance, Navigation, and Control Conference, AIAA Science and Technology Forum and Exposition 2016, San Diego, CA, January 4-8, 2016.

Conference papers:

201. Sagnières, L. B. M. and I. Sharf. Stochastic Modeling of Hypervelocity Impacts on Attitude Propagation of Space Debris, 24th AAS/AIAA Space Flight Mechanics Meeting, AAS 16-462, Napa, CA, USA, February 2016.
202. E.M. Botta, I. Sharf, and A.K. Misra. Evaluation of Net Capture of Space Debris in Multiple Mission Scenarios. 26th AAS/AIAA Space Flight Mechanics Meeting. AAS 16-254, Napa, CA. February 2016.

Conference Abstracts:

203. E.M. Botta, I. Sharf, and A.K. Misra. "Modeling and simulation of the deployment and capture phases of a net-based Active Debris Removal mission," abstract presented at 4th International Workshop on Space Debris Modelling and Remediation, Paris, France, June 2016.
204. E.M. Botta, I. Sharf, and A.K. Misra. "A simulation tool for the deployment and capture dynamics of nets for space debris removal," presented at CASI ASTRO 2016, Ottawa, May 2016.
205. Sagnières, L. B. M. and I. Sharf, "Stochastic modeling of hypervelocity impacts including momentum enhancement in attitude propagation of space debris," abstract presented at 67th International Astronautical Congress, Guadalajara, Mexico, September 2016.
206. Sagnières, L. B. M. and I. Sharf, "Stochastic Modeling of Hypervelocity Impacts in Attitude Propagation of Space Debris," abstract presented at 4th International Workshop on Space Debris Modelling and Remediation, Paris, France, June 2016.

All other publications, including those from research that you supervised

207. Gareth Dicker, ‘Quadrotor Reorientation Control for Collision Recovery’, M.Eng. thesis, Mechanical Engineering, McGill University, 2016.
208. Fiona Chui, ‘Quadrotor Collision Dynamics and Fuzzy Logic Characterization', M.Eng. thesis, Mechanical Engineering, McGill University, 2016.
209. Patrick Abouzakhm, ‘Rendezvous and Docking of Two Lighter-than-air Cubic Blimps', M.Eng. thesis, Mechanical Engineering, McGill University, 2016.

210. Adam Harmat, ‘Multi-camera Visual Tracking and Mapping for Small Drone Autonomy,' PhD dissertation, Mechanical Engineering, McGill University, 2016.

Contributions to industrially relevant research and development

Invited presentations

211. "Towards Greater Autonomy and Safety of UAVs: Recovering from Collisions," Invited presentation at MIT, Boston, November 15, 2016.
212. "Active Space Debris Removal and Space Debris Attitude Propagation," Invited presentation to McGill Space Institute on Space Activities at MIAE, May 16th, 2016.
213. "Playing with Drones: Blimps and the Quad Squad at McGill," Invited presentation at SERI Montreal, La mobilité, du véhicule à la molécule, May 2, 2016.

**Siddiqi, Kaleem**

Publications in refereed conference proceedings

214. “Differential Geometry boosts Convolutional Neural Networks for Object Detection.” Chu Wang and Kaleem Siddiqi. In CVPR Workshop on Differential Geometry in Computer Vision and Machine Learning, Las Vegas, Nevada, 2016.
215. “Cartan Frame Analysis of Hearts with Infarcts.” Damien Goblot, Mihaela Pop and Kaleem Siddiqi. In Statistical Atlases and Computational Modeling of the Heart (STACOM), Athens, Greece. October, 2016.
216. “Cartan Frames for Characterizing Fiber Geometry in Pig Hearts from Diffusion Tensor Imaging (DTI)”, Damien Goblot, Mihaela Pop and Kaleem Siddiqi, 2016 Imaging Network Ontario symposium in Toronto. Refereed abstract

Invited lectures or presentations

217. “Minimal Surfaces in the Heart.” Outreach talk at the Centre for Learning School, Bangalore, India (http://www.centreforlearning.org/), August 2016.
218. “On the Geometry of Fibrous Composites.” Invited talk at the Institute for Stem Cell Biology and Regenerative Medicine, National Centre for Biological Sciences, Bangalore, India, August 2016.
219. “Minimal Surfaces in the Heart.” BIRC (Biomedical Imaging Research Center) Seminar Series, Western University, London, Ontario, March 2016.

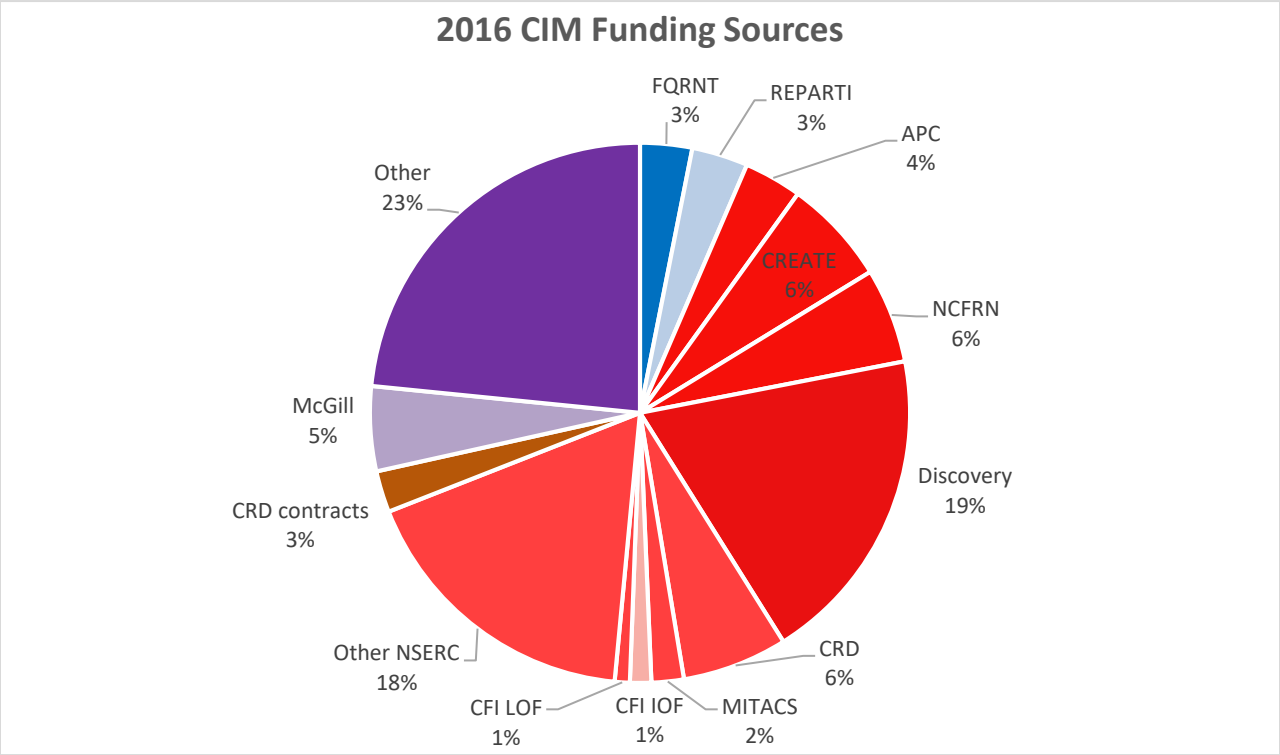
Conference presentations

220. “Differential Geometry boosts Convolutional Neural Networks for Object Detection.” Poster presentation by Chu Wang, my doctoral student, at the CVPR Workshop on Differential Geometry in Computer Vision and Machine Learning, Las Vegas, Nevada, 2016. I was a coauthor on the publication.

221. “Cartan Frame Analysis of Hearts with Infarcts.” Poster presentation by my colleague Mihaela Pop at the Statistical Atlases and Computational Modeling of the Heart (STACOM) Workshop, Athens, Greece. October, 2016. I was a co-author on the publication.

222. “Cartan Frames for Characterizing Fiber Geometry in Pig Hearts from Diffusion Tensor Imaging (DTI)”. Poster presentation by my Masters student Damien Goblot at the 2016 Imaging Network Ontario symposium in Toronto. I was a co-author on the associated refereed abstract.

# Section VIII – Financial Section




| Collaborative Programs | Start | Finish | Grant Total | 2016 Grant Installment |
|---|---|---|---|---|
| APC | February 2013 | August 2017 | $ 4,360,000.00 | $ 164,521.78 |
| REPARTI | April 2006 | March 2019 | $ 2,600,000.00 | $ 160,000.00 |
| CREATE | April 2012 | March 2018 | $ 1,650,000.00 | $ 300,000.00 |
| NCFRN | June 20 2012 | June 29 2018 | $ 5,000,000.00 | $ 270,000.00 |
| Collaborative Programs Total | | | **$ 15,350,000.00** | **$ 894,521.78** |
| **NSERC** | | | | |
| Discovery | | | $ 3,722,000.00 | $ 910,000.00 |
| CRD | | | $ 674,124.00 | $ 299,562.00 |
| MITACS | | | $ 127,834.00 | $ 91,834.00 |
| CFI IOF | | | $ 60,481.00 | $ 60,481.00 |
| CFI LOF | | | $ 390,000.00 | $ 42,900.00 |
| NSERC Other | | | $ 1,096,600.00 | $ 833,350.00 |
| NSERC Total | | | **$ 6,071,039.00** | **$ 2,238,127.00** |
| **FRQNT** | | | **$ 462,547.10** | **$ 147,985.67** |
| CRD contracts | | | **$ 313,250.00** | **$ 117,937.50** |
| McGill | | | **$ 472,572.00** | **$ 240,932.00** |
| All Other | | | **$ 2,397,197.85** | **$ 942,416.45** |
| | | **Grand Total** | **$ 24,594,033.95** | **$ 4,340,988.39** |

[The financial report is available as a separate document]