

**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 Support Innovation**

Fall 2017

Draft Syllabus

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

Prerequisites: Instructor Permission

Semester and day/time: Autumn 2017, Wednesdays 8:30 to 11:30

Location: Room 575, Desautels Faculty of Management, 1001 Sherbooke West

Lead Instructor: Laurette Dubé
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Instruction Support : Andre K. Portella Neuroscience Srinivasan Jayaraman Computer Science

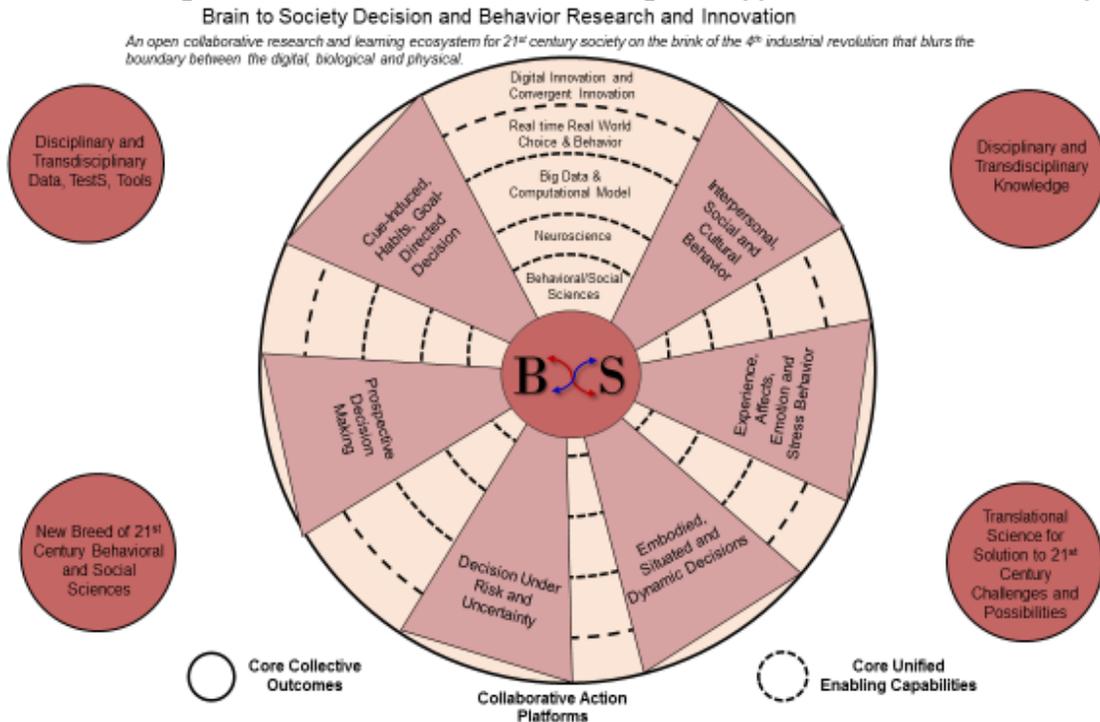
Introduction

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)	20%
Class review and discussion of disciplinary paper (2 over semester)	20%
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 Roberta (betinha_dm@yahoo.com).

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 (*confirmed; **tentative; ***Invited)

		Instructor (s)
Session 1. September 6 th	Introduction	L. Dube* (also in all sessions with specialized co-instructors)
Session 2. September 13 th	Decision making under risk and uncertainty 1-Value Based decision making, computational and consumer choice models	Yu Ma* Lesley Fellows* Doina Precup*
Session 3. September 20 th	Decision making under risk and uncertainty 2-Prospect theory, frames and associated belief systems extraction	Lindsay Duncan* Madeleine Sharp** Jackie Cheung* Jian Yun Nie*
Session 4. September 27	Cue-induced and goal-directed decision making/Habits 1; neurobiology and neurobehavioral adaption to reward learning- behavioral support serious gaming; reinforcement learning models	Mark Balwin*** Stephanie Bolton*** Jia Yuan Yu*
Session 5. October 4 th	Cue-induced and goal-directed decision making 2/ goal-monitoring digital support; neurobiology and neuroinformatics of goal-directed decision making; experimental and real world evidence and computational models	Nathan Yang* Alain Dagher* Shawn Brown***
Session 6. October 11 th	Embodied, situated and dynamic decision making 1- Neurobiology and computational models of single and integrated sensory processing, reward responses and design insights for serious	Stan kubow* Ricardo Accola* Patricia Silveira* Frederick Kingdom* Jian Yun Nie*

	gaming and physical products	
Session 7. November 1st	Embodied, situated and dynamic decision making 2- General affordance	Paul Csizek* Tiago Falk* Philippe Langlais*
Session 8. October 25 th	Experience, Engagement, Affects, Emotions and Stress Behavior 1- Real time engagement in digital contexts and link to short term and long term outcomes	Sylvain Senecal* Pierre Majorique Leger* Patrick Charland* Heungsun Hwang*
Session 9. November 22nd	Experience, Engagement, Affects, Emotions and Stress Behavior 2-Computer-assisted learning and research on stress and emotions	Jorge Armony* Lindsay Duncan*** Abdulmoteleb EI Saddik*** Jian Yun Nie*
Session 10. November 8	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 Yang* Lindsay Duncan* Tom Shultz* Shawn Brown***
Session 11. November 15	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.	Jui Ramaprasad* Jennifer Bartz** John Lydon*** Joelle Pineau***
Session 12. November 29	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; statistical and computational integrative models	Nathan Spreng* Louis Bherer* Heungsun Hwang* Onur Bodur**
Session 13. December 6	Prospective Decision Making 2- Personality Neuroscience, Theory of Mind, Moral Decision Making and Free Will	Nathan Spreng* Amelie Achim*** Lesley Fellows* Jian Yun Nie*

Session 14. To be scheduled during the week of December 4.	Term Projects Presentation	
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Optional Disciplinary Primer Webinars (list to be completed)

Neuroimaging		
Neurocognitive methods		
Physiological methods		
Machine learning		
Natural Language Processing		
Sensor technologies and Internet of Things models		
Behavioral economics		
Insight design and design thinking		
Consumer Choice Models		
Drift diffusion and other sequential sampling decision models		
Multiple Data Integration		
Data-driven distributed optimization and computational models		
Cultural Neuroscience		