



# Action Plan Research, Discovery, Creation, and Innovation 2017-2021

Guidance Document

**Action Plan  
Research,  
Discovery,  
Creation,  
and Innovation  
2017-2021**

**Guidance Document**

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## D<sup>re</sup> Marie-Josée Hébert

is Vice-Rector of Research, Discovery, Creation, and Innovation, Professor at the Faculty of Medicine, and holder of the Shire Chaire in Nephrology and Kidney Transplantation and Regeneration. She also practices as a transplant nephrologist at CHUM.



# Word from the Vice-Rector

Marie-Josée Hébert

Université de Montréal is one of the largest research hubs in Canada and the French-speaking world. At a time when multiple forces of change are intersecting, academic research and scientific rigour are more important than ever. Offering academic excellence and a vast range of disciplines through its 14 faculties and schools, Université de Montréal represents a unique knowledge development ecosystem. This intermingling of perspectives allows for incredibly rich encounters, fostering the co-creation of new knowledge, in response to the complex issues of our time and the challenges of tomorrow.

# Summary

Université de Montréal is one of the largest research hubs in Canada and the French-speaking world. At a time when multiple fundamental forces of change are intersecting, academic research and scientific rigour are more important than ever. This guidance document positions the research and innovation activities of Université de Montréal in a global context. It takes into account UdeM's performance in research and teaching, its unique role in the communities of Montréal, Québec, and Canada, and its international, national, and provincial public policies and strategies for research and innovation. It supports research by affirming its primary objective: the discovery, advancement, and mobilization of knowledge.



Five strategies are used to guide our orientations :

1. Identify cross-cutting research topics that combine various hubs of excellence and strengthen the process of starting and supporting major research projects;
2. Facilitate the Innovation Laboratory to stimulate links between research and teaching activities and ensure their relevance in programs through the implementation of major projects;
3. Implement a research equity and diversity plan;
4. Increase support and training services that promote and model responsible conduct in research;
5. Identify policies that support broad and open dissemination of knowledge and research data produced at UdeM.

## Four projects



1. From Data to Action in Health



2. Understanding and Creating



3. Building a Sustainable Future



4. Life Rethought

## Juan Torres

is Associate Professor at the School of Urban Planning and Landscape Architecture and Vice-Dean of Graduate Studies at the Faculty of Planning, Université de Montréal. He conducts research connecting three areas of research: urban design, community sustainability, and city-child linkages.



# UdeM : a unique scientific and creative ecosystem

With its network of affiliated schools, university hospital centres, affiliated university centres, and university institutes, UdeM and its community provide fertile ground to cover the full range of current knowledge and research, in all its forms. UdeM is at the centre of a knowledge community. With its 450 international partners, 400,000 graduates, and 10,000 donors, UdeM has global influence.

Each year, Université de Montréal contributes to producing the next generation of top-level researchers, with more than 10,000 graduate students. UdeM is home to 99 Canada Research Chairs spanning all sectors of excellence.

The diversity, international perspective, and originality of UdeM's output testify to the quality and depth of the research carried out by our community.

## Sylvie Belleville

is a professor at Université de Montréal's Department of Psychology, a researcher at the Institut universitaire de gériatrie de Montréal, and Director of the CIUSSS Montréal Centre sud research centre. She also leads the Consortium pour l'identification précoce de la maladie d'Alzheimer.



# Vision

Consistent with Université de Montréal's general mission, the office of the Vice-Rectorate of Research, Discovery, Creation, and Innovation offers a vision that :



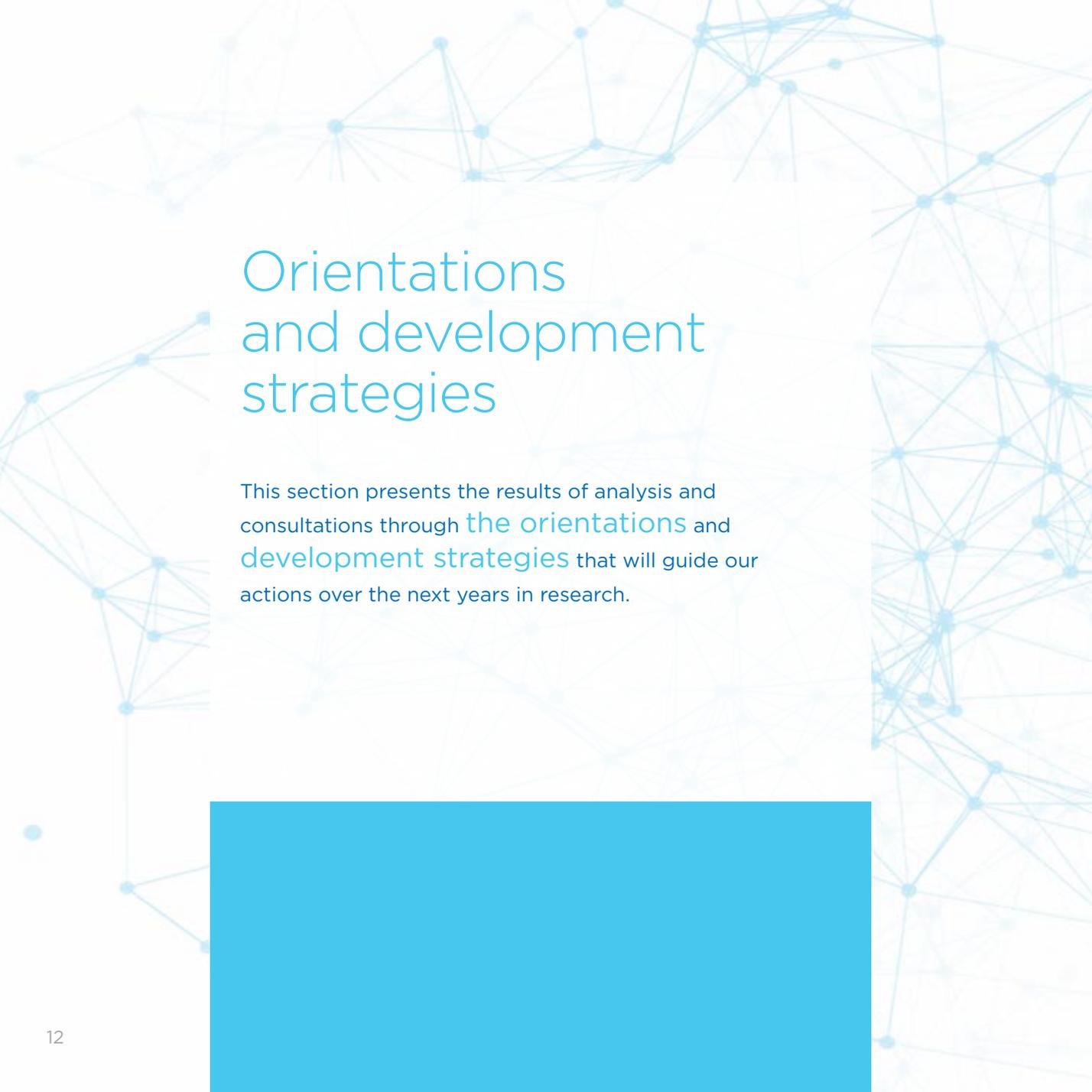
**1.** Fosters a diversity of research models (basic and applied, theoretical, action research, individual and collaborative, disciplinary and multidisciplinary) and their implementation in all fields of knowledge;



**2.** Recognizes the full value of a scientific community that provides equal opportunities for all to contribute to the advancement of knowledge, regardless of gender, origin, age, or individual limitations, and that is a model of responsible conduct in research;



**3.** Affirms the priority given to developing activities at the interface of disciplines and sectors of excellence, which offer added value to interfaculty work and partnerships and act as a lever for developing structuring projects, thus increasing and consolidating UdeM's influence.



# Orientations and development strategies

This section presents the results of analysis and consultations through the **orientations and development strategies** that will guide our actions over the next years in research.

## Strategic orientations

The aspirations of Université de Montréal regarding research, discovery, creation, and innovation can be summarized by our strategic orientations :



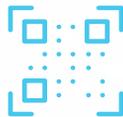
1. Affirm the positioning of UdeM as a powerful vector of discovery, creation, and innovation;



2. Support the development of world-class research, creation, and innovation environments positioned at the interface of our hubs of excellence;



3. Stimulate the training of next-generation researchers and creators to remain at the forefront of knowledge;



4. Provide a model environment for diversity, equity, and responsible conduct in research;



5. Increase the impact of UdeM research and its contribution to society;

## Development strategies

This section presents the development strategies that will guide our efforts to achieve the research orientations outlined in this document.

### 1. Identify cross-cutting research topics that combine various hubs of excellence and strengthen the process of starting and supporting major research projects

This strategy aims to identify cross-cutting research topics to support collaboration, foster interactions between faculty, academic units, and partners, and establish close links between studies and research.

Structuring projects will be implemented to support this developmental approach, whose operational and strategic progress will serve all activities and services. The latter are based on the grouping of cross-cutting topics that offer exceptional collaboration potential.

The development of major projects will continue to be jointly overseen by the Vice-Rectorate of Research, Discovery, Creation, and Innovation and the Vice-Rectorate of Student and Academic Affairs, with the view of mutually linking research and training programs and promoting interfaculty collaboration.

## 2. Facilitate the **Innovation Laboratory** to stimulate links between research and teaching activities and ensure their relevance in programs through the implementation of major projects

Our ambition is that the synergistic effect between teaching and research in the work related to cross-cutting topics will promote rapid appropriation of new knowledge in our teaching, allow us to modernize our training programs, and favour a concerted and integrated approach to enhance interdisciplinary training. This cross-sectoral development is a veritable **laboratory of innovation** and will provide professors and students who wish to adopt an interdisciplinary approach with effective support to increase and facilitate the sharing of expertise, encourage the emergence of original approaches, and strengthen the links between research and studies.

The **Innovation Laboratory** is also a useful instrument for developing an entrepreneurial culture around the production of research knowledge. This approach will increase the social impact of UdeM's output and further our community involvement.

The work of the **Innovation Laboratory** will span over the 2017-2021 period. Continuous performance and impact assessment of the project-based approach will allow us to adapt our modus operandi in such a way that the desire to connect knowledge remains a fundamental and unifying element of institutional change.

### 3. Implement a research equity and diversity plan

Building on its tradition of collegiality and cooperation in research, Université de Montréal wishes to build, through a mosaic of talents, a research community that is as intellectually vigorous and innovative as it is culturally and socially sensitive. It is the condition of a world-class research and training environment.

UdeM can only fulfill its demanding educational and knowledge-sharing mission by itself being a model for diversity, equity, and inclusion. Our desire to be an example of diversity and equity focuses on two areas :

- > its members, for whom it must provide a respectful, inspiring, and engaging environment, valuing difference, and for whom it must overcome discriminatory barriers to developing and carrying out a research career;
- > the community and society, which it must reflect, in order for everyone, by virtue of their goals and talents, to recognize themselves in their chosen career and academic discipline.

In its strictest sense, the definition of diversity refers to women, persons with disabilities, members of visible minorities, and aboriginals. However, the concept has a broader scope and can be applied to approaches, career paths, research trajectories and success models: UdeM places great importance on all these intersecting forms of diversity.

In 2016, Université de Montréal undertook a vast study project involving many aspects of research diversity. Addressing this issue has opened the door to all facets of university life, the professorial career, and scientific activity. It concerns the entire business of research and its overall environment :

- > organization of research teams;
- > publications and impact;
- > collaborative practices with increasing interdisciplinarity;
- > globalization.

Based on bibliometric analysis, qualitative studies, and consultations, the project aims to highlight and document the various factors (internal and external) that may affect full participation of the primary target groups in research; their career paths; recognition of their contributions; and their progress. Its ultimate goal is to create an environment supportive of the goals of diversity and equity at all levels and involving all aspects of the research career. The project will result in

institutional measures whose effects will be regularly assessed.

### Contributing to reconciliation

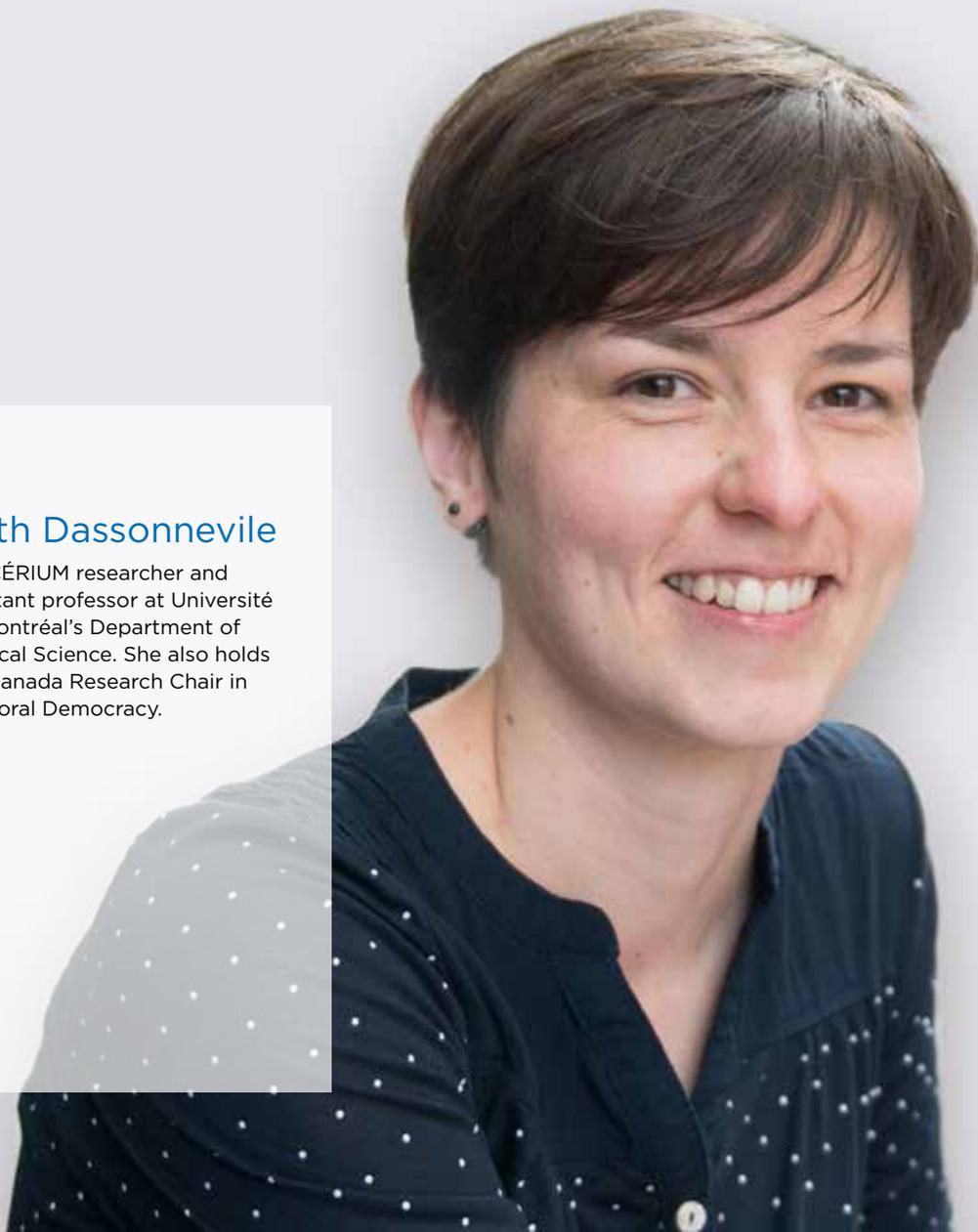
In December 2015, the final report of the Truth and Reconciliation Commission of Canada signalled the beginning of a renewed relationship between the country's Aboriginal and non-Aboriginal populations. Wishing to take an active part in efforts to create the conditions for harmonious living together, the Université de Montréal intends to promote greater appreciation of Aboriginal cultures, knowledge, practices, and experiences, in all their diversity, and to increase the opportunities for collaboration in research and creation.



Credits : LE COLLECTIF TAPISKWAN

## Ruth Dassonneville

is a CÉRIUM researcher and assistant professor at Université de Montréal's Department of Political Science. She also holds the Canada Research Chair in Electoral Democracy.

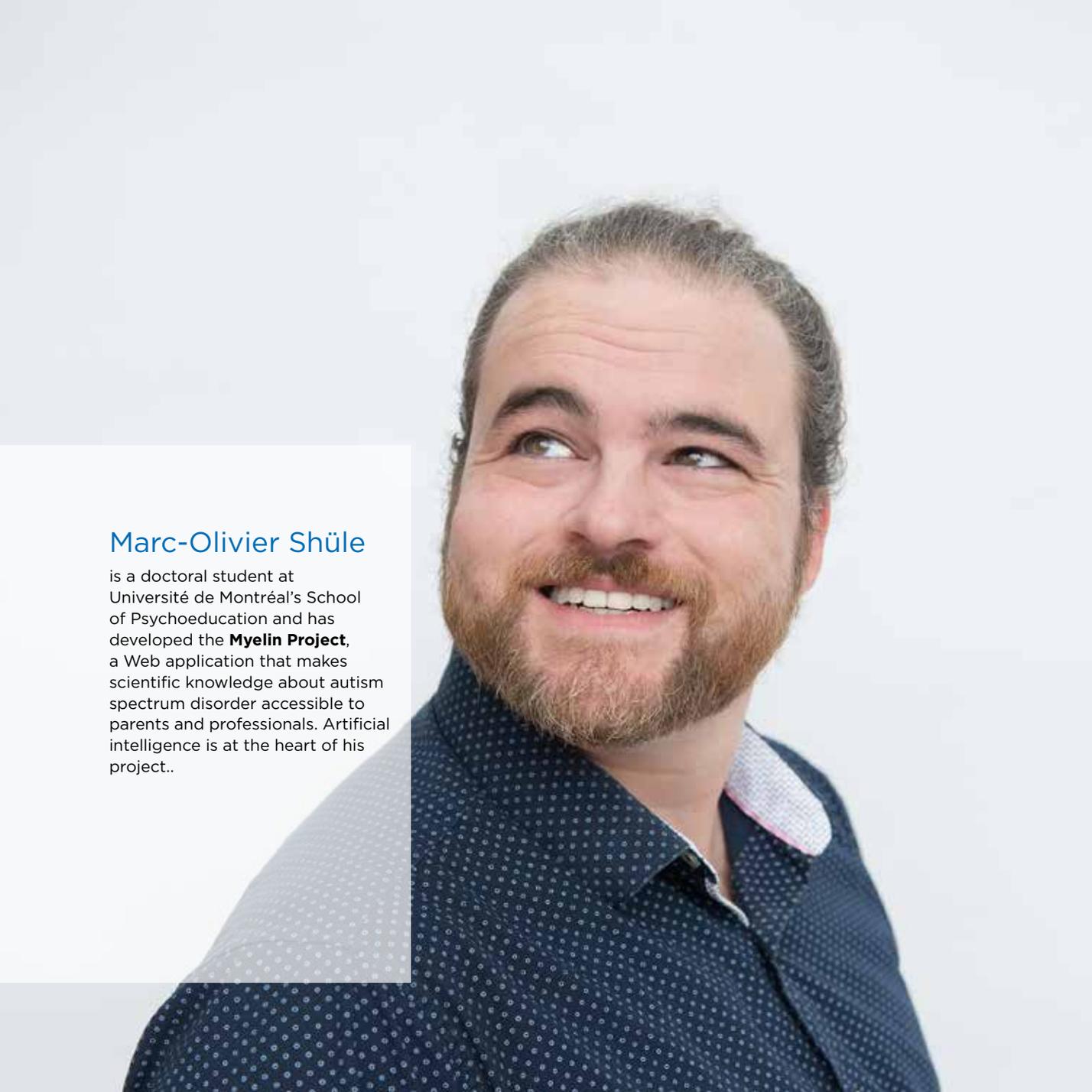


#### 4. Increase support and training services that promote and model responsible conduct in research

Université de Montréal offers an exceptional diversity of research and teaching disciplines, as well as exclusive programs. These distinctive features are as much a source of pride as challenges for research conducted at our institution. Added to this situation are the regulatory changes of granting agencies. Université de Montréal must be able to apply the same level of excellence, rigour, and compliance to all research activities carried out under its responsibility. Through appropriate training activities, Université de Montréal must also encourage the entire research community to adopt best practices in research and the management of research data.

Developing a culture of responsible research conduct within the institution will enable UdeM not only to maintain its enviable position in the area of academic research, but also to provide outreach and serve as a model for incorporating ethics and responsible conduct upstream of establishing research, training, and development policies and practices. Creating the Office of Responsible Research Conduct, in January 2017, was the first step toward offering services and support in this regard to the entire university community.

The Office of Responsible Research Conduct will also ensure that the use of research animals is consistent with responsible conduct toward animals and complies with the rules regarding the use of animals established by the Canadian Council on Animal Care.

A portrait of Marc-Olivier Shüle, a man with a beard and long hair, smiling and looking upwards and to the right. He is wearing a dark blue patterned shirt. The background is a plain, light color.

## Marc-Olivier Shüle

is a doctoral student at Université de Montréal's School of Psychoeducation and has developed the **Myelin Project**, a Web application that makes scientific knowledge about autism spectrum disorder accessible to parents and professionals. Artificial intelligence is at the heart of his project..

## 5. Identify policies that support broad and open dissemination of knowledge and research data produced at UdeM.

In a context in which Canadian granting agencies have adopted an Open Access Policy on Publications<sup>1</sup> and a Statement of Principles on Digital Data Management<sup>2</sup> and in which Université de Montréal wishes to increase its impact on society by committing itself more fully to open science and citizenship, the time is ripe to intensify our work around these issues. Studies have shown that the more broadly research results are shared, the more they contribute to developing new knowledge.

Already in 2016, the Research Committee and the Library Advisory Committee set up a joint working group on open access. In 2017, the Vice-Rectorate of Research, Discovery, Creation, and Innovation and the Libraries Directorate created an advisory committee on research data management. Université de Montréal wishes to continue these efforts over the next few years and put in place the necessary means to support open access to the knowledge produced by the university community and to promote the widest possible reuse of research data while guaranteeing their security and durability.

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<sup>1</sup> [Tri-Agency Open Access Policy on Publication](http://www.science.gc.ca/eic/site/063.nsf/fra/h_F6765465.html), 2015. [http://www.science.gc.ca/eic/site/063.nsf/fra/h\\_F6765465.html](http://www.science.gc.ca/eic/site/063.nsf/fra/h_F6765465.html)

<sup>2</sup> [Tri-Agency Statement of Principles on Digital Data Management](http://www.science.gc.ca/eic/site/063.nsf/eng/h_83F7624E.html), 2016. [http://www.science.gc.ca/eic/site/063.nsf/eng/h\\_83F7624E.html](http://www.science.gc.ca/eic/site/063.nsf/eng/h_83F7624E.html)

## Yoshua Bengio

is Professor at Université de Montréal's Department of Computer Science and Operational Research and Scientific Director of the Montreal Institute for Learning Algorithms (**MILA**) and the Institute for Data Valorization (**IVADO**), which brings together researchers from HEC Montréal, Polytechnique Montréal, and Université de Montréal in data science..

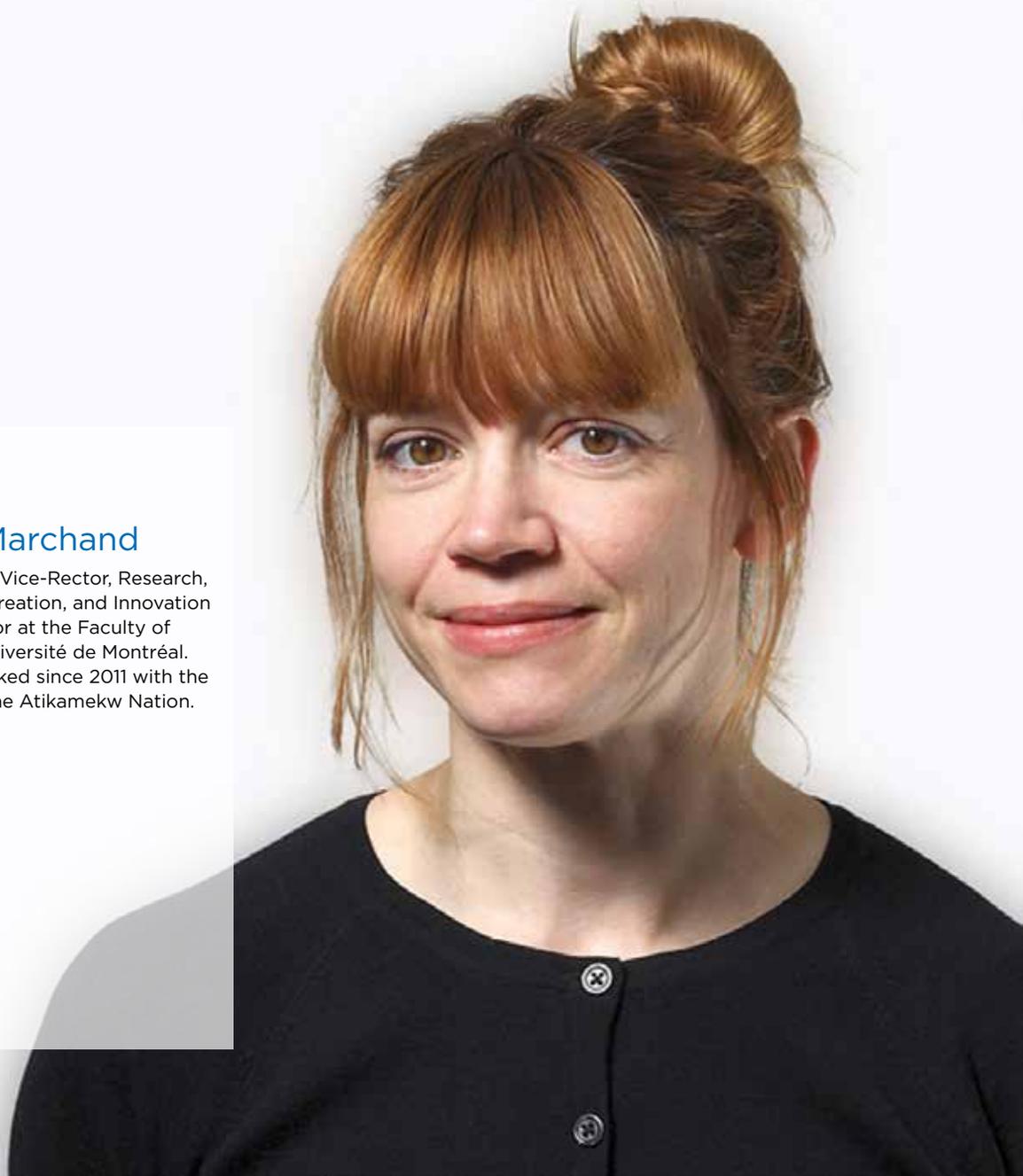


In this respect, UdeM's continued investment in the Érudit platform, created in 1998 by Université de Montréal Press, is exemplary. Érudit went from an enriched innovative digitization project (1998-2004) to a scientific dissemination platform of international calibre (2004-2013) to an experimental laboratory in digital humanities (2013), whose research potential, unique in the humanities and social sciences, is made possible through grants from the Canada Foundation for Innovation (Major Science Initiatives Fund competition, 2017-2022; Cyberinfrastructure Initiative competition, 2017-2020)

Érudit provides access to the bulk of French-language research results in Canada, 97% of which is distributed in open access. The extent and comprehensiveness of Érudit's research corpus makes it an essential tool in the documentation process, which fuels the work of researchers, and its digital expertise ensures the international dissemination of Québec research. In 2016, some 23 million pages were viewed by a readership of more than 70% from outside Canada.

## Anne Marchand

is Associate Vice-Rector, Research, Discovery, Creation, and Innovation and Professor at the Faculty of Planning, Université de Montréal. She has worked since 2011 with the Council of the Atikamekw Nation.

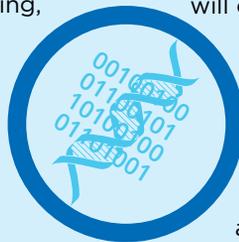


# Four structuring research projects

Structuring research projects bring together cross-cutting research topics to cultivate interactions between faculty, academic units, and partners, and establish close links between studies and research. These projects are based on unique interdisciplinary encounters whose purpose is to propose original and fruitful perspectives that offer answers to today's issues.

## Project 1 — From Data to Action in Health

Recognized hubs of excellence in data science and artificial intelligence come together at the Institute for Data Valorization (IVADO), which has received a \$93.6 million grant from the Canada First Research Excellence Fund. IVADO contributes to the advancement of knowledge and to training the next generation of data scientists at the cutting-edge of operational research and deep learning, and promotes the development of a new economy evolving around massive data processing to support decision-making.

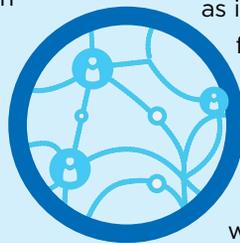


The project From Data to Action in Health, in conjunction with IVADO, aims to increase research and training opportunities at the interface between artificial intelligence, operational research, and life sciences.

The project will bring together the best of research in oncology, immunology, and cardiovascular and metabolic diseases. It will create or strengthen links between data science, biomedical sciences including therapeutic innovation and drug discovery, “omic” approaches, personalized health, imaging, patient expertise, health systems, ethics, and legal aspects, with the goal of adopting an interdisciplinary approach to the valorization of health data, in a perspective of social acceptability.

## Projet 2 – Understanding and Creating. Creating to understand

Understanding and Creating brings together the humanities and social sciences and arts and letters in an interdisciplinary perspective and provides an opening to intersectoral cooperation. The initiative is based on the premise that research and teaching can be an extraordinary way to empower people and communities based on their needs, strengths, and aspirations. The project was born from a firm desire to promote university-community permeability. It advocates the co-creation of knowledge and practices as well as research-creation as a space for dialogue and reciprocity with communities. The approach may involve the creation of a piece of work, a product, a material or virtual environment, a training activity, or a service, among other things.



Within the framework of Understanding and Creating, objects may include experiential knowledge, memory, culture, heritage, digital humanities, narratives, and the relationship between the arts, society, and the environment.

In addition to generating new teaching and research initiatives that may take such forms as interdisciplinary summer schools, field-based training organized around missions or challenges from the public, and innovative co-creation or research-creation projects, the project will develop new ways of interacting with the community, in particular, through the establishment of a platform for interaction with the public.

## Projet 3 — **Building a Sustainable Future**

Building a Sustainable Future brings together sectors of excellence from the fields of natural sciences, humanities and social sciences, public health, political science, and law — with a special purpose: to work in a coherent and concerted way to equip citizens and decision makers to confront socio-environmental and humanitarian challenges in a sustainable way.

The project will foster, among other things, closer links between our hubs of excellence in the areas of new materials, energy, transportation, public health, microbiology, animal welfare, biodiversity, land-use planning, and related regulatory mechanisms. The project will also build on the success of on-going interdisciplinary and inter-institutional initiatives, including IVADO, as well as our hubs of excellence in operational research and artificial intelligence.



## Projet 4 — Life Rethought

This project brings together the strengths of research in neuroscience, mental health, vision, rehabilitation, development, aging, and computational neuroscience to increase opportunities for innovation through the collision of ideas and expertise. The project is rooted in our hubs of excellence in both human and animal health and embraces life from beginning to end. It promotes exchanges between teams interested in early life and childhood, and seniors and end of life.

The project enables collaborations that touch on both the physiological mechanisms of development and aging and the social, organizational, and political interrelationships underlying the demographic changes that characterize 21st century society. Thus, by considering life from beginning to end, and its organization, this project calls us to review our fundamental understanding of thought, language, memory, movement, and learning, as well as individual and collective mechanisms and technologies of adaptation.





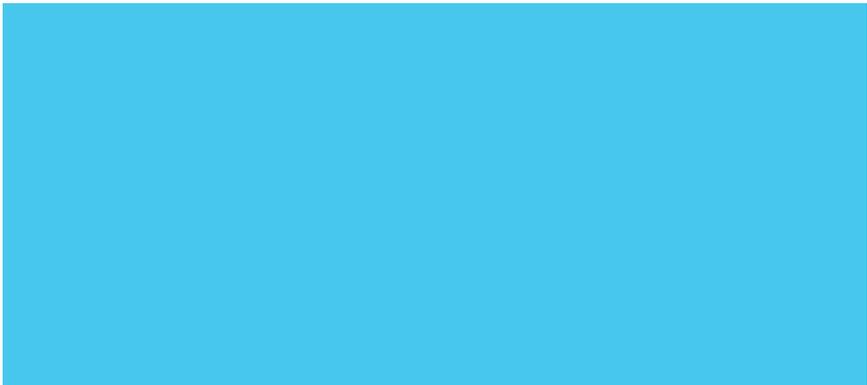
Université  
de Montréal

The future Campus MIL of  
Université de Montréal

# Conclusion

The orientations and strategies presented here are an invitation to mobilize for our community and partners, and a road map for faculty, school, and department administrations.

We wish to thank all those who contributed to this work through the wealth of their reflections, generosity, and commitment.



# Appendix

## Sectors of excellence for UdeM

UdeM's sectors of excellence are the result of concerted development efforts and investments over many years. Each sector targets a unique field of research that is exceptional and impactful, as well as an innovative approach to research and creation, with a great potential for interdisciplinarity.

Our sectors of excellence constitute the foundations on which we base the development of strategic, original and innovative research groups. In this section, the sectors are presented in terms of a series of keywords that focus on specific fields of expertise.

## List of sectors of excellence



## 1. Acquisition of knowledge

- Theories, policies, measures and ultimate goals of education
- Images in motion
- Languages (oral, musical, visual, digital, the teaching profession — education)
- Learning, psychology and development

## 2. Creation and experiential knowledge

- Research-creation (music, film, design, urban planning, architecture, literature)
- Co-creation/co-construction, reception and audiences (narratives, urban planning, music, patient involvement, community involvement)
- Digital humanities
- Indigenous perspectives and practices
- Gender studies (diversity, equity)
- Film, art history and video games

## 3. Imagination, values and collective heritages

- Diversity and interculturalism
- Language, literature and society
- Intermediality (music, film, literature, communication, video games, interactive design, art history)
- Religions and sociocultural perspectives of the sacred
- Memory, heritage and civilization (digital and conservation tools)

## 4. Foundations of reality

- Mathematics
- Physics and foundations of matter
- Universe and exoplanets
- Nature of reality, philosophy, cosmogony

## 5. The brain, thinking, perception

- Cognition and neurosciences (motor control and oral motor control, vision, pain, musical neurocognition, trauma, CVA, sleep, organic brain syndrome)
- Neuropsychology and psychology
- Epistemology (anthropology, linguistics, sociology)

## 6. The life cycle

- Beginning of life (reproduction, conception, birth, prematurity)
- End of life (aging, death)
- Development (adaptation through life, developmental psychology and biology)
- Extremes of life (health, adaptation to school, adapted environments)

## 7. Social and political organization

- Family and communities (new family models in health care)
- Demographic change (migratory flows, Indigenous communities, intergenerationality)
- Society and living together (organizational communication, labour market, regulation, security, transportation and mobility, social inclusion, social justice and vulnerable individuals, consultation and public debate, public space, transformation of cities, new economic models, microcredit)
- International relations (mobility and international trade, globalization and circulation of legal models)

## 8. Biodiversity

- The food industry and animal health (animal welfare, zoonoses, urban agriculture)
- Fabricating nature
- Plant biodiversity
- Population health

## 9. Ethics and politics

- Ethics, equity and fundamental rights
- Law and emerging technologies - cyberjustice
- Cybercrime, cybersecurity
- Legislation and public policy
- Privacy, confidentiality
- Social responsibility and justice
- Governance and regulation
- Socially responsible development of artificial intelligence

## 10. Determinants of health

- Psychological, sociological and economic determinants (mental health, aggression, violence, social and economic status, inequalities)
- Genetics
- Lifestyle habits (physical activity and exercise, cardio-metabolics, nutrition, hygiene and oral health)
- Host-environment links (toxicology, built environment, immunology-Infection-Inflammation)
- Oncology
- Chronic illnesses
- Quality of life

## 11. Collective systems

- Political systems (globalization and internationalism, individual and collective rights, diversity and social inequalities, demographic change, governance and communities)
- Health systems (international health, health-care system, Indigenous health, rights and legislation, organization of work, public health)
- Education systems (education policy, measures and assessments, diversity and inequality, learning places)

## 12. Environment and sustainable development

- Environment (water, ecotoxicology, energy, climate change)
- Sustainable development (green chemistry, electrification, land use planning and the landscape, memory and heritage, sustainable living environments, energy, logistics, transportation, sustainable services and products, reconstruction, circular economy, governance, corporate social responsibility)

## 13. Data in action

- Artificial intelligence (machine learning, deep learning, neural networks)
- Science of decision-making (mathematical optimization, operational research, bioinformatics)
- Statistics (biostatistics, social statistics)
- Digital and information sciences
- High-throughput approaches (genomics, proteomics, metabolomics)
- Recognition (imagery/image, language, movement, data visualization)

## 14. Therapeutic innovation

- Chemistry of health and medicinal chemistry
- Nanomedicine
- Immunotherapy and cell therapy
- Rehabilitation
- Personalized and precision medicine
- e-health (e-health, oral e-health, game therapy)

## 15. Innovative systems

- Information technologies in teaching
- Learning health systems
- Transformation of systems (health care, education, politics, law)
- Human interactions in a digital world (virtual reality, distance collaboration, video games, digital tools and conservation, security)

## 16. New materials

- Nanotechnology
- Innovative materials
- Tissues and membranes
- Innovative use of materials

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