

**Desautels Faculty of Management – McGill University
Decision Neuroscience (MRKT 709)**

**Translational Brain-to-Society Decision and Behavior Research:
Individual Choice, Real-Time Learning and Long-Term Dynamics
Fall 2018**

Draft Syllabus for Invitation to Session-Specific Instructors

Course ID and Title: MRKT 709 (PhD)
Topics: Decision Neuroscience

Prerequisites: Instructor Permission
Semester and day/time: Autumn 2018, Wednesdays 8:30 to 11:30
Location: Room 575, Desautels Faculty of Management, 1001 Sherbooke West

Instructor: **Laurette Dubé**
James McGill Chair Consumer and Lifestyle Psychology and Marketing
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Collaborators: **Shawn Brown, PhD**
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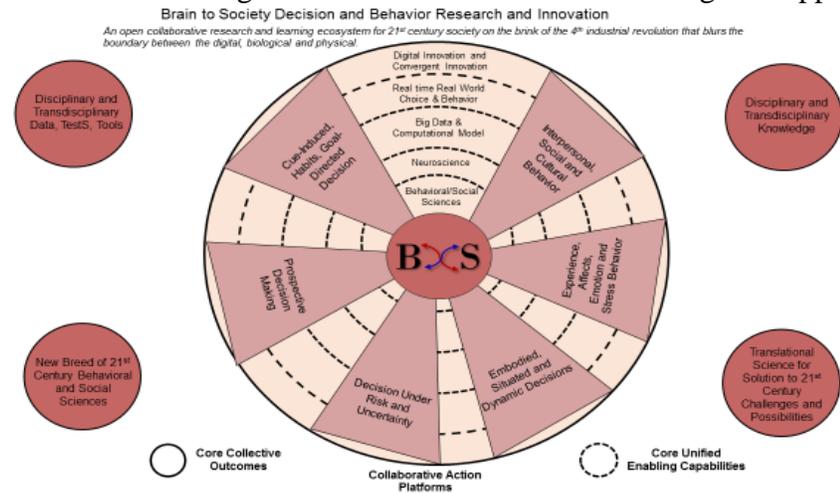
Introduction

Since pioneer work by Tversky and Kahneman in the late 1970s, behavioral economics, and now decision neuroscience, are providing a strong foundation for the scientific study of human decision making and behavior that accounts for the whole diversity of rational and less-rational motives and processes impacting choice. While behavioral economics is evidencing a rich diversity of cognitive and affective heuristics and biases in decision under risk and uncertainty that violates rationality in both personal and professional judgments, decision neuroscience is combining cognitive neuroscience (in humans) with related fields of systems and behavioral neuroscience (in animal models) to define the neurobiological basis of decision making in both deterministic and probabilistic contexts. Important insights have already been provided on differentiated functions of the human frontal lobes, the crucial role of dopamine in reward learning, and the interactions between goal-directed behavior, habitual responses, impulsive drives, and, more generally, the complex and dynamic biological, social, and cultural processes that altogether define how the brain make decision.

Decision neuroscience, as taught in this seminar offered by the marketing division of the Montreal joint doctoral management program, covers the above topics, while pushing the boundaries of what behavioral and brain sciences can contribute, when combined with social sciences in reciprocal and meaningful way, to inform and accelerate, in real time and in real world contexts, pragmatic solutions for individual and society in their decision and behavior. The Brain-to-Society decision and behavioral research, in development for more than a decade, aims to jointly harness the exponential growth in our understanding of the workings of the human brain and society to assist individual and society in making choice and behavior that goes beyond what has been possible thus far in achieving their full possibilities and confronting complex challenges still confronting a 21st century world on the brinks of its fourth industrial revolution that blurs the boundary between the biological, physical and digital spheres.

Brain-to-Society Decision and Behavior Research Framework

Part of the biological sciences are effectively becoming social sciences as genomic, proteomics, metabolomics, and brain imaging produces a large number of individual-level variables and researchers in these fields are on the hunt for measures of behavioral phenotypes. This happens while social sciences research and designers of real-world products, services, and programs supporting individuals in their decision making and behaviors are exploring neural and physiological signatures of differentiated facets of real-time experience for better impact and more precise targeting. Moreover, both science and action around the world now occur in extremely diverse contexts characterized by unprecedented speed and connectivity, accelerating the emergence of individual and societal patterns that may have different adaptive quality and would benefit from the more solid integrative scientific inquiry. The toughest challenges and the highest possibilities facing humanity in such as context require new ways of thinking about both science and action. They also call for different kinds of thinkers engaged in both society---exceptional individuals working together to gain insights that might otherwise remain undiscovered and translated into action. The Brain to Society (BtS) Decision and Behavior Research framework is designed to train and contribute knowledge to support this new breed of experts.



Seminar overview, audience, and objectives

The BtS decision and behavior research seminar builds upon behavioral economics and decision neuroscience research while establishing reciprocal relationships with, on the one hand the psychology,

management and other social sciences and on the other hand complexity and computational sciences, in an integrative translational paradigm anchored into the specific individual and societal-scale solutions these disciplines altogether can provide. With a special emphasis on understanding the full cascade of responses that shape decision and behavior in real time in similarly complex, diverse and dynamic environment, BtS decision and behavior research is built upon collaborative synergies across disciplines and between science and action. Structured around the BtS's six types of decision and behavior, the program integrates more deeply and comprehensively contributions from both behavioral/social and for novel solutions while bridging these through powerful AI/ big data/complexity sciences for individuals to thrive in all dimensions of a long, healthy and successful life.

This seminar is designed for graduate and post-graduate students in consumer behavior, marketing, information systems, finances, strategy, and other management disciplines where understanding human decision and behavior is a key component to achieve performance at professional, organization or institutional level. The seminar is also designed for neuroscience students interested to enrich their disciplinary training by articulating reciprocal pathways with behavioral and social sciences, moving toward the co-creation of a full translational BtS science to inform real world decision-making in a diversity of contexts. The course could also be of high interest for students in psychology, health, political sciences, and economics who are attempting to understand the neural basis of decision-making and behaviors, and the insights these provide for their respective domains of research and practice. This course, the first of twin program in development, focuses on individual decision making and behavior, real-time learning and long term support innovation to this individual, be it in personal or professional contexts. The companion seminar will expand insights to decision making, design, and practices at organizational, institutional, system levels and policy. The objectives are:

- Acquire an integrative disciplinary and interdisciplinary translational framework that maps key decisional and behavioral constructs at the interfaces between neuroscience and social sciences and guide future conceptual, methodological and analytical developments.
- Discover a portfolio of integrative characterization tools, statistical, and computational models of underlying mechanisms for decision-making and behavior in diverse and dynamic conditions observed in experimental and naturalistic real-world physical and virtual contexts.
- Learn who to translate science into actionable insights for design, production and evaluation of serious gaming and other digital and convergent innovation that fosters learning, decision and behavior to enhance individual and collective performance and well-being.
- Form the next generation of social scientists through cutting edge disciplinary research and training enriched with neuroscience and data/computer sciences, while providing solution-oriented integrative mindsets, methods, and tests beds for more impact and more precise targeting,

Course Format:

The seminar is organized around the six types of decision making and behavior grouped in the BtS model, with two sessions devoted to each to cover the layers of behavioral/social sciences, neuroscience,

big data/computational models, real-time/real-world choice and behavior, and the application of preceding to digital and convergent innovation as appropriate.

Each session will consist, for two-third of its time, in a live translational exercise where leading disciplinary scientists are brought together for reviewing key feature their work that altogether can advance science. The last third is devoted for students of brain and behavioral/management sciences featuring a paper from their discipline with the double objective of critically reviewing the paper from state-of-the-art disciplinary and transdisciplinary standard, while briefing each other on key concepts and methods of their respective discipline. Thoughtful personal preparation and class dialogue are twin core elements to both sharpen students' critical disciplinary thinking and articulate vision and pathways for how their respective work can be brought together in accelerating science- based solutions to complex challenges and possibilities facing individual and society. Optional webinars for more in-depth coverage of specific methods and models in management, neuroscience, computer science will be offered throughout the semester.

The class will meet once per week for approximately 3 hours per session/class for a total of 13 sessions. Each session will revolve around a separate topic (**see schedule below**).

Course Requirements and Grades

Students are responsible for all announcements or schedule changes made in class, whether or not they are in attendance.

Required Texts: There are no required texts. However, a list of articles and reading assignments will be provided.

Examinations and Grading: The final grade in the course will be based on the following weights:

Weekly translational short essays (5 over semester)	15%
Class review and discussion of disciplinary paper (3 over semester)	25%
Participation in class discussion	20%
Term project (presentation last week of class)	<u>40%</u>
Final Grade	100%

Translational short essays: There will be a translational short essay assignment (600 word limit) every week except for session 1, 2, and 13. For this essay, you choose one of the papers featured by experts in the BtS translational research discussion. You first review and comment on the disciplinary contribution of the paper and then address whether and how its scientific and societal contribution to the session's targeted decision making/behavior could be improved through disciplinary and/or interdisciplinary translational research (with yours or other disciplines). You can submit these essays weekly and the best five will be taken or you can submit only 5. The grade will reflect the depth of thinking, insights originality and analysis/writing clarity. These essays are due at 5pm the day before class sessions.

Class review and disciplinary paper: Students choose one paper from the separate list of disciplinary papers provided for each session. In a 20 min presentation, the paper is reviewed, commented upon and positioned within the disciplinary research on its key concepts. Presentation is to clear, concise, organized, and reflects an understanding of the potential disciplinary interfaces that can lead to novel BtS translational research. The grade will also reflect the extent to which you are able to engage the

class in a deep and useful discussion and answer questions posed by other students or faculty members in a thoughtful and responsive manner. Session and paper are to be selected by session 2.

Participation in class discussion: You will be evaluated based on our overall assessment of the amount and quality of the individual's comments. High quality contributions will reflect both a depth and breadth of knowledge gained from the assigned readings, will be clearly stated and effectively communicated, and will be insightful and relevant to the issues under discussion. Although the quantity of comments is important, students should refrain from monopolizing discussions and should aim to be succinct.

Translational term paper: The term paper can be individual or in small groups of 2-3 persons. It can take one of three forms:

- Theoretical development and/or analytical work on translational research live cases discussed in class that address BtS mechanisms and/or real time/long term process and outcome;
- Comprehensive disciplinary literature review that identifies important research gap(s) of scientific and societal significance in providing science-based solution to normative choice in one of the targeted decision making/behavior type that could benefit from a BtS translational research approach. Formulates research question, specify complementary disciplinary to be brought together and sketch research strategy;
- Research protocol developed to address specific research question(s) of scientific and societal significance.

Once the paper topic has been chosen, please confirm it by sending a brief e-mail outlining your topic to support instructor no **later than Tuesday October 10. Individual appointments will be given in the following week early feedback.** Do not hesitate to consult with us throughout the process.

About course material: All the articles will be available at Slack, which is a software that you can download or use in your browser (<https://slack.com/signin>). A team called mrkt709 has been created and will invite you to join the team. You will receive an email with the invitation. Please click in 'Join mrkt709' and set your password. As soon as you accept the invitation and create your password you will be able to see our team page, share files and also send messages to one person in particular (in DIRECT MESSAGES) or to the whole group (in CHANNELS #general). Our Slack domain is: mrkt709.slack.com (this is request for sign in). In our team page, all the articles' files will be named according to the session (e.g. S1, S2...) and the "author_publication date". You will be able to find the articles by clicking in the button (...) located at the top right of the page and, after, in the link "All files". If you have any question, please contact Dr Andre Portella (andre.portella@mcgill.ca).

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester.

Statement on Academic Integrity

McGill seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles.

Hybrid, Local Online, or Distance Learning Courses: Not applicable

Tentative Course Schedule (updated Fall 2018)

***Confirmed ** Invited**

		Instructor (s)
Session 1. September 5 th	Introduction	L. Dube (also in all sessions with specialized co-instructors)
Session 2. September 12 th	Decision making under risk and uncertainty 1-Value Based decision making and reinforcement/machine learning models of strategic and everyday choice	Lesley Fellows* Nathan Yang*
Session 3. September 26 ^h	Decision making under risk and uncertainty 2-Prospect theory, frames and associated belief systems extraction/Computational model of value-based decision making	Madeleine Sharp* Lindsay Duncan* Michel Desmarais**
Session 4. September 19 th	Cue-induced and goal-directed decision making/Habits 1; Computational models of effortful goal-directed choice and deep learning decision support model for purchase portfolio recommendation	Ross Otto* Jian Yun Nie*
Session 5. October 3 th	Cue-induced and goal-directed decision making 2/ goal-monitoring digital support; neurobiology of cue- induce and goal-directed decision making and real world statistical and computational models of food choice in real world physical and digital context	Alain Dagher* Yu Ma* Warut Kher-am-Nuai*
Session 6. October 17 th	Embodied, situated and dynamic decision making 1-Neurobiology and computational models of integrated sensory processing, attentional and motivational salience, and linkages to decision theory, choice and behavior in real-world digital and physical contexts	Frederick Kingdom* Sylvain Senecal* James Clark*
Session 7. October 10 th	Embodied, situated and dynamic decision making 2- Neurobiology	Paul Csizek* Bratislav Mistic*

	and neuropsychology of affordance and complex, dynamic decision making context	Y.F.Zhao*
Session 8. October 24th	Experience, Engagement, Affects, Emotions and Stress Behavior 1- Real time engagement in digital contexts and link to short term and long term outcomes	Patrick Charland* Heungsun Hwang* Laurent Charlin**
Session 9. October 31 st	Experience, Engagement, Affects, Emotions and Stress Behavior 2- Computer-assisted learning and research on stress and emotions	Jorge Armony* Yu Ma* (computer games-emotion/experience) Jian Yun Nie* (deep learning emotional script*)
Session 10. November 7th	Interpersonal, Social and Cultural processes and behaviors 2- neurobiology of attachment, self-other relation, and social engagement; real time experience, dynamics, outcomes and computational models of physical and digital social exchanges.	Jennifer Bartz* Tiago Falk* Jian Yun Nie* (deep learning adaptive interpersonal response*)
Session 11. November 14 th	Interpersonal, Social and Cultural processes and behaviors 1-social brain, social norms, small-and large-scale social network structure and dynamics; strategic and computational modeling of knowledge and innovation diffusion in social networks.	Nathan Spreng* Tom Shultz*
Session 12. November 21 th	Prospective Decision Making 1- Lifespan neurobiology of default network, spontaneous thoughts and future-oriented prediction; support to decision and action in physical and digital contexts;	Nathan Spreng* Eric Delage** Tal Arbel**
Session 13. November 28 th	Prospective Decision Making 2- Autobiological memory and Theory of Mind processes in self-image and strategy social decision making and training / Deep reinforcement learning model of strategic choice	Amelie Achim ** Mark Baldwin** Doina Precup**
Session 14. December 5 th	Term Projects Presentation	

Instructors Team

Lead Instructor

Laurette Dube, Professor, Marketing; James McGill Chair of Consumer and Lifestyle Psychology and Marketing; Chair and Scientific Director, McGill Centre for the Convergence for Health and Economics

Dr. Dubé is a Full Professor and holds the James McGill Chair of consumer and lifestyle psychology and marketing at the Desautels Faculty of Management of McGill University, Canada. Her research interest bears on the study of affects and behavioural economic processes underlying consumption and lifestyle behaviour and how such knowledge can inspire more effective health and marketing communications in both real-life and technology-supported media. She is the Founding Chair and Scientific Director of the McGill Centre for the Convergence of Health and Economics. The MCCHE was created to foster partnerships among scientists and decision-makers from all sectors of society to encourage a more ambitious notion of what can be done for more effective health management and novel pathways for social and business innovation. Beyond books and scientific publications in the leading scientific journals of her field, including *Journal of Consumer Research*, *Journal of Marketing Research*, *Journal of Marketing*, *Management Information System Quarterly* and *Journal of Personality and Social Psychology*, her transdisciplinary work has been presented in the Proceedings of the National Academy of Sciences and the Annals of the New York Academy of Sciences. Her work has been covered in general audience and business publications such as *Maclean's*, *The Globe and Mail*, *USA Today*, *The Wall Street Journal*, *The Atlantic*, and *The Economist*. Dr. Dubé received the YMCA Women of Distinction Award for the social sciences in 2011 and the Queen Elizabeth II Diamond Jubilee Medal in 2013. She is a Fellow of the Royal Society of Canada.

Instruction Support

Shawn Brown, Shawn T. Brown received his PhD. in Chemistry from the University of Georgia in 2001 and is an expert in scientific simulation and modeling. He leads a team of developers, scientists and modelers in research spanning agent-based modeling of public health systems, obesity prevention, and mitigating infectious disease spread; supply chain modeling for immunization, agri-food, and other public health commodities in low and middle income countries; and development of computational infrastructure for public health decision support. He also leads the software development of several computational models and platforms and manages the software development of the VPOP agent-based modeling tool to address obesity at the Global Obesity Prevention Center.

Andre Krumel Portella, MD PhD. Andre is a research associate at McGill Center for the Convergence of Health and Economics, studying the links between individual neurobiology, metabolism and nutrition over the life course. Andre has a MSc in Neurosciences and a Phd in Pediatrics from Universidade Federal do Rio Grande do Sul, RS Brazil. Before joining MCCHE, he was an Assistant Professor of Pediatrics at Universidade Federal de Ciencias da Saude de Porto Alegre, RS, Brazil where he was in charge of the social pediatrics program.

Specialized instructors

Yu Ma, Associate professor of Marketing, McGill University

Dr. Yu Ma is Associate Professor of Marketing and Bensadoun Faculty Scholar at McGill University. He obtained his PhD in management from Olin School of Business, Washington University in St. Louis. Before joining McGill, he was Associate Professor at University of Alberta. His research interest includes food marketing, retailing and big data analytics. Using consumer purchase data and advanced econometric and statistical models, he studies how consumers react to various marketing incentives. He also examines broader marketing issues such as the influence of macro environment on the retail sector and the impact of food marketing on population health. He has published in top management journals such as Journal of Marketing, Journal of Marketing Research, Journal of Consumer Research, Management Science, and Journal of Retailing.

Lesley Fellows, Associate professor, McGill University, Department of Neurology & Neurosurgery

Dr. Fellows trained in Physiology at McGill and then completed her doctoral work in neurophysiology at the University of Oxford as a Rhodes Scholar. She returned to McGill to train in medicine and neurology, followed by a postdoctoral fellowship in cognitive neuroscience at the University of Pennsylvania. She is an Associate Professor in the Department of Neurology and Neurosurgery at McGill, and attending staff neurologist at the Montreal Neurological Hospital. Her clinical practice focuses on disorders of cognition and behavior. Her research applies neuropsychological methods to understand the neural substrates of decision-making, with a particular focus on the human frontal lobes.

Doina Precup, Associate Professor, McGill University, School of Computer Science, Reasoning and Learning Lab

Doina Precup received her B.Sc. from the Computer Science Department, Technical University Cluj-Napoca, Romania, in 1994, and the M.S. and PhD from the Department of Computer Science, University of Massachusetts, Amherst, in 1997 and 2000 respectively. In July 2000 she joined the School of Computer Science at McGill University, as a tenure-track assistant professor. Doina Precup's research interests lie mainly in the field of machine learning. She is especially interested in the learning problems that face a decision-maker interacting with a complex, uncertain environment. Doina uses the framework of reinforcement learning to tackle such problems. Her current research is focused on developing better knowledge representation methods for reinforcement learning agents. Doina Precup is also more broadly interested in reasoning under uncertainty, and in the applications of machine learning techniques to real-world problems.

Lindsay Duncan, Assistant professor, McGill University, Department of Kinesiology & Physical Education

Dr. Duncan's research is focused on investigating strategies to support the initiation and maintenance of physical activity and health behaviour change; particularly among those who face disproportionate risks from unhealthy behaviours (e.g., cancer survivors), or those who face disproportionate challenges to engaging in health behaviour (e.g., medically-underserved populations or the elderly). Dr. Duncan's research focuses primarily on the promotion of exercise and physical activity; however,

she has a keen interest in a wide variety of health behaviours including but not limited to: healthy eating, smoking cessation, prevention of alcohol, tobacco, and drug use. Currently, Dr. Duncan is working on developing interventions to motivate and support physical activity participation women who are undergoing treatment for cancer. She also is collaborating on a series of projects in the evolving area of “serious games” (i.e., videogames intended for use in education or health) with the goal of developing innovative evidence-based educational materials and targeted videogame interventions for risk reduction and prevention in youth and young adults. Dr. Duncan believes strongly in taking a theory-based approach to health-behaviour research as well as partnering with community-based organizations to develop practically-relevant and sustainable interventions.

Madeleine Sharp, Assistant professor, Montreal Neurological Institute and Hospital, Department of Neurology and Neurosurgery

Her research focuses on understanding the cognitive mechanisms underlying cognitive symptoms in patients with disorders of the basal ganglia, in particular, Parkinson’s and Huntington’s disease. Cognitive dysfunction in these patients is broadly defined as a deficit of executive function, and ascribed to involvement of the frontostriatal network. This is a remarkably vague clinico-pathological correlation considering how much work has been done in recent decades to understand the specific cognitive functions of the relevant brain regions and their networks. Madeleine Sharp will leverage these advances to define with greater specificity the cognitive changes of Parkinson’s and Huntington’s disease. Some current questions include: does reduced plasticity in basal ganglia networks cause cognitive impairment through reduced consolidation of learning? Does reduced dopamine prevent the necessary prioritization of information for entry into working memory and long-term memory? Does this influence what patients learn and remember? How is this reflected in patients’ daily experiences and in their representations of the past and the future? Ultimately, the goal is to develop more precise models of cognitive dysfunction, grounded in neurobiology, in order to develop and to reliably test novel behavioral and pharmacologic therapies.

Jian Yun Nie, Full Professor, University of Montreal, Department of Computer Science and Operations Research

Jian Yun Nie is a professor in University of Montreal, which he joined as assistant professor in 1991. He holds a PhD in computer science from University Joseph Fourier of Grenoble under the supervision of Yves Chiaramella. His research focuses on information retrieval and on Web search engines. The goal is the improvement of the state of the art and the current practices in this field, through the development of novel information retrieval models, and by exploiting new data sources. These sources, such as user logs, Wikipedia entries and thesauri are put to use to expand, rewrite and otherwise reorganize user queries. My research interests also lie in taking into account the user’s various intentions in different application contexts. To achieve this, we develop statistical methods to address the specific needs of information retrieval. My research also include multilingual aspects, i.e. successfully finding relevant documents in a language different from that of the query. The methods developed can be applied in various domains: medical information retrieval, e-commerce, opinion analysis on the Web, etc.

Mark Baldwin, Professor, McGill University, Department of Psychology, Social Cognition and Social Intelligence Lab

Prof. Baldwin's main area of research is social cognition, with a focus on the representation and activation of information about significant relationships. His studies often involve questions about relationship security and insecurity, and how they relate to self-esteem and attachment processes. Recent projects have focused on the idea that specially designed computer games might help players develop positive habits of thinking, to boost self-confidence and reduce stress.

Heungsun Hwang, Associate Professor, McGill University, Department of Psychology

Prof. Hwang is interested in the development and applications of quantitative methods and advanced modeling methodologies to diverse issues and topics in psychology and various fields. His current interests include (1) a component-based approach to structural equation modeling; (2) capturing cluster-level respondent heterogeneity inherent to data; and (3) the analysis of repeated measures data.

Nathan Yang, Assistant professor, McGill University, Faculty of Marketing

Nathan Yang is an Assistant Professor in Marketing at McGill Desautels Faculty of Management. He is also a Research Fellow at the Centre interuniversitaire de recherche en économie quantitative (CIREQ), Researcher at the Center for Interuniversity Research and Analysis of Organizations (CIRANO), Academic Member at the McGill Centre for the Convergence of Health and Economics (MCCHE), Faculty Associate at the Canadian Centre for Health Economics (CCHE), and Associate Member at the Group for Research in Decision Analysis (GERAD). Nathan received his Ph.D and M.A. in Economics from the University of Toronto, where his doctoral studies were funded by the Social Sciences and Humanities Research Council of Canada (SSHRC), as well as the NET Institute summer research grant. Prior to his graduate studies, he received a B.Sc. in Mathematics from the University of Alberta. His main research interests are in **quantitative marketing** and **empirical industrial organization**.

Alain Dagher, Associate Professor, McGill University, Dagher Lab

Dr. Alain Dagher is a neurologist specializing in movement disorders and functional brain imaging. His research aims at understanding the function of the basal ganglia, with a particular emphasis on appetitive behaviours. This involves studying how we learn about rewards and punishments, and become motivated to engage in reward-seeking behaviour. The two main techniques used are positron emission tomography (PET) targeting the dopamine system, and functional magnetic resonance imaging (fMRI). The research focusses on Parkinson's Disease, stress, drug addiction (notably cigarette smoking), pathological gambling, and obesity. Dr. Dagher is funded by CIHR, FRSQ, NIDA, the Parkinson Society of Canada, the Institute for Research on Pathological Gambling and Related Disorders, and Unilever PLC.

Frederick Kingdom, Professor, McGill University, Department of Ophthalmology

Frederick Kingdom is interested in the relationship between the initial stages of vision that detect local features such as edges, bars and surface markings, and intermediate stages that link up those features to form contours, textures and surfaces. A full understanding of this process involves research in a number of domains, including spatial vision, colour vision, stereopsis, texture perception, brightness & lightness

perception and transparency. He primarily uses psychophysical methods, but also image processing and fMRI.

Paul Csizek, PhD, University of Montréal, Department of Neuroscience

Paul Csizek is interested in how the brain controls behavior. Many scientists approach this very large question by starting with perception and asking how the brain builds an internal representation of the world, and how it then uses this representation to guide action. In contrast, I study behavior by starting with a concrete task such as a voluntary movement and asking what parameters of the task the brain must specify and control, and what information from the environment it may employ toward that specification. The goal here is an understanding of brain mechanisms for mediating *interaction with the world*, not necessarily of mechanisms for representing the world. A research program based on such an approach begins with questions concerning motor control and gradually works its way toward the perceptual systems which guide that control. One could say I'm going backwards through the brain...

Tiago H. Falk, Lab Director of Musaelab

Tiago H. Falk is an Assistant Professor at INRS-EMT (Institut National de la Recherche Scientifique - Energie, Matériaux, et Télécommunications) where he directs the Multimedia/Multimodal Signal Analysis and Enhancement (MuSAE) Laboratory. Dr. Falk received the BSc degree from the Federal University of Pernambuco, Brazil, in 2002, and the MSc and PhD degrees from Queen's University, Canada, in 2005 and 2008, respectively, all in electrical engineering. In 2007, he was a visiting Research Fellow at the Sound and Image Processing Lab, Royal Institute of Technology (KTH), Sweden, and in 2008 at the Quality and Usability Lab, Deutsche Telekom/TU Berlin, Germany. From 2009-2010 he was a Postdoctoral Fellow at Holland-Bloorview Kids Rehabilitation Hospital, affiliated with the University of Toronto. Dr. Falk is also an Adjunct Professor at the ECE Department, McGill University. His research interests are at the cross-roads of multimedia and biomedical signal processing. More specifically, they involve human perceptual and cognitive modeling for next-generation multimedia communications, health diagnostics, and defense applications; neurotechnologies; sensor fusion; and human-machine interfaces. He has published over 70 journal manuscripts, conference papers, and book chapters in these topics and received numerous awards for his contributions.

Sylvain Senecal, Professor, HEC Montreal, Faculty of Marketing

Sylvain Senecal is Professor of Marketing, RBC Financial Group E-commerce Chair, and Tech3Lab Co-director at HEC Montreal. Prior to joining HEC Montreal in 2004, he was Assistant Professor of Marketing and Electronic Commerce at the University of Toledo (Ohio, USA.). He has taught several marketing and ecommerce courses in Austria, Canada, France, South Korea, and the United States. His research interests are related to consumer marketing on the Internet (decision-making, social influence, personalization, web site evaluation, clickstream analysis) and consumer neuroscience. His work has been presented at several international conferences (e.g., Australia, Canada, Finland, United States) and published in marketing and ecommerce scientific journals such as the Journal of Retailing and the International Journal of Electronic Commerce. He holds a M.Sc. and a Ph.D. in marketing from HEC Montreal. Prior to his academic career he held marketing positions at Arcelor Mittal. He has worked or currently works with various Canadian and international companies. He is also President of

imarklab, an interactive marketing intelligence consulting firm. Specialties: E-commerce, online retailing, consumer behavior

Patrick Charland, Professor, UQAM, Didactic Department

Dr. Patrick Charland is an Associate Professor from the Didactic Department at the Université du Québec à Montréal. His research interest are primarily focused on teaching practices in science and technology and on epistemological issues/practices linked to the integration of school subjects with a focus on scientific disciplines, technology and education on environment. His area of interest also includes neurophysiology (behavioral, cognitive and emotional) linked to the problem solving issue and/or the learning of sciences in an authentic context. Professor Charland is also involved in the field of international education and the curriculum development.

Nathan Spreng, Assistant Professor, Cornell University, Department of Human Development

Nathan Spreng is an assistant professor and the director of the Laboratory of Brain and Cognition in the Department of Human Development at Cornell University. His research examines large-scale brain network dynamics and their role in cognition. Currently, he is investigating the link between autobiography and imagination, how we conceive of the future, and successful navigation of the social world. These investigations extend to the related processes of memory, cognitive control, and social cognition and the interacting brain networks that support them. He is also actively involved in the development and implementation of multivariate and network-based statistical approaches to assess brain activity. In doing so, he hopes to better understand the properties of the brain networks underlying complex cognitive processes as they change across the lifespan.

Amelie Achim, Assistant Professor, University of Laval, Department of Psychiatry and Neuroscience

Amelie Achim's research interests include higher level cognitive functions, particularly social cognition and associative memory. Social cognition can be defined as a group of processes that allow people to understand and interact with each other. Her research program's main target is to better understand the social cognition deficits observed in schizophrenia. To this end, her team is developing new tests or paradigms, optimizes and validates these measures by realizing studies with healthy participants, and finally uses these measures to better understand 1) which aspects of social cognition are affected in schizophrenia, 2) how these deficits are linked to social functioning of patients or to other characteristics of the disease (ex : clinical symptoms or comorbidities) or finally 3) which aspects of social cognition seem to represent genetic vulnerability factors of the disease. Social cognition deficits represent a major obstacle to occupational and social functioning of schizophrenia patients. A better comprehension of these deficits is indeed necessary to develop more adapted treatments and identify genetic vulnerability factors allowing to diagnose this disease earlier.

Michel C. Desmarais, Professor, Department of Computer and Software Engineering, Ecole polytechnique Montreal

Michel Desmarais is professor at the Computer and Software Engineering Department of Polytechnique Montreal since 2002. His fields of expertise are Artificial Intelligence, Human Computer Interfaces, and Cognitive modeling. After his Ph.D. in Psychology at the University of Montreal, he spent ten years at

the Montreal Computer Research Institute (CRIM) as scientific lead of a research team. He later held management and R&D positions in a private firm specialized in the development of Web applications. He is editor of the Journal of Educational Data Mining since 2013 and is highly involved in the Educational Data Mining and User Modeling communities.

Ross Otto, Assistant Professor, Department of Psychology, McGill University

Dr. Ross Otto is Assistant Professor in the department of psychology at McGill University. He obtained his PhD in psychology from University of Texas at Austin, where he was supervised by Dr. Bradley Love and Dr. Arthur Markman. Dr. Otto's research investigates why we sometimes rely on slow and effortful choices, while at other times we rely on fast and reflexive choice. For example, how does an individual's reliance upon reflective versus reflexive choice vary situationally based on factors like availability of cognitive resources, stress, time pressure, or perceived costs and benefits? Why might individuals differ, dispositionally, in their reliance upon reflective versus reflexive choices? To answer these questions, he uses a combination of computational, behavioral, and psychophysiological, and neuroimaging techniques.

Warut Khern-am-nuai, Assistant Professor, Information Systems, McGill University

Warut is an assistant professor of Information Systems at the Desautels Faculty, McGill University. The areas of his expertise are platform for online marketplaces, management of information security, and predictive analytics. Warut has a M.Sc. in Economics and a Ph.D. in Management Information Systems with Minor in Computer Science from Purdue University. Before joining McGill University he was a Research and Teaching Assistant at the Purdue University.

Bratislav Mistic, Assistant Professor of Neurology & Neurosurgery, McGill University

Bratislav trained in neuroscience and mathematics at the University of Toronto. He completed his PhD with Randy McIntosh (2014, University of Toronto) and his postdoctoral work with Olaf Sporns (2016, Indiana University). Bratislav investigates how global dynamics, cognitive operations and complex behaviour emerge from the connections and interactions among distributed brain areas, with an emphasis on the integrative properties of brain networks. His work lies at the intersection of network science, dynamical systems and multivariate statistics, with a focus on complex data sets involving multiple neuroimaging modalities, including MRI and MEG. At the BIC, Bratislav will continue to build a translational approach for studying network structure and function in clinical populations. Dr. Bratislav Mistic leads the Network Neuroscience Lab. We investigate how cognitive operations and complex behaviour emerge from the connections and interactions among brain areas. The goal of this research is to quantify the effects of disease on brain structure and function. Our research program emphasizes representations and models that not only embody the topological organization of the brain, but also capture the complex multi-scale relationships that link brain network topology to dynamic biological processes, such as neural signaling and disease spread. Our research lies at the intersection of network science, dynamical systems and multivariate statistics, with a focus on complex data sets involving multiple neuroimaging modalities, including fMRI, DWI, MEG/EEG and PET.

Joëlle Pineau, Associate Professor, School of Computer Science, McGill University

Joëlle Pineau received her PhD. in Robotics from the Carnegie Mellon University and is an expert in biological modeling. Prof. Pineau is the Co-director of the Reasoning and Learning Lab in the School of Computer Science. Prof. Pineau's research focuses on developing new models and algorithms that allow computers to learn to make good decisions in complex real-world domains, even in circumstances where

there is incomplete or incorrect information. She also works on applying these algorithms to complex problems in robotics and health care. Prof. Pineau is a Senior Fellow of the Canadian Institute for Advanced Research and a member of the Center for Intelligent Machines at McGill.

Yaoyao Fiona Zhao, Assistant Professor, Department of Mechanical Engineering, McGill University
 Dr. Yaoyao Fiona Zhao is Assistant Professor at the Department of Mechanical Engineering at McGill University. She obtained her PhD in mechanical engineering from the University of Auckland. Her interests are in the general area of design and manufacturing, including the exploration of new design methods, the use of advanced technologies, and the integration of better computer software and metrology tools to improve production. My research program is focused on two central and connected themes: 1) Sustainable Manufacturing; and 2) Additive Manufacturing. The first aims are to develop sustainability analysis methods and material databases, to establish information and process models and metrics, and to analyze end-of-life product reuse/recycling methods. The second aim is to explore and discover applications for new and emerging additive manufacturing technologies, within a sustainable manufacturing perspective. Rising concerns over escalating emissions, resource depletion, and other environmental issues have led to an increased emphasis on the design and manufacturing of environmentally benign products. Additive manufacturing with its unique capabilities has brought great potentials in product design, re-manufacturing, repair and direct manufacturing.

James J. Clark, Professor, Department of Electrical and Computer Engineering; Director of the McGill Centre for Intelligent Machines (CIM), McGill University

Dr. Clark attended the University of British Columbia, obtaining BAsC and PhD degrees in electrical engineering. He moved to Boston and became a faculty member in the Division of Applied Sciences at Harvard University, associated with the Harvard Robotics Lab. After spending 9 years at Harvard he left and joined Nissan Cambridge Basic Research. After spending two years with Nissan he returned to Canada, joining the Department of Electrical Engineering at McGill University in Montreal. His current research projects include Attention Modeling and Tracking, Generation and Analysis of Cinematic Imagery, Spectral Modeling and Colour Vision, Augmented Reality and Video Surveillance.

Laurent Charlin, Assistant Professor, Department of Decision Sciences, HEC Montreal

Dr. Charlin is an assistant professor in the department of decision sciences at HEC (and adjunct at the DIRO). He develops novel machine learning models, particularly probabilistic graphical models, to help in decision making. His recent work has focused on extending the capabilities of recommender systems. Dr. Charlin is generally interested in applying learning methods to analyze different data. He has co-developed the Toronto Paper Matching System (TPMS) which is a tool to assist conference organizers match their reviewers to submitted papers. The system is now online and has been used by large machine learning and computer vision conferences over the last few years. Dr. Charlin graduated with a PhD from the University of Toronto where he worked with Rich Zemel and Craig Boutilier. He also has a Master's from U. Waterloo where he was supervised by Pascal Poupart. Finally, he did his postdoctoral research at Princeton and Columbia under the supervision of David Blei and at McGill with Joelle Pineau.

Jorge Armony, Canada Research Chair in Affective Neuroscience, Assistant Professor, Department of Psychiatry, McGill University

Jorge Armony, PhD conducts research on how the brain detects stimuli in the environment that may signal threat or danger, and how this mechanism interacts with other processes, such as consciousness,

attention, and memory. In his quest for answers, Jorge Armony uses several state-of-the-art research techniques, including functional magnetic resonance imaging (fMRI), behavioral and physiological measures (i.e. skin conductance and heart rate), as well as computational modeling. Dr. Armony has made significant contributions toward the understanding of psychiatric disorders involving dysfunctions of the fear system. For example, Jorge Armony recently found behavioural and anatomical correlates for the modulation of spatial attention by emotion using a fear conditioning paradigm. These findings further characterized the role of the amygdala in fear processing, as well as defining selective roles for the frontal, parietal, and lateral orbitofrontal cortices in spatial attention.

Jennifer A. Bartz, Associate Professor in the Department of Psychology, McGill University

Dr. Bartz completed her Ph.D. in Experimental Psychology in 2004 with John Lydon at McGill University. She then went on to a Post-doctoral fellowship with Eric Hollander at the Seaver Autism Center in the Department of Psychiatry at the Mount Sinai School of Medicine in New York, NY. In 2007 she became an Assistant Professor in the Department of Psychiatry at Mount Sinai, and in 2011 she returned to McGill University, and is now an Associate Professor in the Department of Psychology. Dr. Bartz is interested in the factors—both individual difference and situational—that facilitate or hinder the prosocial, communal behaviors that are vital to developing and maintaining close relationships. Her research is grounded in empirical social psychology, but she draws upon methods from neuroscience and psychopharmacology to better understand the neurobiological mechanisms underlying prosocial behavior. Although primarily aimed at answering basic scientific questions, her research also is designed to inform our understanding of and treatment of psychiatric disorders involving prominent social impairments (e.g., autism spectrum disorders, and borderline personality disorder).

Thomas R. Shultz, Professor, Department of Psychology, McGill University

Thomas Shultz (PhD Yale, Psychology) is Professor of Psychology and Associate Member of the School of Computer Science at McGill University. He teaches courses in Computational Psychology and Cognitive Science. He is a Fellow of the Canadian Psychological Association, and a founder and current Director of the McGill Cognitive Science Program. Research interests include cognitive science, cognitive development, evolution and learning, relations between knowledge and learning, decision making, problem solving, neural networks, and agent-based modeling. He has over 390 research publications in these areas.

Erick Delage, Canada Research Chair in Decision Making under Uncertainty, Associate professor, Department of Decision Sciences, HEC Montréal

Dr. Delage is an associate professor at HEC Montréal in the department of Decision Sciences. He graduated in 2009 with a Ph.D. in Electrical Engineering from Stanford University. During his stay at Stanford, Dr. Delage had the opportunity to work with Prof. Andrew Y. Ng, Prof. Shie Mannor, and Prof. Yinyu Ye. His thesis presented new optimization models for taking into account parameter and distribution uncertainty in a range of decision problems where the knowledge of some parameters is limited to historical samples. Since he joined HEC Montréal, Dr. Delage has entertained a strong interest for quantitative methodologies that can help manage the risks related to market, environmental or physical uncertainty that is present in industrial and financial decision problems. Specifically, his research interests span the areas of optimization, decision analysis, artificial intelligence and applied statistics. He is especially fascinated about how concept of robust optimization can successfully reconcile the design of a decision model with the prevailing ambiguity about outcomes and about how these might be perceived by the decision maker. Applications that have caught his attention include, but

are not limited to, portfolio selection, e-commerce, resource allocation, network routing, inventory management and energy production problems.

Tal Arbel, Professor, Dept. of Electrical and Computer Engineering, McGill University; Member of the McGill Centre for Intelligent Machines; Research Director of the Probabilistic Vision Group, and Electrical & Computer Engineering "Medical Imaging Lab"

Tal Arbel received her M.Sc. and Ph.D. from the Department of Electrical and Computer Engineering, McGill University in 1995 and 2000 respectively. She joined McGill University as assistant professor (2001) and then as associate professor (2009). Dr. Arbel's research goals are to develop new probabilistic machine learning frameworks in computer vision and in medical imaging, particularly in the context of neurology and neurosurgery. Recent work has focused on the development of probabilistic graphical models for pathology (lesion, tumor) detection and segmentation in large, multi-center patient images dataset, on automatically identifying imaging biomarkers that predict disease progression in patients as well as potential responders to treatment. I have worked extensively on developing fast and efficient multi-modal image registration techniques for clinical interventions, such as image-guided neurosurgery. Recent research led to new frameworks to learn how cortical folding patterns on the surface of the brain vary over the population. Key topics of interest: Bayesian inference, statistical models, statistical pattern recognition, information theory, face detection and trait classification, medical image analysis, neurology and neurosurgery, including multi-modal image registration and lesion and tumor, detection, segmentation, classification and prediction.