GERAD ANNUAL REPORT

2021–2022

GERAD

GROUP FOR RESEARCH
IN DECISION ANALYSIS

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MESSAGE FROM THE DIRECTOR

As Director of GERAD, I am very pleased to present our 2021-2022 Annual Report.

One of the key events this year was the renewal of our strategic cluster grant from the Fonds de recherche du Québec – Nature et technologies (FRQNT), for the maximum eligible amount and for a six-year period (2022–2028). This recognition is evidence of the scientific excellence of GERAD's researchers, which is reflected in the many indicators presented in this report, including the number of graduate and supervised students (p. 12), number of students in the field (p. 14), number of researchers in the field (p. 15), rankings among the world's most influential researchers (according to Research.com, (p. 13), and Mendeley-Elsevier, (p. 17), awards and distinctions obtained by our members (pp. 15–16) and our students (p. 18), grants received (p. 19), and the publications and scientific activities organized (p. 20).

In addition, during the year 2021–2022, GERAD has continued to grow, having recruited ten regular members (David Ardia, HEC Montréal; Okan Arslan, HEC Montréal; Maxime Cohen, McGill University; Franklin Djeumou Fomeni, Université du Québec à Montréal (UQAM); Mary Kang, McGill University; Antoine Legrain, Polytechnique Montréal; Antoine Lesage-Landry, Polytechnique Montréal; Carolina Osorio, HEC Montréal; Alton Russell, McGill University; Xiaozhe Wang, McGill University), as well as a new associate member (Amir Ardestani-Jaafari, University of British Columbia).

To conclude, I would like to offer some thanks on behalf of the entire GERAD community. First, I want to extend my warmest thanks to our funders, whose financial support is essential to GERAD's smooth operation: the FRQNT, the Institute for Data Valorization (IVADO), our sponsoring universities (HEC Montréal, Polytechnique Montréal, McGill University, and UQAM), as well as several of the research chairs active at GERAD. I would also like to express my gratitude to our industrial partners, who trust GERAD's expertise. My thanks also go out to all GERAD members who are involved in our committees and organize scientific activities, thereby helping to make GERAD a stimulating environment for research. Finally, I would like to thank our administrative and technical staff for the indispensable support they provide the entire GERAD community.

Enjoy your reading!

Olivier Bahn

Olivier Bahn
GERAD Director

GERAD
IN BREF

Created in 1979, GERAD is an inter-university research centre that brings together specialists in data and decision sciences, computer science, applied mathematics and mathematical engineering. These scientists come mainly from HEC Montréal, Polytechnique Montréal, McGill University and the Université du Québec à Montréal.

73 regular members from Quebec universities

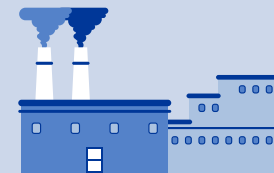**113** research professionals and postdoctoral researchers

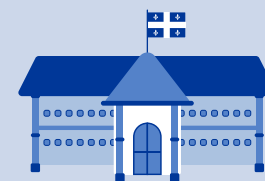**over $32M** in grants and projects

111 members

718 students

ABOUT 90 industrial partners

93 research activities
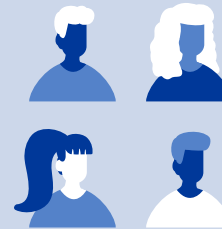
392 scientific publications

14 Quebec universities

GERAD'S MISSION:

To develop the mathematics of decision-making in all its forms in complex systems – be they technological, commercial or economic – and upstream of decision-making, to develop modelling based on statistics, simulation and data valuation

To train highly qualified personnel in the above fields, promoting equity, diversity and inclusion
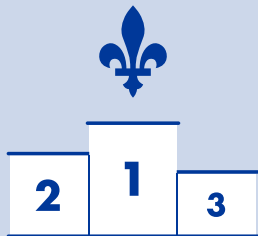
To bring university researchers together with industry, with a view to carrying out large-scale research and development projects and to contribute to the international influence of Quebec research

To have a significant impact on society through scientific innovation, the transfer of know-how in important sectors of the economy and the development of decision-making tools

FUNDAMENTAL RESEARCH

GERAD's scientific program is based on **four research axes:**

1 Data valuation for decision-making

2 Decision support made in complex systems

3 Decision support made under uncertainty

4 Real-time decision support

APPLICATIONS

GERAD doesn't only tackle theoretical and methodological developments along these four research axes, in fact, one of its defining characteristics is that it deploys these methods in the following **broad fields of application.**

1 Economy and finance

2 Energy, environment and natural resources

3 Smart infrastructures

4 Engineering

5 Smart logistics

6 Marketing

7 Health

BOARD OF **DIRECTORS**

Caroline Aubé
Director of the Research and Knowledge
Transfer Office

HEC Montréal

Olivier Bahn
GERAD Director and Chairman of the Board

HEC Montréal

Roussos Dimitrakopoulos
Professor; Member Representative

McGill University

Olivier Grenier
Director of the Research Office/Centre for
Technological Development

Polytechnique Montréal

Patrick Jeandroz
Head of Expertise – Data Science and
High-Performance Computing; Industry
Representative

IREQ

Kristina Öhrvall
Director, Strategic Initiatives

McGill University

Jean-Pierre Richer
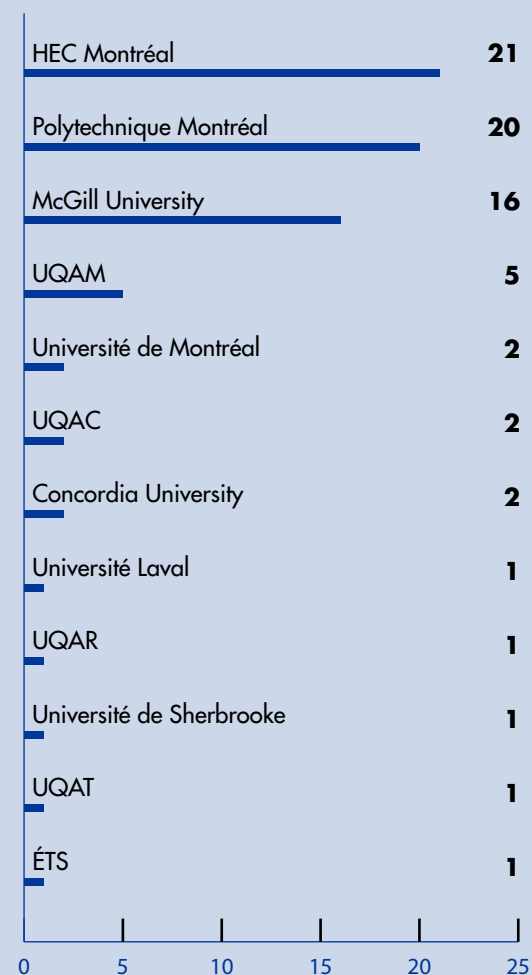Director of the Research and Creation Office

UQAM

OUR MEMBERS

EVOLUTION OF OUR MEMBERSHIP

	2018-19	2019-20	2020-21	2021-22
Regular members	61	62	69	73
Associated members	30	32	32	34
Honorary members	4	4	3	3
Visiting members	5	4	2	1

DISTRIBUTION OF OUR ASSOCIATED MEMBERS

- **24** North America
- **15** Quebec
- **8** Europe
- **1** Asia
- **1** South America

REGULAR MEMBERS BY INSTITUTION

Institution	Count
HEC Montréal	21
Polytechnique Montréal	20
McGill University	16
UQAM	5
Université de Montréal	2
UQAC	2
Concordia University	2
Université Laval	1
UQAR	1
Université de Sherbrooke	1
UQAT	1
ÉTS	1
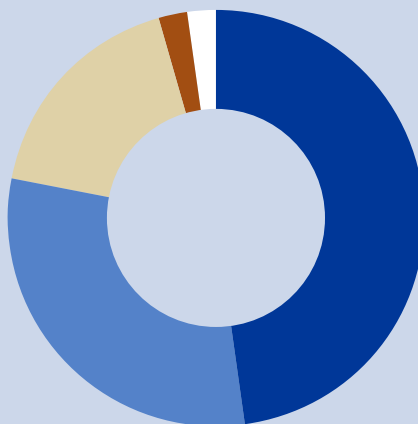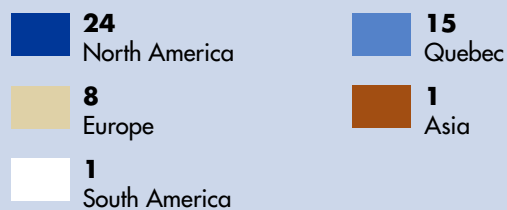
CHAIR HOLDERS AT GERAD

Yossiri Adulyasak
Canada Research Chair in Supply Chain Analytics

Miguel F. Anjos
Inria International Chair on Power Peak Minimization for the Smart Grid
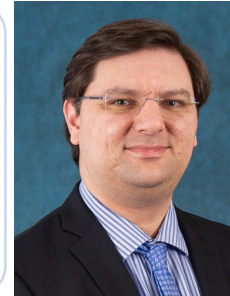
Leandro C. Coelho
Canada Research Chair in Integrated Logistics

Maxime Cohen
Scale AI Chair in Data Science for Retail

Jean-François Cordeau
Chair in Logistics and Transportation

Erick Delage
Canada Research Chair in Decision Making Under Uncertainty

Roussos Dimitrakopoulos
Canada Research Chair in Sustainable Mineral Resource Development and Optimization Under Uncertainty

Christian Genest
Canada Research Chair in Stochastic Dependence Modeling

Raf Jans
Chair in Supply Chain Operations Planning

Andrea Lodi
Canada Excellence Research Chair in Data Science for Real-Time Decision-Making

Carolina Osorio
Scale AI Research Chair in Artificial Intelligence for Urban Mobility and Logistics

Georges Zaccour
Chair in Game Theory and Management

MEMBERS OF THE
ROYAL SOCIETY OF CANADA (RSC)

Michèle Breton

Peter E. Caines

Jean-François Cordeau

Erick Delage

Jacques Desrosiers

Christian Genest

Pierre Hansen

Gilbert Laporte
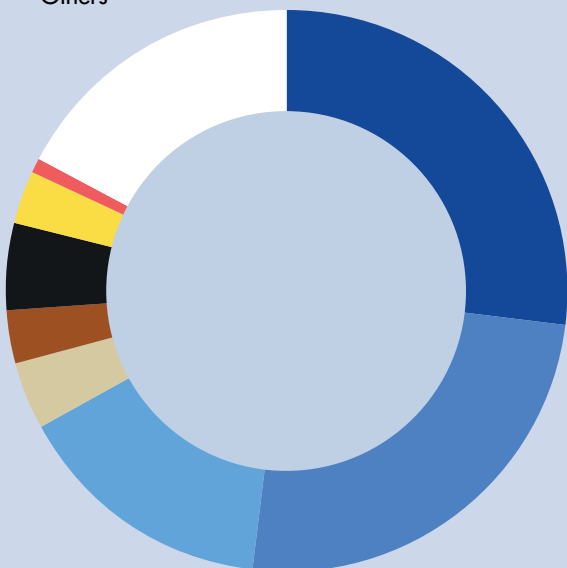
Saibal Ray

Georges Zaccour

COMPOSITION OF THE GERAD

111
Members

351
PhD students

367
MSc students

14
Technical and administrative staff

35
Trainees

97
Postdoctoral fellows

16
Research professionnals

STUDENTS

STUDENTS ENROLLED AND GRADUATES BY UNIVERSITY

- **27%** HEC Montréal
- **25%** Polytechnique Montréal
- **15%** McGill University
- **4%** UQAM
- **3%** Université de Montréal
- **5%** Concordia University
- **3%** Université Laval
- **1%** ÉTS
- **17%** Others
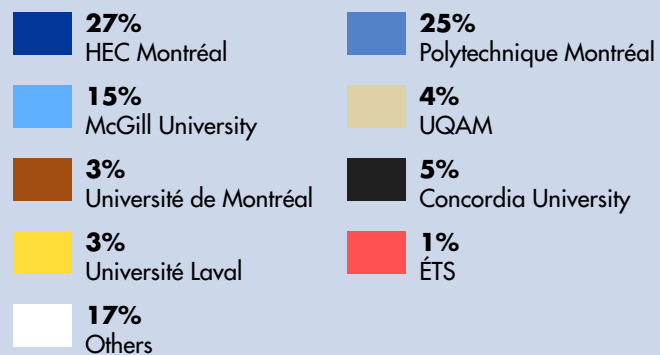
BREAKDOWN BY LEVEL

	2018-19	2019-20	2020-21	2021-22
MSc graduates	124	132	123	**133**
MSc enrolled	221	200	192	**234**
PhD graduates	46	29	44	**50**
PhD enrolled	219	228	277	**301**

2018-2019   2019-2020   2020-2021   2021-2022
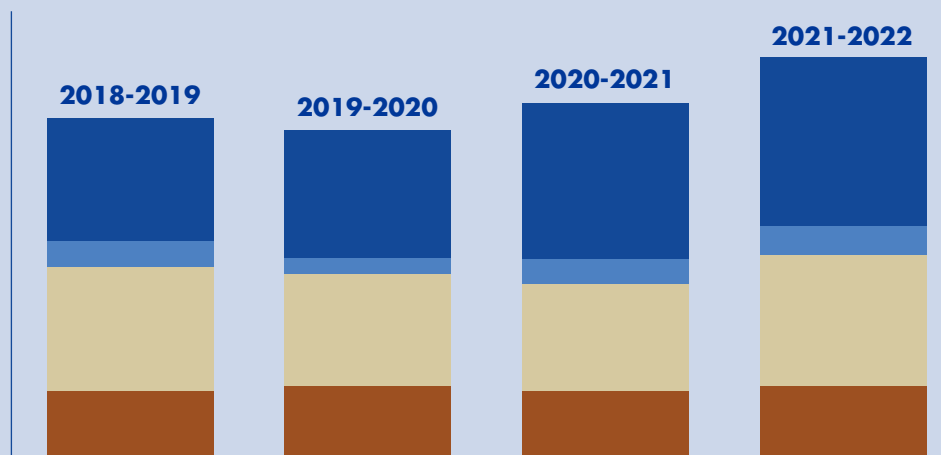
HIGHLIGHTS
OF THE YEAR

On January 2, 2022, we learned with regret of the death of Jean-Louis Goffin, one of the founding members of GERAD and Professor Emeritus in the Department of Management Sciences at McGill University.

Two GERAD members were awarded new research chairs.

Carolina Osorio leads the Scale AI Research Chair in Artificial Intelligence for Urban Mobility and Logistics at HEC Montréal.

The Scale AI Chair in Data Science for Retail is held by Professor Maxime Cohen at McGill University.

IVADO's research program "Integrated Machine Learning and Optimization for Decision Making under Uncertainty: Towards Robust and Sustainable Supply Chains," led by members Erick Delage and Yossiri Adulyasak of HEC Montréal, received a $1.2 million grant.

A GERAD study project is funded by OBVIA. This project focuses on the study the governance and ethics of algorithms in an on-demand mobility and innovation ecosystem environment. The GERAD team consists of Andrea Lodi, Antoine Legrain, François Soumis and Hugues Delmaire, along with researchers Patrick Turmel, Vincent Gautrais and Sébastien Gambs.

Maxime Cohen was appointed as the first ELNA Medical Chief Artificial Intelligence Officer.

Professor Georges Zaccour's Chair in game theory and management has been renewed until May 2027.

SPECIAL 40TH ANNIVERSARY ISSUES

To celebrate GERAD's 40th anniversary, **Daniel Aloise**, **Gilles Caporossi** and **Sébastien Le Digabel** published a special issue of the *Journal of Global Optimization* (volume 81, number 1, September 2021).

GERAD's 40th anniversary also inspired **Michèle Breton** and **Olivier Bahn** to publish a special issue of the *Environmental Modeling & Assessment* journal ("Energy, Environment and Sustainable Development", volume 26, number 6, December 2021)

Research.com has published the 2022 edition of its ranking of the top 1,000 scientists in several fields. Here are the 15 GERAD members listed.

In the field of mathematics (rank in Canada, rank in the world):

- **Gilbert Laporte** (#1, #3)
- **Pierre Hansen** (#5, #68)
- **Jean-François Cordeau** (#9, #214)
- **Pierre L'Ecuyer** (#11, #271)
- **Christian Genest** (#14, #453)
- **François Soumis** (#31, #788)
- **Jacques Desrosiers** (#32, #790)
- **Andrea Lodi** (#33, #832)
- **Guy Desaulniers** (#47, #1206)
- **Charles Audet** (#50, #1244)
- **Alain Hertz** (#52, #1322)
- **Brigitte Jaumard** (#83, #1933)

In the field of economics and finance:
- **Georges Zaccour** (#36, #1539)

In the field of electronics and electrical engineering:
- **Peter Caines** (#128, #2454)

In the field of engineering and technology:
- **Roussos Dimitrakopoulos** (#197, #4770)

OUR MEMBRES
IN THE MEDIA

"Tramway : la chasse aux fournisseurs est relancée," with Leandro C. Coelho, Université Laval. (article published on ici.radio-canada.ca, September 2021)

"Former les "télégestionnaires" de demain," with François Bellavance. HEC Montréal. (interview published in *La Presse*, October 2021)

"Le Canada veut désormais atteindre la carboneutralité et cela change tout," with Olivier Bahn, HEC Montréal. (article published in *Le Soleil*, October 2021)

"When Bad News About the Climate Is Good for Green Stocks," with David Ardia, HEC Montréal. (article published in the *New York Times*, November 2021)

"Mauvaise nouvelle pour le climat, bonne nouvelle pour la Bourse?," with David Ardia, HEC Montréal. (article published in *Les affaires*, November 2021)

"Chaîne d'approvisionnement : des laboratoires aux activités quotidiennes," with Jean-François Plante, HEC Montréal. (article published in *La Presse*, February 2022)

"Lock-out au CP : un fort impact économique?," with Leandro C. Coelho, Université Laval. (interview on ICI RDI, March 2022)

"How Retailers Can Put Data to Work, with McGill's Research Chair in Data Science, Maxime Cohen," (article published in *Forbes*, April 2022)

"Comment les détaillants peuvent tirer parti des données," with Maxime Cohen, McGill University. (guest blog in *Les affaires*, May 2022)
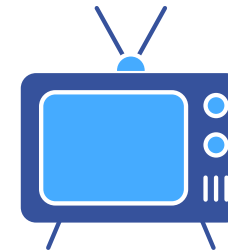
AWARDS AND HONOURS

Yossiri Adulyasak

Chenelière Éducation, Gaëtan-Morin Award, HEC Montréal, 2021

Luminescence Prize, HEC Montréal, 2021

Yossiri Adulyasak, Raf Jans and Narges Seresthri

Best Paper Award published in the journal *Omega*, 2021 (for the paper entitled "The value of aggregate service levels in stochastic lot sizing problems")

David Ardia

Best asset pricing paper award during the 38th International Conference of the French Finance Association (for the paper entitled "Evaluating Hedge Fund Performance when Models are Misspecified")

Best Paper Award for 2018-2019, *International Journal of Forecasting* (for the paper entitled "Questioning the news about economic growth: Sparse forecasting using thousands of news-based sentiment values")

Okan Arslan

Young Researcher Award , HEC Montréal, 2021

Third place in the Amazon Last Mile Routing Research Challenge, 2021

Charles Audet

Palais des congrès Ambassador, 2022

Mathieu Boudreault

Award of Excellence, Canadian Institute of Actuaries Legacy Awards, 2021

François Bouffard

Outstanding Academic Service Award, McGill University, Faculty of Engineerin , 2021

Leandro C. Coelho

1st Prize at the Practice Prize Competition, Canadian Operational Research Society, 2021 (for the project entitled "Fleet sizing and routing problem with synchronization for AGVs with dynamic demands")

Best Paper Award published in the journal *Omega*, 2021 (for the paper entitled "The Multi-Period Workforce Scheduling and Routing Problem")

Maxime Cohen

RETHINK Retail's Top Retail Influencers, 2022

Jean-François Cordeau and Raf Jans

Augusto Queirós Novais Award, Associação Portuguesa de Investigação Operacional (APDIO), 2021 (for the paper entitled "Solving a large multi-product production-routing problem with delivery time windows")

Roussos Dimitrakopoulos

Gold Medal Award, Southern African Institute of Mining and Metallurgy (SAIMM), 2021 (for the paper entitled "Adaptive simultaneous stochastic optimization of a gold mining complex")

Yichuan Daniel Ding

Winner of the Best Paper Competition in the category of statistical methods / econometric modeling, 4th annual Canadian Healthcare Optimization Workshop (CHOW), 2021

Christian Genest

David Sprott Distinguished Lectureship, University of Waterloo, 2021

Brigitte Jaumard

2nd rank at Graph Neural Networking (GNN) Challenge, Barcelona Neural Networking Center, Polytechnic University of Catalonia, 2021

AWARDS AND HONOURS

Mary Kang

Christophe Pierre Research Excellence Award, McGill University, 2022

Michael Kokkolaras

Ranked among the reviewers' Favorite Papers (ranked 35 out of 359), International Conference on Engineering Design, 2021 (for the paper entitled "Exploring the Potential of Digital Twin-Driven Design of Aero-Engine Structures")

Gilbert Laporte

Transportation Science Meritorious Service Award, 2021

Honorary doctorate, Norwegian University of Science and Technology, 2021

Best Editor Award, *Communications in Transportation* Research, 2022

Andrea Lodi

Farkas Prize, INFORMS, 2021

Roland P. Malhamé

Fellowship nomination, IEEE Control Systems Society, 2022

Meritas Award for best graduate course teacher in electrical engineering, Polytechnique Montréal, 2022

Vahid Partovi Nia

Best Industrial Paper Award, Institute for Systems and Technologies of Information, Control and Communication, 2022 (for the paper entitled "iRNN: Integer-only Recurrent Neural Network")

Wei Qi

Chuck ReVelle Rising Star Award, INFORMS, 2021

Fatiha Sadat

Research Incubator Award, Centre for Research on Brain, Language and Music, 2021 (for the project entitled "Towards an Emotional Chatbot adapted for Indigenous Language Learning and Revitalization")

Brunilde Sansò

Co-president nomination, International Council of Academies of Engineering and Technological Sciences (CAETS), 2021

Georges Zaccour

Pierre Laurin Research Award, HEC Montréal, 2021

Best Paper Award published in the journal *Omega*, 2021 (for the article entitled "Optimal dynamic management of a charity under imperfect altruism")

These 19 GERAD members are among the most influential scientists in the world in various fields of research, according to a study by Mendeley (Elsevier) published in 2021.

- **Charles Audet**
- **François Bouffard**
- **Peter E. Caines**
- **Leandro C. Coelho**
- **Jean-François Cordeau**
- **Hanane Dagdougui**
- **Guy Desaulniers**
- **Roussos Dimitrakopoulos**
- **Christian Genest**
- **Pierre Hansen**
- **Alain Haurie**
- **Alain Hertz**
- **Minyi Huang**
- **Brigitte Jaumard**
- **Gilbert Laporte**
- **Pierre L'Ecuyer**
- **Sébastien Le Digabel**
- **Andrea Lodi**
- **Georges Zaccour**

GERAD AWARDED $91,500 IN SCHOLARSHIPS AND PRIZES

STUDENTS WHO OBTAINED SCHOLARSHIPS

FRQ

Samuel Desparois (HEC Montréal), master's research scholarship, FRQNT

Sina Shahnejat Bushehri (HEC Montréal), doctoral research scholarship, FRQNT

Ahmadreza Tavasoli (HEC Montréal), doctoral research scholarship, FRQSC

Xiaoting Wang (McGill University), doctoral research scholarship, FRQNT

NSERC

Samuel Desparois (HEC Montréal), Master's scholarship

Farhad Rahbarnia (Polytechnique Montréal), Doctoral scholarship

IVADO

Saad Akhtar (Polytechnique Montréal), postdoctoral research scholarship, 2022

GERAD

Claudia Bongiovanni (HEC Montréal), postdoctoral fellowship

Dorian Dumez (HEC Montréal), postdoctoral fellowship

G. Selin Savaşkan (HEC Montréal), postdoctoral fellowship

Others

Youness Chahdi (HEC Montréal),
Fin-ML scholarship, Collaborative Research and
Training Experience program (CREATE), NSERC

Ndeye Rokhaya Dieng (HEC Montréal),
Fin-ML scholarship, Collaborative Research and
Training Experience program (CREATE), NSERC

Gaspard Lapierre-Fecteau (HEC Montréal),
Fin-ML scholarship, Collaborative Research and
Training Experience program (CREATE), NSERC

Rosnel Sessinou (HEC Montréal),
Fin-ML postdoctoral scholarship, Collaborative
Research and Training Experience program
(CREATE), NSERC

Scott Seymour (McGill University),
Vadasz Scholar, McGill Engineering Doctoral Award,
McGill University

Idriss Wannassy (HEC Montréal),
Fin-ML scholarship, Collaborative Research and
Training Experience program (CREATE), NSERC

James P Williams (McGill University),
McGill Engineering Doctoral Award Leveraged
Funding, McGill University

Qihua Zhong (HEC Montréal),
J.A. DeSève (PhD) Merit Scholarship,
Fondation J.A. DeSève

Seventeen HEC Montréal students have been awarded
MITACS accelerate scholarships

Student awards

Wenqing Ai (Tsinghua University)
Honorable mention, 2022 Student Paper Competition
of College of Sustainable Operations, Production
& Operations Management Society (POMS),
"Crowdsourcing Electric Mobility for Omni-Sharing
Distributed Energy Resources"

Carole Brunet Idriss-Kanago
(Polytechnique Montréal),
Roger A. Blais Award for the best thesis,
Polytechnique Montréal, 2021

Emeric Courtade and **Pierre Pereira**
(Polytechnique Montréal),
1st place, PlankThon Challenge, Veolia and Tara
Ocean Foundation, 2021

Farouk Hammami (Université Laval),
People's choice award at the Three Minute Thesis
Competition, Université Laval, 2022

Kwassi Holali Degue (Polytechnique Montréal),
2021 best thesis award, GERAD

Matheus Faria (McGill University),
Tied second place in the OR/MS scientific writing
activity, GERAD, 2021

Narges Sereshti (HEC Montréal),
Esdras-Minville Award, HEC Montréal, 2022

Mohammed Shalaby (McGill University),
Nominated as a finalist for the Best Student Paper
Award, IEEE Robotics and Automation Society,
International Conference on Robotics and Automation
(ICRA), 2021

Julie Sliwak (Polytechnique Montréal),
Best doctoral thesis in engineering mathematics,
Polytechnique Montréal, 2022

FUNDING AND GRANTS

GERAD RECEIVED THE FOLLOWING IN INFRASTRUCTURE GRANTS:

$502,085
of the FRQNT Strategic Clusters program

$264,637
from IVADO

$174,000
from academic institutions

$10,000
from research chairs

$32 MILLION IN RESEARCH GRANTS

*Amount of the grants received by GERAD members. Annual amounts are the total grant divided by the duration of the grant (number of years). By weighting by the number of researchers on a project by those who are GERAD members, the amount that is directly tied to members is approximately $19,4 million annually.

- **$12,063,680** NSERC
- **$3,895,984** Research chairs
- **$3,519,206** MITACS
- **$1,105,301** Contracts
- **$1,071,023** IVADO
- **$945,402** FRQ
- **$334,726** Academic institutions
- **$534,851** SSHRC
- **$176,916** Scholarships
- **$8,213,455** Others

- $2,9 million in Discovery Grants this year
- Over $4,3 million in NSERC research and development projects
- $3,5 million in MITACS projects
- 17 NSERC Alliance Grants for a total of $4,2 million
- $875K for two projects under the Innovation for Defence Excellence and Security (IDEeS) program, Department of National Defence
- $400K for COSMO Stochastic Mine Planning Laboratory

PUBLICATIONS

296
published articles
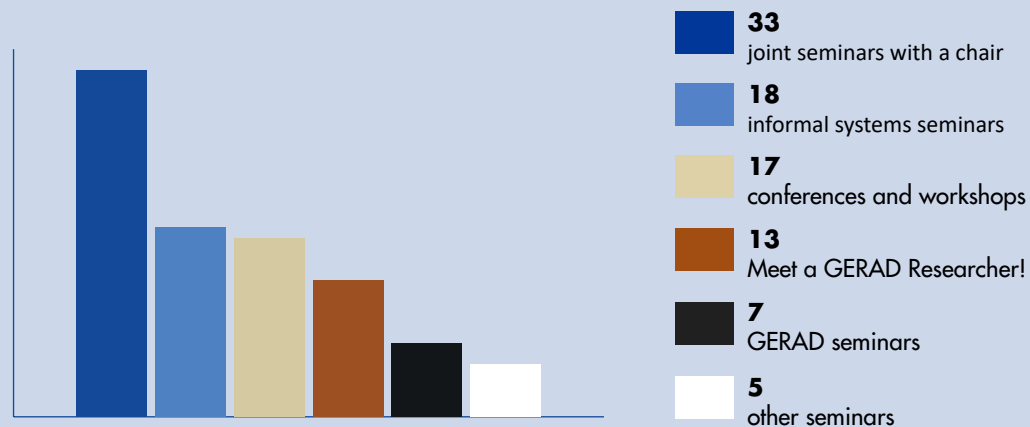
84
papers in refereed conference proceedings

12
books and chapters

76
Cahiers du GERAD and revisions

ORGANIZED SCIENTIFIC ACTIVITIES BY GERAD

ACTIVITIES IN 2021–2022

33 joint seminars with a chair

18 informal systems seminars

17 conferences and workshops

13 Meet a GERAD Researcher!

7 GERAD seminars

5 other seminars

WORKSHOPS

- 4 Python, 4 LaTeX and one TikZ workshops
- Communicating OR/MS: Writing and Presenting Activities
- "Writing a scientific paper" Q&A session with Gilbert Laporte
- 11th International Workshop on Lot Sizing
- CanQueue 2021
- Showcase yourself and hunt jobs
- Mean Field Games on Networks Workshop

CONFERENCE

- 2022 Optimization Days

SCHOOL

- School of Decision Science and Operations Research

GERAD

GROUP FOR RESEARCH
IN DECISION ANALYSIS

Visit our website for more information.

WWW.GERAD.CA